Flood-Depth Frequency Relations for Streams in Alabama

by D.A. Olin

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Factors for converting inch-pound units to International System of units (SI) and abbreviation of units.

Multiply	By	To obtain
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meter per second per square kilometer [$(m^3/s)/km^2$]

FLOOD-DEPTH FREQUENCY RELATIONS FOR STREAMS IN ALABAMA

by D. A. Olin

ABSTRACT

Equations are defined for estimating the depth of water for floods having recurrence intervals of 2, 5, 10, 25, 50, 100, and 200 years on rural and urban streams in Alabama. Multiple regression analyses were made using the "maximum RSQUARE improvement" procedures. The dependent variable was the flood depth and the independent variables were 10 basin and climatic characteristics. For rural streams, drainage-area size (0.44 to 1,344 square miles) was the only statistically significant independent variable tested to estimate flood depths in six different hydrologic areas. Other variables affecting flood-depth relations are reflected in the equation constant and coefficient for each hydrologic area. These account for differences in geologic and topographic characteristics. For urban streams, drainage-area size (0.16 to 83.5 square miles) and percent impervious area (8.3 to 42.9 percent) of the basin were the most significant independent variables tested to estimate flood depths.

For most streams where the drainage area is larger than 1,344 square miles, the drainage basin extends into more than one hydrologic area and the equations presented would not apply. Flood-profile data and gaging-station records are available from the U.S. Geological Survey for use in estimating flood depths for these large streams. Flood-routing and historic flood profiles are also available for many of the large streams which have flood regulation.

INTRODUCTION

The Alabama Highway Department designs bridges, culverts, and highway embankments on the basis of the rate of discharge (magnitude) and the height (depth) of floods. Depending on the importance of the highway, the 10-, 25-, 50-, or 100-year flood depth and magnitude are used in the design. The 10-year flood having a one in ten chance of occurring in one year. Additionally, the 2-, 5-, and 200-year flood depth and magnitude are used by governmental agencies responsible for land-use development, flood-plain zoning, and flood-insurance studies.

When the U.S. Geological Survey began preparing maps of flood-prone areas as directed by the 89th Congress in House Document 465 (1966), a need arose for a method of determining flood depths for use in delineating approximate flood-prone areas. Regional flood-depth-frequency relations were developed in Alabama for this purpose (Hains, 1977). Since that report was published, more flood data have been collected. Updated techniques for estimating flood depths on most streams in Alabama were derived for this study. Data for small rural and urban streams in addition to the stations used in Hains's report, including flood records collected through 1983, were used in the analysis.

The purpose of this report is to present equations for estimating depths of floods having recurrence intervals of 2, 5, 10, 25, 50, 100, and 200 years. Equations and graphs for six different hydrologic areas for rural streams and one set for urban stations statewide are given as the result of flood-depth frequency studies in Alabama.

This report was prepared by the U.S. Geological Survey in cooperation with the Alabama Highway Department. It is based on data collected as a part of a cooperative program with the Alabama Highway Department, the Federal Highway Administration, and other State, municipal, and Federal agencies.

DETERMINATION OF FLOOD-DEPTH FREQUENCY RELATIONS

Streamflow and stage records are available for 164 gaging stations on rural streams and 23 gaging stations on urban streams in Alabama. Records were analyzed to provide equations for estimating the depth of floods in these streams with recurrence intervals of 2, 5, 10, 25, 50, 100, and 200 years. Of these 187 stations, six rural gaging stations were deleted for the following reasons: (1) variable backwater during floods, (2) stage-discharge relations not defined, (3) regulation of floods by storage reservoirs upstream from the gaging station, or (4) too much variation in elevation of the point of zero flow. One urban station was deleted because urban development changed the size of the drainage area several times during the period of record. For location of the 22 urban gaging stations see figure 1 in the report by Olin and Bingham (1982). The locations of the remaining 158 gaging stations on rural streams are shown in figures 1 through 4.

Flood depths were computed as the differences in the elevation of the point of zero flow and the elevation of the flood. The elevation at the point of zero flow was computed from discharge measurements made in the vicinity of the gaging station and stage-discharge relations. Discharges were obtained for the 2-, 5-, 10-, 25-, 50-, 100-, and 200-year floods at stations using procedures from "Magnitude and Frequency of Floods in Alabama" by Olin (1984). The depths for each recurrence interval at each gaging station are shown in the Supplementary Data section at the end of this report. Selected data from two completed studies are included in the Supplementary Data section. The first study was for 37 small rural streams (Olin and Bingham, 1977) and the second for 23 urban streams in Alabama (Olin and Bingham, 1982). Synthetic data derived from a rainfall-runoff model were used in both of these studies.

Regression Analysis

Since flood-depth information is collected only at gaging stations, mathematical methods are required to transfer the measured information to ungaged sites within the State where flood-depth information is needed. Regional analysis is a method of doing this. The regression method described by Riggs (1973) is a useful means of regionalization within a State because flood depth for a selected flood recurrence interval can be related to basin and climatic characteristics.

The regression model used in this study is of the form

$$Dn = aX^{b} Y^{c} Z^{d}$$

where Dn = flood depth above bottom of channel having an n-year recurrence interval (dependent variable),

X, Y, Z = basin and climatic characteristics of drainage basin (independent variables), and

a, b, c, d = constant and coefficients for a given recurrence interval n.

A previous study in Alabama (Hains, 1977) indicated that flood depth is linearly related to the drainage area of the basin in hydrologically similar areas if the logarithmic-transformed data are used. Therefore, in this study all values of flood depths and drainage basin characteristics were transformed to logarithmic values. Multiple regressions were performed using the stepwise procedure "maximum RSQUARE improvement" (MAXR) (SAS, 1982).

RSQUARE is the coefficient of determination (square of the multiple correlation coefficient); it measures how much variation in the dependent variable can be accounted for by the model (independent variables). The MAXR method begins by finding the one-variable model producing the largest RSQUARE and adds another variable that will produce the largest increase in RSQUARE. Each variable in the two-variable model is compared to each variable not in the model. MAXR determines if removing one variable and replacing it with another would improve RSQUARE. Comparison or replacement of variables continues until the "best" two-variable model, three-variable model, and so forth, is derived.

The drainage basin characteristics tested for significance (5-percent level) in the regression are:

- Drainage area (A), in square miles. The total drainage area upstream from the gaging station, as planimetered from U.S. Geological Survey topographic maps or aerial photographs.

- Main channel slope (S), in feet per mile. The average slope between points 10 and 85 percent of the distance from the gaging site to the basin divide.

- Main channel length (L), in miles. The length of the main channel between the gaging site and the basin divide, as measured along the channel which drains the largest area of the basin above each junction.

- Mean basin elevation (E), in feet. The mean elevation of the entire basin above National Geodetic Vertical Datum of 1929, measured from topographic maps by transparent grid-sampling method (20 to 60 points sampled in each basin).

- Storage (St). The surface area of lakes, ponds, and swamps expressed as a percentage of the total basin drainage area.

- Forest cover (F), in percent. The area of forest expressed as a percentage of the total drainage area.

- Soils index (Si), in inches. Data obtained from a previous flood report by Olin (1984).

- Mean annual precipitation (P), in inches. Data obtained from Climates of the States (U.S. Weather Service, 1957).

- 24-hour 2-year interval rainfall (I24-2), in inches. Data obtained from Technical Paper 40 (U.S. Weather Bureau, 1961).

- Latitude and longitude of the gage (LAT and LONG), in degrees. Data obtained from the previous flood report by Olin (1984).

- Impervious area (IA), in percent. Data obtained from previous urban flood report (Olin and Bingham, 1982).

The multiple regression analysis of the data for 22 urban stations indicated that, of the characteristics tested, the most significant were the drainage area and the percent of the basin occupied by impervious area. Residuals of this regression were plotted on a map of Alabama and no geographic bias was detected.

The regression equations for urban streams are of the form:

$$Du = a\,(A)^{b}\,(IA)^{c}$$

where Du is the flood depth, in feet,

A is the drainage area, in square miles, and

IA is the impervious area, in percent of total drainage area.

The equations for estimating flood depths for the 2-, 5-, 10-, 25-, 50-, 100-, and 200-year recurrence-interval floods on urban streams are given in table 1.

The multiple regression analysis of the data for 158 rural stations indicated that the most significant characteristic tested was the drainage area. The residuals of this regression were plotted on a map of Alabama to check for geographic bias. A geographic bias was detected and the State was divided into six hydrologic areas. The boundaries of the six hydrologic areas initially were chosen to agree with those used in a report by Olin (1984), and then were modified and are shown on figure 5.

Table 1.--Regression equations

[A = drainage area, in square miles, and IA = impervious area, in percent of drainage area]

Recurrence interval, in years	Urban streams		Hydrologic-area number for rural streams				
			1 & 6	2	3	4	5
2	$1.725(A)^{0.231}$	$(IA)^{0.336}$	$3.223(A)^{0.280}$	$2.939(A)^{0.255}$	$3.844(A)^{0.195}$	$4.146(A)^{0.265}$	$3.180(A)^{0.265}$
5	$1.719(A)^{0.237}$	$(IA)^{0.420}$	$4.397(A)^{0.262}$	$3.533(A)^{0.240}$	$5.083(A)^{0.186}$	$5.844(A)^{0.226}$	$3.978(A)^{0.259}$
10	1.961(A)0.2[illegible]	$(IA)^{0.425}$	$5.091(A)^{0.253}$	$3.887(A)^{0.233}$	$5.917(A)^{0.178}$	$6.939(A)^{0.207}$	$4.557(A)^{0.250}$
25	$2.182(A)^{0.218}$	$(IA)^{0.437}$	$5.907(A)^{0.244}$	$4.311(A)^{0.227}$	$7.049(A)^{0.166}$	$8.252(A)^{0.187}$	$5.232(A)^{0.242}$
50	$2.353(A)^{0.216}$	$(IA)^{0.437}$	$6.449(A)^{0.239}$	$4.526(A)^{0.226}$	$7.920(A)^{0.158}$	$8.983(A)^{0.180}$	$5.708(A)^{0.237}$
100	$2.523(A)^{0.214}$	$(IA)^{0.437}$	$7.024(A)^{0.233}$	$4.744(A)^{0.225}$	$8.792(A)^{0.149}$	$9.744(A)^{0.172}$	$6.120(A)^{0.233}$
200	$2.558(A)^{0.213}$	$(IA)^{0.453}$	$7.551(A)^{0.230}$	$5.025(A)^{0.221}$	$9.443(A)^{0.145}$	$10.530(A)^{0.165}$	$6.532(A)^{0.230}$

A second multiple regression analysis was made on the data for the rural stations grouped into the six hydrologic areas. The residuals from this second regression when plotted on a map of Alabama showed no geographic bias except for hydrologic area 6. Two stations in hydrologic area 6 [Big Escambia Creek at Flomaton, Ala. (02375000) and Franklin Creek near Grand Bay, Ala. (02480150)] had flood depths closely related to those of hydrologic area 5. For this report the boundary of hydrologic area 6 was redrawn so that these two stations would be in hydrologic area 5.

Flood depths from the remaining stations in area 6 were combined with flood depths from stations in hydrologic area 1 and another regression performed. Residuals from this regression were plotted on a map and no bias was detected. One reason that the flood depths in areas 1 and 6 are similar is that the flood magnitudes for streams in each area have similar characteristics and were estimated from the same equations (Olin, 1984).

The regression equations for rural streams are of the form:

$$Du = a\,(A)^{b}$$

where Du and A are as defined above. The equations for estimating flood depths for the 2-, 5-, 10-, 25-, 50-, 100-, and 200-year recurrence-interval floods for rural streams in hydrologic areas 1 through 6 are given in table 1.

Drainage area for the rural gaging stations used in the regression analyses ranged from 0.44 to 1,344 mi^2. However, the distribution of drainage areas varies from one hydrologic area to another. The following table shows the range of drainage areas for each hydrologic area, and the drainage area and percent impervious area ranges for the urban stations. The user is cautioned that if the equations are used outside the limits shown, errors may be greater than those defined by the data.

Ranges of drainage area and percent impervious area

Hydrologic area nos.	Drainage area	Percent impervious area
1, 6	0.44 to 1,027	--
2	3.65 to 769	--
3	1.27 to 792	--
4	2.69 to 333	--
5	1.44 to 1,344	--
Urban	0.16 to 83.5	8.3 to 42.9

Accuracy and Limitations

The reliability of the flood-depth frequency equations is approximated by the standard error of regression of the equations. The standard error of regression is the standard deviation of the distribution of residuals about the regression line. This means that approximately two-thirds of the values estimated are within one standard error and 95 percent are within two standard errors of the observed values. The errors associated with the use of the equations to estimate flood depths in ungaged streams are unknown. The errors are assumed to equal the standard errors of the regression equations. Table 2 gives the standard error of estimate by hydrologic area for the selected recurrence intervals.

The urban equations should not be used in hydrologic area 4. The rural equations estimate larger flood depths for some recurrence intervals in hydrologic area 4 than the urban equations due to the area having impervious chalk and marl which produces high runoff. The equations should not be used for any streams subject to regulation, significant channelization, or where other man-made structures significantly affect peak stage, discharge, or channel slope.

A check for bias in differences in flood depths from station data and flood depths from estimating equations showed that the equations tend to overestimate the 2-year recurrence interval depths by an average of 7 percent and under estimate the 200-year recurrence interval by an average of 25 percent.

In computing flood-depths for a minor tributary near the confluence of a major tributary, the drainage area below the confluence should be used in the areas of backwater because the major tributary would cause backwater for some distance upstream in the minor tributary.

The equations should not be used for streams with drainage areas larger than those of the gaging stations used to define them. If information about flood depths is needed for these large area streams contact the U.S. Geological Survey.

Table 2.--Standard errors of estimate, in percent, for regression equations

Recurrence interval, in years	Urban streams	Hydrologic-area number for rural streams				
		1 & 6	2	3	4	5
2	23	27	18	26	27	24
5	23	28	19	22	28	24
10	25	28	19	21	28	25
25	25	29	19	19	29	27
50	25	30	19	18	28	28
100	25	31	19	17	28	28
200	26	32	20	17	29	29

USE OF FLOOD-DEPTH EQUATIONS

Flood depths can be estimated for the 2-, 5-, 10-, 25-, 50-, 100-, and 200-year recurrence intervals for most ungaged rural streams within the drainage area limits shown on page 6 and urban streams with drainage areas from 0.16 to 83.5 mi^2 with impervious areas from 8.3 to 42.9 percent by solving the equations in table 1. The hydrologic areas needed for selecting the applicable equations are shown in figure 5. Graphs showing the relation of flood-depth versus drainage area were prepared using the equations in table 1 for estimating the 2- through 200-year depths for each hydrologic area for rural streams (figs. 6-10) and for urban streams in Alabama (figs. 11-17). Flood depth estimated from these equations and graphs is the depth in feet from the points of zero flow to the water-surface elevation. The boundaries of the hydrologic areas shown in figure 5 were drawn to avoid crossing most streams except for large streams (streams with drainage areas greater than those used to define the equations). For ungaged basins lying in more than one hydrologic area, flood depths downstream from the boundary can be estimated by using the following weighting equation.

$$\log(Ds) = 1.66 \left\{ \log(2As/Ab) \left[\log(Ddw/Dup) \right] \right\} + \log(Dup)$$

where Ds is the depth at the study site,

Ddw is the depth at a site where the drainage area is two times the drainage area at the boundary between the hydrologic areas. This depth is estimated from the equation for the downstream hydrologic area,

Dup is the depth at a site where the drainage area is 0.5 times the drainage area at the boundary between the hydrologic areas. This depth is estimated from the equation for the upstream hydrologic area,

As is the drainage area at the study site, and

Ab is the drainage area at the boundary between the hydrologic areas.

Flood-depth relations should not be used to obtain flood discharges; the methods for discharge estimation are presented in the report by Olin (1984).

As an example, the depth of the 25-year flood may be estimated by the following procedure:

1. Locate the drainage basin in figure 5 to find which hydrologic area it is in. For example, Mulwee Branch at County Road 48, near Old Bethel, Colbert County, lies in hydrologic area 1.

2. From the best topographic map or aerial photograph, determine the drainage area size upstream from the site at the road crossing. The drainage area size as determined from a U.S. Geological Survey quadrangle map is 1.70 mi^2.

3. Using the equations for hydrologic area 1 from table 1 or the graph in figure 6, the 25-year flood depth is determined as 6.7 ft above the point of zero flow. This is the estimated 25-year flood depth for Mulwee Branch near Old Bethel.

The user is cautioned that the urban equations should be used for computing flood depths in urban areas if the impervious area is greater than the lower limit shown in the following table. If impervious area is less than the lower limit shown, use the applicable rural equations. The urban equations should not be used in hydrologic area 4.

Hydrologic area	Lower limit of impervious area, in percent
1, 6	13.0
2	8.3
3, 5	9.5

The depth of a flood for selected recurrence intervals for an urban stream may be estimated by the following procedure:

For example, the depth of a 50-year flood is needed for Cribbs Mill Creek at Kauloosa Avenue in Tuscaloosa.

1. From the best topographic map or aerial photograph, determine the drainage area size. By using the grid method, (Olin and Bingham, 1982) determine the percent of the drainage area that is impervious. The drainage area size as determined from a U.S. Geological Survey quadrangle map is 10.7 mi^2, of which 22.3 percent is impervious.

2. Using the equations for urban areas in table 1, the 50-year flood depth is determined as 15.2 ft above the point of zero flow. This is the estimated 50-year flood-depth for Cribbs Mill Creek at Kauloosa Avenue in Tuscaloosa.

The following procedure is recommended for estimating flood depths for an ungaged site on the same stream as one of the gaged sites listed in Supplementary Data. The procedure is used for sites where the ungaged area is within 50 percent of the gaged area. Flood depth data can be estimated by using nearby gaged site data at the ungaged site and weighting with the regression data for the ungaged site. Locate the gaged site on the topographic map. Check the reach between the gaged and ungaged sites to see if the flood plain and channel slope are fairly uniform. If they are, the flood depth at the gaged site can be transferred either upstream or downstream by the following equation:

$$Du = [(Au/Ag)^b]\ Dg$$

and a weighted value can be computed by the equation:

$$Dw = (2\Delta A/Ag)\ Dr + [1-(2\Delta A/Ag)]\ Du$$

where Du is the flood depth at the ungaged site for the selected recurrence interval transferred from the gaged site;

Dg is the flood depth for the selected recurrence interval at the nearby gaged site from the Supplementary Data;

Dr is the regional flood depth for the selected recurrence interval at the ungaged site computed from the applicable hydrologic area equation;

Dw is the weighted flood depth for the selected recurrence interval at the ungaged site;

b is the drainage area regression exponent from table 1 for the applicable hydrologic area and selected recurrence interval;

Au is the drainage area at the ungaged site;

Ag is the drainage area at the gaged site; and

ΔA is the difference between the drainage areas of the gaged and ungaged site.

The difference in drainage area between the two sites should be less than 50 percent. If the difference in drainage area is more than 50 percent or the flood-plain width and channel slope in the reach is not uniform, then use the applicable regression equations (table 1).

The depth of floods for selected recurrence intervals of an ungaged site on the same stream as a gaged site may be determined for example, by the following procedure:

1. Locate the stream in figure 5 and the gaging station location in figures 1 through 4. For example, Kelly Creek at mouth of and including Wolf Creek about 1.7 miles southeast of Lawley, in Shelby County, lies in hydrologic area 1.

2. For the gaging station on Kelly Creek, station 02405500, obtain from Supplementary Data the drainage area, Ag, of 193 mi^2 and the 100-year flood-depth, Dg, of 26.6 ft.

3. For the ungaged site, determine the drainage area, Au, of 175 mi^2.

4. From table 1, obtain "n" of 0.233 for hydrologic area 1 for the 100-year equation.

5. Transfer the 100-year flood depth from the gage site using

$$Du=\left(\frac{Au}{Ag}\right)^{b} Dg = \left(\frac{175}{193}\right)^{0.233} \left(26.6\right) = 26.0 \text{ ft}$$

6. The regional 100-year flood depth estimated using the areal equation is

$$D_r = 7.024(A)^{0.233} = 7.024(175)^{0.233} = 23.4 \text{ ft}$$

7. The weighted 100-year flood depth is estimated using

$$D_w = \left(\frac{2\Delta A}{Ag}\right) Dr + \left(1 - \frac{2\Delta A}{Ag}\right) Du = \left(\frac{36}{193}\right) 23.4 + \left(1 - \frac{36}{193}\right) 26.0 = 25.5 \text{ ft}$$

The weighted 100-year flood depth at the ungaged site upstream from Kelly Creek, station 02405500, is 25.5 ft.

SUMMARY

This report presents methods and examples for determining flood-depths for rural and urban streams in Alabama that can be used in designing highways, culverts, and bridges.

The depths of floods at gaging stations were computed by taking the difference between the elevation of floods with recurrence intervals of 2, 5, 10, 25, 50, 100, and 200 years and the elevation at the point of zero flow. The elevation at the point of zero flow was determined from the latest stage-discharge relation and discharge measurements made in the vicinity of each gaging station. The elevations of the flood peaks were determined from the latest stage-discharge relation for each station.

Multiple regression analyses were made using the "maximum RSQUARE improvement" procedures. The dependent variable was the flood depth and the independent variables were 10 basin and climatic characteristics. Drainage area was the only independent variable significant at the 5-percent level for rural streams. Drainage-area size and percent impervious area of the basin were significant for urban streams.

Residuals from the regression of urban stream data were plotted on a map of Alabama and no geographic bias was detected. The residual plot from the regression of rural stream data showed geographic bias and the plot was used to redraw boundaries of six hydrologic areas used in Olin's (1984) flood report. Regressions were run using the stations grouped in each of the hydrologic areas. The plot of these residuals for each hydrologic area showed no geographic bias. Stations in hydrologic areas 1 and 6 were combined and a single set of flood-depth equations was determined for these two areas.

The urban equations should not be used in hydrologic area 4. The rural equations for hydrologic area 4 estimate larger flood-depths then the urban equations for some recurrence intervals. Area 4 has impervious chalk and marl which causes the high runoff. The rural equations should be used for urban streams where the percent impervious area is less than the lower limit shown in the use of flood-depth equations section of this report. Urban equations should not be used for streams in some of the hydrologic areas when the impervious area is 13 percent or less. Urban equations underestimate the flood depth for urban streams when the impervious area is 13 percent or less in some of the hydrologic areas. The equations should not be used for streams subject to regulation or significant channelization, or where other manmade structures significantly affect peak stage, discharge, or channel slope. The rural equations can be used for streams with drainage areas within the limits shown in this report (0.44 to 1,344 mi^2), and the urban equations can be used for streams with drainage areas of 0.16 to 83.5 mi^2 and impervious areas from 8.3 to 42.9 percent.

When computing flood depths for a minor tributary near the confluence of two streams, use the drainage area below the confluence in the area of backwater is because the larger tributary would probably cause backwater for some distance upstream in the smaller tributary.

The flood-depth relations should not be used to compute flood discharges; methods for computing flood discharges are given in the report by Olin (1984).

For most streams where the drainage area is greater than indicated, flood-profile data and gaging station records are available for use in estimating flood-depths. Flood routing and historic flood profiles are available for many of the large streams which have flood regulation.

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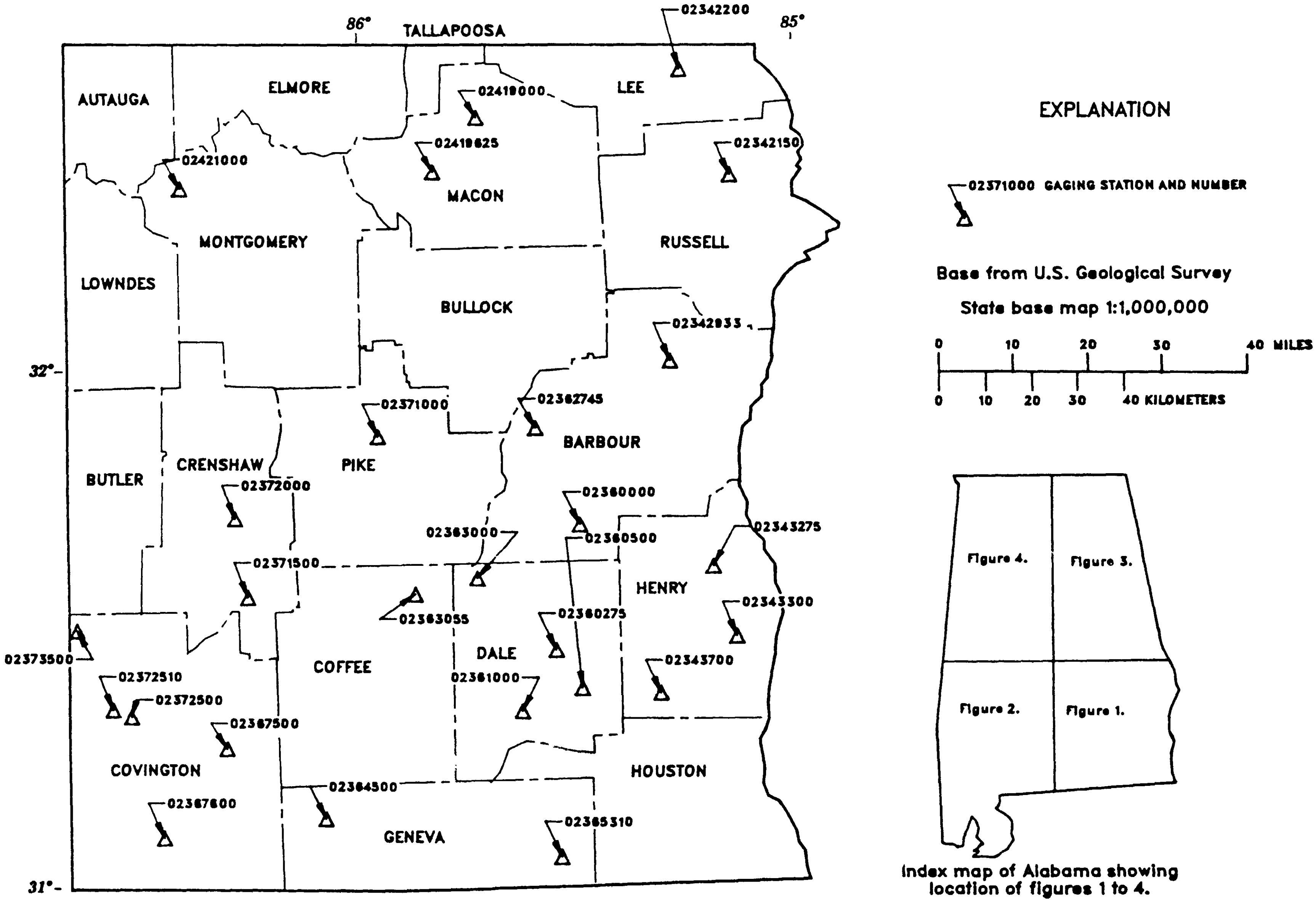


Figure 1. – Location of gaging stations in southeastern Alabama.

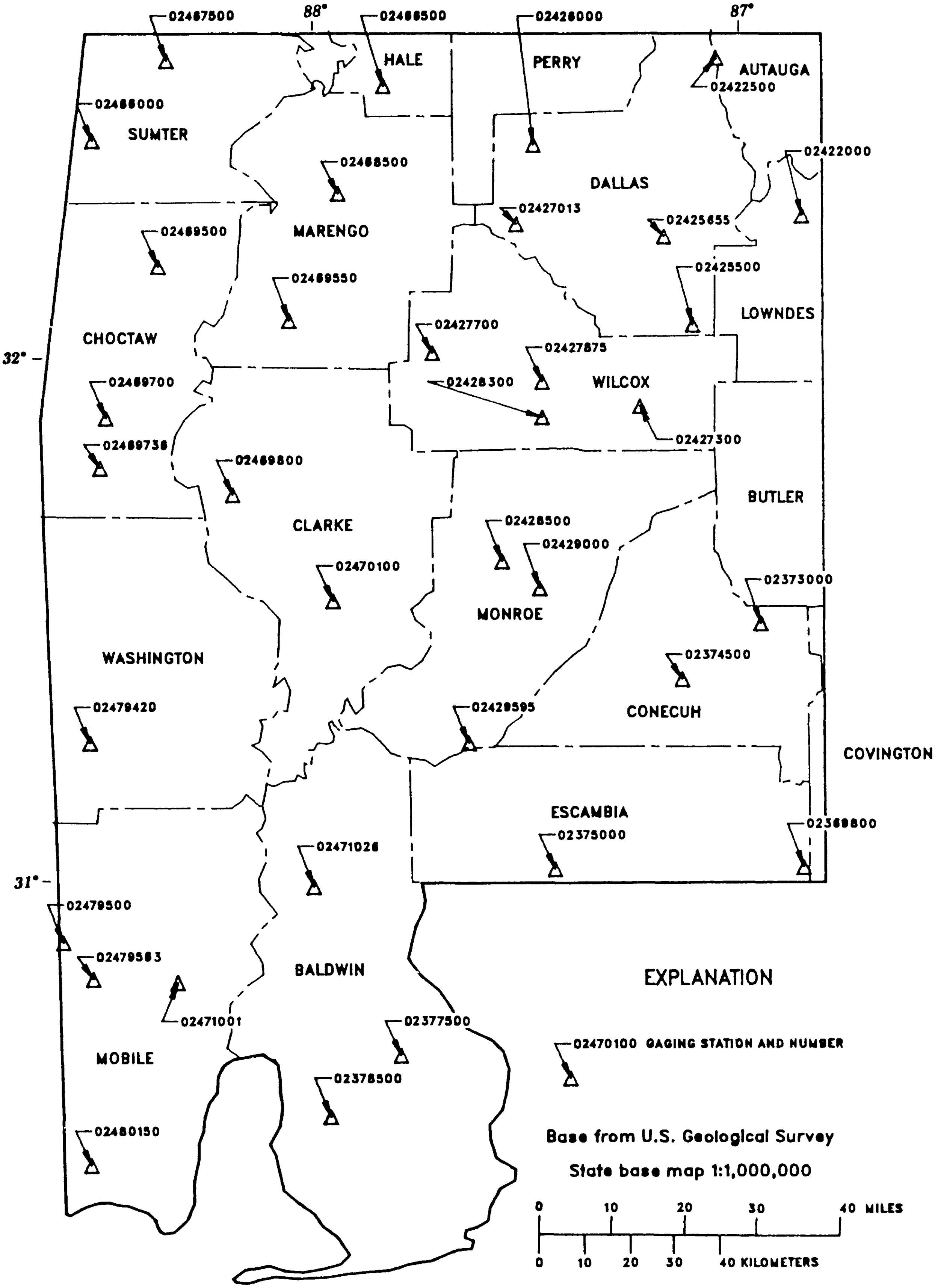


Figure 2. – Location of gaging stations in southwestern Alabama.

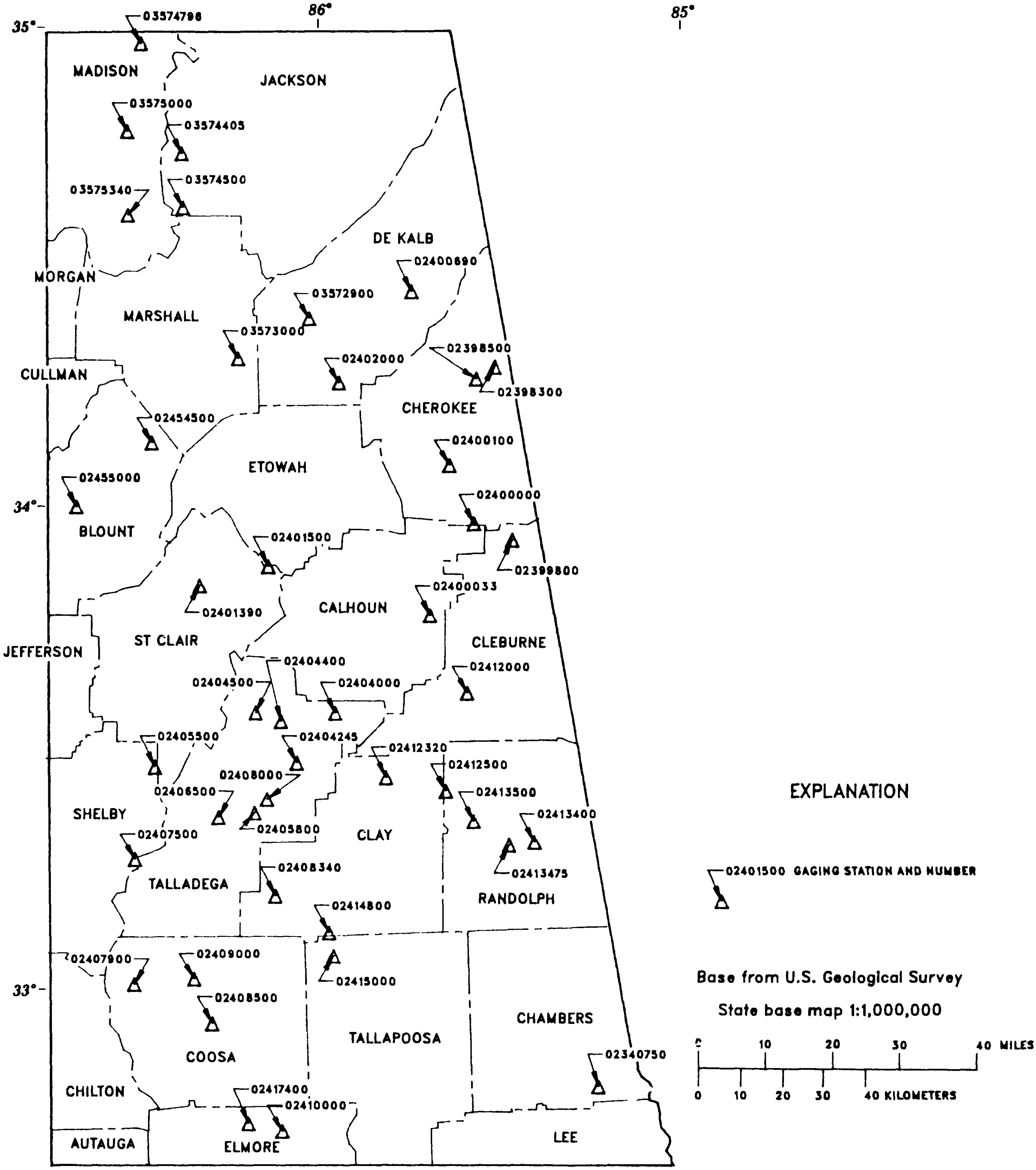


Figure 3. – Location of gaging stations in northeastern Alabama.

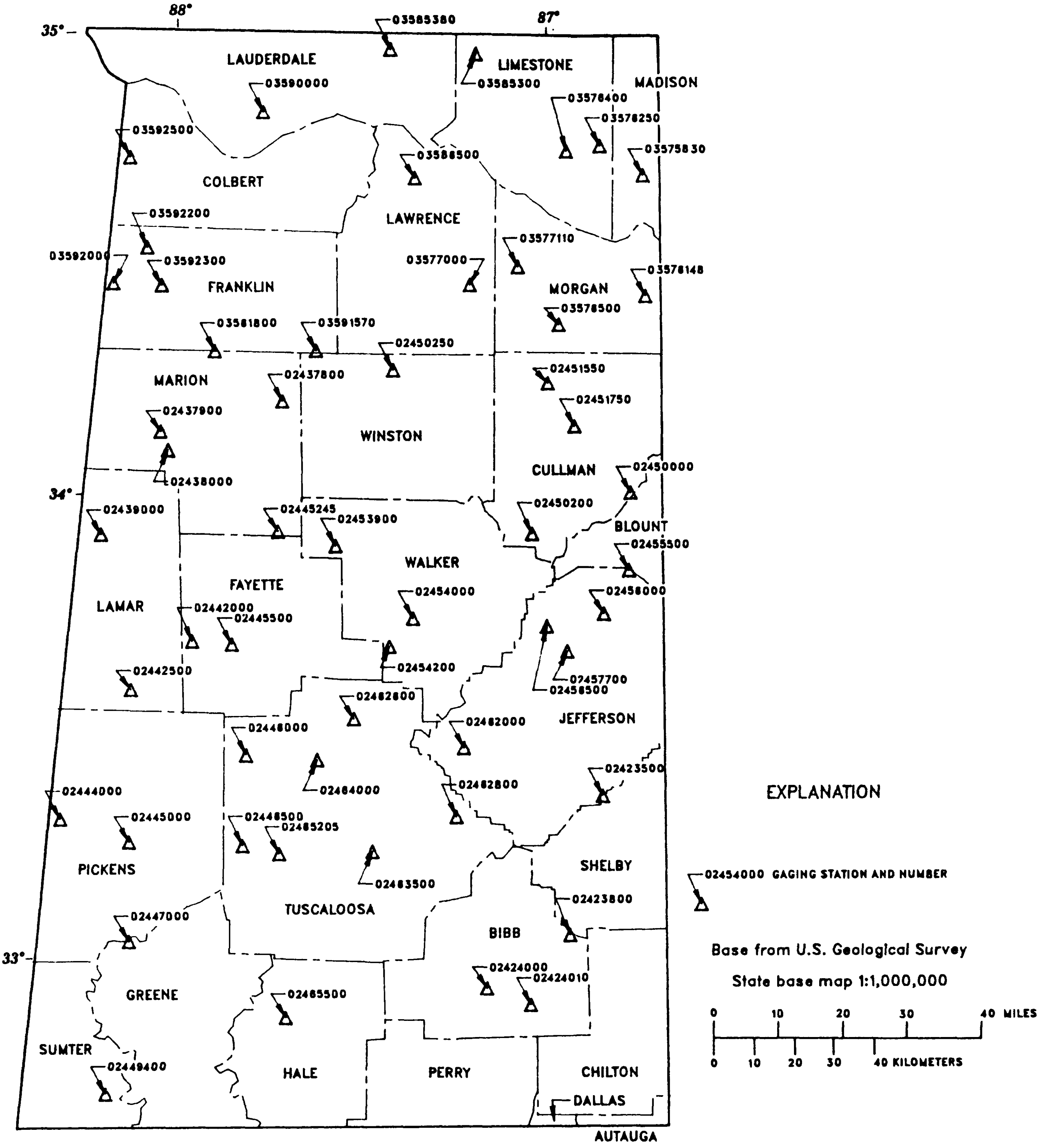


Figure 4. – Location of gaging stations in northwestern Alabama.

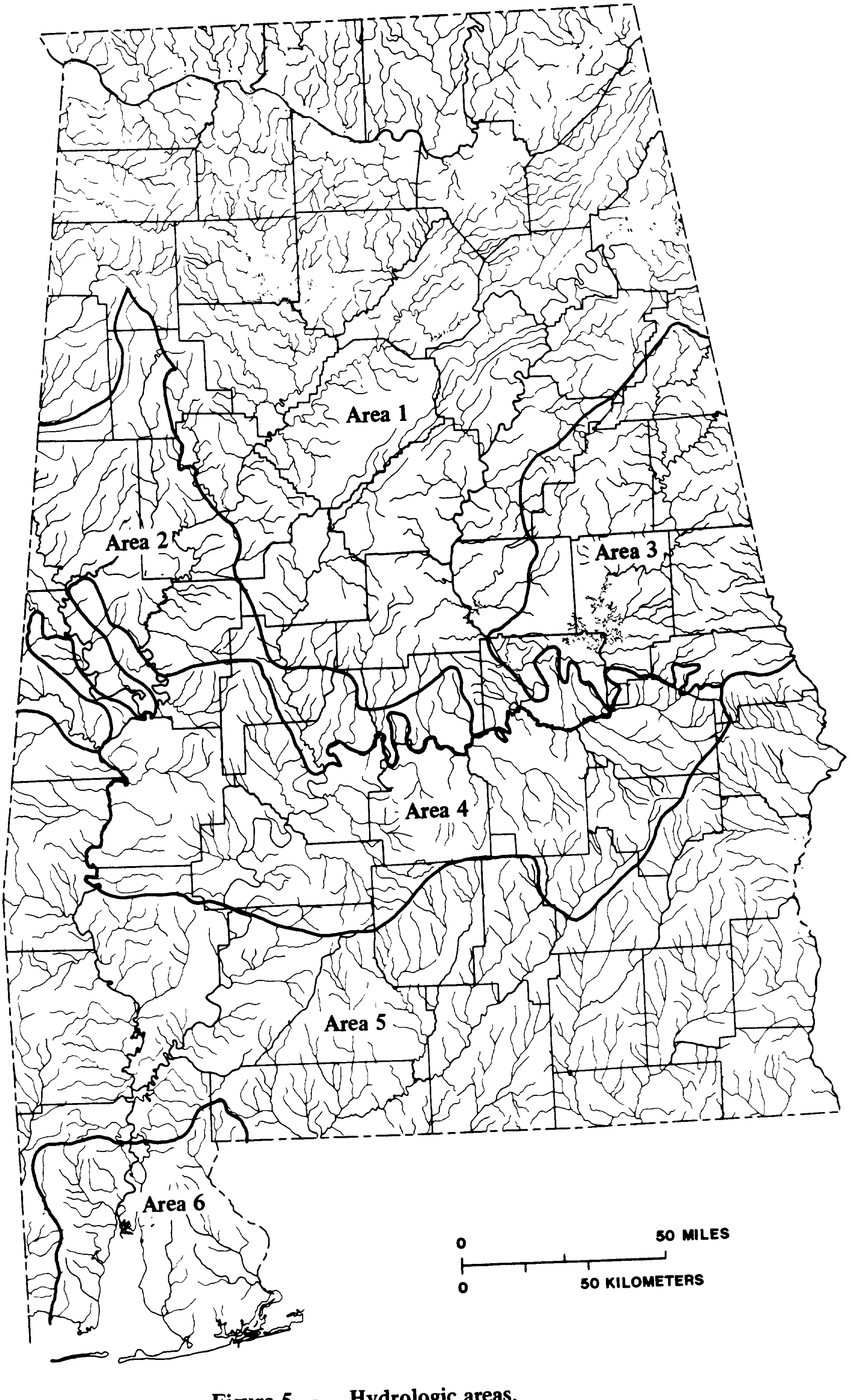


Figure 5. – Hydrologic areas.

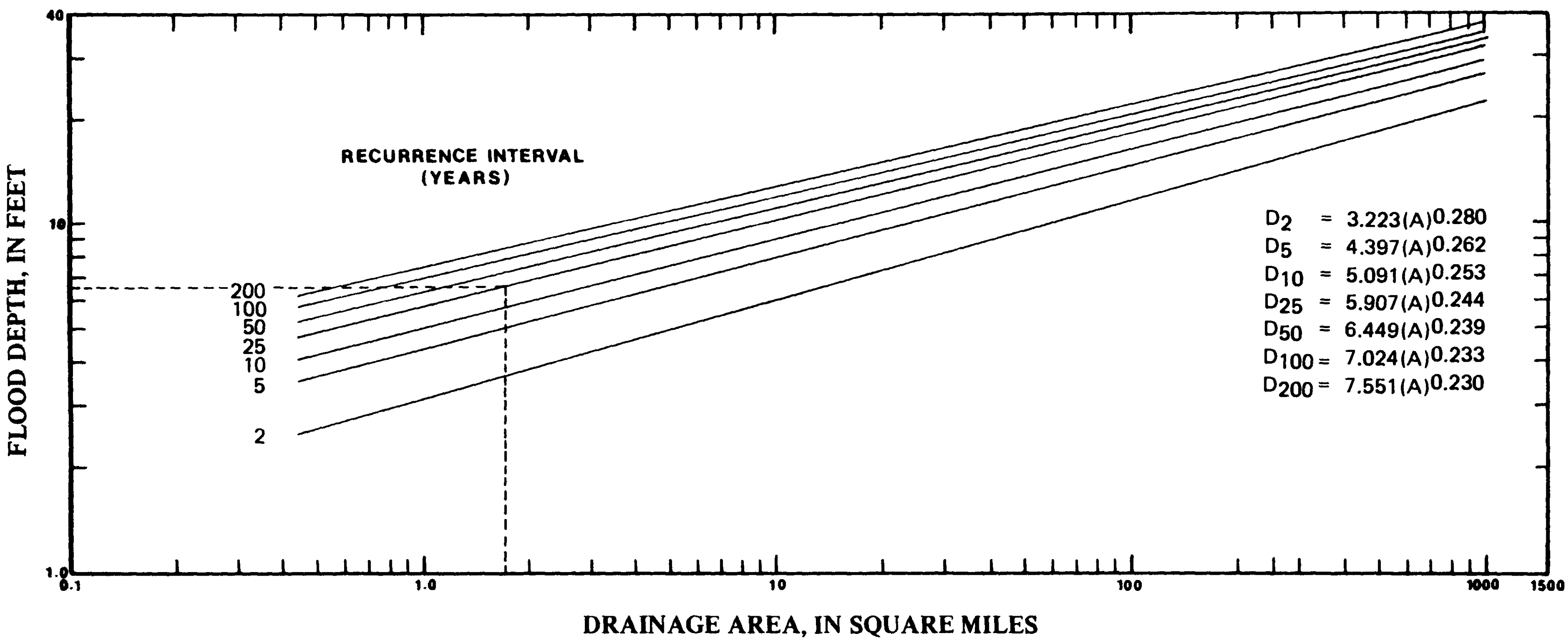


Figure 6. – Relation of flood-depth frequency to drainage area in hydrologic areas 1 and 6.

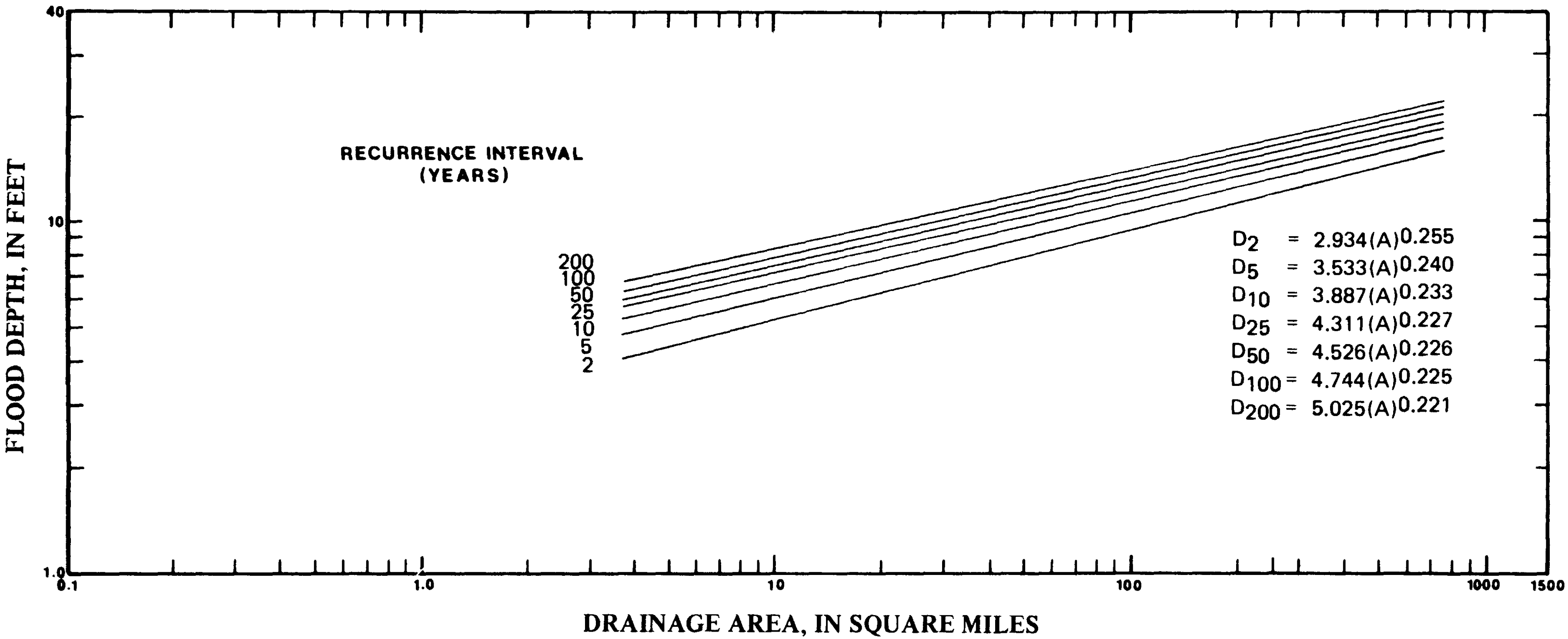


Figure 7. – Relation of flood-depth frequency to drainage area in hydrologic area 2.

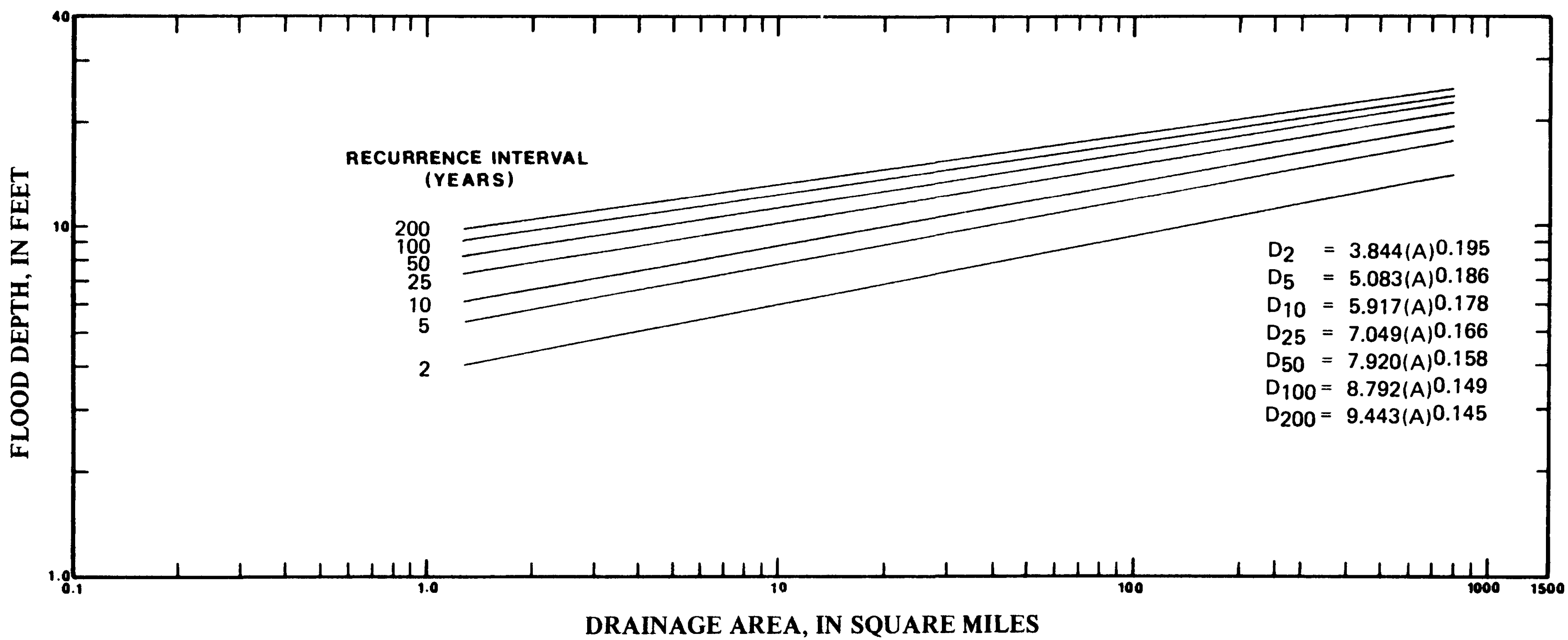


Figure 8. – Relation of flood-depth frequency to drainage area in hydrologic area 3.

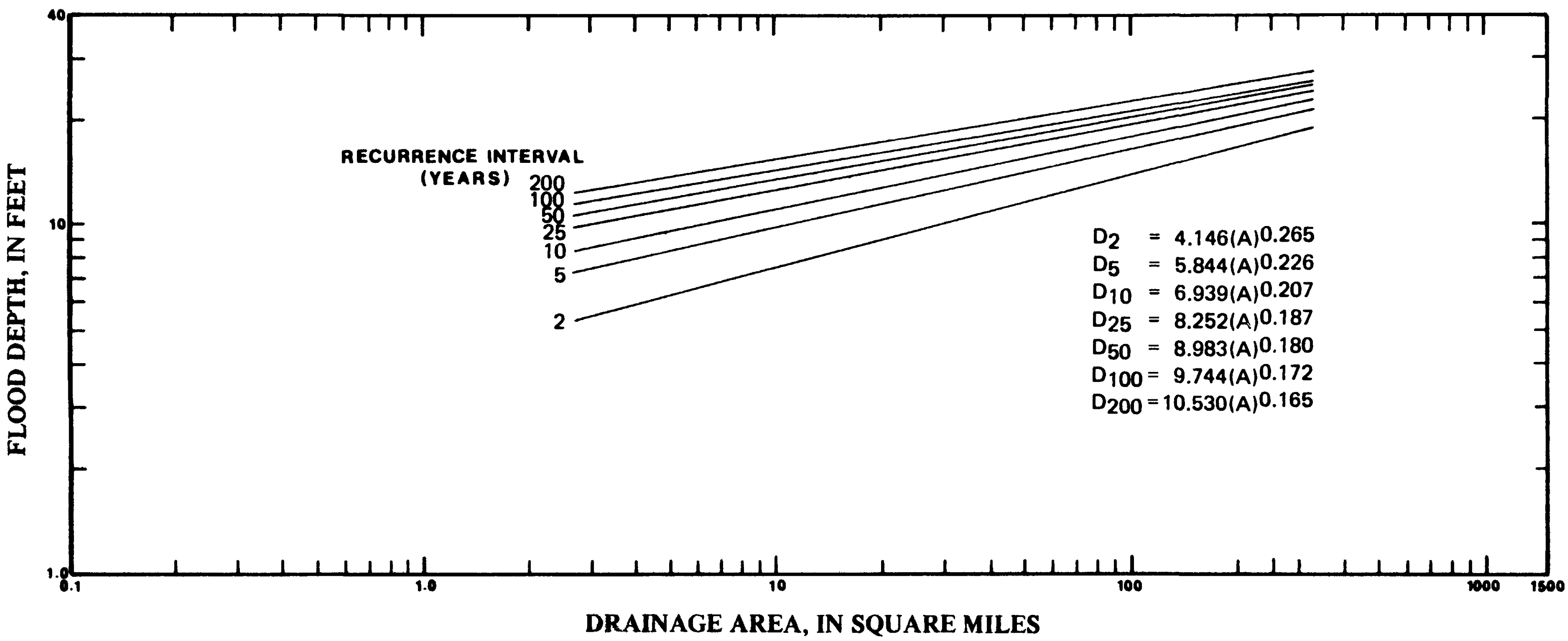


Figure 9. – Relation of flood-depth frequency to drainage area in hydrologic area 4.

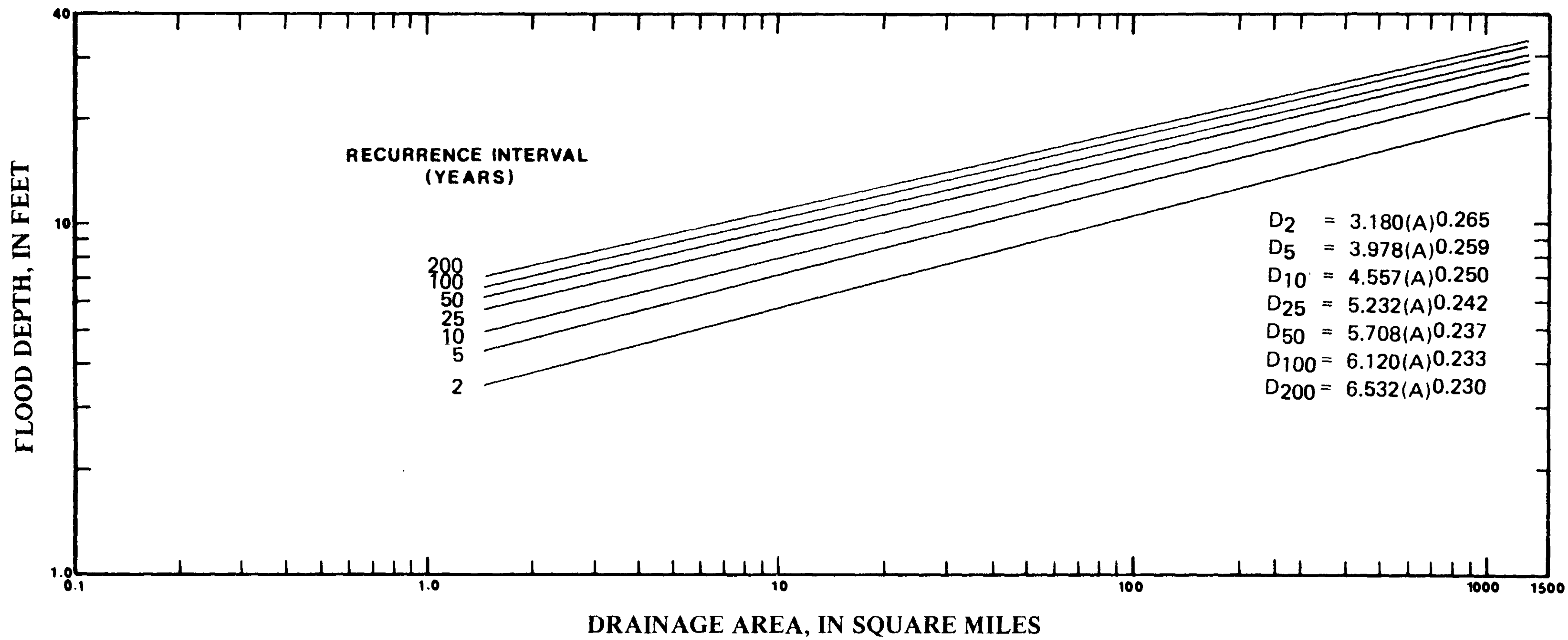


Figure 10. – Relation of flood-depth frequency to drainage area in hydrologic area 5.

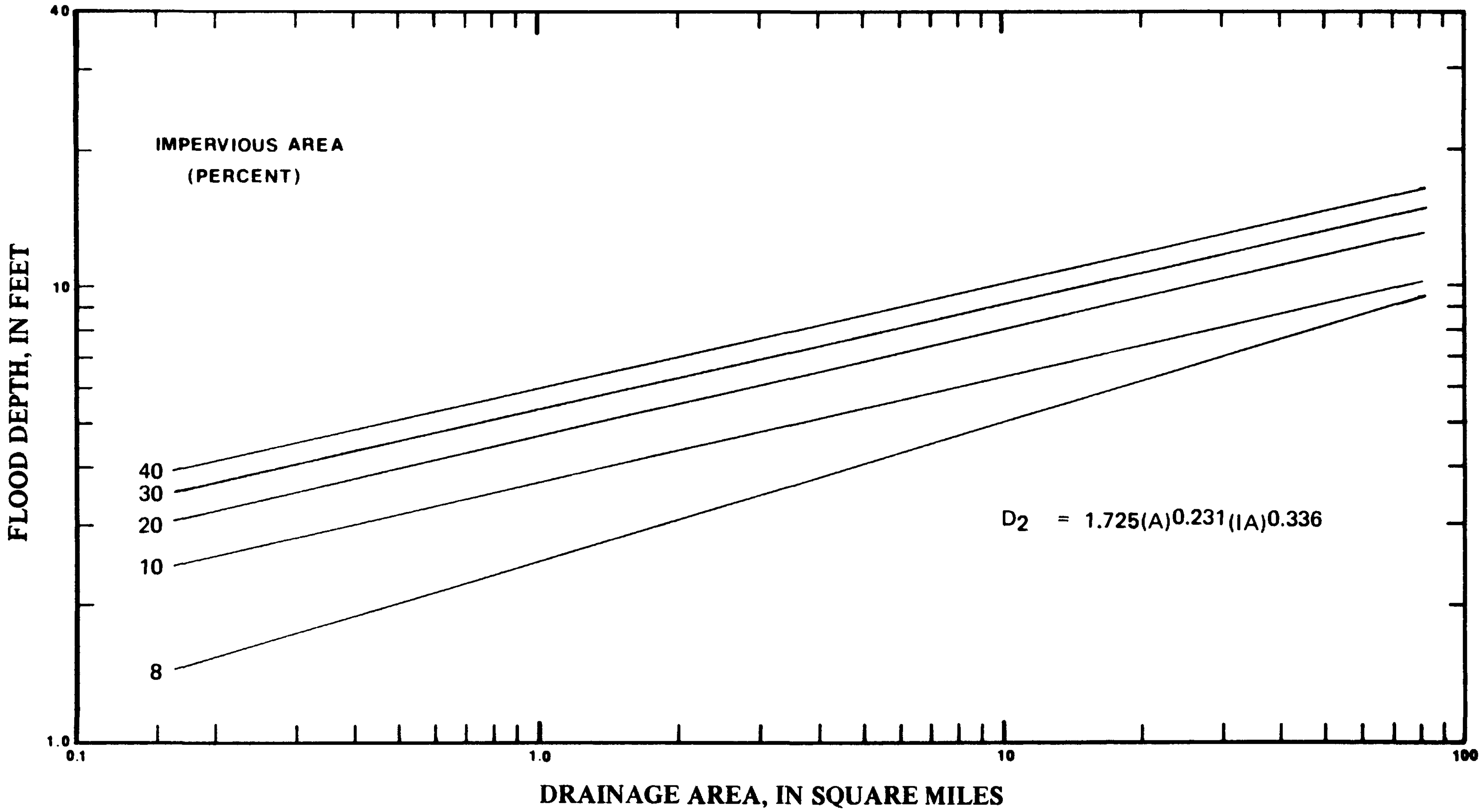


Figure 11. – Relation of 2-year flood depth to drainage area and impervious area in urban areas.

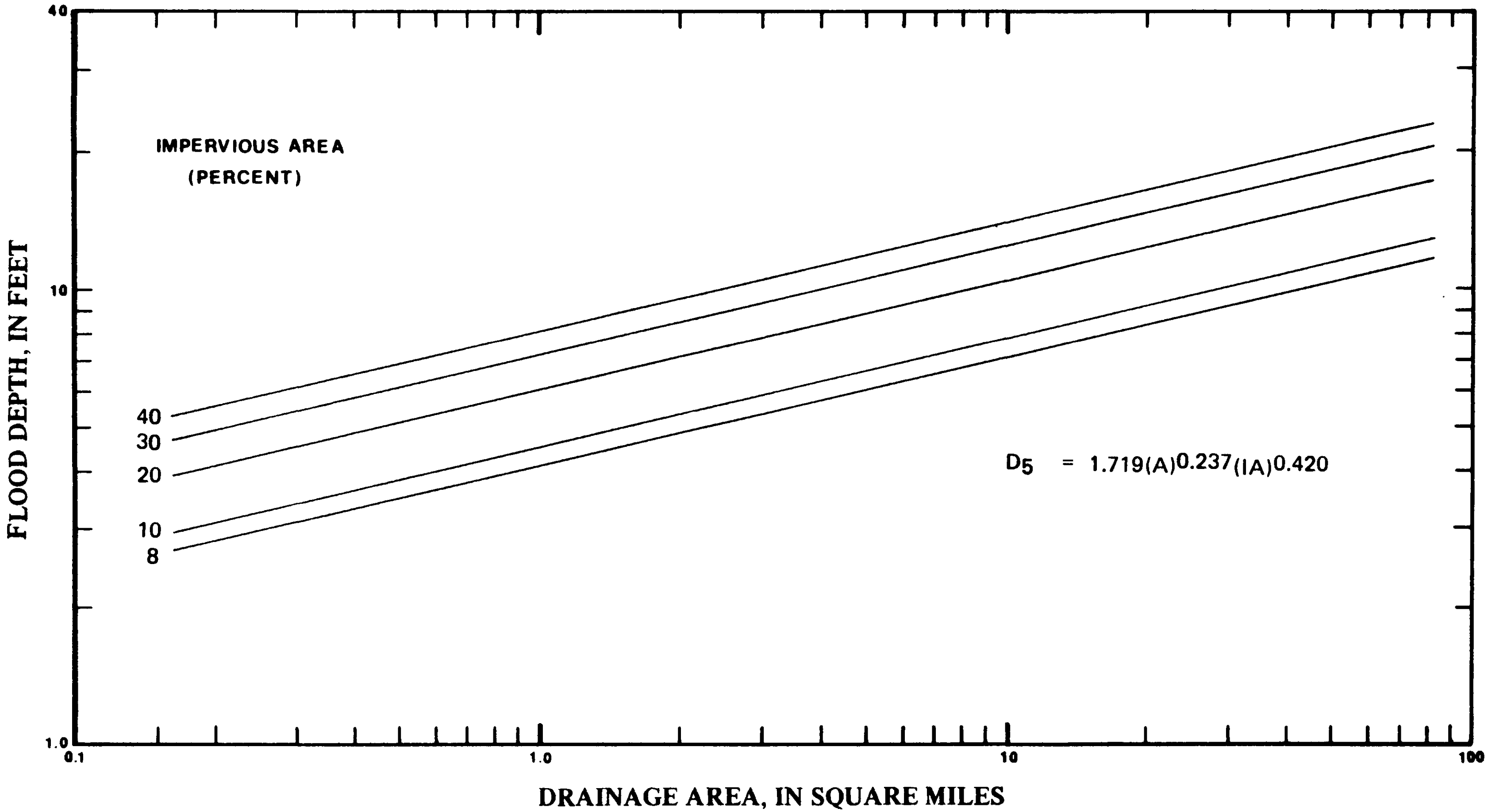


Figure 12. – Relation of 5-year flood depth to drainage area and impervious area in urban areas.

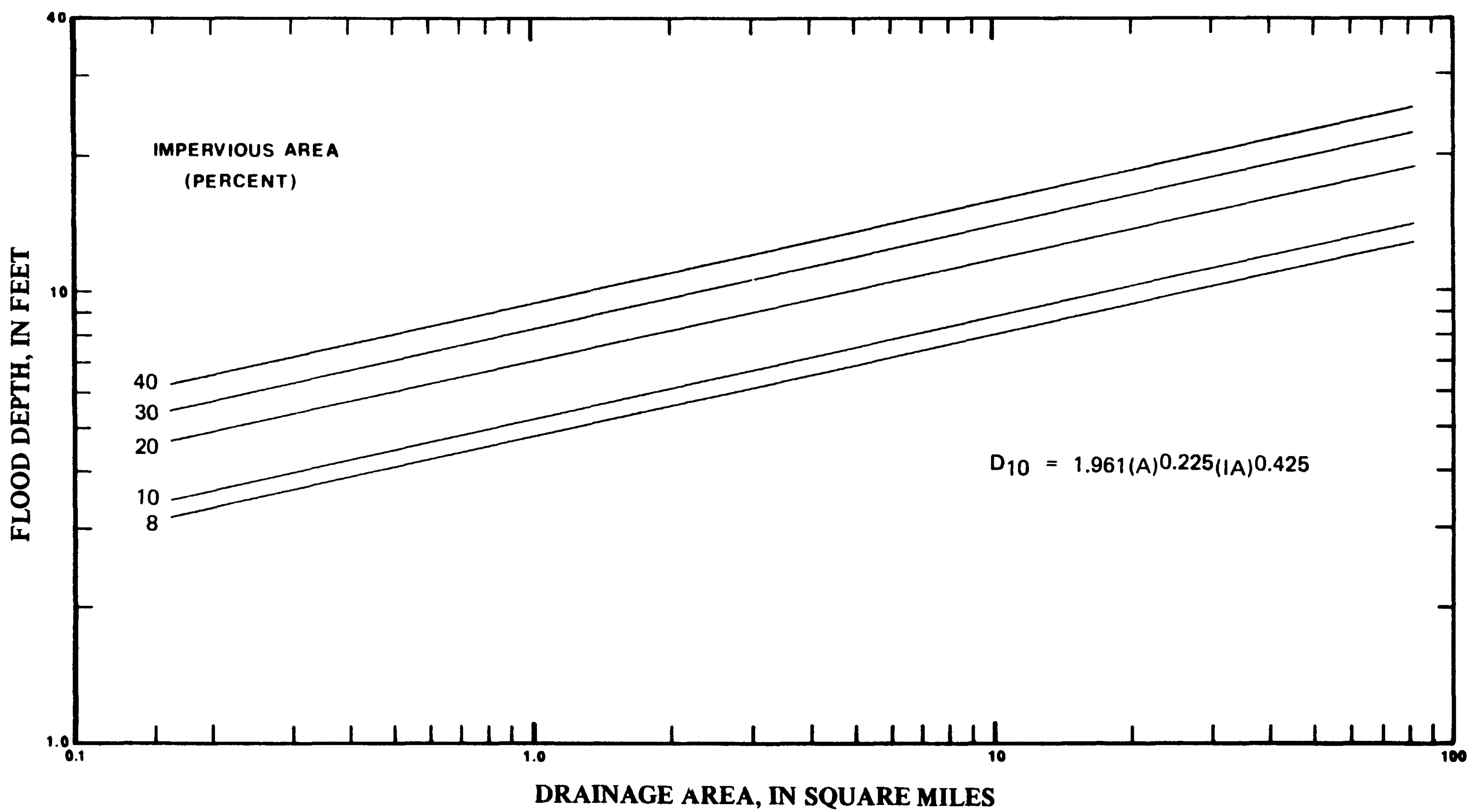


Figure 13. – Relation of 10-year flood depth to drainage area and impervious area in urban areas.

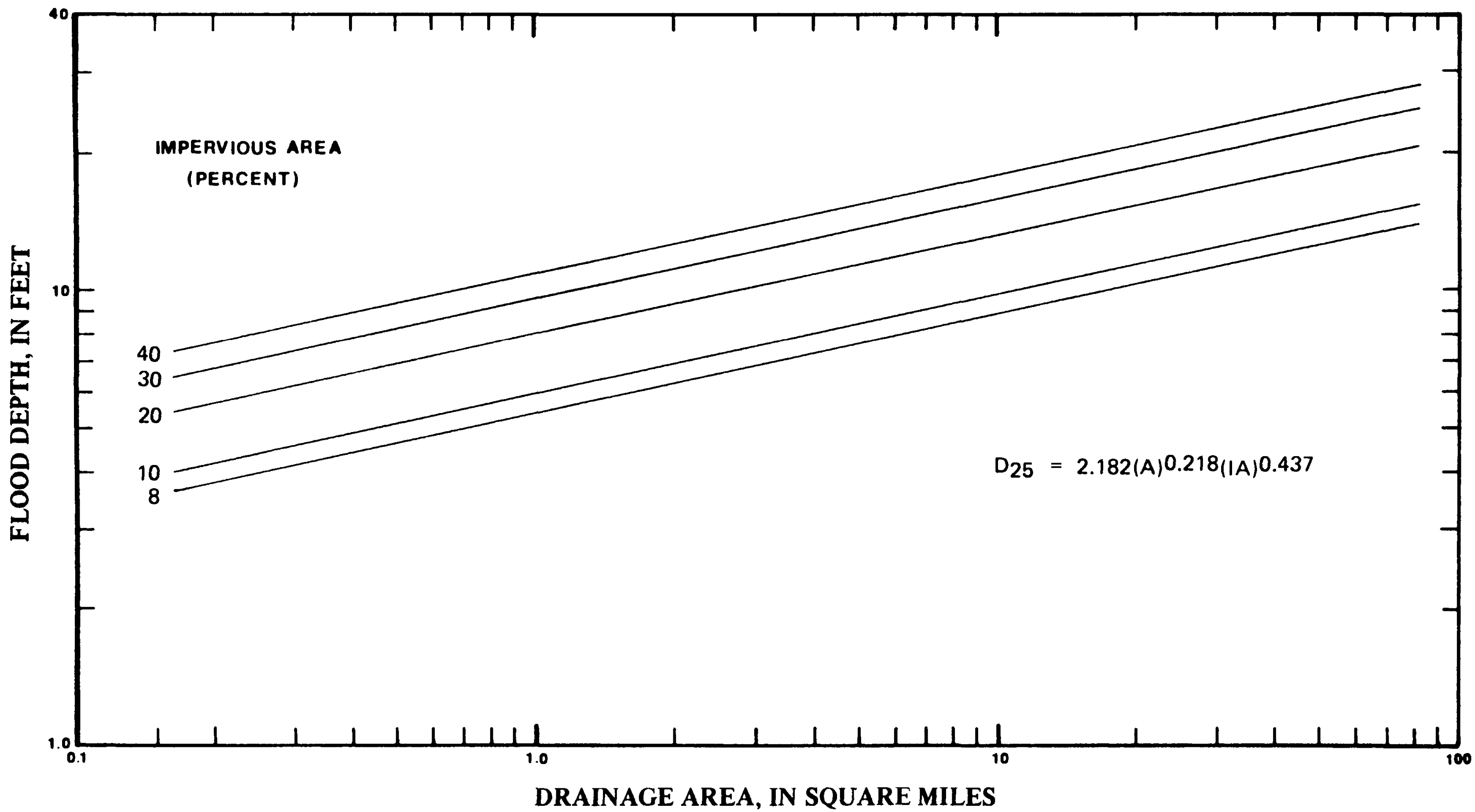
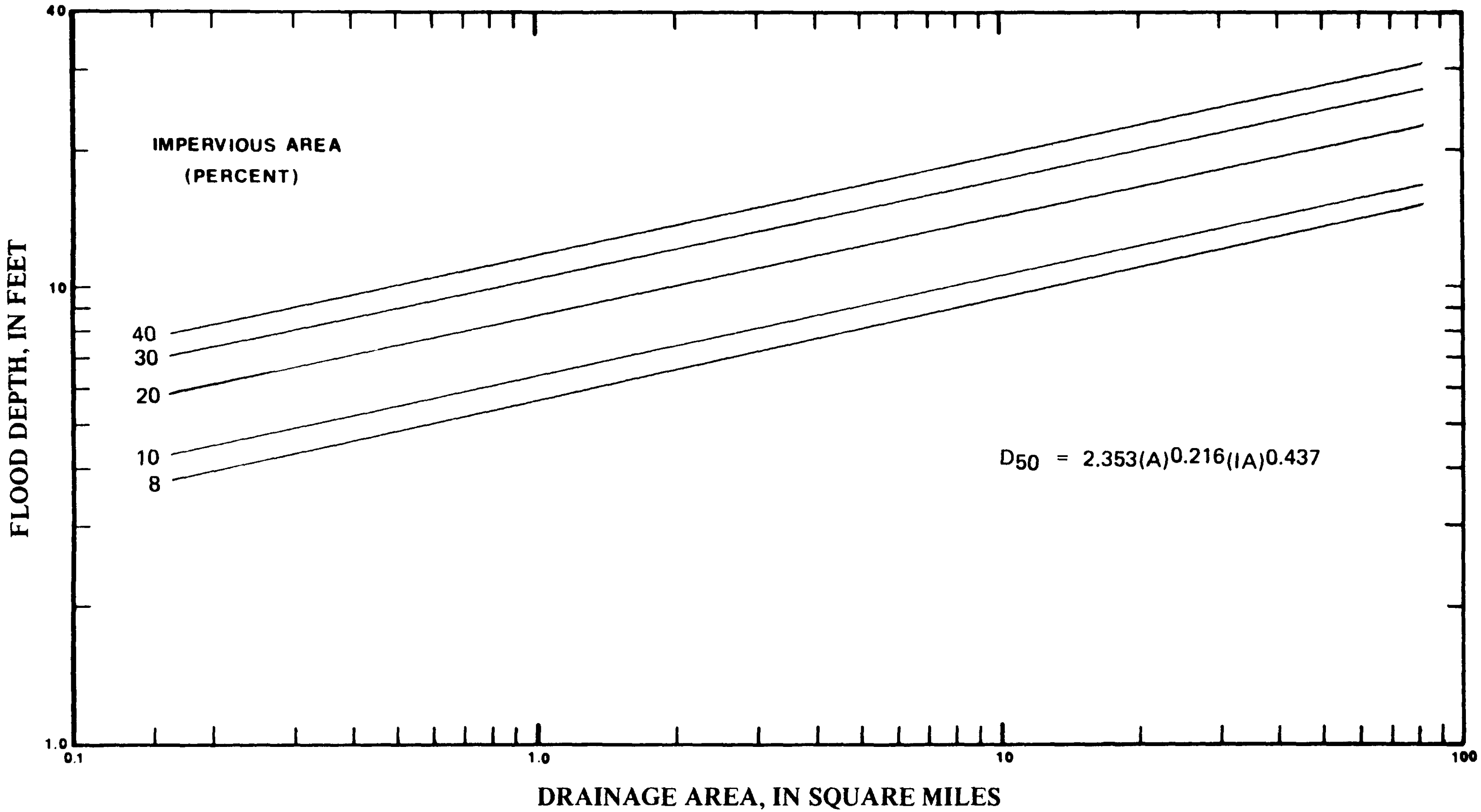


Figure 14. -- Relation of 25-year flood depth to drainage area and impervious area in urban areas.



...of 50-year flood depth to drainage area and impervious area in urban areas.

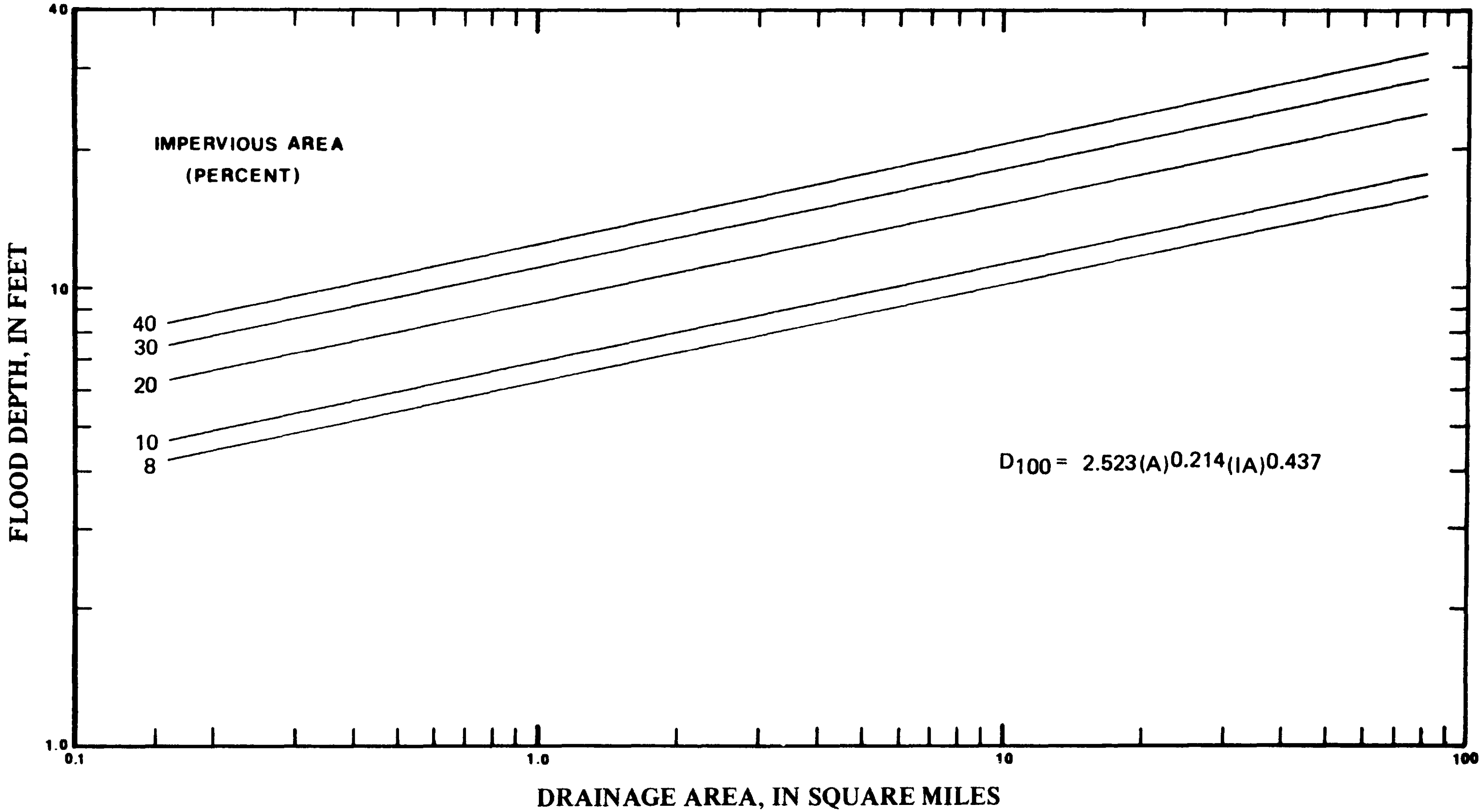


Figure 16. – Relation of 100-year flood depth to drainage area and impervious area in urban areas.

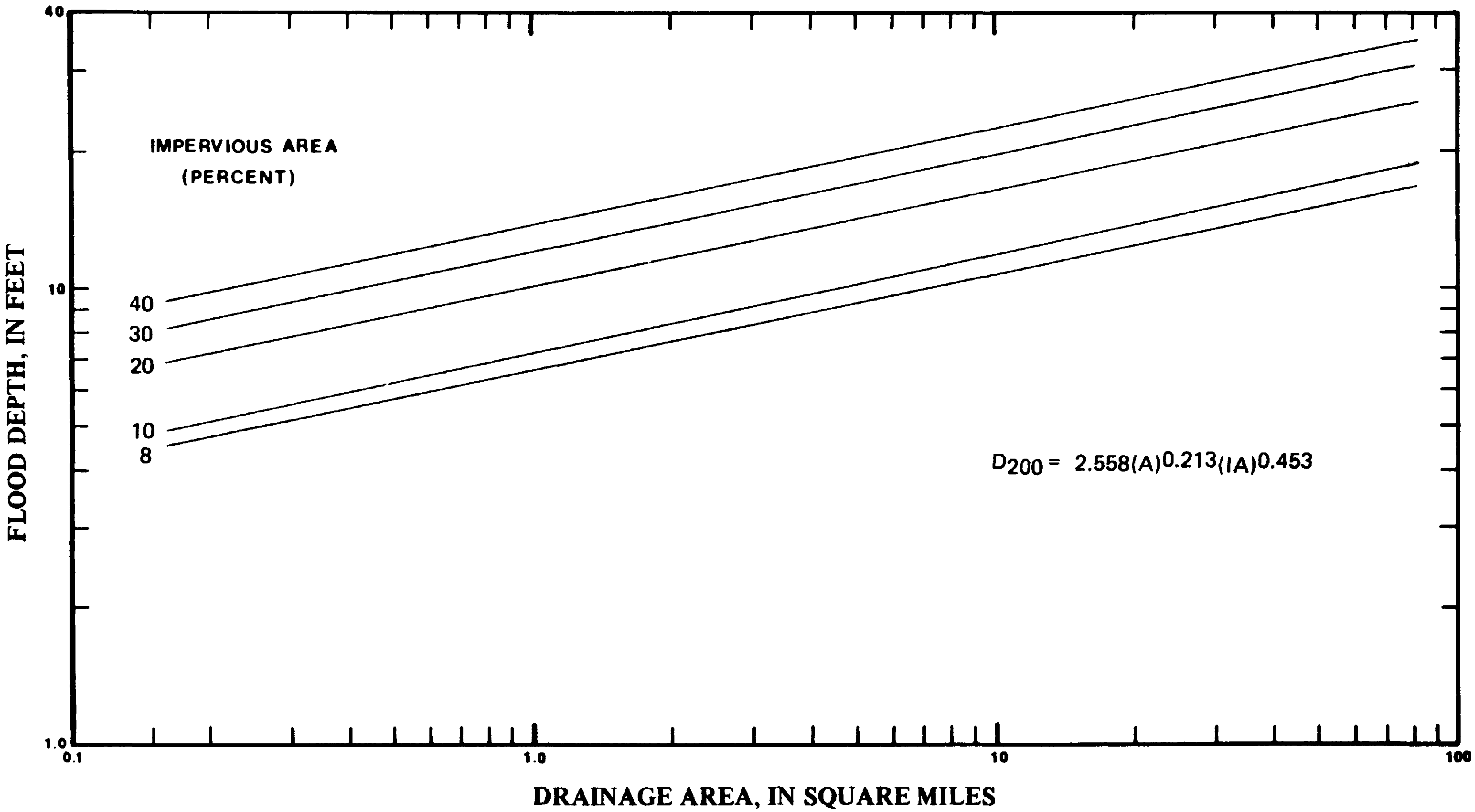


Figure 17. – Relation of 200-year flood depth to drainage area and impervious area in urban areas.

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SUPPLEMENTARY DATA

HYDROLOGIC AREA 1

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02398300	Chattooga River above Gaylesville	366	16.2	19.4	21.4	23.6	25.2	26.8	28.2
02398500	Chattooga River at Gaylesville	379	17.1	19.2	20.5	22.0	23.2	24.3	25.3
02399800	Little Terrapin Cr nr Borden Sprs.	15.4	6.3	8.8	10.5	12.7	14.4	16.1	17.9
02400000	Terrapin Creek near Piedmont	116	8.5	10.0	10.8	11.6	12.1	12.6	13.2
02400033	Nances Creek near White Plains	4.62	3.2	4.4	5.4	6.5	7.3	8.1	9.0
02400100	Terrapin Creek at Ellisville	252	13.2	15.2	16.7	18.7	20.1	21.6	23.1
02400690	Jacks Creek near Fort Payne	6.76	3.8	5.3	6.3	7.5	8.5	9.4	10.3
02401000	Big Wills Creek near Grudup	182	11.0	13.3	14.8	16.6	17.9	19.2	20.6
02401390	Big Canoe Creek at Ashville	141	15.1	17.0	18.0	19.3	20.1	20.9	21.7
02401500	Big Canoe Creek near Gadsden	253	16.7	20.1	22.4	24.5	26.1	27.5	28.8
02404000	Choccolocco Creek near Jenifer	277	10.6	14.1	16.0	18.2	20.0	21.8	23.5
02404245	Cheaha Creek near Talladega	71.8	10.8	13.0	14.2	15.3	16.1	17.0	17.8
02404400	Choccolocco Cr at Jackson Shoal near Lincoln	481	14.3	18.8	21.3	24.1	26.0	27.9	29.6
02404500	Choccolocco Creek near Lincoln	496	17.8	21.3	22.5	24.0	24.9	25.8	26.8
02405500	Kelly Creek near Vincent	193	17.9	21.8	23.3	25.0	25.9	26.6	27.1

HYDROLOGIC AREA 1 (continued)

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02406000	Talladega Creek near Talladega	101	10.3	13.5	15.4	18.0	19.8	21.8	23.7
02406500	Talladega Creek at Alpine	150	11.0	11.8	12.2	12.6	12.9	13.1	13.3
02407500	Yellowleaf Creek nr Wilsonville	96.5	17.1	18.4	19.0	19.8	20.3	20.8	21.4
02407900	Paint Creek near Marble Valley	12.7	8.0	10.5	11.6	12.4	12.8	13.2	13.5
02408340	Little Hatchet Cr nr Goodwater	8.09	5.7	6.9	7.7	8.6	9.3	9.8	10.4
02408500	Hatchet Creek near Rockford	233	17.4	20.6	22.1	24.1	25.4	26.6	27.9
02409000	Weogufka Creek near Weogufka	73.4	9.4	10.7	11.4	12.2	12.7	13.2	13.7
02410000	Paterson Creek near Central	4.91	5.0	7.3	8.2	8.8	9.0	9.2	9.4
02422500	Mulberry Creek at Jones	203	12.5	17.8	20.9	24.1	26.1	27.8	29.4
02423500	Cahaba River near Acton	230	23.8	29.8	34.0	38.7	41.5	43.8	45.5
02423800	Little Cahaba R nr Brierfield	147	15.3	20.1	22.6	25.2	27.3	28.9	30.4
02424000	Cahaba River at Centreville	1027	25.9	29.9	32.1	34.3	35.5	36.7	38.0
02424010	Sandy Creek near Centreville	0.59	3.0	4.0	4.7	5.6	6.3	7.0	7.7
02437800	Barn Creek near Hackleburg	13.1	6.6	9.2	10.5	12.0	12.5	13.2	14.0
02437900	Woods Creek near Hamilton	14.3	11.1	15.5	17.8	20.0	21.3	22.5	23.6
)2438000	Buttahatchee River below Hamilton	277	14.8	20.6	24.2	27.6	30.0	32.3	33.8

HYDROLOGIC AREA 1 (continued)

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02439000	Buttahatchee River near Sulligent	472	15.7	16.8	17.5	18.3	18.8	19.3	19.8
02445245	New River near Winfield	59.3	14.3	18.0	20.2	22.6	24.4	25.8	27.0
02450000	Mulberry Fork nr Garden City	365	9.8	12.8	14.8	17.3	19.1	20.8	22.7
02450200	Dorsey Creek near Arkadelphia	13.0	5.7	7.5	8.7	10.2	11.4	12.5	13.8
02450250	Sipsey Fork near Grayson	92.1	16.9	23.4	27.2	32.2	35.5	38.5	41.9
02451550	Jaybird Creek near West Point	1.42	4.9	5.8	6.3	6.8	7.2	7.5	7.8
02451750	Vest Creek near Baldwin	1.64	3.6	4.9	5.5	6.1	6.4	6.6	6.7
02453900	Cheatham Creek near Carbon Hill	4.70	5.1	6.9	8.0	9.3	10.4	11.3	12.4
02454000	Lost Creek near Oakman	134	20.5	24.5	26.3	28.6	30.2	31.6	33.1
02454200	Wolf Creek near Oakman	85.0	15.3	18.8	20.6	22.6	23.7	24.9	26.2
02454500	Locust Fork below Snead	147	20.0	26.2	30.7	35.4	38.9	40.2	42.2
02455000	Locust Fork near Cleveland	303	9.6	11.6	12.9	14.2	15.2	16.1	17.0
02455500	Locust Fork at Trafford	624	24.4	35.7	41.8	47.7	51.2	54.7	57.7
02456000	Turkey Creek at Morris	80.9	11.8	15.5	17.5	20.2	21.8	22.8	24.5
02456500	Locust Fork at Sayre	885	25.6	35.1	41.8	49.8	55.4	58.4	66.4
02457700	Fivemile Creek at Linn Crossing	96.2	7.7	11.8	14.7	18.8	22.1	25.2	28.6

HYDROLOGIC AREA 1 (continued)

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02462000	Valley Creek near Oak Grove	148	12.7	20.2	22.2	24.0	25.1	26.2	27.2
02462600	Blue Creek near Oakman	5.32	3.7	4.6	5.1	5.7	5.8	6.2	6.5
02462800	Davis Creek below Abernant	45.3	10.4	14.8	17.3	20.7	23.1	25.6	28.0
02463500	Hurricane Creek near Holt	108	8.4	12.8	16.4	18.4	20.2	22.0	24.0
02464000	North River near Samantha	223	16.1	24.5	28.0	32.5	35.8	38.8	40.8
03572900	Town Creek near Geraldine	141	11.0	14.8	17.5	21.0	23.6	26.2	28.8
03573000	Short Creek near Albertville	91.6	9.3	11.4	13.0	14.6	15.9	17.2	18.6
03574405	Little Dry Creek near Garth	3.91	3.5	4.9	5.8	7.1	8.2	9.9	11.4
03574500	Paint Rock River near Woodville	320	17.4	18.5	19.5	20.3	20.9	21.4	22.0
03574796	Walker Branch near Plevna	0.44	2.7	3.6	4.2	5.1	5.7	6.3	7.0
03575000	Flint River near Chase	342	10.3	14.0	15.8	18.1	19.7	21.2	22.7
03575340	Clover Cove Creek near Owens Cross Roads	3.50	4.1	5.7	6.5	7.4	7.9	8.4	8.8
03575830	Indian Creek near Madison	49.0	7.0	8.0	8.6	9.2	9.7	10.1	10.5
03576148	Cotaco Creek at Florette	136	13.5	15.0	15.7	16.6	17.2	17.7	18.3
03576250	Limestone Creek near Athens	119	9.5	11.2	12.1	13.0	13.7	14.3	14.9

HYDROLOGIC AREA 1 (continued)

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
03576400	Piney Creek near Athens	55.8	7.1	8.7	9.8	11.1	11.8	12.5	12.9
03576500	Flint Creek near Falkville	86.3	11.7	13.0	13.7	14.6	15.1	15.8	16.4
03577000	West Flint Creek near Oakville	87.6	20.0	25.2	28.1	31.0	32.9	34.6	36.0
03577110	West Flint Creek near Hartselle	158	15.6	17.2	18.0	19.0	19.7	20.2	20.8
03585300	Sugar Creek near Good Springs	152	10.6	11.0	11.5	12.1	12.5	12.8	13.2
03585380	West Fk Anderson Cr nr Lexington	5.92	4.9	6.7	7.9	9.4	10.5	11.4	12.2
03586500	Big Nance Creek at Courtland	166	19.0	21.3	22.4	23.0	23.5	23.9	24.4
03590000	Cypress Creek near Florence	209	9.6	13.1	15.3	18.0	20.1	22.2	24.3
03591570	Bear Creek at Posey Mill	26.8	13.8	18.6	21.1	23.7	25.4	26.8	28.0
03591800	Bear Creek near Hackleburg	143	16.9	22.6	26.1	30.5	33.9	36.8	40.7
03592000	Bear Creek near Red Bay	263	13.6	14.6	14.9	15.4	15.7	15.9	16.1
03592200	Cedar Creek near Pleasant Site	189	16.5	20.4	22.6	25.0	26.6	28.4	30.1
03592300	Little Bear Creek near Halltown	78.2	10.9	13.0	13.9	15.0	15.8	16.6	17.2
03592500	Bear Creek at Bishop	667	17.5	20.0	21.4	22.9	23.9	24.8	25.8

HYDROLOGIC AREA 2

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02442000	Luxapallila Creek near Fayette	130	10.3	11.9	12.4	13.0	13.4	13.8	14.1
02442500	Luxapallila Creek at Millport	247	11.2	12.2	12.7	13.3	13.7	14.1	14.4
02444000	Coal Fire Creek nr Pickensville	126	8.5	9.4	9.9	10.8	11.0	11.3	11.7
02445000	Lubbub Creek near Carrollton	112	9.5	10.6	11.5	12.6	13.5	14.3	15.0
02445500	Sipsey River at Fayette	282	12.0	13.3	14.0	14.9	15.6	16.4	17.1
02446000	Sipsey River at Moores Bridge	413	13.2	14.1	14.8	15.7	16.4	17.2	17.8
02446500	Sipsey River near Elrod	528	12.0	13.0	13.7	14.8	15.6	16.3	17.0
02447000	Sipsey River near Pleasant Ridge	769	17.9	20.7	22.1	23.8	25.0	26.1	27.3
02465205	Jay Creek near Coker	3.65	4.7	5.6	6.2	6.8	7.2	7.5	8.0
02465500	Fivemile Creek near Greensboro	73.6	7.6	8.4	9.0	9.8	10.3	10.8	11.3
02467500	Sucarnocchee River at Livingston	607	22.4	24.4	25.5	27.0	28.0	29.1	29.8

HYDROLOGIC AREA 3

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02340750	Osanippa Creek near Fairfax	99.7	7.0	9.3	10.4	12.0	13.2	14.4	15.4
02405800	Talladega Creek above Talladega	69.6	7.7	10.2	11.8	13.5	14.6	15.5	16.4
02412000	Tallapoosa River near Heflin	448	18.4	21.9	23.5	24.9	25.8	26.5	27.2
02412320	Elder Creek near Dempsey	1.79	5.3	6.9	8.0	9.6	10.6	11.6	12.1
02412500	Tallapoosa River near Ofelia	792	10.3	13.5	15.2	17.1	18.6	19.8	20.9
02413400	Wedowee Creek above Wedowee	6.87	5.0	6.5	7.2	8.1	8.7	9.4	9.8
02413475	Wedowee Creek near Wedowee	46.6	10.0	11.9	13.7	15.9	17.4	18.6	19.7
02413500	Little Tallapoosa River near Wedowee	591	14.1	17.2	18.8	20.8	21.8	22.6	23.4
02414800	Harbuck Creek near Hackneyville	7.97	4.4	6.0	7.1	8.6	9.9	11.4	12.7
02415000	Hillabee Creek nr Hackneyville	190	13.5	16.7	18.4	20.4	22.0	23.2	24.5
02417400	Stearns Creek near Seman	1.27	4.2	5.5	6.3	7.3	8.1	8.8	9.4

HYDROLOGIC AREA 4

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02371000	Conecuh River near Troy	257	13.6	15.5	17.0	18.7	20.0	21.3	22.7
02419000	Uphapee Creek near Tuskegee	333	18.1	22.8	25.4	28.9	31.4	33.7	36.2
02419625	Calebee Creek near Tuskegee	124	12.0	12.9	13.4	14.0	14.5	14.9	15.3
02421000	Catoma Creek near Montgomery	290	21.1	23.4	24.5	25.9	26.9	27.9	28.9
02422000	Big Swamp Creek nr Lowdesboro	244	17.0	18.0	18.8	19.7	20.4	21.1	21.8
02425500	Cedar Creek at Minter	211	17.9	19.9	20.6	21.1	21.5	21.8	22.3
02425655	Mush Creek near Selma	44.4	6.6	8.5	9.8	11.3	12.6	13.6	14.6
02426000	Boguechitto Creek nr Browns	95.4	15.4	16.9	18.1	19.7	21.0	22.3	23.3
02427013	Caine Creek near Safford	2.69	3.2	4.6	5.6	7.0	8.0	9.0	10.0
02427300	Prairie Creek near Oak Hill	10.3	11.3	15.1	17.2	19.1	20.2	21.6	22.7
02427700	Turkey Creek at Kimbrough	97.5	16.2	20.2	21.4	22.4	22.8	23.3	23.8
02427875	Pursley Creek near Camden	64.3	13.5	18.2	21.6	25.8	28.4	30.8	33.1
02428300	Tallatchee Creek nr Vredenburgh	13.2	10.4	11.0	11.4	11.9	12.2	12.5	12.8
02449400	Jones Creek near Epes	11.8	11.0	15.5	17.6	19.8	20.3	21.0	21.9
02466500	Prairie Creek near Gallion	171	16.0	17.1	17.7	18.6	19.4	20.1	20.9
02468500	Chickasaw Bogue near Linden	257	19.8	26.7	30.6	34.0	35.9	37.0	38.4
02469550	Horse Creek near Sweetwater	60.4	13.8	14.6	15.1	15.6	16.0	16.3	16.6

HYDROLOGIC AREA 5

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02342150	Uchee Creek near Seale	134	8.7	9.8	10.4	11.2	11.8	12.4	13.0
02342200	Phelps Creek near Opalika	6.67	7.9	8.5	8.7	9.1	9.2	9.3	9.4
02342933	South Fork Cowikee Creek near Batesville	112	12.2	17.7	21.5	26.0	29.6	33.2	36.8
02343275	Abbie Creek near Abbeville	48.7	6.9	7.5	8.0	8.6	9.0	9.4	9.8
02343300	Abbie Creek near Haleburg	146	10.5	17.6	23.0	32.5	36.3	39.6	42.7
02343700	Stevenson Creek near Headland	14.0	7.6	9.4	10.2	10.9	11.4	11.8	12.1
02360000	West Fork Choctawhatchee River at Blue Springs	86.8	6.8	8.4	9.3	10.6	11.4	12.3	13.2
02360275	Judy Creek near Ozark	102	12.0	14.3	15.4	16.3	16.9	17.3	17.7
02360500	East Fork Choctawhatchee River near Midland City	291	16.0	19.0	20.9	23.2	24.8	26.6	28.6
02361000	Choctawhatchee River near Newton	686	19.2	27.0	31.2	35.6	38.7	41.2	43.4
02362745	Hurricane Creek near Clayton	4.40	4.6	5.6	6.2	7.2	8.0	8.9	9.8
02363000	Pea River near Ariton	498	14.7	17.4	18.3	19.4	20.1	20.8	21.4
02363055	Moores Branch near Victoria	2.17	3.1	4.4	5.4	6.5	7.4	8.2	9.0
02364500	Pea River near Samson	1182	26.7	34.4	37.5	40.6	42.5	43.8	44.9
02365310	Grants Branch Tributary near Fayette	1.44	4.5	6.2	7.6	8.8	8.9	9.0	9.1

HYDROLOGIC AREA 5 (continued)

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02367500	Lightwood Knot Creek at Babbie	114	8.0	9.4	10.4	11.9	13.1	14.4	15.9
02367800	Yellow River near Wing	461	13.8	16.3	17.8	19.5	20.7	21.9	23.3
02369800	Blackwater River near Bradley	87.7	13.5	15.9	17.2	18.6	19.6	20.5	21.3
02371500	Conecuh River at Brantley	500	18.5	21.9	24.0	26.4	28.5	30.5	32.6
02372000	Patsaliga Creek at Luverne	254	12.9	14.2	15.0	16.3	17.3	18.2	19.3
02372500	Conecuh River near Andalusia	1344	28.2	34.1	37.0	40.4	43.2	45.5	47.9
02372510	Catoe Creek near Andalusia	2.46	4.2	5.4	6.2	7.3	8.2	9.2	10.1
02373000	Sepulga River near Mckenzie	470	11.6	17.4	20.4	23.0	25.1	26.8	28.3
02373500	Pigeon Creek near Thad	307	19.3	22.8	25.0	27.6	29.4	31.2	33.1
02374500	Murder Creek near Evergreen	176	10.5	11.9	12.8	13.8	14.6	15.2	15.7
02375000	Big Escambia Creek at Flomation	330	14.7	17.4	18.2	19.2	19.8	20.4	20.8
02428500	Big Flat Creek near Fountain	247	14.7	17.8	18.8	20.0	21.1	21.7	22.4
02429000	Limestone Creek near Monroeville	121	9.1	9.6	10.5	11.5	12.2	12.9	13.7
02429595	Little River near Uriah	99.2	9.8	12.0	13.4	15.1	16.1	17.1	18.1
02468000	Alamuchee Creek near Cuba	62.3	14.4	15.2	15.7	16.3	16.8	17.3	17.9
02469500	Tuckabum Creek near Butler	115	15.2	17.8	18.6	19.4	20.1	20.7	21.3
02469700	Okatuppa Creek at Gilbertown	148	10.8	14.2	15.6	16.5	17.1	17.4	17.8

HYDROLOGIC AREA 5 (continued)

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02469736	Little Souwilpa Cr at Bolinger	7.25	3.5	6.0	8.1	11.2	13.0	14.1	15.1
02469800	Satilpa Creek near Coffeeville	164	12.8	13.9	14.6	15.7	16.5	17.3	17.9
02470100	East Bassett Cr at Walker Springs	188	8.6	9.8	10.6	11.2	12.3	12.7	13.2
02471026	Watson Creek near Stockton	2.25	3.7	4.2	4.6	5.2	5.6	6.1	6.6
02479420	Whites Branch near Escatawpa	2.56	3.4	4.3	4.9	5.5	6.4	7.1	7.8
02479500	Escatawpa River near Wilmer	511	16.2	19.0	20.8	22.6	23.8	25.1	26.4
02479583	Flat Creek near Wilmer	6.55	6.4	6.9	7.3	7.7	8.0	8.2	8.5
02480150	Franklin Creek near Grand Bay	16.4	8.5	9.3	9.8	10.2	10.5	10.8	11.2

HYDROLOGIC AREA 6

Station number	Station name	Drainage area (mi^2)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02377500	Styx River near Loxley	92.2	14.7	17.3	18.2	19.1	19.7	20.2	20.8
02378500	Fish River near Silver Hill	55.3	12.8	14.6	15.6	16.8	17.8	18.4	19.2
02471001	Chickasaw Creek near Kushla	125	16.0	17.7	18.6	19.7	20.4	21.1	21.8

URBAN STATIONS

Station number	Station name	Drainage area (mi^2)	Impervious area (percent)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02361093	Tributary to Beaver Creek at Ross Clark Circle in Dothan	1.81	30.5	6.4	8.8	10.2	12.0	13.6	14.9	16.4
02416032	Sugar Creek at Alexander City	1.67	20.2	6.4	8.5	9.9	11.3	12.2	13.0	13.8
02419975	Three Mile Branch at Biltmore Avenue in Montgomery	7.26	25.0	5.5	7.2	8.2	9.4	10.1	11.0	12.4
02420987	Hannon Slough at Montgomery	1.32	42.9	5.6	6.7	7.2	8.0	8.4	8.8	9.3
02423580	Shades Creek at Homewood	20.7	16.3	11.0	12.8	13.8	15.0	15.5	16.2	16.6
02423630	Shades Creek at Greenwood	72.3	8.30	12.8	13.5	13.8	14.2	14.5	14.7	14.8
02457000	Fivemile Creek at Ketona	23.9	17.0	10.0	15.4	18.8	22.2	24.6	26.9	28.9
02458200	Village Creek at Apalachee Street in Birmingham	15.6	33.3	14.4	22.0	25.2	29.0	30.9	31.5	34.5
02458300	Village Creek at 24th Street in Birmingham	26.0	25.0	10.6	13.4	14.6	15.8	16.6	17.4	18.0
02458450	Village Cr at Avenue W in Ensley	33.5	25.0	11.4	16.9	19.4	22.3	24.0	25.6	27.1
02460500	Village Creek at Adamsville	83.5	18.0	15.8	19.8	21.8	24.2	26.0	27.7	29.2
02461200	Valley Creek at Cleburn Avenue in Birmingham	20.1	36.8	10.5	14.2	16.2	18.8	20.6	22.6	24.4
02465286	Cribbs Mill Creek at 2nd Avenue in Tuscaloosa	2.75	28.9	7.9	10.3	11.7	13.1	13.9	14.6	15.2

URBAN STATIONS (continued)

Station number	Station name	Drainage area (mi^2)	Impervious area (percent)	Flood depth, in feet 2-year	5-year	10-year	25-year	50-year	100-year	200-year
02471043.15	Woodcock Creek at Airport Boulevard in Mobile	1.85	25.0	5.0	6.4	7.3	8.5	9.3	10.2	11.2
03575686	Aldridge Creek at Dunsmore Street in Huntsville	1.15	10.2	3.2	3.9	4.4	5.0	5.4	5.7	6.0
03575696	Aldridge Creek near Lily Flagg	13.9	8.40	5.2	6.7	7.7	8.9	9.8	10.7	11.5
03575880	Five Points Ditch at Howe Street in Huntsville	0.62	20.0	6.1	7.2	7.7	8.1	8.4	8.6	8.9
03575890	Pinhook Creek at Clinton Avenue in Huntsville	22.5	12.0	6.6	8.7	10.1	11.8	13.2	14.5	15.8
03575910	Pinehaven Ditch at Gayhart Drive in Huntsville	0.16	20.0	3.3	4.4	5.8	7.4	8.2	8.9	9.6
03575930	Broglan Branch at Holmes Avenue in Huntsville	8.87	19.3	5.8	7.5	8.5	9.6	10.4	11.1	11.9
03575950	Huntsville Spring Branch at Johnson Road in Huntsville	41.8	21.4	8.8	11.3	12.2	14.6	15.9	17.1	18.3
03589450	Sweetwater Creek at Florence	4.92	24.1	7.5	10.0	11.5	13.3	13.8	14.2	14.8