



*Introducing Iowa StreamStats
Version 4, a Redesign of the
USGS Application for
Estimating Streamflow Stats*

Presented for Iowa County Engineer's Association

Ames, IA

May 17, 2016

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What is StreamStats?

- A map-based Web application that provides information that can be used by engineers, managers, and planners to make informed decisions on water-related activities
- Primary products are basin delineations, basin-characteristic measurements, and estimates of streamflow statistics
- Version 3 released July 2015
- Beta Version 4: released March 2016

StreamStats Beta Version 4

- Redesigned single user interface for all states
- Streamlined core functionality
- Map interaction that is more intuitive for users
- Improved communication with users
- All functionality will be available as web services
- Batch processing will be available for multiple sites
- V.4 functionality not yet fully implemented for Iowa
- Users encouraged to provide feedback – Help button

How is StreamStats Information Used?

- Engineering Design—Bridges, culverts, roads, levees, dams, and other structures along streams; flood-plain mapping
- Water and Land Management—Water rights adjudication, in-stream flows, fish passage/habitat studies
- Water Quality Regulation—Low flows, perennial vs. intermittent streams (TMDL's, NPDES Permits)

StreamStats Site Capabilities

- Provides published streamflow statistics and basin characteristics for USGS streamgages
- For user-selected ungaged sites:
 - Delineates drainage basin boundaries
 - Computes basin characteristics
 - Provides estimates of streamflow statistics based on regression equations
 - Allows for download of basin boundary shapefiles

StreamStats Implementation for Iowa

- 90 regression equations from 4 USGS streamflow-estimation reports will be implemented in StreamStats
- StreamStats allows users to click on any ungaged or gaged stream site in Iowa and obtain estimates of 30 streamflow statistics
- 7 low-flow statistics that include 4 annual and 2 seasonal low-flow probabilities and the harmonic mean
- 15 flow-duration statistics that include 1% - 99% exceedance probabilities

StreamStats Implementation for Iowa

- 8 peak-flow statistics that include 2- to 500-year recurrence-interval floods
- 90-percent prediction intervals are computed for an ungaged site for the peak-flow & low-flow regression estimates
- Peak-flow equations were implemented in June 2013
- Low-flow and flow duration equations were implemented in July 2015

IA StreamStats app uses peak-flow regional-regression equations published in SIR 2013-5086



Prepared in cooperation with the Iowa Department of Transportation and the Iowa Highway Research Board (Project TR-519)

Methods for Estimating Annual Exceedance-Probability Discharges for Streams in Iowa, Based on Data through Water Year 2010

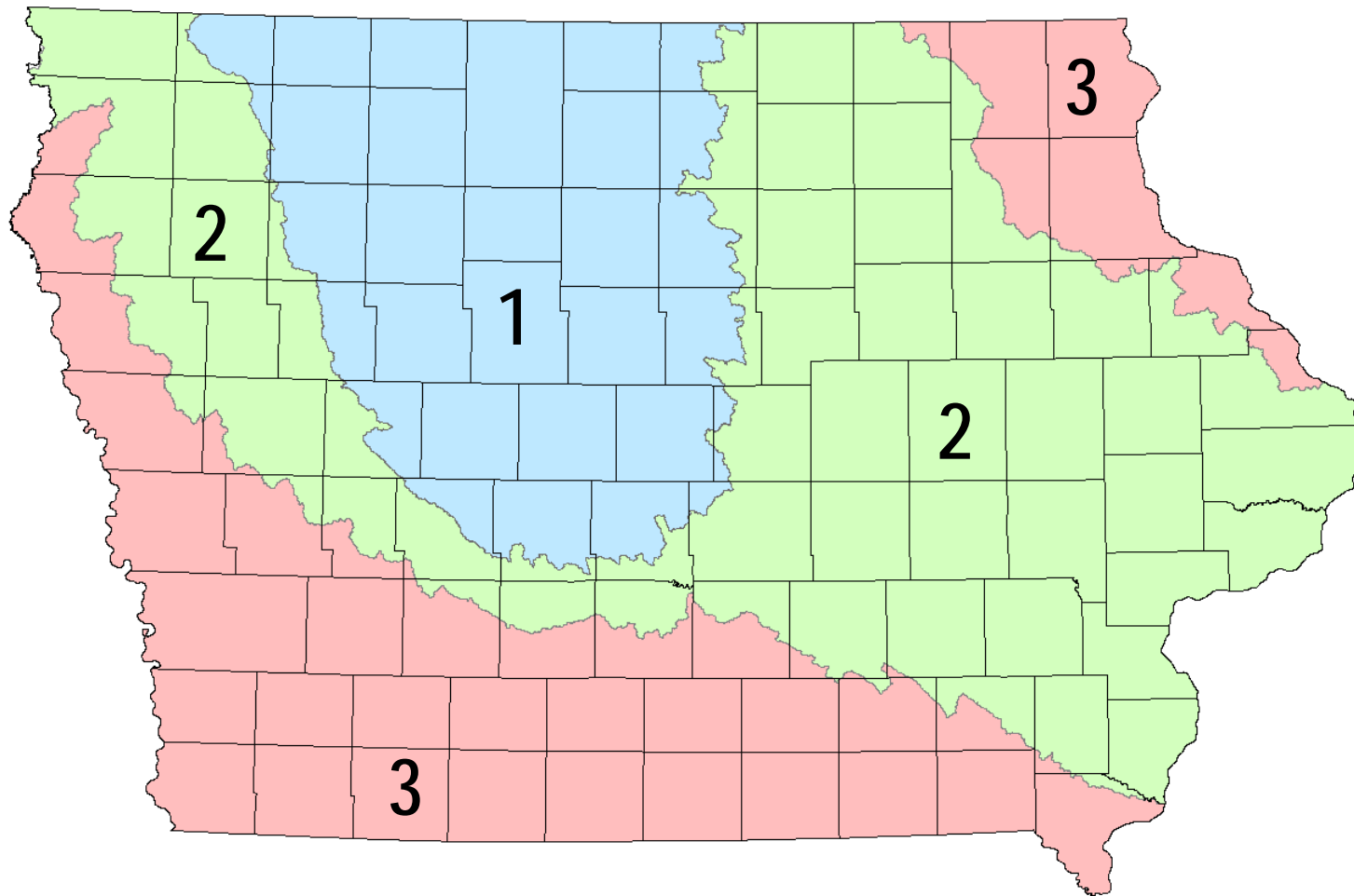


Scientific Investigations Report 2013–5086

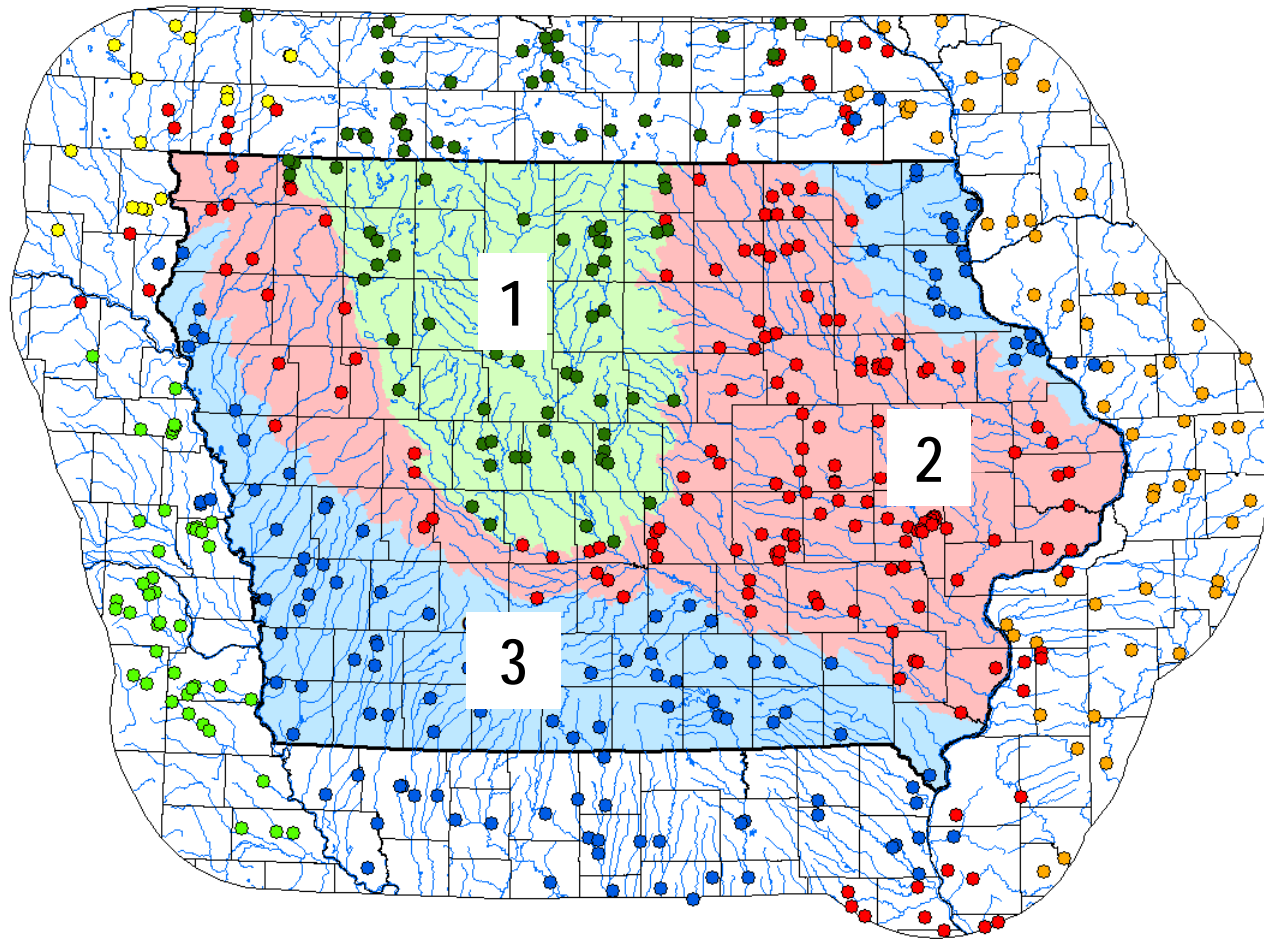
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Iowa 2013 Flood Regions



518 streamgages used for defining six flood regions



New Statistical Methodologies included in the Iowa Peak-Flow Estimation Study

- Flood-probability analyses include results of new statewide regional skew analysis (Bayesian GLS/WLS regression analysis – constant value -0.4)
- New flood-probability analysis method used - EMA (expected moments algorithm) with new MGB (multiple Grubbs-Beck) test for detecting low-outliers
- New optimization test used for selecting best transformation for drainage area for the regression analyses - either a log 10 or a power transformation

2013 Flood Region 1 Regression Equation

- Regression equations take the form:

$$Q_{1\%} = \text{DRNAREA}^{0.566} 10^{(0.917 + 0.567 I_{24H10Y} - 0.742 \text{CCM}^{0.55})}$$

- where: (91 streamgages used to develop equations)

DRNAREA is drainage area, in square miles

I_{24H10Y} is maximum 24-hour precipitation that occurs on average once in 10 years, in inches

CCM is constant of channel maintenance (DRNAREA/total length of all streams in basin), in mi²/mi

2013 Flood Region 2 Regression Equation

- Regression equations take the form:

$$Q_{1\%} = 10^{(11.1 - 7.92 \times \text{DRNAREA}^{-0.031} - 0.002 \times \text{DESMOIN} - 0.025 \times \text{BSHAPE})}$$

- where: (176 streamgages used to develop equations)

DRNAREA is drainage area, in square miles

DESMOIN is percent area of basin within Des Moines Lobe landform region (percent area)

BSHAPE is a shape factor measure of basin shape computed as $\text{BASLEN}^2/\text{DRNAREA}$

2013 Flood Region 3 Regression Equation

- Regression equations take the form:

$$Q_{1\%} = 10^{(6.41 - 3.06 \times \text{DRNAREA}^{-0.097} - 0.009 \times \text{KSATSSUR} - 0.035 \times \text{BSHAPE})}$$

- where: (127 streamgages used to develop equations)

DRNAREA is drainage area, in square miles

KSATSSUR is the average saturated hydraulic conductivity of soil (micrometers per second)

BSHAPE is a shape factor measure of basin shape computed as $\text{BASLEN}^2/\text{DRNAREA}$

IA StreamStats app will use peak-flow regional-regression equations published in SIR 2015-5055



Prepared in cooperation with the Iowa Department of Transportation and the Iowa Highway Research Board (Project TR-678)

Comparisons of Estimates of Annual Exceedance-Probability Discharges for Small Drainage Basins in Iowa, Based on Data through Water Year 2013



Scientific Investigations Report 2015–5055

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Iowa Landform Regions

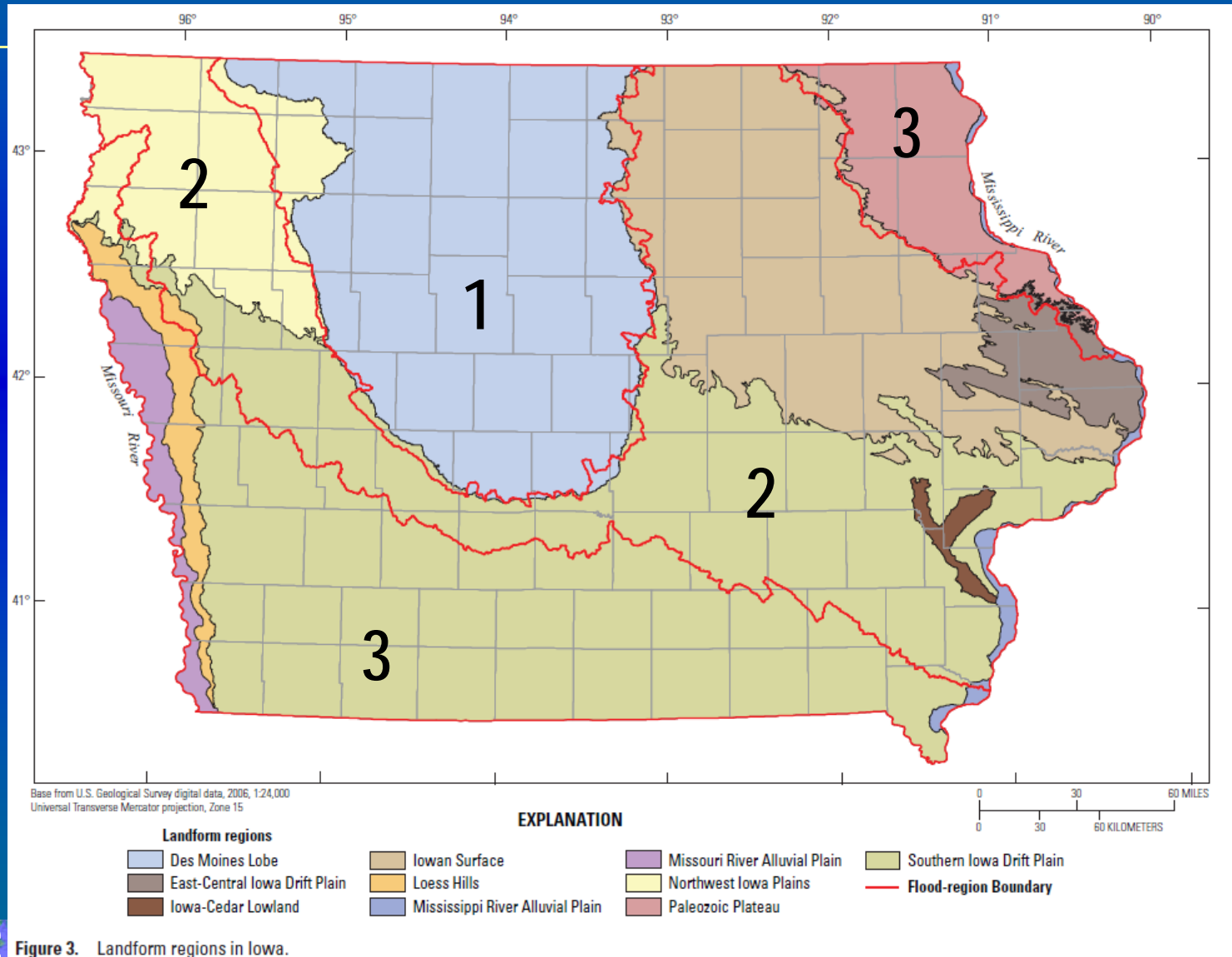
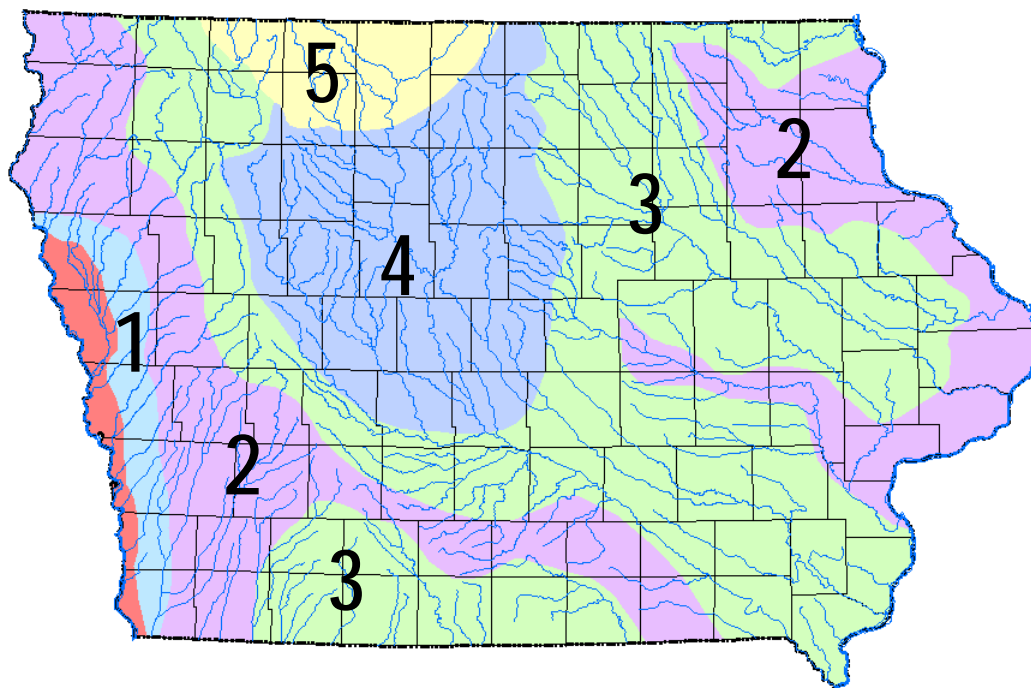


Figure 3. Landform regions in Iowa.

Summary of flood-frequency-estimation comparison results from SIR 2015-5055

- For $DA < 2 \text{ mi}^2$, use of the TR-55 method for flood regions 1 and 3 and the 1987 RREs for flood region 2 may provide the best overall results
- For DA from 2-20 mi^2 , use of the 1987 RREs for the Southern Iowa Drift Plain landform region and for flood region 3, the 2013 multi-var RREs for the lowan Surface landform region, the 2013 or 1987 single-var RREs for flood region 2, and the 2013 single-var RREs elsewhere may provide the best overall results

Iowa 1987 Hydrologic Regions



1987 Regional Regression Equations

Table 2.--Regional flood-frequency equations

| Hydrologic region 1 (19 stations) | | Hydrologic region 2 (81 stations) | |
|--|--------------------------|--|--------------------------|
| Equation for indicated recurrence interval | Standard error (percent) | Equation for indicated recurrence interval | Standard error (percent) |
| $Q_2 = 211A^{0.62}$ | 61 | $Q_2 = 196A^{0.57}$ | 55 |
| $Q_5 = 502A^{0.60}$ | 37 | $Q_5 = 402A^{0.55}$ | 39 |
| $Q_{10} = 757A^{0.60}$ | 28 | $Q_{10} = 570A^{0.55}$ | 34 |
| $Q_{25} = 1,140A^{0.57}$ | 24 | $Q_{25} = 821A^{0.54}$ | 32 |
| $Q_{50} = 1,500A^{0.60}$ | 21 | $Q_{50} = 1,020A^{0.53}$ | 33 |
| $Q_{100} = 1,880A^{0.60}$ | 24 | $Q_{100} = 1,230A^{0.53}$ | 36 |
| Hydrologic region 3 (119 stations) | | Hydrologic region 4 (24 stations) | |
| Equation for indicated recurrence interval | Standard error (percent) | Equation for indicated recurrence interval | Standard error (percent) |
| $Q_2 = 129A^{0.62}$ | 44 | $Q_2 = 31A^{0.77}$ | 40 |
| $Q_5 = 265A^{0.59}$ | 36 | $Q_5 = 67A^{0.72}$ | 33 |
| $Q_{10} = 381A^{0.57}$ | 35 | $Q_{10} = 98A^{0.70}$ | 31 |
| $Q_{25} = 555A^{0.55}$ | 37 | $Q_{25} = 145A^{0.68}$ | 29 |
| $Q_{50} = 695A^{0.54}$ | 39 | $Q_{50} = 180A^{0.66}$ | 30 |
| $Q_{100} = 851A^{0.53}$ | 41 | $Q_{100} = 227A^{0.65}$ | 30 |
| Hydrologic region 5 (8 stations) | | | |
| Equation for indicated recurrence interval | Standard error (percent) | | |
| $Q_2 = 30A^{0.66}$ | 27 | | |
| $Q_5 = 37A^{0.71}$ | 21 | | |
| $Q_{10} = 41A^{0.74}$ | 20 | | |
| $Q_{25} = 45A^{0.77}$ | 24 | | |
| $Q_{50} = 47A^{0.79}$ | 24 | | |
| $Q_{100} = 50A^{0.80}$ | 26 | | |

2013 Flood Region 1 Drainage-Area Only Regression Equation

- Regression equations take the form:

$$Q_{1\%} = 462 \text{ DRNAREA}^{0.524}$$

- where:

DRNAREA is drainage area, in square miles

IA StreamStats app uses low-flow regional-regression equations published in SIR 2012-5171



Prepared in cooperation with the Iowa Department of Natural Resources

Methods for Estimating Selected Low-Flow Frequency Statistics and Harmonic Mean Flows for Streams in Iowa

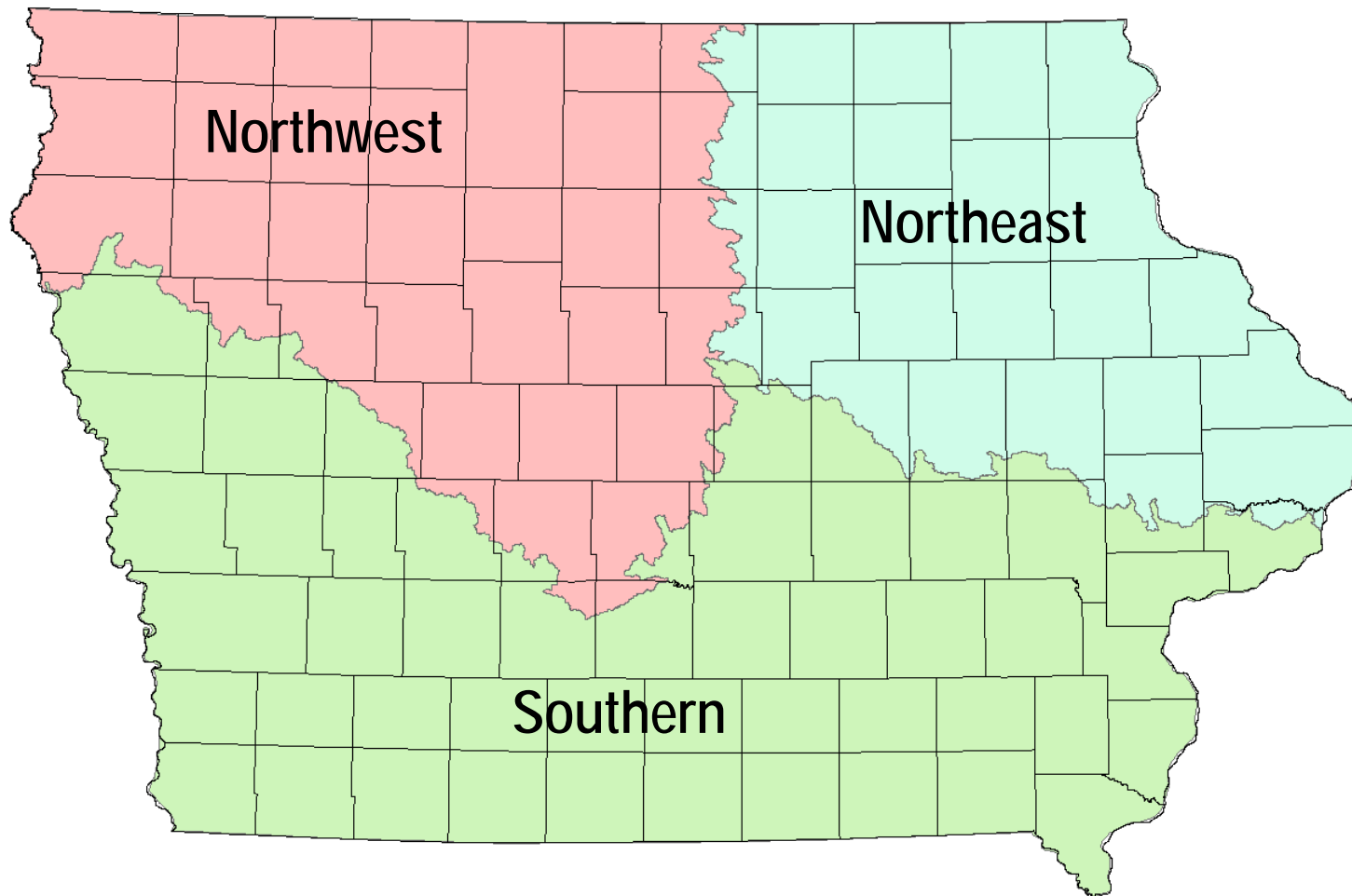


Scientific Investigations Report 2012-5171

U.S. Department of the Interior
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Iowa Low-Flow Regions



IA StreamStats app uses statewide flow-duration equations published in SIR 2012-5232



Prepared in cooperation with the Iowa Department of Natural Resources

Computing Daily Mean Streamflow at Ungaged Locations in Iowa by using the Flow Anywhere and Flow Duration Curve Transfer Statistical Methods



Scientific Investigations Report 2012-5232

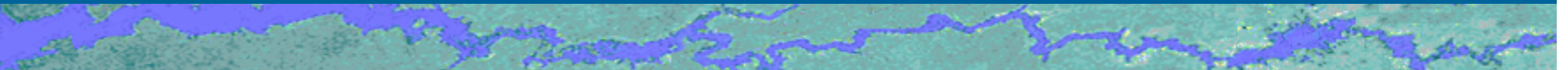
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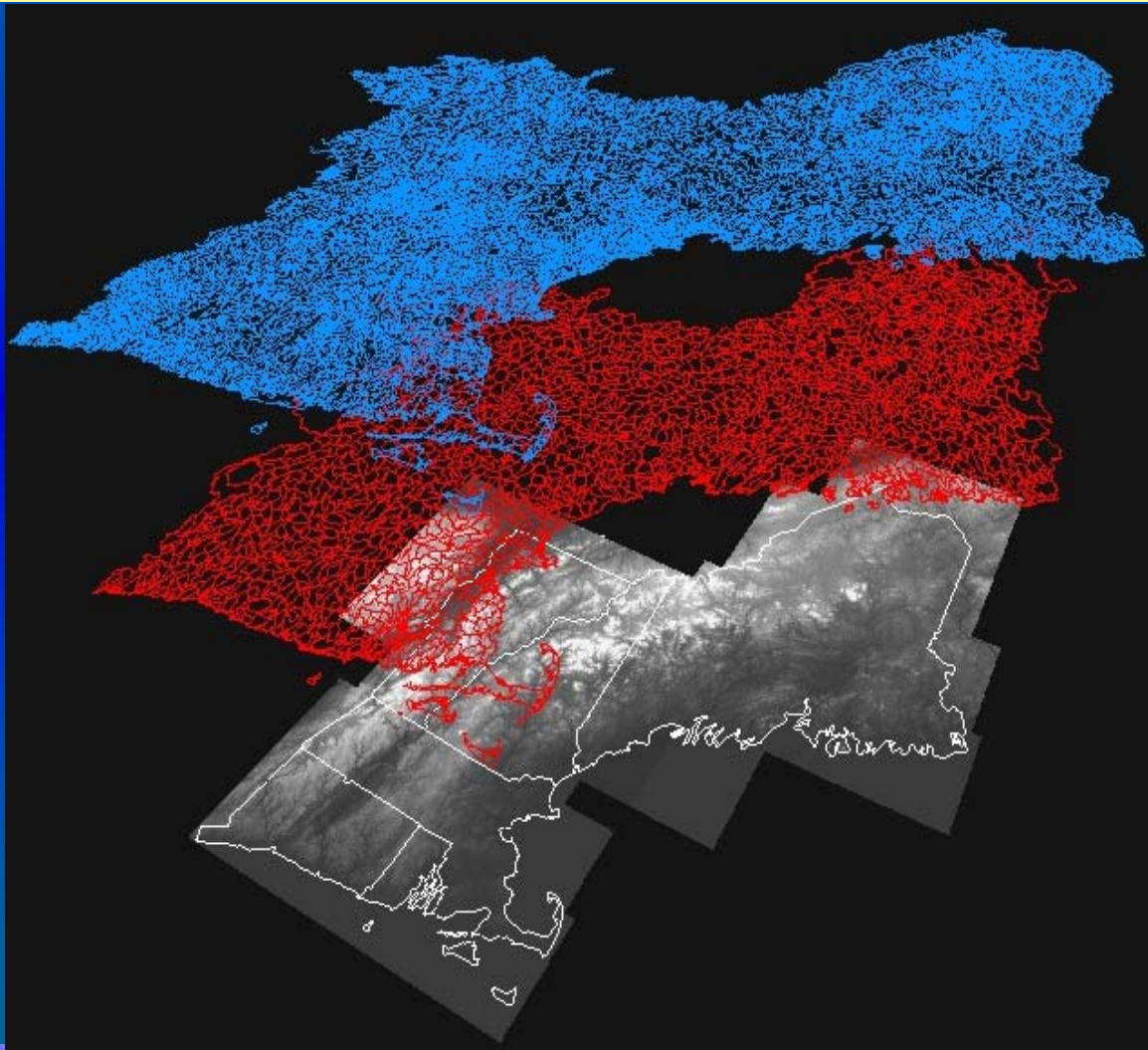
StreamStats Version 4 App

Watershed Delineation from a Point

1. User selects point on stream
2. Point is transferred to a cell in a flow-direction grid derived from a DEM
3. GIS determines boundary from flow-direction grid up to points at which the boundary for the new site intersects boundaries in boundary map layer
4. GIS accumulates all upstream areas and dissolves internal boundaries



StreamStats Integrates NHD Streams, WBD Boundaries and NED Elevation in ArcHydro

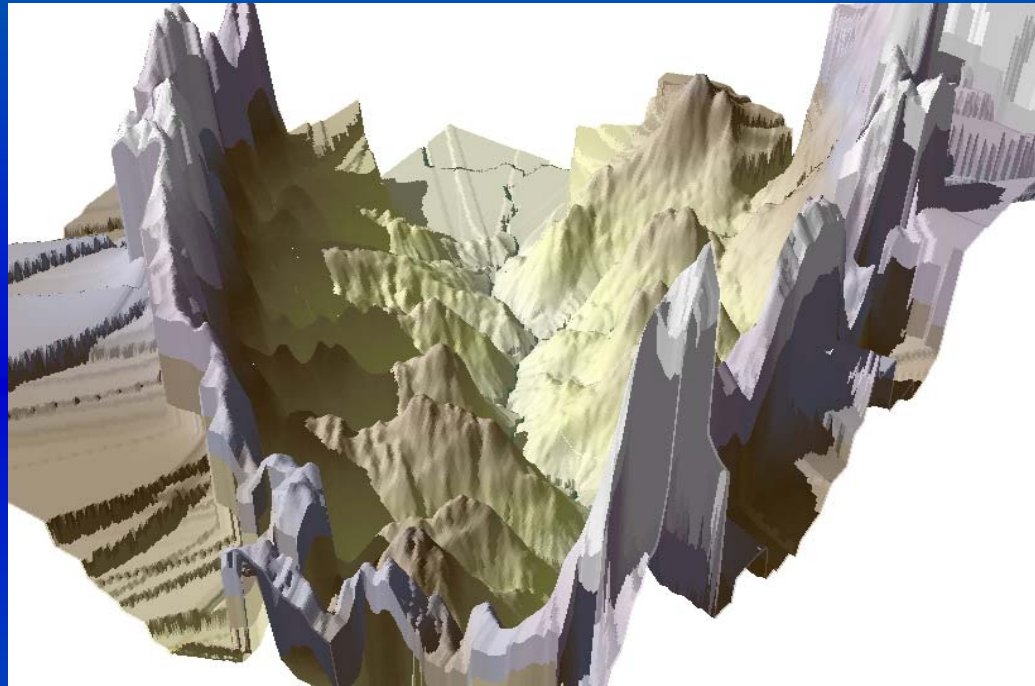


National
Hydrography
Dataset (NHD)

Watershed
Boundary
Dataset (WBD)

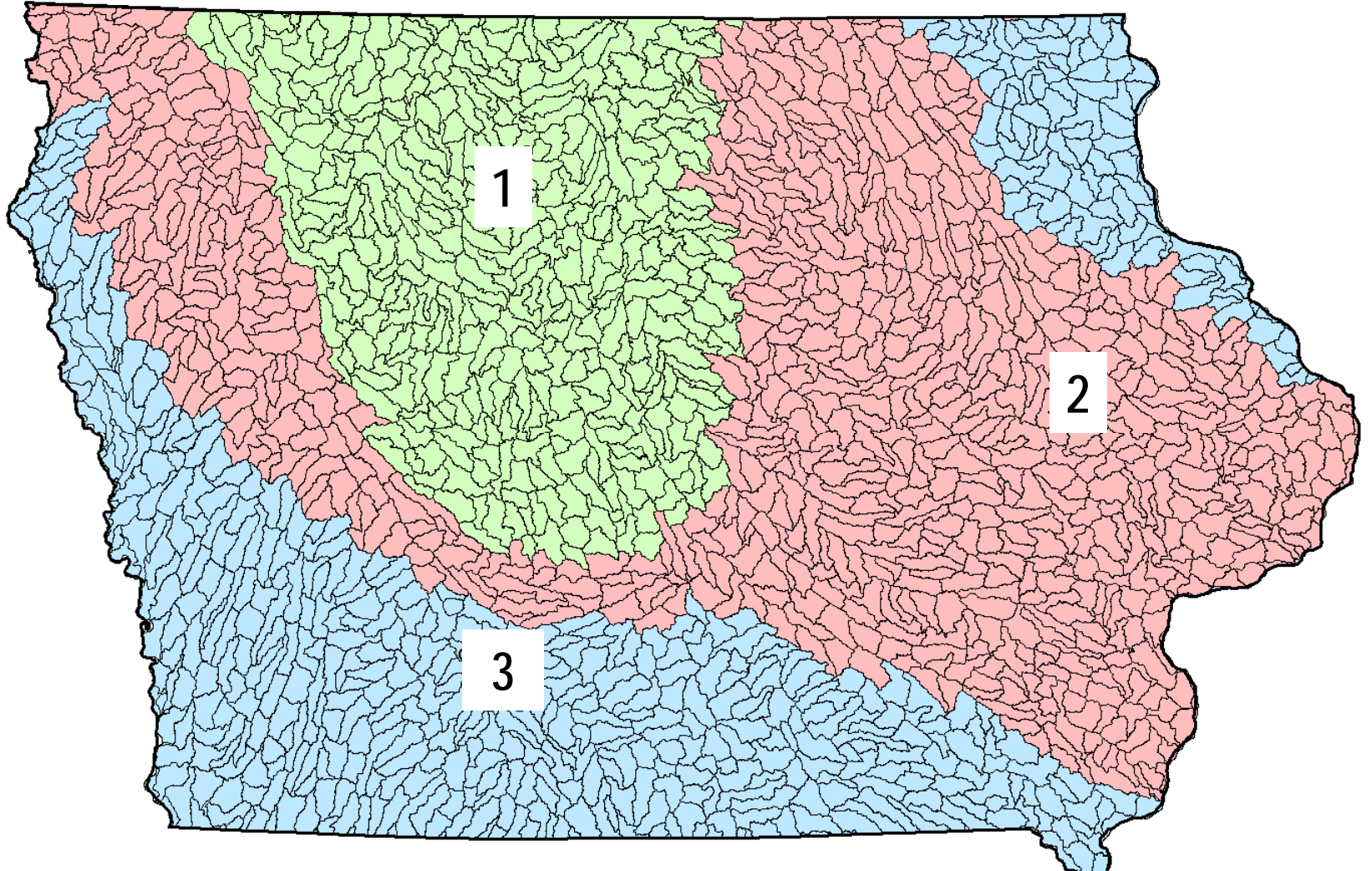
National
Elevation
Dataset (NED)

Burning and Walling of DEM



Forces DEM to agree with stream network and WBD or locally digitized drainage boundaries

12-digit HUCs Watershed Boundary Dataset



StreamStats Version 4 App

ArcMap showing downloaded Shapefiles

Attribute table lists basin-characteristic and flow-statistic results

| FID | Shape * | HydroID | DrainID | Name | Descript | GlobalWshd | RELATEDOID | WarningMsg | DRNAREA | M1D10Y | M7D10Y | M30D10Y | M30D5Y | M1D10Y1012 | M7D10Y1012 | QAH | KSATSSUR | STREAM_VAR | DRNFREQ | BFI | SOILASSURG | SOILBSSURG | SOILCSSURG | SOILDSSURG | RSD | PRECIP | HYSEP | |
|-----|---------|---------|---------|--------|-----------|------------|------------|------------|------------|--------|--------|---------|--------|------------|------------|------|----------|------------|---------|----------|------------|------------|------------|------------|----------|----------|----------|---|
| 0 | Polygon | 2 | 2 | ags101 | W07080105 | 1 | | | 229.009778 | 0.1 | 0.13 | 0.45 | 1.17 | 0.51 | 0.67 | 2.29 | 0 | 0 | 0 | 0.540912 | 0 | 0 | 0 | 0 | 0.327329 | 34.26129 | 54.11327 | 1 |

QUESTIONS



StreamStats Home Page

water.usgs.gov/osw/streamstats



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Beta version 4 has arrived!

Beta version 4 is now available for most states on a trial basis, and version 3 remains available. Beta version 4 provides a single user interface (at <http://streamstatsags.cr.usgs.gov/streamstats/>) for all states that are implemented, rather than separate applications for each state, as in versions 2 and 3, and the user interface is more user friendly than previous versions. Information for user-selected ungaged sites currently cannot be obtained using beta version 4 for the States of Arkansas, Arizona, Georgia, Iowa, Indiana, Maryland, North Carolina, Oregon, South Carolina, and Tennessee because of unique functionality for those states that is not yet implemented. Users are encouraged to provide comments and report bugs by use of the Help button on the interface, which also provides access to limited beta version 4 documentation. See below for additional information about versions both 3 and 4.

Please contact the StreamStats by email at support@streamstats.freshdesk.com if you have any questions.

The StreamStats Program

StreamStats is a Web application that incorporates a Geographic Information System (GIS) to provide users with access to an assortment of analytical tools that are useful for a variety of water-resources planning and management purposes, and for engineering and design purposes. In version 3 as well as beta version 4, StreamStats users can select USGS data-collection station locations shown on a map and obtain previously published information for the stations, including descriptive information, and previously published basin characteristics and streamflow statistics. Currently, StreamStats provides additional tools that allow users to select sites on ungaged streams and do the following:

- obtain the drainage-basin boundary (version 3 and beta version 4),
- compute selected basin characteristics (version 3 and beta version 4),
- estimate selected streamflow statistics using regression equations (version 3 and beta version 4),
- download a shapefile of the drainage-basin boundary, as well as any computed basin characteristics and flow statistics (version 3 and beta version 4),
- edit the delineated basin boundary (beta version 4 only),
- modify the basin characteristics that are used as explanatory variables in the regression equations and get new estimates of streamflow statistics (beta version 4 only),
- print the map (beta version 4 only),
- measure distances between user-selected points on the map (beta version 4 only),
- obtain plots of the elevation profile between user-selected points on the map (beta version 4 only).

The streamflow statistics that StreamStats can provide for data-collection stations and for user-selected ungaged sites vary among the states that are implemented in StreamStats and among data-collection stations within states. Unless otherwise noted on a state's introductory page, estimates obtained for ungaged sites assume natural flow conditions at the site.

StreamStats generally is implemented separately for each state, with the needed data preparation work accomplished through cooperative agreements with state or other agencies. When states have not been implemented, it is generally because no state or other agency has been willing to enter into a cooperative agreement with the USGS to assist with funding the needed work.

StreamStats applications for individual states are accessed separately in version 3, whereas beta version 4 provides a single national user interface for all state applications. Use the State Applications link at the left to access a web page that shows where StreamStats version 3 is available and where it is being implemented. Users can select an individual state application from the map or the pull-down list on the State Applications page to view an introductory page for the state, which contains a link to the StreamStats version 3 user interface. The introductory pages explain any unique functionality that is available for the state and provides citations to reports that document the methods implemented for the state. The StreamStats beta version 4 user interface may be accessed at <http://ssdev.cr.usgs.gov/streamstats/>.

Several tools, mostly related to stream-network navigation, were lost from StreamStats when version 2 was retired and version 3 was introduced on July 14, 2015, before all tools from version 2 were redeveloped for version 3. These tools allowed users to search upstream or downstream along the stream network from user-selected sites to identify stream reaches and water-related activities along the streams, such as dams and point discharges, and obtain information about those activities. In addition, users could (1) estimate flow statistics at ungaged sites based on the statistics at upstream or downstream streamgages, (2) trace the path of a drop of water that falls on any point on the land surface downstream through the stream network, and (3) obtain elevation profiles along stream channels and between points on the land surface. Version 2 was retired because it was operated on computers that used an older operating system that was considered a security risk for use on U.S. government servers. Beta version 4 restores some of the tools that were lost from version 2. Also, the outputs that list the basin characteristics and estimated streamflow statistics for user-selected ungaged sites now include maps of the site locations. All other functionality that was available in Version 2, including all tools that rely on stream-network navigation, is still in development, with a goal of having completing development by late spring of 2016. Version 3 will remain available and should be used for official purposes until version 4 is more thoroughly tested.



State Applications



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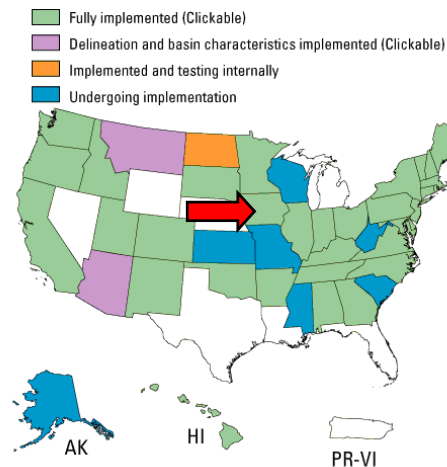
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State Applications

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OR

Efforts are underway to make StreamStats operational for many states, with a long-term goal of national coverage. Work needed to implement StreamStats is generally done by the USGS in cooperation with various state and local agencies. The map below indicates states where StreamStats has been implemented, and where work on implementation is currently underway. Green states have fully implemented StreamStats applications, orange states have been completed and are in testing internally, and blue states are undergoing implementation. Users may access the implemented state applications by selecting the state of interest on the map below, or by selecting the name of the state from the list above.



For the states that are not yet fully implemented, StreamStats provides a separate application that allows users to [obtain information for USGS data-collection stations](#), including descriptive information, and previously published streamflow statistics and physical and climatic characteristics of the drainage basins for the stations. All of the information provided by this national application is also available from the separate state applications. If your state is not highlighted in the above map and you are interested in making StreamStats operational there, contact the [USGS Water Science Center Director](#) for your state. The application continues to be improved and expanded. Please continue to come back to this page to see future enhancements.



Iowa StreamStats Introductory Page



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Iowa

StreamStats Version 3 for Iowa includes new regression equations

New regression equations for estimating low-flow frequencies and flow-duration statistics are now available in StreamStats version 3 for Iowa (see the citations below). Version 3 is now available for all states. Version 2 has been retired. Currently, version 3 can only delineate drainage basins, compute basin characteristics, and estimate streamflow statistics using regression equations for user-selected sites. It also can provide reports of information for USGS data-collection stations. All other functionality that previously was available in version 2 will be added to version 3 as quickly as possible, with a goal of having all functionality available by the end of 2015.

Please help us conserve our server system resources by closing the Interactive Map window when you are finished using it. Doing so will help ensure system availability for all users. Thank you.

Also, please bookmark this page rather than the Interactive Map page, as the URL for the interactive map may change in the future.

Iowa StreamStats incorporates regression equations that can be used to obtain estimates of (1) low-flow statistics (the annual 1-, 7-, and 30-day mean low flows for a recurrence interval of 10 years, the annual 30-day mean low flow for a recurrence interval of 5 years, the seasonal (October 1 through December 31) 1- and 7-day mean low flows for a recurrence interval of 10 years, and the harmonic mean), (2) flow duration statistics (0.01-, 0.05-, 0.10-, 0.15-, 0.20-, 0.30-, 0.40-, 0.50-, 0.60-, 0.70-, 0.80-, 0.85-, 0.90-, 0.95-, and 0.99-exceedance probabilities), and (3) peak-flow statistics (50-, 20-, 10-, 4-, 2-, 1-, 0.5-, and 0.2-percent annual exceedance probabilities, which are equivalent to annual flood-frequency recurrence intervals of 2, 5, 10, 25, 50, 100, 200, and 500 years, respectively). The reports below document the regression equations available in StreamStats for Iowa, the methods used to develop the equations and to measure the basin characteristics used in the equations, references to GIS data layers used in the analysis, and the errors associated with the estimates obtained from the equations. Users should familiarize themselves with the reports before using StreamStats to obtain estimates of streamflow statistics for ungauged sites.

- Eash, D.A., and Barnes, K.K., 2012. Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa. U.S. Geological Survey Scientific Investigations Report 2012-5171. 94 p.
- Eash, D.A., Barnes, K.K., and Velieux, A.G., 2013. Methods for estimating annual exceedance-probability discharges for streams in Iowa, based on data through water year 2010. U.S. Geological Survey Scientific Investigations Report 2013-5086. 63 p.
- Linhart, S.M., Nania, J.F., Sanders, C.L., Jr., and Archfield, S.A., 2012. Computing daily mean streamflow at ungauged locations in Iowa by using the Flow Anywhere and Flow Duration Curve Transfer statistical methods. U.S. Geological Survey Scientific Investigations Report 2012-5232. 50 p.

Interactive Map

WARNINGS:

Missing outputs: The regression equations used to estimate streamflow statistics for Iowa StreamStats use a number of basin characteristics as explanatory variables that are very computationally demanding to compute. As a result, when using the Estimate Flows Using Regression Equations tool or choosing to compute all possible basin characteristics when using the Basin Characteristics tool, the internet connection from the StreamStats may time out before an output report can be produced because the processing time required for the computation exceeds the time allowed for the internet connection. This is especially likely to occur for large drainage basins, typically in excess of about 1,500 square miles, in peak-flow regions 2 and 3, where one of the explanatory variables is the basin shape factor. Occasionally it can happen for smaller basins. If StreamStats times out before a report is produced, then usually the process is still running in the background. It usually is possible to wait a few more minutes and then use the Download tool to obtain a shapefile for the selected basin. The downloaded shapefile will contain a .dbf file that includes values for all basin characteristics and streamflow statistics that were computed for the selected site. Also, when using the Basin Characteristics tool it is recommended that users should select only the basin characteristics needed for their specific purposes.

When using the Basin Characteristics tool, if a value for basin shape (BSHAPE) is determined, then a two-step process is required. First, use the tool to compute either the basin length or the 10-85 slope, and then use it again to compute BSHAPE.

Use of drainage-area only equations for peak-flow region 1: Peak-flow regression equations used in the StreamStats Estimate Flows Using Regression Equations tool for region 1 appear in table 9 of Eash and others (2013). Those equations require the measurement of the sum of stream lengths in the basin in order to calculate the basin characteristic CCM (constant of channel maintenance). The sum of stream lengths in the basin is measured using 1:24,000-scale streams. For stream lengths in peak-flow region 1, no 1:24,000-scale streams may be present and the value measured for the sum of stream lengths in the basin will equal zero. In these cases, then drainage-area only equations from table 15 in Eash and others (2013) will be used. A header in the StreamStats Un-gauged Site Report will note the use of the drainage-area only equations by stating: "Sum of stream lengths in basin in miles = 0.000."

The drainage-area only equations from table 15 in Eash and others (2013) will also be used for computing peak-flow estimates for region 2 if CCM > 3.87, which is the maximum value for CCM used to develop the region 1 peak-flow equations. Errors for basins with CCM values greater than 3.87 are unknown and use of the drainage-area only equations with the Estimate Flows Using Regression Equations tool will report the uncertainty of the estimates for ungauged basins when the area in square miles is within the range of basins that were used to develop the regression equations.

Selected sites with drainage area in multiple hydrologic regions: Eash and others (2013) identified three peak-flow regions for which separate regression equations were developed for estimating peak-flow statistics in Iowa. StreamStats provides estimates based on the regression equations for each peak-flow region that is within the drainage area and final weighted estimates, with weights corresponding to the proportion of the drainage area that is in each peak-flow region. Because the Des Moines Lobe basin characteristic is a weighting factor that decreases peak-flow estimates for region 2 relative to the percentage of drainage area within the Des Moines Lobe landform region, use of the area-averaged peak-flow estimates may underestimate flows. If the value for the Des Moines Lobe basin characteristic is greater or equal to 10 percent for peak-flow region 2, the preferred peak-flow estimates are those determined using only the regression equations for the peak-flow region in which the selected site is located. The Basin Characteristics tool can be used to determine the peak-flow region number for the region in which the selected site is located.

Errors associated with estimated streamflow statistics for ungauged sites: StreamStats outputs from the Estimate Flows Using Regression Equations tool report the uncertainty of the estimates for ungauged sites when basin characteristics for selected sites are within the ranges of the basin characteristics for streamgages that were used to develop the regression equations. Errors for basins with basin characteristics that are beyond these bounds are unknown. The applicable ranges of the basin characteristics are provided in the outputs and messages are provided when basin characteristics are outside of the applicable ranges. See the Streamflow Statistics Definitions page for explanations of the statistics used as indicators of uncertainty.

Iowa StreamStats does not provide error indicators for estimates of the 99-percent duration flow. The average standard errors of prediction are given for other flow-duration percentiles, but it was not possible to compute this statistic for the 99-percent duration flow equation because a different method was used to develop the equation. Instead, the average standard error of estimate was computed, which was 97.7 percent. As StreamStats programming allows the display of only one type of standard error statistic for all equations within a hydrologic region, the error statistic for the 99-percent duration flow is not shown in StreamStats outputs.

A "jagging" phenomenon can sometimes be encountered with the estimates from flow-duration regression statistics when a discharge estimate for a particular exceedance probability is greater than the discharge estimate for the next successively lower exceedance probability. For example, an estimate for the 0.15-exceedance probability may be greater than the estimate for the 0.10-exceedance probability. Jagging can occur when the basin characteristics that are included as explanatory variables in the regression equations change between adjacent exceedance probabilities, and is a result of the inherent uncertainty in the estimates obtained from the individual regression equations. The magnitude of the jagging is approximately 20 percent of the streamgages used to develop the flow-duration regression equations. See Linhart and others (2012) for more information about this error.

StreamStats for Iowa was developed in cooperation with the Iowa Department of Transportation and the Iowa Department of Natural Resources.



Contact Us if you experience any problems with this application.



Lists statistics
estimated

Gives report
references

Link to Iowa StreamStats application

Warnings,
cooperative statement

StreamStats Home Page

water.usgs.gov/osw/streamstats



USGS Home
Contact USGS
Search USGS

Welcome to StreamStats

Best viewed in Internet Explorer 10 or higher with pop-up blocker disabled

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Beta version 4 has arrived!

Beta version 4 is now available for most states on a trial basis, and version 3 remains available. Beta version 4 provides a single user interface (at <http://streamstatsags.cr.usgs.gov/streamstats/>) for all states that are implemented, rather than separate applications for each state, as in versions 2 and 3, and the user interface is more user friendly than previous versions. Information for user-selected ungaged sites currently cannot be obtained using beta version 4 for the States of Arkansas, Arizona, Georgia, Iowa, Indiana, Maryland, North Carolina, Oregon, South Carolina, and Tennessee because of unique functionality for those states that is not yet implemented. Users are encouraged to provide comments and report bugs by use of the Help button on the interface, which also provides access to limited beta version 4 documentation. See below for additional information about versions both 3 and 4.

Please contact the StreamStats by email at support@streamstats.freshdesk.com if you have any questions.

The StreamStats Program

StreamStats is a Web application that incorporates a Geographic Information System (GIS) to provide users with access to an assortment of analytical tools that are useful for a variety of water-resources planning and management purposes, and for engineering and design purposes. In version 3 as well as beta version 4, StreamStats users can select USGS data-collection station locations shown on a map and obtain previously published information for the stations, including descriptive information, and previously published basin characteristics and streamflow statistics. Currently, StreamStats provides additional tools that allow users to select sites on ungaged streams and do the following:

- obtain the drainage-basin boundary (version 3 and beta version 4),
- compute selected basin characteristics (version 3 and beta version 4),
- estimate selected streamflow statistics using regression equations (version 3 and beta version 4),
- download a shapefile of the drainage-basin boundary, as well as any computed basin characteristics and flow statistics (version 3 and beta version 4),
- edit the delineated basin boundary (beta version 4 only),
- modify the basin characteristics that are used as explanatory variables in the regression equations and get new estimates of streamflow statistics (beta version 4 only),
- print the map (beta version 4 only),
- measure distances between user-selected points on the map (beta version 4 only),
- obtain plots of the elevation profile between user-selected points on the map (beta version 4 only).

The streamflow statistics that StreamStats can provide for data-collection stations and for user-selected ungaged sites vary among the states that are implemented in StreamStats and among data-collection stations within states. Unless otherwise noted on a state's introductory page, estimates obtained for ungaged sites assume natural flow conditions at the site.

StreamStats generally is implemented separately for each state, with the needed data preparation work accomplished through cooperative agreements with state or other agencies. When states have not been implemented, it is generally because no state or other agency has been willing to enter into a cooperative agreement with the USGS to assist with funding the needed work.

StreamStats applications for individual states are accessed separately in version 3, whereas beta version 4 provides a single national user interface for all state applications. Use the State Applications link at the left to access a web page that shows where StreamStats version 3 is available and where it is being implemented. Users can select an individual state application from the map or the pull-down list on the State Applications page to view an introductory page for the state, which contains a link to the StreamStats version 3 user interface. The introductory pages explain any unique functionality that is available for the state and provides citations to reports that document the methods implemented for the state. The StreamStats beta version 4 user interface may be accessed at <http://ssdev.cr.usgs.gov/streamstats/>.

Several tools, mostly related to stream-network navigation, were lost from StreamStats when version 2 was retired and version 3 was introduced on July 14, 2015, before all tools from version 2 were redeveloped for version 3. These tools allowed users to search upstream or downstream along the stream network from user-selected sites to identify stream reaches and water-related activities along the streams, such as dams and point discharges, and obtain information about those activities. In addition, users could (1) estimate flow statistics at ungaged sites based on the statistics at upstream or downstream streamgages, (2) trace the path of a drop of water that falls on any point on the land surface downstream through the stream network, and (3) obtain elevation profiles along stream channels and between points on the land surface. Version 2 was retired because it was operated on computers that used an older operating system that was considered a security risk for use on U.S. government servers. Beta version 4 restores some of the tools that were lost from version 2. Also, the outputs that list the basin characteristics and estimated streamflow statistics for user-selected ungaged sites now include maps of the site locations. All other functionality that was available in Version 2, including all tools that rely on stream-network navigation, is still in development, with a goal of having completing development by late spring of 2016. Version 3 will remain available and should be used for official purposes until version 4 is more thoroughly tested.



Version 4 User Interface

SELECT A STATE / REGION

Click a state or region on the map or use the search box to zoom to an area of interest

Location Search

IDENTIFY A STUDY AREA

SELECT SCENARIOS

BUILD A REPORT

POWERED BY WIM

Click a state or region on the map or use the search box to zoom to an area of interest

Location search

Zoom Level, Map Scale, Lat/Long
Zoom level 3

Zoom Level: 3
Map Scale: 1:73,957,193
Lat: -32.9902, Lon: -210.2344

Version 4: Iowa User Interface

The image shows the USGS StreamStats Iowa User Interface. The top navigation bar includes the USGS logo, "StreamStats", and links for "? HELP", "i ABOUT", and "REPORT". The left sidebar contains a menu with "SELECT A STATE / REGION" (IOWA selected), "IDENTIFY A STUDY AREA", "Zoom in to level 15 or greater to enable the delineation tool", "Delineate", "SELECT SCENARIOS", "BUILD A REPORT", and "POWERED BY WIM". The main map area displays a topographic map of Iowa with stream networks, cities, and various colored markers (triangles). A red arrow points to a map icon in the sidebar, labeled "Exploration Tools". Another red arrow points to a zoom-in button, labeled "Zoom in to level 15 or greater to enable the delineation tool". A third red arrow points to a map icon in the top right corner, labeled "Base Maps". A text box at the bottom left of the map area displays "Zoom Level: 8", "Map Scale: 1:2,311,162", and "Lat: 40.1369, Lon: -96.0590". A red arrow points to this text box, labeled "Zoom level 8". The USGS logo is visible in the bottom left corner of the interface.

Base Maps

CLOSE LEGEND

BASE MAPS

IA MAP LAYERS

NATIONAL LAYERS

CLOSE LEGEND

BASE MAPS

Mapquest Hybrid

Mapquest Areal

ESRI Gray

ESRI Imagery

Mapquest Streets

National Geographic

ESRI Oceans

ESRI Streets

USGS National Map

ESRI World Topographic

IA MAP LAYERS

NATIONAL LAYERS

CLOSE LEGEND

BASE MAPS

IA MAP LAYERS

Streamgages

- Gaging Station, Continuous Record
- Low Flow, Partial Record
- Peak Flow, Partial Record
- Peak and Low Flow, Partial Record
- Stage Only
- Low Flow, Partial Record, Stage
- Miscellaneous Record
- Unknown

Area of Limited Functionality

- Outside State, No functionality
- Regulated River Warning

Stream Grid

- 1

Iowa

- IA

Study Area Bndys

- State HUCpoly
- Regional Study

NATIONAL LAYERS

CLOSE LEGEND

BASE MAPS

IA MAP LAYERS

NATIONAL LAYERS

Streamgages

- Gaging Station, Continuous Record
- Low Flow, Partial Record
- Peak Flow, Partial Record
- Peak and Low Flow, Partial Record
- Stage Only
- Low Flow, Partial Record, Stage
- Miscellaneous Record
- Unknown

Regional Studies

- Undergoing Implementation
- Implemented

Availability

- Not Available (2)

State Applications

- Not Implemented
- Undergoing implementation
- Implemented and testing internally
- Delineation and Basin

Characteristics

- Version 3 Implemented
- Outside of Pilot Area

Study Area Bndys

- State HUCpoly

Iowa User Interface without Streamgages

SELECT A STATE / REGION

IOWA

IDENTIFY A STUDY AREA

Zoom in to level 15 or greater to enable the delineation tool

Delineate

SELECT SCENARIOS

BUILD A REPORT

POWERED BY WIM

Can zoom in and out with zoom tool or by scrolling, and can drag map in any direction

Search box reappears by clicking on 'Select A State / Region'

Zoom level 8

Zoom Level: 8
Map Scale: 1:2,311,162
Lat: 40.1285, Lon: -97.7728

Location Search

SELECT A STATE / REGION

IOWA

Click a state or region on the map or use the search box to zoom to an area of interest

Location Search

You have zoomed in sufficiently to select a state or regional study area. Your selection will dictate the data used to perform basin delineation and flow statistics calculation.

Select a State or Regional Study Area

Wisconsin

Illinois

Minnesota

South Dakota

Iowa

IDENTIFY A STUDY AREA

SELECT SCENARIOS

Supported search strings:

- Geographic Names Information System Locations
- USGS Sites
- Zip Codes
- Area Codes
- States
- Lat/Long (ie. '43.9,-72.1)
- Street Addresses

Zoom level 8

Location Search: Ames, IA: then click on Ames Story County, IA

The screenshot displays the USGS StreamStats web application interface. The top navigation bar includes the USGS logo, the text "StreamStats", and links for "HELP", "ABOUT", and "REPORT". On the left side, there is a sidebar with a "SELECT A STATE / REGION" dropdown menu. Below this menu is a "Location Search" input field and a blue informational box that reads: "You have zoomed in sufficiently to select a state or regional study area. Your selection will dictate the data used to perform basin delineation and flow statistics calculation." The "Select a State or Regional Study Area" section shows two buttons: "Wisconsin" and "Iowa", with "Iowa" being the selected option. Below this are three more menu items: "IDENTIFY A STUDY AREA", "SELECT SCENARIOS", and "BUILD A REPORT". At the bottom of the sidebar, it says "POWERED BY WIM". The main area of the interface is a topographic map of Ames, Iowa. A red arrow points from the "Iowa" button in the sidebar to the map. A red arrow points from a blue triangle on the map to a light blue box containing the text "Project site". The map shows various landmarks, including "Iowa State University", "College Creek", and "Ames Municipal Cem". A small information box in the bottom left of the map displays: "Zoom Level: 14", "Map Scale: 1:36,111", and "Lat: 68.3992, Lon: -238.0078". The bottom of the interface features a blue footer with the USGS logo and the text "Leaflet | U.S. Department of the Interior | U.S. Geological Survey | Policies".

Need to select 'Iowa' as State or Regional Study Area

Project site

Zoom level 14

USGS StreamStats

SELECT A STATE / REGION

Click a state or region on the map or use the search box to zoom to an area of interest

Location Search

You have zoomed in sufficiently to select a state or regional study area. Your selection will dictate the data used to perform basin delineation and flow statistics calculation.

Select a State or Regional Study Area

Wisconsin

Iowa

IDENTIFY A STUDY AREA

SELECT SCENARIOS

BUILD A REPORT

POWERED BY WIM

Zoom Level: 14
Map Scale: 1:36,111
Lat: 68.3992, Lon: -238.0078

Leaflet | U.S. Department of the Interior | U.S. Geological Survey | Policies

How to Perform a Basin Delineation

USGS StreamStats

HELP ABOUT REPORT

SELECT A STATE / REGION

IOWA

IDENTIFY A STUDY AREA

Click the 'Delineate' button, then use your mouse or finger to click or tap a blue stream cell on the map

Delineate

SELECT SCENARIOS

BUILD A REPORT

POWERED BY WIM

Click the 'Delineate' button, then use your mouse or finger to click or tap a blue stream cell on the map

Project site

Zoom level 18

Base Map: ESRI Imagery

USGS

POWERED BY
esri

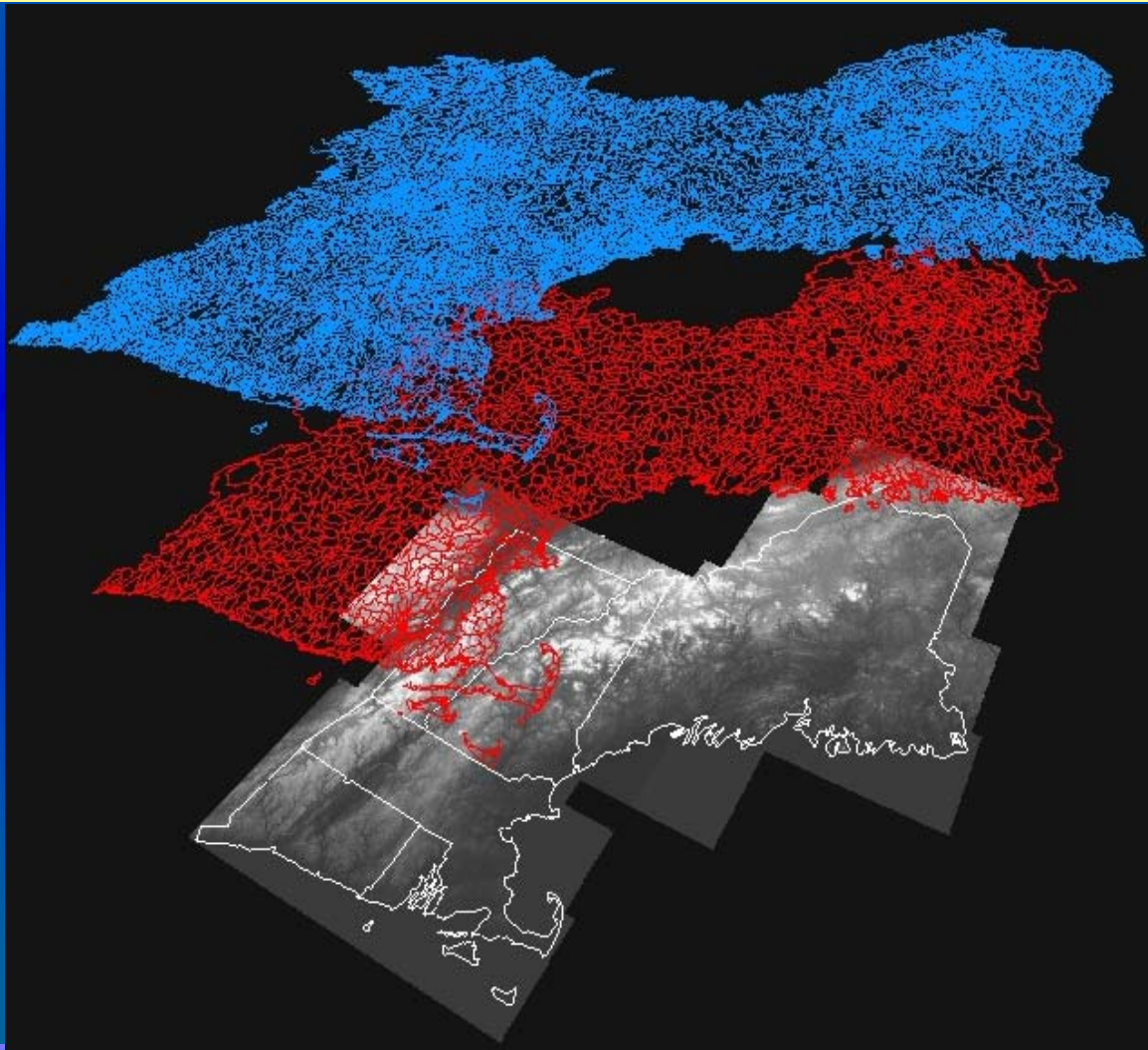
IGP, swisstopo, and the GIS User Community

Watershed Delineation from a Point

1. User selects point on stream
2. Point is transferred to a cell in a flow-direction grid derived from a DEM
3. GIS determines boundary from flow-direction grid up to points at which the boundary for the new site intersects boundaries in boundary map layer
4. GIS accumulates all upstream areas and dissolves internal boundaries



StreamStats Integrates NHD Streams, WBD Boundaries and NED Elevation in ArcHydro

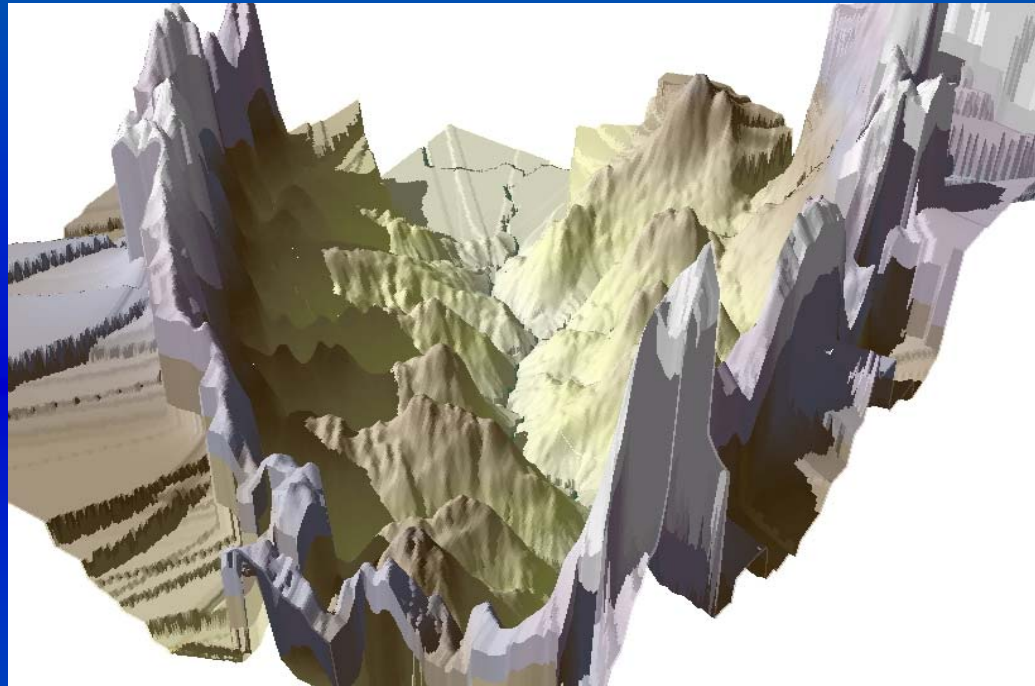


National
Hydrography
Dataset (NHD)

Watershed
Boundary
Dataset (WBD)

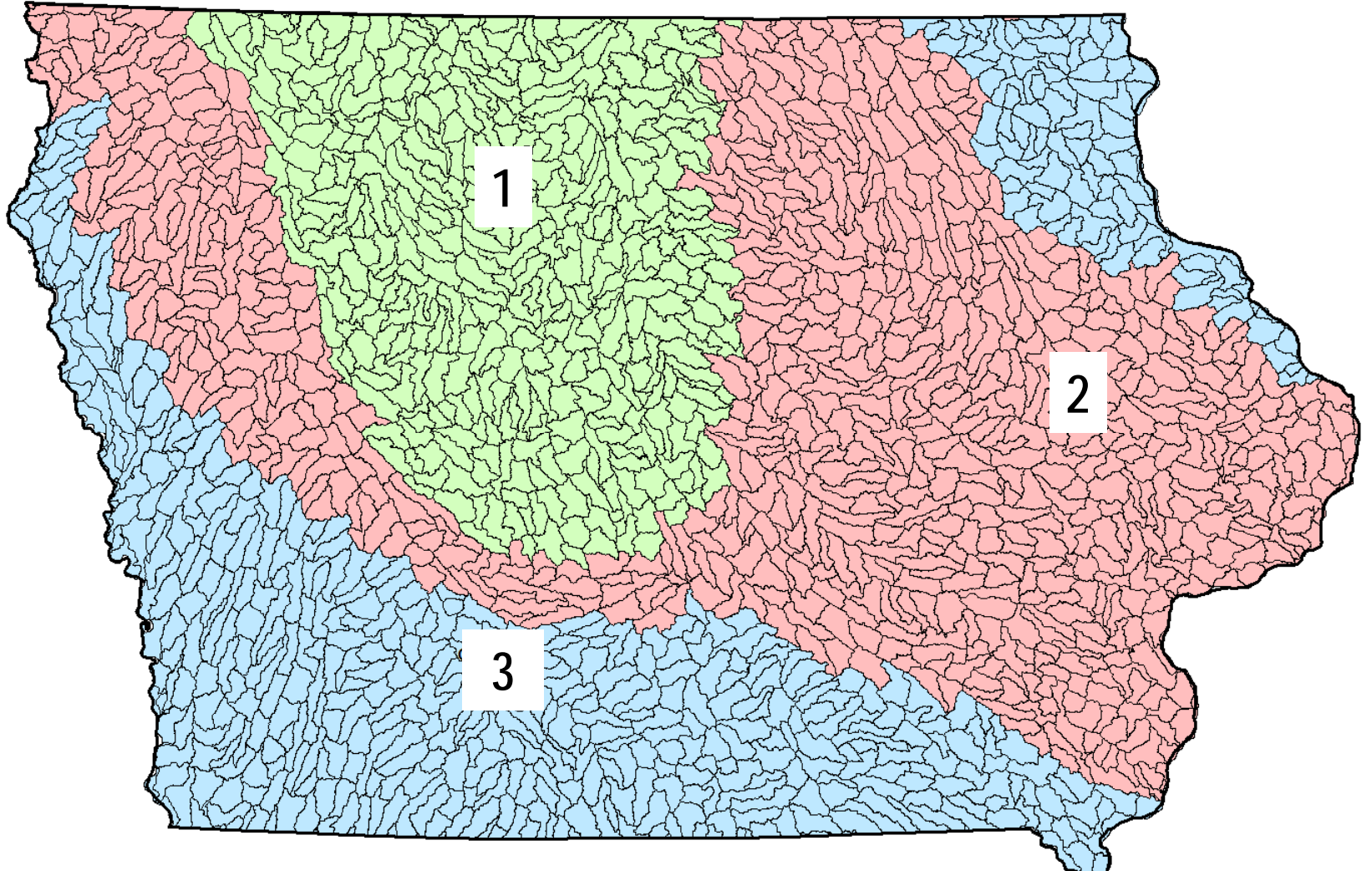
National
Elevation
Dataset (NED)

Burning and Walling of DEM



Forces DEM to agree with stream network and WBD or locally digitized drainage boundaries

12-digit HUCs Watershed Boundary Dataset



Basin Delineation

USGS StreamStats HELP ABOUT REPORT

SELECT A STATE / REGION
IOWA

IDENTIFY A STUDY AREA
BASIN DELINEATED

Your delineation is complete. You can now clear your basin, edit your basin, or choose a state or regional study specific function (if available). Click **continue** when you are ready.

SELECT SCENARIOS

BUILD A REPORT

POWERED BY WIM

Zoom Level: 11
Map Scale: 1:288,895
Lat: 41.9391, Lon: -94.0601

Project site

Zoom level 11

USGS

Leaflet | Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

powered by **esri**

Select Scenarios

SELECT A STATE / REGION

IOWA

IDENTIFY A STUDY AREA

BASIN DELINEATED

SELECT SCENARIOS

Select a scenario below, or expand the "Basin Characteristics" panel to select specific basin characteristics. Next, click "Continue" to proceed.

Regression Based Scenarios

Peak-Flow Statistics

Low-Flow Statistics

Annual Flow Statistics

Flow-Duration Statistics

Basin Characteristics

One or more basin characteristics must be selected from the 'Basin Characteristics' dropdown above

Continue

Select a scenario below, or expand the 'Basin Characteristics' panel to select specific basin characteristics. Next, click 'Continue' to proceed.

One or more basin characteristics must be selected from the 'Basin Characteristics' dropdown above

Regression Based Scenarios

- **Peak-Flow Statistics** (8 flood-frequency statistics that include 2- to 500-year recurrence-interval floods)
- **Low-Flow Statistics** (4 annual and 2 seasonal low-flow probabilities)
- **Annual-Flow Statistics** (Harmonic mean)
- **Flow-Duration Statistics** (15 statistics that include 1% - 99% exceedance probabilities)

Peak-Flow Scenario

SELECT A STATE / REGION

IOWA

IDENTIFY A STUDY AREA

BASIN DELINEATED

SELECT SCENARIOS

Select a scenario below, or expand the "Basin Characteristics" panel to select specific basin characteristics. Next, click "Continue" to proceed.

Regression Based Scenarios

Peak-Flow Statistics

Low-Flow Statistics

Annual Flow Statistics

Flow-Duration Statistics

Basin Characteristics

Continue

BUILD A REPORT

POWERED BY WIM

Zoom Level: 11
Map Scale: 1:288,895
Lat: 42.2585, Lon: -94.3334

Select Peak-Flow Scenario and click 'Continue'

Build A Report

SELECT A STATE / REGION

IOWA

IDENTIFY A STUDY AREA

BASIN DELINEATED

SELECT SCENARIOS

BASIN CHARACTERISTICS
CALCULATED

BUILD A REPORT

You can modify computed basin characteristics here, then select the types of reports you wish to generate. Then click the "Build Report" button

Show Basin Characteristics

Select available reports to display:

- Basin Characteristics Report
- Scenario Flow Reports

Build Report

You can modify computed basin characteristics here, then select the types of reports you wish to generate. Then click the 'Build Report' button

Zoom Level: 11
Map Scale: 1:288,895
Lat: 42.2234, Lon: -94.3300

Peak-Flow Report: top half

USGS StreamStats

SELECT A STATE / REGION
IOWA

IDENTIFY A STUDY AREA
BASIN DELINEATED

SELECT SCENARIOS
BASIN CHARACTERISTICS CALCULATED

BUILD A REPORT
REPORT BUILT

You can modify computed basin characteristics here, then select the types of reports you wish to generate. Then click the "Build Report" button

Show Basin Characteristics

Select available reports to display:

- Basin Characteristics Report
- Scenario Flow Reports

Build Report

POWERED BY WIM

Zoom Level: 1
Map Scale: 1:100000
Lat: 42.0300, Long: -93.6308

Report

Enter a report title and/or comments here that will display on the printed report. Use the print button below.

Enter report title:
StreamStats Report

Enter comments:
Some comments here

StreamStats Report

Region ID:
IA

Workspace ID:
IA20160225120533835000

Clicked Point (Latitude, Longitude):
42.07284, -93.63083

Time:
2016-02-25 13:05:14 -0600

Map of basin

Leaflet | U.S. Department of the Interior | U.S. Geological Survey | Policies

POWERED BY ESRI

USGS, AEC, Geomapping, Aerognd, ISN, IGP, swisstopo, and the GIS User Commu

Peak-Flow Report: bottom half

Peak-Flow Statistics Parameters 100 Percent Peak Region 1 2013 5086

| Parameter | Value | Min Limit | Max Limit |
|---------------------------------|-------|-----------|-----------|
| Drainage Area | 210 | 0.06 | 5464.00 |
| 24 Hour 10 Year Precipitation | 4.46 | 3.58 | 4.50 |
| Constant of Channel Maintenance | 0.79 | 0.11 | 3.87 |

Peak-Flow Statistics Flow Report

| Statistic | Value | Unit | Prediction Error |
|---|-------|--------------------|------------------|
| 2 Year Peak Flood [100 Percent Peak Region 1 2013 5086] | 2346 | ft ³ /s | 41.6 |
| 5 Year Peak Flood [100 Percent Peak Region 1 2013 5086] | 4592 | ft ³ /s | 32.6 |
| 10 Year Peak Flood [100 Percent Peak Region 1 2013 5086] | 6404 | ft ³ /s | 31.8 |
| 25 Year Peak Flood [100 Percent Peak Region 1 2013 5086] | 8880 | ft ³ /s | 33.2 |
| 50 Year Peak Flood [100 Percent Peak Region 1 2013 5086] | 10767 | ft ³ /s | 35.6 |
| 100 Year Peak Flood [100 Percent Peak Region 1 2013 5086] | 12836 | ft ³ /s | 38 |
| 200 Year Peak Flood [100 Percent Peak Region 1 2013 5086] | 15082 | ft ³ /s | 41 |
| 500 Year Peak Flood [100 Percent Peak Region 1 2013 5086] | 17678 | ft ³ /s | 45.2 |

Peak-Flow Statistics Citations

Eash, D.A., Barnes, K.K., and Veilleux, A.G., 2013, Methods for estimating annual exceedance-probability discharges for streams in Iowa, based on data through water year 2010: U.S. Geological Survey Scientific Investigations Report 2013-5086, 63 p. with a

100 Percent Peak Region 1

Basin-characteristic values

Peak-Flow Estimates

Download Basin

Download CSV

Download Basin or CSV or Print

Close

Print



ArcMap showing downloaded Shapefiles

Attribute table lists basin-characteristic and flow-statistic results

| FID | Shape * | HydroID | DrainID | Name | Descript | GlobalWshd | RELATEDOID | WarningMsg | DRNAREA | M1D10Y | M7D10Y | M30D10Y | M30D5Y | M1D10Y1012 | M7D10Y1012 | QAH | KSATSSUR | STREAM_VAR | DRNFREQ | BFI | SOILASSURG | SOILBSSURG | SOILCSSURG | SOILDSSURG | RSD | PRECIP | HYSEP |
|-----|---------|---------|---------|--------|-----------|------------|------------|------------|------------|--------|--------|---------|--------|------------|------------|------|----------|------------|---------|----------|------------|------------|------------|------------|----------|----------|----------|
| 0 | Polygon | 2 | 2 | ags101 | W07080105 | 1 | | | 229.009778 | 0.1 | 0.13 | 0.45 | 1.17 | 0.51 | 0.67 | 2.29 | 0 | 0 | 0 | 0.540912 | 0 | 0 | 0 | 0 | 0.327329 | 34.26129 | 54.11327 |

CSV Download

| StreamStats Output Report | | | |
|---|------------------------|----------------------|------------------|
| State/Region ID | IA | | |
| Workspace ID | IA20160225120533835000 | | |
| Latitude | 42.02284 | | |
| Longitude | -93.63083 | | |
| Time | 2/25/2016 | 1:05:14 PM | |
| Parameters | | | |
| Name | Value | Unit | |
| DRNAREA | 210 | square miles | |
| I24H10Y | 4.46 | inches | |
| CCM | 0.79 | square mile per mile | |
| DRNAREA | 210 | square miles | |
| I24H10Y | 4.46 | inches | |
| CCM | 0.79 | square mile per mile | |
| Peak-Flow Statistics Parameters 100 Percent Peak Region 1 2013 5086 | | | |
| Name | Value | Min Limit | Max Limit |
| Drainage Area | 210 | 0.06 | 5464 |
| 24 Hour 10 Year Precipitation | 4.46 | 3.58 | 4.5 |
| Constant of Channel Maintenance | 0.79 | 0.11 | 3.87 |
| Peak-Flow Statistics Flow Report | | | |
| Name | Value | Unit | Prediction Error |
| 2 Year Peak Flood | 2346 | ft ³ /s | |
| 5 Year Peak Flood | 4592 | ft ³ /s | |
| 10 Year Peak Flood | 6404 | ft ³ /s | |
| 25 Year Peak Flood | 8880 | ft ³ /s | |
| 50 Year Peak Flood | 10767 | ft ³ /s | |
| 100 Year Peak Flood | 12836 | ft ³ /s | |
| 200 Year Peak Flood | 15082 | ft ³ /s | |
| 500 Year Peak Flood | 17678 | ft ³ /s | |

Low-Flow Report: bottom half

100 Percent Low Flow Northwest Region

Low-Flow Statistics Parameters 100 Percent Low Flow Northwest Region 2012 5171

| Parameter | Value | Min Limit | Max Limit |
|---------------------------------------|----------|-----------|-----------|
| Drainage Area | 210 | 23.40 | 5464.00 |
| Base Flow Index | 0.540759 | 0.36 | 0.62 |
| SSURGO Percent Hydrologic Soil Type A | 1.49 | 0.00 | 7.87 |

Basin-characteristic values

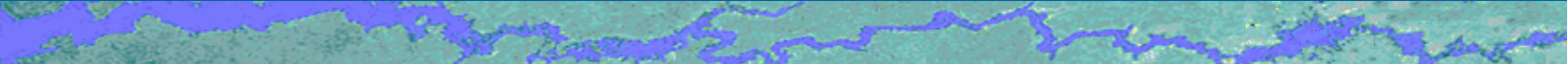
Low-Flow Statistics Flow Report

| Statistic | Value | Unit | Prediction Error |
|--|-------|--------------------|------------------|
| 1 Day 10 Year Low Flow [100 Percent Low Flow Northwest Region 2012 5171] | 0 | ft ³ /s | 104.8 |
| 7 Day 10 Year Low Flow [100 Percent Low Flow Northwest Region 2012 5171] | 0 | ft ³ /s | 111.8 |
| 30 Day 10 Year Low Flow [100 Percent Low Flow Northwest Region 2012 5171] | 0 | ft ³ /s | 109.7 |
| 30 Day 5 Year Low Flow [100 Percent Low Flow Northwest Region 2012 5171] | 1 | ft ³ /s | 87.2 |
| 1 Day 10 Year lowflow Oct to Dec [100 Percent Low Flow Northwest Region 2012 5171] | 0 | ft ³ /s | 85.8 |
| 7 Day 10 Year lowflow Oct to Dec [100 Percent Low Flow Northwest Region 2012 5171] | 1 | ft ³ /s | 88.4 |

Low-Flow Estimates

Low-Flow Statistics Citations

Eash, D.A., and Barnes, K.K., 2012, Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa: U.S. Geological Survey Scientific Investigations Report 2012-5171, 99 p.



Annual-Flow Report: bottom half

100 Percent Low Flow Northwest Region

Annual Flow Statistics Parameters [100.00 Percent Low Flow Northwest Region 2012 5171]

| Parameter | Value | Min Limit | Max Limit |
|-------------------------|-------|-----------|-----------|
| Drainage Area | 210 | 23.4 | 5464 |
| Tau Annual from Grid | 21.96 | 21.2 | 35.8 |
| Relative Stream Density | 0.34 | 0.189 | 0.511 |

Basin-
characteristic
values

Annual Flow Statistics Flow Report [100.00 Percent Low Flow Northwest Region 2012 5171]

| Statistic | Value | Unit | Prediction Error |
|--------------------------|-------|--------------------|------------------|
| Harmonic Mean Streamflow | 2.159 | ft ³ /s | 71.6 |

Harmonic Mean
Streamflow
Estimate

Annual Flow Statistics Citations

Eash, D.A., and Barnes, K.K., 2012, Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa: U.S. Geological Survey Scientific Investigations Report 2012-5171, 99 p.

Flow-Duration Report: bottom half

| Flow-Duration Statistics Parameters 100 Percent Statewide Flow Duration 2012 5232 | | | |
|---|-------|-----------|-----------|
| Parameter | Value | Min Limit | Max Limit |
| Drainage Area | 210 | 15.50 | 7782.00 |
| Mean Annual Precipitation | 34.24 | 27.70 | 38.00 |
| SSURGO Percent Hydrologic Soil Type C | 4.43 | 0.09 | 83.50 |
| Relative Stream Density | 0.34 | 0.22 | 0.49 |
| Hydrograph separation percent | 54.13 | 20.30 | 78.00 |
| Streamflow Variability Index from Grid | 0.63 | 0.21 | 0.76 |
| SSURGO Percent Hydrologic Soil Type B | 94.1 | 5.70 | 99.40 |
| SSURGO Percent Hydrologic Soil Type D | 0 | 0.00 | 57.00 |

Basin-characteristic values

| Flow-Duration Statistics Flow Report | | | |
|---|-------|--------------------|------------------|
| Statistic | Value | Unit | Prediction Error |
| 1 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 1256 | ft ³ /s | 23.5 |
| 5 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 471 | ft ³ /s | 23.6 |
| 10 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 262 | ft ³ /s | 24.2 |
| 15 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 225 | ft ³ /s | 24.6 |
| 20 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 175 | ft ³ /s | 22.1 |
| 30 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 124 | ft ³ /s | 17.1 |
| 40 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 87 | ft ³ /s | 14.9 |
| 50 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 66 | ft ³ /s | 16.4 |
| 60 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 48 | ft ³ /s | 22.1 |
| 70 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 31 | ft ³ /s | 32.4 |
| 80 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 13 | ft ³ /s | 40.1 |
| 85 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 10 | ft ³ /s | 42.5 |
| 90 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 7 | ft ³ /s | 51 |
| 95 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 4 | ft ³ /s | 74.9 |
| 99 Percent Duration [100 Percent Statewide Flow Duration 2012 5232] | 1 | ft ³ /s | 97.7 |

Flow-Duration Estimates

StreamStats Streamgage Information

SELECT A STATE / REGION

Click a state or region on the map or use the search box to zoom to an area of interest

Location Search

You have zoomed in sufficiently to select a state or regional study area. Your selection will dictate the data used to perform basin delineation and flow statistics calculation.

Select a State or Regional Study Area

Wisconsin

Iowa

IDENTIFY A STUDY AREA

SELECT SCENARIOS

BUILD A REPORT

POWERED BY WIM

Exploration Tools

Query Streamgages

Measure Tool

Elevation Profile Tool

Show your location

Reset the view

Exploration Tools: Query Streamgages

latitude: 42.02279
longitude: -93.63078
sta_id: 05470500
sta_name: Squaw Creek at Ames, IA
NWIS page: [link](#)
StreamStats Gage page: [link](#)
drnarea: 209.65

Pop-up with two links appears after clicking on streamgage symbol

Zoom Level: 14
Map Scale: 1:36,111
Lat: 42.0405, Lon: -93.6808

StreamStats Streamgauge Information

latitude: 42.02279

longitude: -93.63078

sta_id: 05470500

sta_name: Squaw Creek at Ames, IA

NWIS page: [link](#) **NWIS Link**

StreamStats Gage page: [link](#)

drnarea: 209.65 **StreamStats Link**

StreamStats Streamgage Information



StreamStats Data-Collection Station Report

USGS Station Number 05470500
Station Name Squaw Creek at Ames, IA

[Click here to link to available data on NWIS-Web for this site.](#)

Descriptive Information

| | |
|---------------------------|-------------------------------|
| Station Type | Streamgage, continuous record |
| Location | |
| Gage | |
| Regulation and Diversions | |
| Regulated? | False |
| Period of Record | |
| Remarks | |
| Latitude (degrees NAD83) | 42.02304157 |
| Longitude (degrees NAD83) | -93.63049623 |
| Hydrologic unit code | 07080105 |
| County | 169-Story |
| HCDN2009 | No |

Descriptive information

Basin Characteristics

Physical Characteristics

| Characteristic Name | Value | Units | Citation Number |
|--------------------------------|-----------|---------------|--------------------|
| Descriptive Information | | | |
| Datum_of_Latitude_Longitude | NAD83 | dimensionless | 30 |
| District_Code | 19 | dimensionless | 30 |
| Begin_date_of_record | 5/24/1919 | days | 41 |
| End_date_of_record | 9/30/2003 | days | 41 |
| Number_of_days_of_record | 17061 | days | 41 |



StreamStats Streamgage Information

Basin Characteristics

Physical Characteristics

| Characteristic Name | Value | Units | Citation Number |
|---------------------|-------|-------|-----------------|
|---------------------|-------|-------|-----------------|

Descriptive Information

| | | | |
|-----------------------------|-----------|---------------|--------------------|
| Datum_of_Latitude_Longitude | NAD83 | dimensionless | 30 |
| District_Code | 19 | dimensionless | 30 |
| Begin_date_of_record | 5/24/1919 | days | 41 |
| End_date_of_record | 9/30/2003 | days | 41 |
| Number_of_days_of_record | 17061 | days | 41 |
| Number_of_days_GT_0 | 16685 | days | 41 |

Precipitation Statistics

| | | | |
|-------------------------------|--------|--------|---------------------|
| 24_Hour_2_Year_Precipitation | 3.2000 | inches | 31 |
| 24_Hour_10_Year_Precipitation | 4.461 | inches | 244 |
| Mean_Annual_Precipitation | 30.900 | inches | 31 |

Climate Characteristics

| | | | |
|----------------------|--------|--------|--------------------|
| Mean_Annual_Snowfall | 32.000 | inches | 31 |
|----------------------|--------|--------|--------------------|

Temperature Statistics

| | | | |
|------------------------------|--------|-----------|--------------------|
| Mean_Min_January_Temperature | 10.500 | degrees F | 31 |
| Mean_Max_July_Temperature | 87.000 | degrees F | 31 |

Topographical Characteristics

| | | | |
|----------------------|---------|------|--------------------|
| Mean_Basin_Elevation | 1060.00 | feet | 31 |
|----------------------|---------|------|--------------------|

Geological Characteristics

| | | | |
|-----------------|--------|---------|---------------------|
| Des_Moines_Lobe | 100 | percent | 244 |
| Loess_Depth | 0.1000 | feet | 31 |

Land Cover Characteristics

| | | | |
|----------------|--------|---------|--------------------|
| Percent_Forest | 2.2000 | percent | 31 |
|----------------|--------|---------|--------------------|

Soil Properties

| | | | |
|---|--------|------------------------|---------------------|
| Soil_Infiltration | 3.2000 | inches | 31 |
| SSURGO_Percent_Hydrologic_Soil_Type_A | 1.487 | percent | 243 |
| SSURGO_Percent_Hydrologic_Soil_Type_B | 93.732 | percent | 243 |
| SSURGO_Percent_Hydrologic_Soil_Type_C | 4.358 | percent | 243 |
| SSURGO_Saturated_Hydraulic_Conductivity | 11.726 | micrometers per second | 243 |

Stream Channel Properties

| | | | |
|--------------------|-------|-----------------|---------------------|
| Drainage_Frequency | 0.534 | per square mile | 243 |
|--------------------|-------|-----------------|---------------------|

StreamStats Streamgage Information

Streamflow Statistics

| Statistic Name | Value | Units | Citation Number | Preferred? | Years of Record | Standard Error, percent | Variance log-10 | Lower 95% Confidence Interval | Upper 95% Confidence Interval | Start Date | End Date | Remarks |
|-------------------------------------|---------|-----------------------|---------------------|------------|-----------------|-------------------------|-----------------|-------------------------------|-------------------------------|------------|-----------|---------|
| Peak-Flow Statistics | | | | | | | | | | | | |
| 2_Year_Peak_Flood | 2680 | cubic feet per second | 244 | Y | 93 | 9.6 | 0.00173 | 2200 | 3220 | 6/4/1918 | 8/11/2010 | EMA/MGB |
| 5_Year_Peak_Flood | 4960 | cubic feet per second | 244 | Y | 93 | 9.82 | 0.00181 | 4080 | 6040 | 6/4/1918 | 8/11/2010 | EMA/MGB |
| 10_Year_Peak_Flood | 6860 | cubic feet per second | 244 | Y | 93 | 11.1 | 0.0023 | 5580 | 8740 | 6/4/1918 | 8/11/2010 | EMA/MGB |
| 25_Year_Peak_Flood | 9730 | cubic feet per second | 244 | Y | 93 | 13.9 | 0.0036 | 7690 | 13700 | 6/4/1918 | 8/11/2010 | EMA/MGB |
| 50_Year_Peak_Flood | 12200 | cubic feet per second | 244 | Y | 93 | 16.6 | 0.00512 | 9350 | 18900 | 6/4/1918 | 8/11/2010 | EMA/MGB |
| 100_Year_Peak_Flood | 15000 | cubic feet per second | 244 | Y | 93 | 19.6 | 0.00714 | 11100 | 25600 | 6/4/1918 | 8/11/2010 | EMA/MGB |
| 200_Year_Peak_Flood | 18100 | cubic feet per second | 244 | Y | 93 | 23 | 0.00969 | 12800 | 34400 | 6/4/1918 | 8/11/2010 | EMA/MGB |
| 500_Year_Peak_Flood | 22800 | cubic feet per second | 244 | Y | 93 | 27.6 | 0.01388 | 15200 | 49900 | 6/4/1918 | 8/11/2010 | EMA/MGB |
| Regression_2_Year_Peak_Flood | 2350 | cubic feet per second | 244 | Y | | | | | | | | RRE |
| Regression_5_Year_Peak_Flood | 4590 | cubic feet per second | 244 | Y | | | | | | | | RRE |
| Regression_10_Year_Peak_Flood | 6400 | cubic feet per second | 244 | Y | | | | | | | | RRE |
| Regression_25_Year_Peak_Flood | 8880 | cubic feet per second | 244 | Y | | | | | | | | RRE |
| Regression_50_Year_Peak_Flood | 10800 | cubic feet per second | 244 | Y | | | | | | | | RRE |
| Regression_100_Year_Peak_Flood | 12800 | cubic feet per second | 244 | Y | | | | | | | | RRE |
| Regression_200_Year_Peak_Flood | 15100 | cubic feet per second | 244 | Y | | | | | | | | RRE |
| Regression_500_Year_Peak_Flood | 17700 | cubic feet per second | 244 | Y | | | | | | | | RRE |
| Weighted_5_Year_Peak_Flood | 4930 | cubic feet per second | 244 | Y | | 8.6 | 0.0014 | 4170 | 5830 | | | WIE |
| Weighted_10_Year_Peak_Flood | 6810 | cubic feet per second | 244 | Y | | 10.1 | 0.0019 | 5600 | 8280 | | | WIE |
| Weighted_25_Year_Peak_Flood | 9600 | cubic feet per second | 244 | Y | | 12.4 | 0.0029 | 7520 | 12300 | | | WIE |
| Weighted_50_Year_Peak_Flood | 11900 | cubic feet per second | 244 | Y | | 14.8 | 0.0041 | 8960 | 15900 | | | WIE |
| Weighted_100_Year_Peak_Flood | 14500 | cubic feet per second | 244 | Y | | 17 | 0.0054 | 10400 | 20200 | | | WIE |
| Weighted_200_Year_Peak_Flood | 17300 | cubic feet per second | 244 | Y | | 19.6 | 0.0071 | 11900 | 25300 | | | WIE |
| Weighted_500_Year_Peak_Flood | 21300 | cubic feet per second | 244 | Y | | 22.9 | 0.0096 | 13700 | 33100 | | | WIE |
| Systematic_peak_years | 20.000 | years | 31 | Y | | | | | | | | |
| Peak_years_with_historic_adjustment | 0.0000 | years | 31 | Y | | | | | | | | |
| Weighted_2_Year_Peak_Flood | 2670 | cubic feet per second | 244 | Y | | 7.6 | 0.0011 | 2290 | 3110 | | | WIE |
| Flood-Volume Statistics | | | | | | | | | | | | |
| 3_Day_2_Year_Maximum | 1354.00 | cubic feet per second | 31 | Y | | | | | | | | |
| 3_Day_10_Year_Maximum | 2015.00 | cubic feet per second | 31 | Y | | | | | | | | |
| 3_Day_50_Year_Maximum | 2160.00 | cubic feet per second | 31 | Y | | | | | | | | |
| 3_Day_100_Year_Maximum | 2193.00 | cubic feet per second | 31 | Y | | | | | | | | |

Peak-flow statistics

Citation number to report with published statistic



StreamStats Streamgauge Information

Low-Flow Statistics

| | | | | | | | | | |
|------------------------------------|--------|-----------------------|---------------------|---|----|--|--|-----------|------------|
| 1_Day_10_Year_Low_Flow | 0 | cubic feet per second | 243 | Y | 40 | | | 4/1/1966 | 3/31/2005 |
| 7_Day_10_Year_Low_Flow | 0 | cubic feet per second | 243 | Y | 40 | | | 4/1/1966 | 3/31/2005 |
| 30_Day_5_Year_Low_Flow | 0.66 | cubic feet per second | 243 | Y | 40 | | | 4/1/1966 | 3/31/2005 |
| 30_Day_10_Year_Low_Flow | 0.15 | cubic feet per second | 243 | Y | 40 | | | 4/1/1966 | 3/31/2005 |
| Low_flow_years | 20.000 | years | 31 | Y | | | | | |
| 1_Day_10_Year_lowflow_Oct_to_Dec 0 | 0 | cubic feet per second | 243 | Y | 40 | | | 10/1/1966 | 12/31/2005 |
| 7_Day_10_Year_lowflow_Oct_to_Dec 0 | 0 | cubic feet per second | 243 | Y | 40 | | | 10/1/1966 | 12/31/2005 |

Flow-Duration Statistics

| | | | | | | | | | |
|---------------------|--------|-----------------------|--------------------|---|----|--|--|--|--|
| 1_Percent_Duration | 1400 | cubic feet per second | 41 | Y | 47 | | | | |
| 5_Percent_Duration | 571.45 | cubic feet per second | 41 | Y | 47 | | | | |
| 10_Percent_Duration | 339 | cubic feet per second | 41 | Y | 47 | | | | |
| 20_Percent_Duration | 174 | cubic feet per second | 41 | Y | 47 | | | | |
| 25_Percent_Duration | 134 | cubic feet per second | 41 | Y | 47 | | | | |
| 30_Percent_Duration | 104 | cubic feet per second | 41 | Y | 47 | | | | |
| 40_Percent_Duration | 68 | cubic feet per second | 41 | Y | 47 | | | | |
| 50_Percent_Duration | 43 | cubic feet per second | 41 | Y | 47 | | | | |
| 60_Percent_Duration | 27 | cubic feet per second | 41 | Y | 47 | | | | |
| 70_Percent_Duration | 15 | cubic feet per second | 41 | Y | 47 | | | | |
| 75_Percent_Duration | 10 | cubic feet per second | 41 | Y | 47 | | | | |
| 80_Percent_Duration | 6.4 | cubic feet per second | 41 | Y | 47 | | | | |
| 90_Percent_Duration | 1.6 | cubic feet per second | 41 | Y | 47 | | | | |
| 95_Percent_Duration | 0.44 | cubic feet per second | 41 | Y | 47 | | | | |
| 99_Percent_Duration | 0 | cubic feet per second | 41 | Y | 47 | | | | |

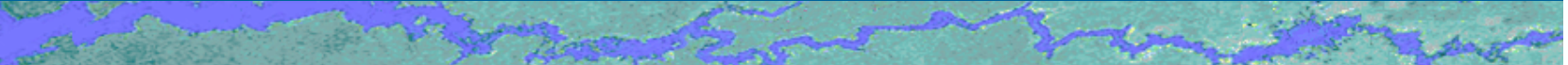
Low-flow and flow-duration statistics

Annual Flow Statistics

| | | | | | | | | | |
|-------------------------------|--------|-----------------------|---------------------|---|----|--|--|----------|-----------|
| Mean_Annual_Flow | 90.390 | cubic feet per second | 31 | Y | | | | | |
| Daily_flow_years | 20.000 | years | 31 | Y | | | | | |
| Stand_Dev_of_Mean_Annual_Flow | 37.980 | cubic feet per second | 31 | Y | | | | | |
| Harmonic_Mean_Streamflow | 2.36 | cubic feet per second | 243 | Y | 40 | | | 4/1/1966 | 9/30/2006 |
| Tau_Annual | 22.174 | days | 243 | Y | | | | | |

Monthly Flow Statistics

| | | | | | | | | | |
|--------------------|---------|-----------------------|--------------------|---|--|--|--|--|--|
| January_Mean_Flow | 28.000 | cubic feet per second | 31 | Y | | | | | |
| January_STD | 24.940 | cubic feet per second | 31 | Y | | | | | |
| February_Mean_Flow | 68.570 | cubic feet per second | 31 | Y | | | | | |
| February_STD | 48.720 | cubic feet per second | 31 | Y | | | | | |
| March_Mean_Flow | 145.400 | cubic feet per second | 31 | Y | | | | | |
| March_STD | 100.400 | cubic feet per second | 31 | Y | | | | | |
| April_Mean_Flow | 126.600 | cubic feet per second | 31 | Y | | | | | |



StreamStats Streamgauge Information

| | | | | | |
|--------------------------------------|---------|-----------------------|---------------------|---|----|
| August_STD | 72.480 | cubic feet per second | 31 | Y | |
| September_Mean_Flow | 148.400 | cubic feet per second | 31 | Y | |
| September_STD | 197.000 | cubic feet per second | 31 | Y | |
| October_Mean_Flow | 97.490 | cubic feet per second | 31 | Y | |
| October_STD | 80.220 | cubic feet per second | 31 | Y | |
| November_Mean_Flow | 80.760 | cubic feet per second | 31 | Y | |
| November_STD | 74.470 | cubic feet per second | 31 | Y | |
| December_Mean_Flow | 39.630 | cubic feet per second | 31 | Y | |
| December_STD | 24.780 | cubic feet per second | 31 | Y | |
| General Flow Statistics | | | | | |
| Minimum_daily_flow | 0 | cubic feet per second | 41 | Y | 47 |
| Maximum_daily_flow | 12200 | cubic feet per second | 41 | Y | 47 |
| Std_Dev_of_daily_flows | 316.869 | cubic feet per second | 41 | Y | 47 |
| Average_daily_streamflow | 137.433 | cubic feet per second | 41 | Y | 47 |
| Streamflow_Variability_Index_At_Site | 0.629 | dimensionless | 243 | Y | |
| Base Flow Statistics | | | | | |
| Number_of_years_to_compute_BFI | 46 | years | 42 | Y | 47 |
| Average_BFI_value | 0.365 | dimensionless | 42 | Y | 47 |
| Std_dev_of_annual_BFI_values | 0.098 | dimensionless | 42 | Y | 47 |
| Base_Flow_Index | 0.535 | dimensionless | 243 | Y | |

Citations

| Citation Number | Citation Name and URL |
|-----------------|---|
| 30 | Imported from NWIS file |
| 31 | Imported from Basin Characteristics file |
| 41 | Wolock, D.M., 2003, Flow characteristics at U.S. Geological Survey streamgages in the conterminous United States: U.S. Geological Survey Open-File Report 03-146, digital data set |
| 42 | Wolock, D.M., 2003, Base-flow index grid for the conterminous United States: U.S. Geological Survey Open-File Report 03-263, digital data set |
| 243 | Eash, D.A., and Barnes, K.K., 2012, Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa: U.S. Geological Survey Scientific Investigations Report 2012-5171, 99 p. |
| 244 | Eash, D.A., Barnes, K.K., and Veilleux, A.G., 2013, Methods for estimating annual exceedance-probability discharges for streams in Iowa, based on data through water year 2010: U.S. Geological Survey Scientific Investigations Report 2013-5086, 63 p. with a |

Cited reports which include published streamflow statistics

NWIS Streamgage Information

USGS 05470500 Squaw Creek at Ames, IA

Available data for this site **SUMMARY OF ALL AV**

Stream Site

DESCRIPTION:

Latitude 42°01'23", Longitude 93°37'49" NAD27
 Story County, Iowa, Hydrologic Unit 07080105
 Drainage area: 204 square miles
 Datum of gage: 881.00 feet above NGVD29.

Summary of all available data

AVAILABLE DATA:

| Data Type | Begin Date | End Date | Count |
|--|-------------------|-----------------|--------------|
| Current / Historical Observations (availability statement) | 2007-10-01 | 2015-09-21 | |
| Daily Data | | | |
| Discharge, cubic feet per second | 1919-05-24 | 2015-09-20 | 21434 |
| Daily Statistics | | | |
| Discharge, cubic feet per second | 1919-05-24 | 2015-04-27 | 21288 |
| Monthly Statistics | | | |
| Discharge, cubic feet per second | 1919-05 | 2015-04 | |
| Annual Statistics | | | |
| Discharge, cubic feet per second | 1919 | 2015 | |
| Peak streamflow | 1918-06-04 | 2014-07-01 | 59 |
| Field measurements | 1918-06-04 | 2015-09-01 | 674 |
| Field/Lab water-quality samples | 1969-11-06 | 2009-09-21 | 183 |
| Water-Year Summary | 2006 | 2014 | 9 |
| Additional Data Sources | | | |
| | Begin Date | End Date | Count |
| Instantaneous-Data Archive **offsite** | 1990-10-01 | 2007-09-30 | 506900 |

OPERATION:

Record for this site is maintained by the USGS Iowa Water Science Center

Email questions about this site to [Iowa Water Science Center Water-Data Inquiries](#)



QUESTIONS

