

StreamStats for Ohio's Fire Service

Getting Flow Estimates for Current or Proposed Drafting Sites

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Establishing a pre-planned draft site on a creek or river can be tricky. Flows vary throughout the year, and there is no way to determine a hydrologically valid estimate for a site without long-term data from a U.S. Geological Survey (USGS) stream gage. Unfortunately, stream gages are few and far between, and many smaller tributary streams are not gaged at all.

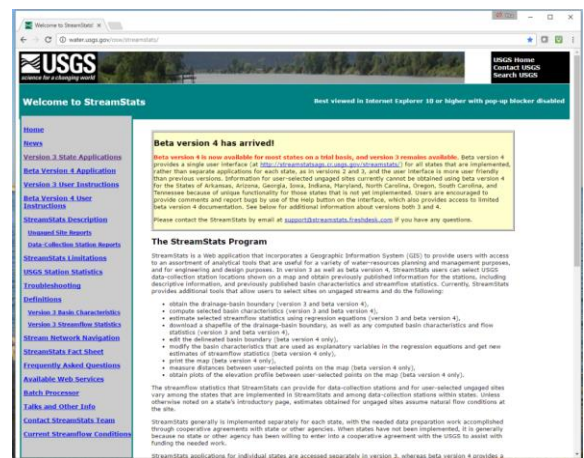
Fortunately for Ohio, the USGS and Ohio state agencies have developed an online tool called StreamStats that provides hydrologically valid estimates for stream flows, even on ungaged streams, using models based on decades of hydrology data collected for the state's river systems.

Using the StreamStats online tools and the Ohio StreamStats Worksheet, you can create a performance profile for a current or proposed draft site using the most hydrologically sound data and processes available.

1. Navigate to the USGS StreamStats homepage:

Web link: <http://water.usgs.gov/osw/streamstats/>

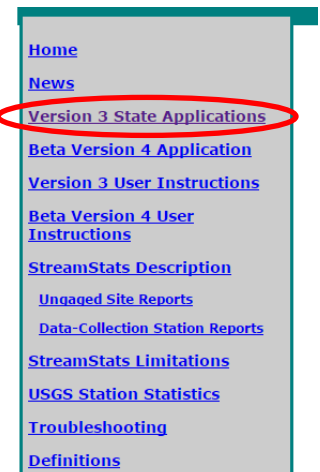
You should land on a page that looks like the image to the right. USGS is always making upgrades to StreamStats, so it may not look exactly like the image.



2. Go to the state applications

In the menu on the left-hand side of the StreamStats homepage, click on the link for "Version 3 State Applications"

Direct link here: <http://water.usgs.gov/osw/streamstats/ssonline.html>

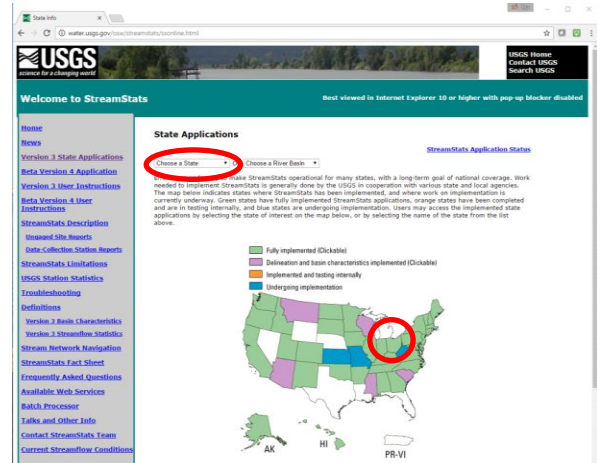


3. Go to the Ohio-specific application page

On the state-specific page, select “Ohio” from the pull-down menu at the top or click on it in the map (your choice)

Direct Link:

<http://water.usgs.gov/osw/streamstats/ohio.html>

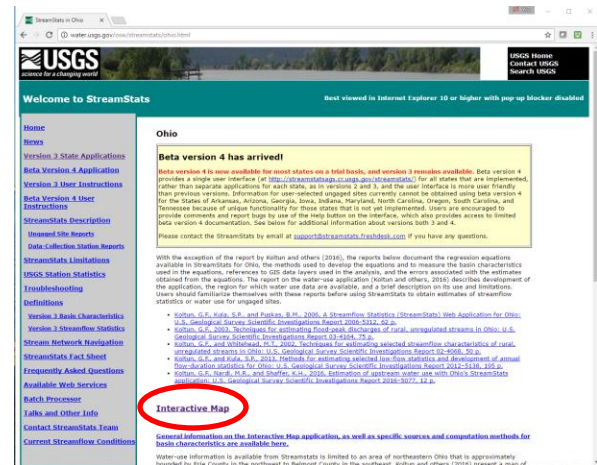


5. Go to the Interactive Map application

Click on the “Interactive Map” link on the Ohio-specific page, and be patient as the map application loads.

Direct Link:

http://streamstatsags.cr.usgs.gov/v3_beta/viewer.htm?stabbr=OH

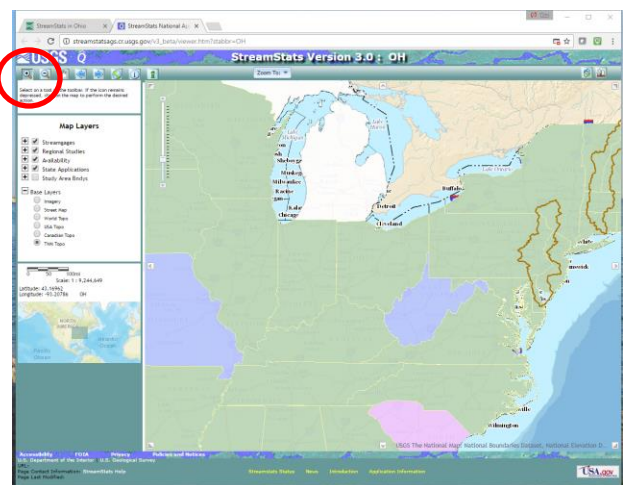


6. Locate the Zoom Tool

After the interactive map loads, you should be looking at a web map that is more or less centered on Ohio, like the image below.

You will need to zoom in to your draft site to use the flow estimation tools.

Make sure that the zoom in tool is selected (magnifying glass with plus sign, at top left of map)

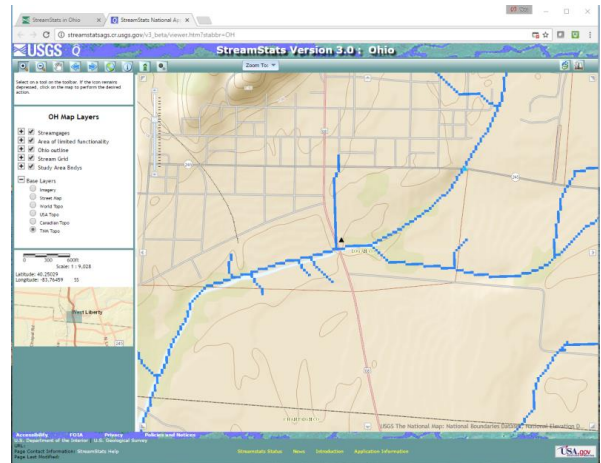


7. Zoom in to your draft site

You must be zoomed in to at least 1:24,000 scale before the flow estimation tools will work.

Keep zooming in until you locate your draft site. You will know you are zoomed in far enough when you see the streams appear as pixelated blue lines.

I used the US-68 bridge over the Mad River in this example (south of West Liberty in Logan County).



8. Delineate the watershed

Select the watershed delineation tool from the toolbar at the top (button with a black dot and plus sign).



Using the watershed delineation tool, click on the approximate location of the draft site in the map, making sure you select a location along the blue line representing the stream.

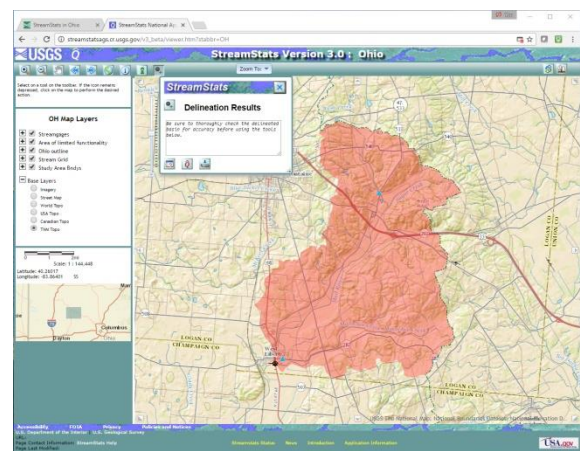
Typically, you would be selecting the intersection of the stream and a road feature, i.e. a bridge.

9. Examine the delineated watershed

The watershed delineation process will take a few minutes to run.

This will identify the entire area upstream of the point you selected, which is the basin that feeds water to your draft site.

The result should look something like the image to the right. The pink area is the watershed feeding your draft site.

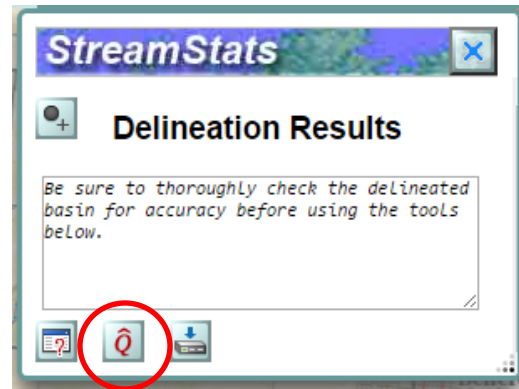


If you don't like the looks of it for some reason, you can just zoom back in and use the delineation tool again until you are satisfied with the results.

10. Compute the Flow Statistics

On the “Delineation Results” pop-up box that appears, locate the “Compute Flow Statistics” button, which looks like a letter “Q” wearing a hat.

Press this button, and StreamStats will start generating your flow estimates.

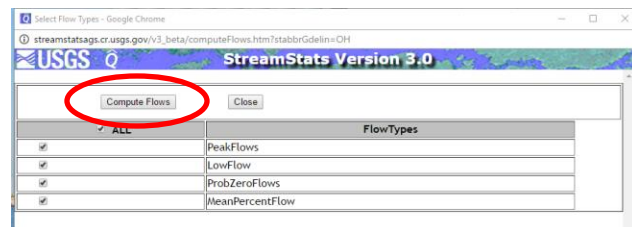


11. Compute the Flow Statistics (continued)

In the pop-up window that appears, click the button to “Compute Flows.”

This will create your estimates.

Just leave it set to compute all flows by leaving the “ALL” box checked.



12. Examine the Flow Statistics Results

The process will run for a few minutes, then you will get results that look like the image to the right.

You will need to extract some of these results to populate the flow estimate worksheet.

You can print the outputs or save to a .pdf document at this point.

Peak Flows Basin Characteristics

Parameter	Value	Min	Max
Drainage Area (square miles)	55.9	0.01	7422
Ohio Region 4 indicator 1 if in a class 0 (dimensionless)	0.0	0.0	1.0
Ohio Region 4 indicator 1 if in a class 0 (dimensionless)	1.1	0.0	1.1
Stream Slope 10 and 05 Longest Flow Paths (feet per mile)	14.5	1.53	674
Percent Storage from HUC021902 (percent)	0.48	0.0	25.3

Low Flows Basin Characteristics

Parameter	Value	Min	Max
Drainage Area (square miles)	55.9	-	1250
Streamflow Variability Index from Grid (dimensionless)	0.4	0.24	1.32

Probability of Zero Flow Basin Characteristics

Parameter	Value	Min	Max
Drainage Area (square miles)	55.9	-	1250
Streamflow Variability Index from Grid (dimensionless)	0.4	0.24	1.32

Mean and Percentile Basin Characteristics

Parameter	Value	Min	Max
Drainage Area (square miles)	55.9	0.12	7422
Percent Forest (percent)	31.8	0.0	98.3
Arc-sin Storage from HUC021902 (percent)	0.48	0.0	19
Mean annual flow (cubic feet per second)	36.3	0.0	413.3
Streamflow Variability Index from Grid (dimensionless)	0.4	0.25	1.33
Latitude of Basin Centroid (decimal degrees)	40.3347	38.44	41.4

13. Extract the Relevant Statistics

Near the bottom of the output window, locate the section titled “Mean and Percentile Statistics.”

The specific items you need are “Value” (monthly average flow volume) and “Prediction Error” (uncertainty factor in the model results).

The statistics of interest are for Q1 through Q12, which are estimated average flows for each calendar month. You will enter these numbers into the flow estimation worksheet (Excel spreadsheet).

Mean and Percentile Statistics				
Statistic	Value	Unit	Prediction Error (percent)	Equivalent year
Q1	73.3	ft3/s	17	
Q2	87.6	ft3/s	12	
Q3	106	ft3/s	14	
Q4	91.3	ft3/s	11	
Q5	66.3	ft3/s	20	
Q6	49.4	ft3/s	27	
Q7	33.4	ft3/s	28	
Q8	20.6	ft3/s	37	
Q9	14.8	ft3/s	44	
QA	53.1	ft3/s	11	
Q10	16.9	ft3/s	51	
Q11	28.2	ft3/s	38	
Q12	56	ft3/s	22	
QAH	16.5	ft3/s	66	
FPS25	14.6	ft3/s	29	
FPS50	26.2	ft3/s	40	
FPS75	52.6	ft3/s	48	

Warning: Be careful not to copy the “QA” statistic, which is the annual flow estimate. For some reason, this always comes out in between Q9 and Q10.

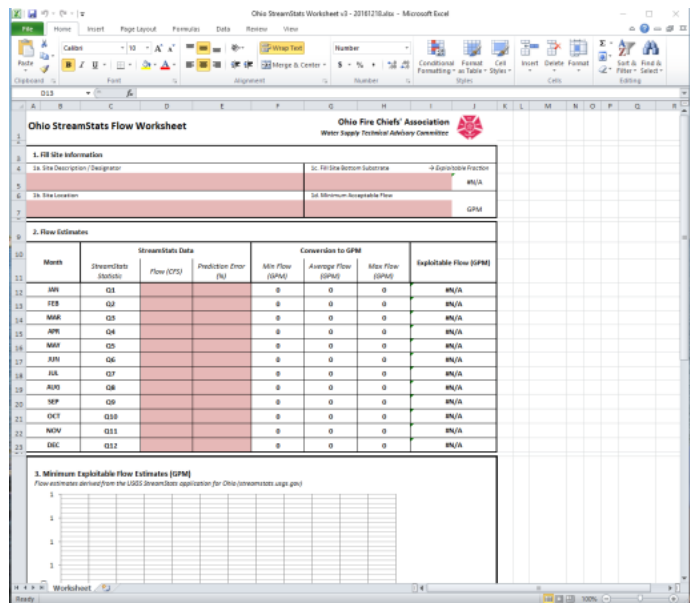
Note that StreamStats provides all estimates in cubic feet per second (ft3/s or CFS), which must be converted to gallons per minute (GPM) for fire service use. The worksheet will automatically make this conversion, using 1 CFS = 448.831169 GPM.

14. Open the StreamStats Flow Worksheet

Open the worksheet, which is an Excel spreadsheet file called “Ohio StreamStats Worksheet v3 – 20161218.xlsx”

The cells that are shaded pink require an input from you. They will change to white once you enter an appropriate value.

Save the worksheet for your drafting site under a new name so that you can keep a “clean” copy of the original file.



15. Complete Block 1. Fill Site Information

Complete the items in Block 1 as follows.

1. Fill Site Information		
1a. Site Description / Designator	1c. Fill Site Bottom Substrate	→ Exploitable Fraction
68-A	3 - Silt / Sand	0.5
1b. Site Location	1d. Minimum Acceptable Flow	
Mad River bridge @ US-68	1000	GPM

- **1a. Site Description / Designator:** Enter your designation for the fill site, up to 50 characters
- **1b. Site Location:** Provide location information for the site (road address, GPS coordinates, etc.), up to 50 characters
- **1c. Fill Site Bottom Substrate:** Select the appropriate bottom material form the pull-down list. This will reduce the flow estimates to account for the pore spaces in the stream bed materials. StreamStats estimates include potential flow that is occurring within this material, which is not accessible for drafting purposes.
- **1d. Minimum Acceptable Flow:** Enter the minimum acceptable flow in GPM for this site, as defined by your department’s needs. Use 250 GPM if you need a good default value, since this is the minimum required under NFPA 1142.

16. Complete Block 2. Flow Estimates

Carefully enter your StreamStats estimates as follows:

Under “Flow (CFS)” enter the “Value” from StreamStats for each month (Q1 through Q12).

Under “Prediction Error (%)” enter the “Prediction Error (percent)” from StreamStats for each month (Q1 through Q12).

Remember to skip over the “QA” value and prediction errors, since this is an annual estimate.

All other items, including the chart, will automatically populate as you enter values.

2. Flow Estimates			
Month	StreamStats Statistic	StreamStats Data	
		Flow (CFS)	Prediction Error (%)
JAN	Q1	73.30	17
FEB	Q2	87.60	12
MAR	Q3	106.00	14
APR	Q4	91.30	11
MAY	Q5	66.30	20
JUN	Q6	49.40	27
JUL	Q7	33.40	28
AUG	Q8	20.60	37
SEP	Q9	14.80	44
OCT	Q10	16.90	51
NOV	Q11	28.20	38
DEC	Q12	56.00	22

17. Examine your Results

Your results should look something like the following:

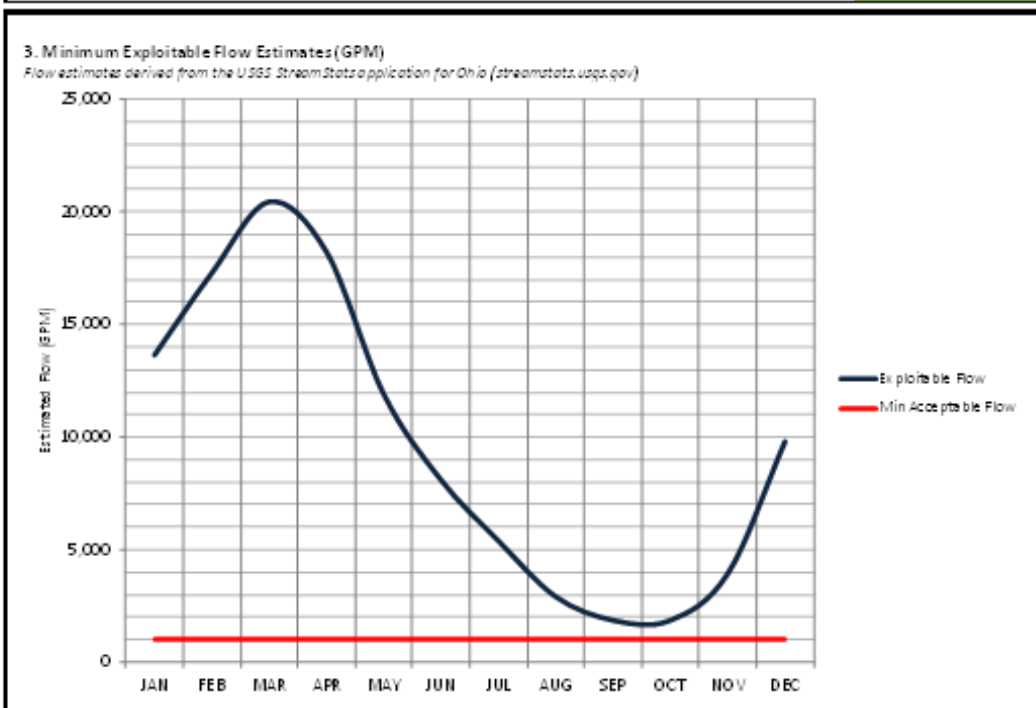
Ohio StreamStats Flow Worksheet

Ohio Fire Chiefs' Association
Water Supply Technical Advisory Committee



1. Fill Site Information	
1a. Site Description / Designator 68-A	1c. Fill Site Bottom Substrate → Exploitable Fraction S - Silt / Sand 0.5
1b. Site Location Mad River bridge @ US-68	1d. Minimum Acceptable Flow 1000 GPM

2. Flow Estimates							
Month	Stream Stats Data			Conversion to GPM			Exploitable Flow (GPM)
	StreamStats Statistic	Flow (CFS)	Prediction Error (%)	Min Flow (GPM)	Average Flow (GPM)	Max Flow (GPM)	
JAN	Q1	73.30	17	27,306	32,899	38,492	13,652
FEB	Q2	87.60	12	34,599	39,318	44,036	17,299
MAR	Q3	106.00	14	40,915	47,576	54,237	20,456
APR	Q4	91.30	11	36,471	40,978	45,486	18,234
MAY	Q5	66.30	20	23,806	29,758	35,709	11,902
JUN	Q6	49.40	27	16,186	22,172	28,159	8,092
JUL	Q7	33.40	28	10,793	14,991	19,188	5,396
AUG	Q8	20.60	37	5,825	9,246	12,667	2,912
SEP	Q9	14.80	44	3,720	6,643	9,565	1,860
OCT	Q10	16.90	51	3,717	7,585	11,454	1,858
NOV	Q11	28.20	38	7,847	12,657	17,467	3,923
DEC	Q12	56.00	22	19,605	25,135	30,664	9,802



18. Understanding the Results

Block 2. Flow Estimates (tabular outputs)

- The StreamStats estimates are in cubic feet per second (CFS), but the worksheet automatically converts these to gallons per minute (GPM) for you.
- The Min Flow, Average Flow, and Max Flow are the monthly average flow estimate (Average Flow), plus or minus the prediction error (Min and Max Flow). These are the raw estimates that include any inaccessible flow occurring in the streambed pore spaces.
- The Exploitable Flow values are the Min Flow values, adjusted by the Exploitable Fraction (which is determined by the streambed substrate). These will be color coded red or green. If they meet the minimum acceptable flow you designated in block 1d, they are shaded green, otherwise, they are red. This gives you a quick visual indication of potential problem months for the draft site.
- Note: The “Exploitable Volume” is an estimate that is meant to represent the volume you could realistically expect to capture while drafting. If you do not want to factor this in, just set block 1d to “1 – No Modifier” and there will be no reduction.

Block 3. Minimum Exploitable Flow Estimates (graphic output)

- This chart provides a graphic visualization of the data from the tabular section.
- The red line represents your minimum acceptable flow (from block 1d), while the dark blue line shows the minimum exploitable flow throughout the year. You can quickly see which months dip below your minimum flow levels.