EXPLORING PAST VELOCITY CONDITIONS IN SOUTHEASTERN STREAMS USING USGS FLOW RECORDS

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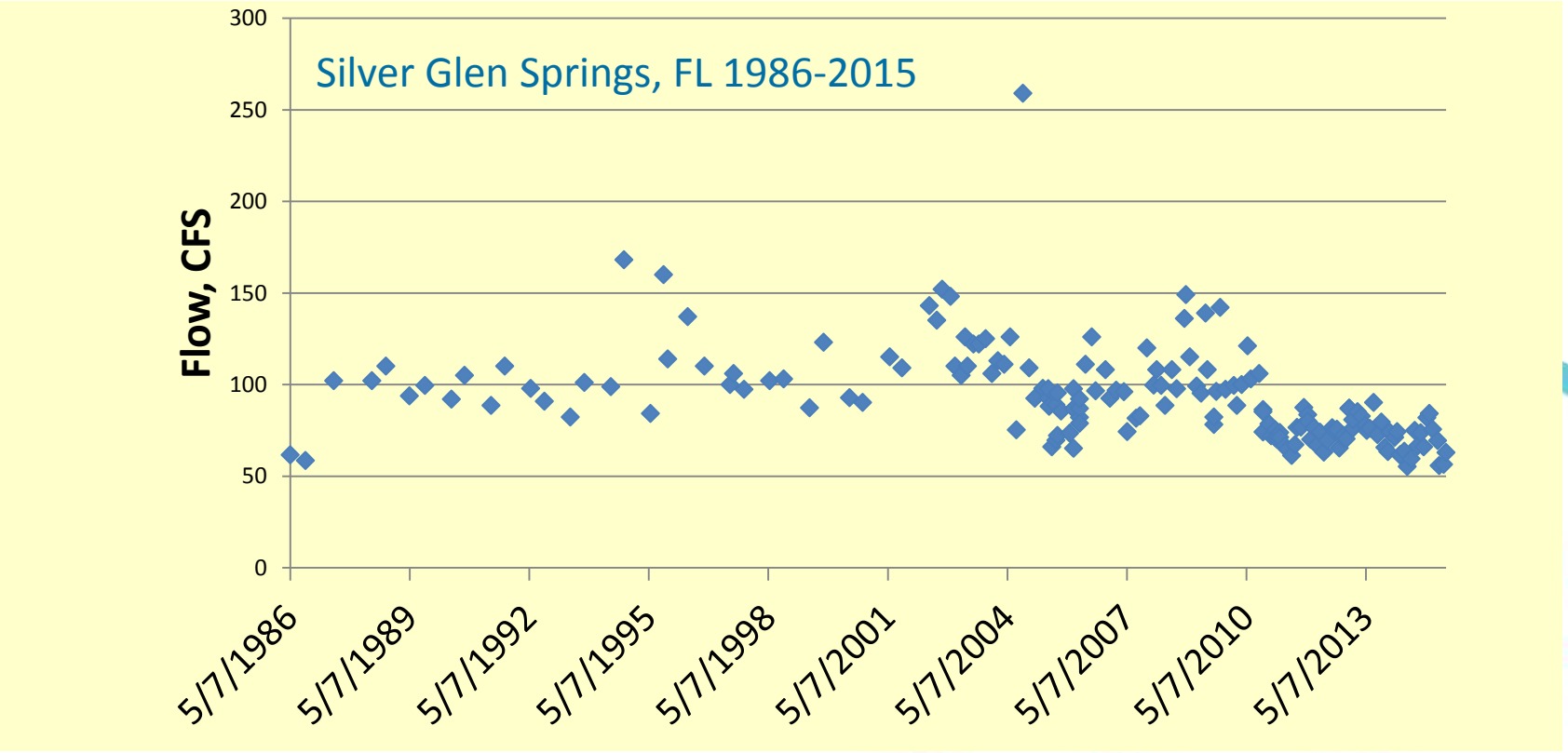
This line of inquiry started with studies at Florida's freshwater springs and the waters that are affected by them.

Analysis of historical flow data at many Florida springs shows a long-term trend of lower flow.



Smothering algae within spring pools and springs runs lead to impairment.

Algal abundance in springs is generally attributed to increased nutrient concentrations.

Smothering algae at Silver Springs, Marion County FL

However, at some springs with algae problems, increased nutrients are not found.

Could changes in stream velocity conditions be contributing to algal abundance?

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Springs are well known for their consistent physical characteristics: flow, temperature, TDS/salinity

Studies at Gum Slough Springs (Citrus County, FL) showed that stream velocity conditions affect algal accumulation *(King, 2014 in Hydrobiologia)*

Thresholds

- > 1.15 ft/sec minimal accumulation
- < 0.73 ft/sec often 100% coverage

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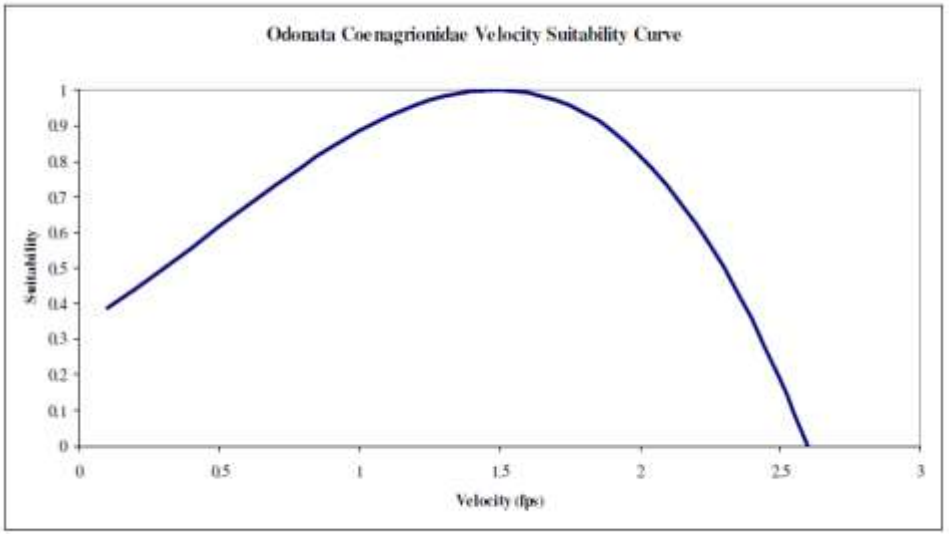
Habitat suitability for many aquatic organisms in streams is affected by stream velocity



Source: Hagan, 2008

Questions

1. Where can we find long term datasets for velocity?
2. Do we see temporal changes in velocity within spring runs that may affect patterns of algal accumulation and/or distribution of aquatic organisms?

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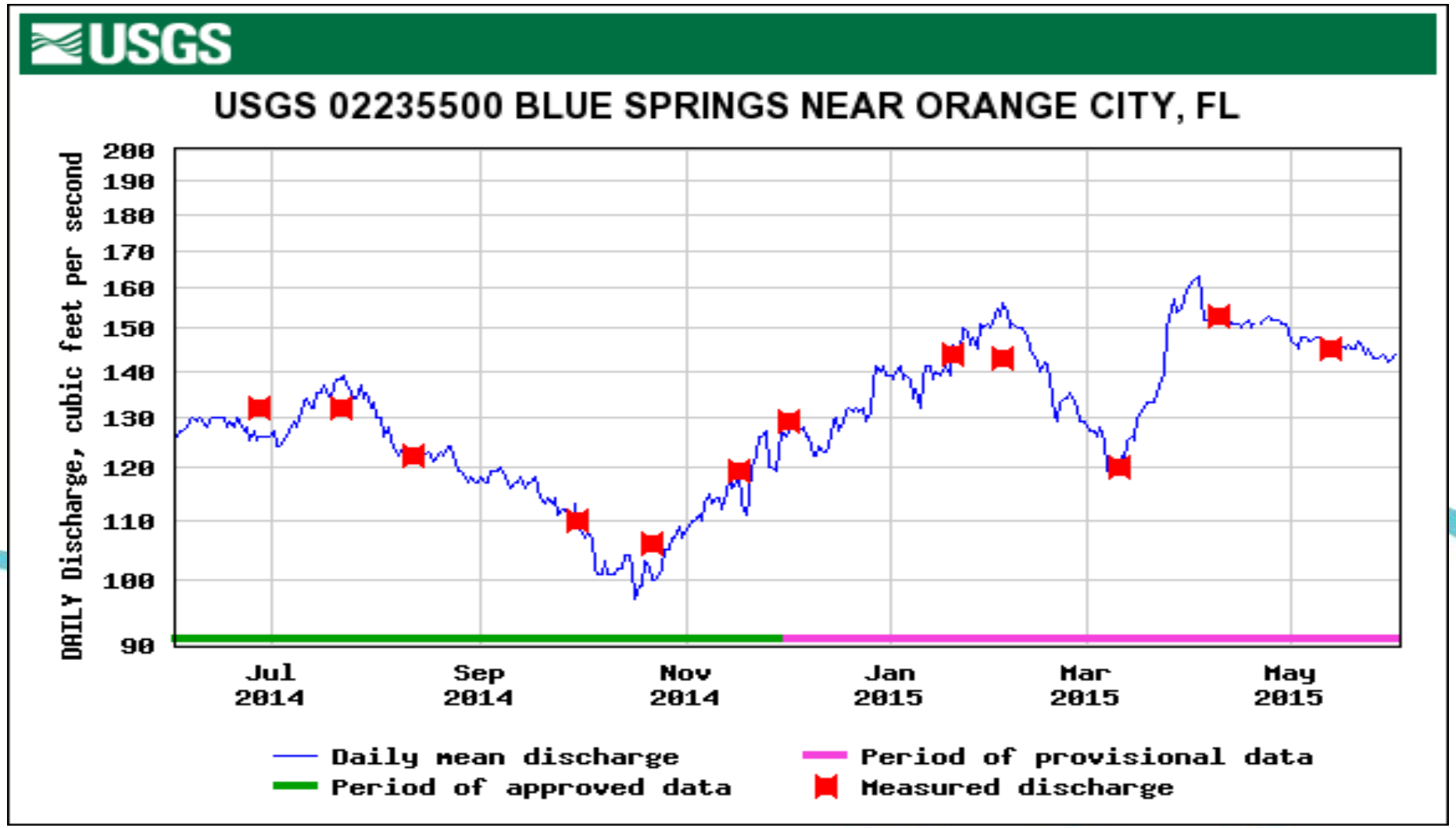
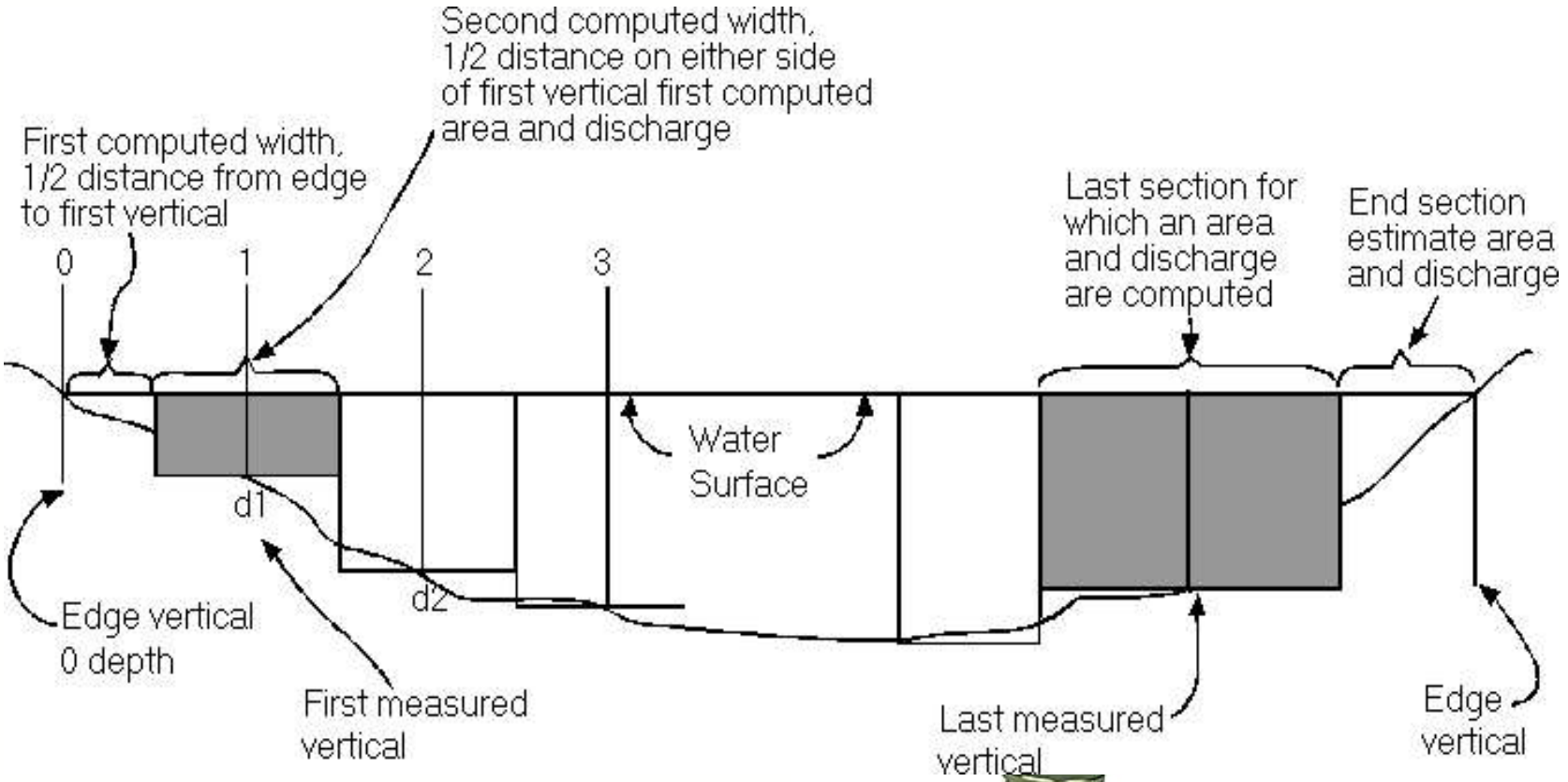
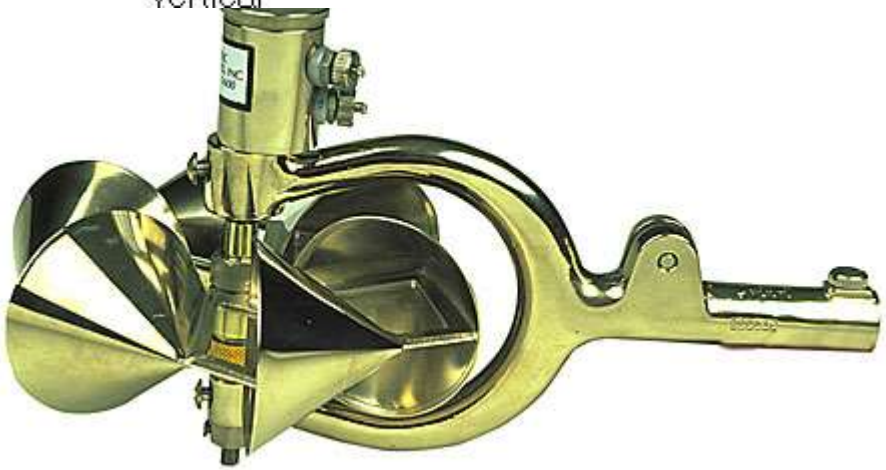
Manual measurements form the basis for daily mean flow estimates





Each manual flow measurement consists of two components: Cross-sectional area and velocity




1. 27. 2009

USGS flow records include cross-sectional average velocity, which is archived with every manual flow measurement made.

This means we can sometimes find relatively long-term records of velocity that may give clues to how velocity conditions have changed over time.

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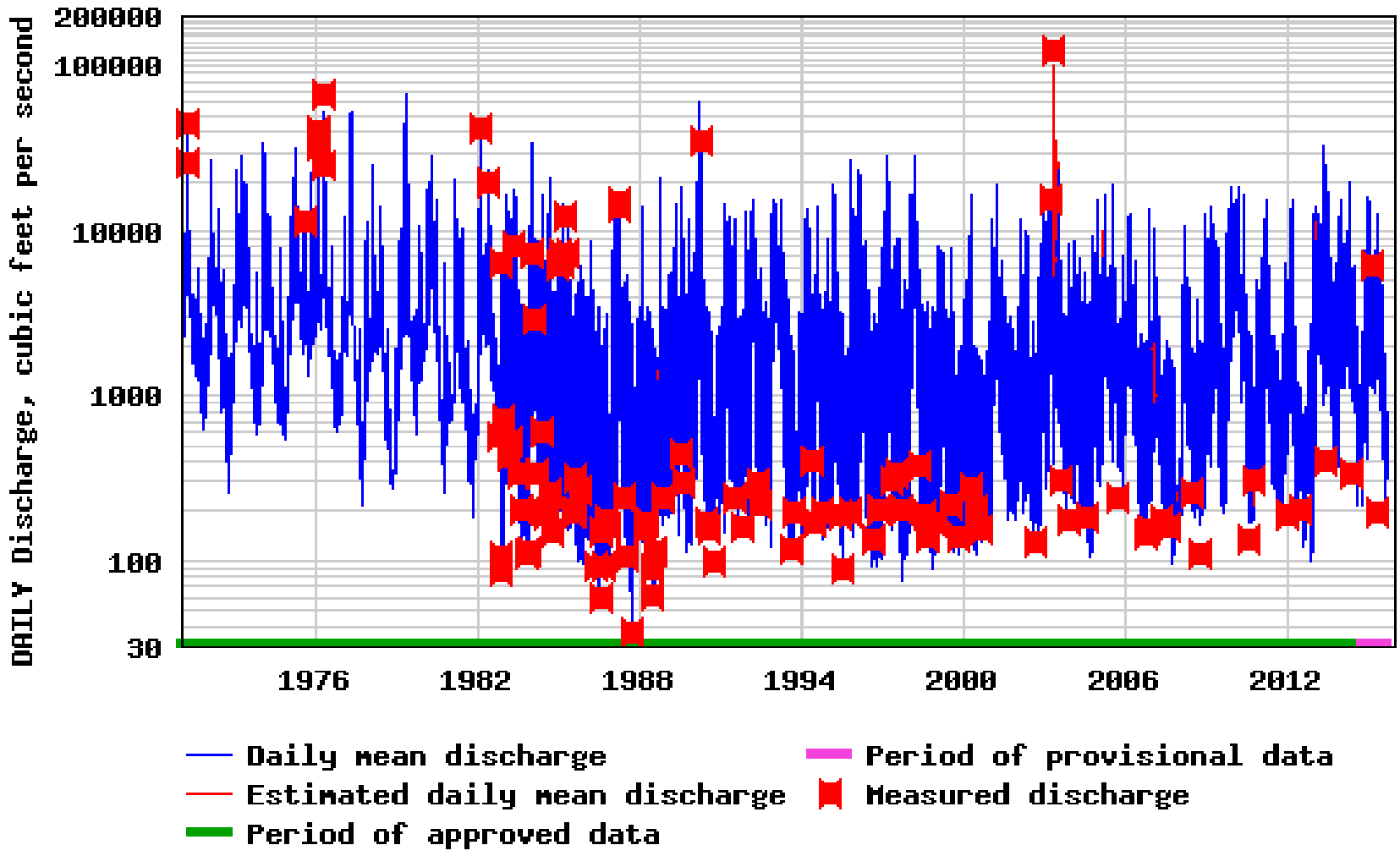
http://waterwatch.usgs.gov

USGS

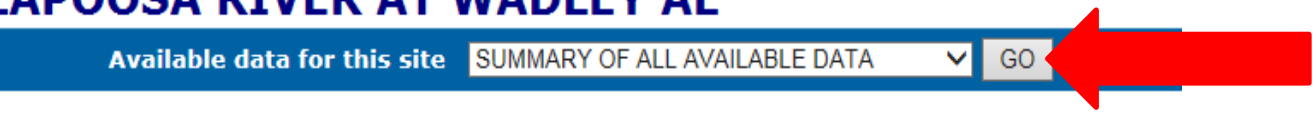
USGS

USGS 02414500 TALLAPOOSA RIVER AT WADLEY AL



USGS 02414500 TALLAPOOSA RIVER AT WADLEY AL

Available data for this site | SUMMARY OF ALL AVAILABLE DATA | GO



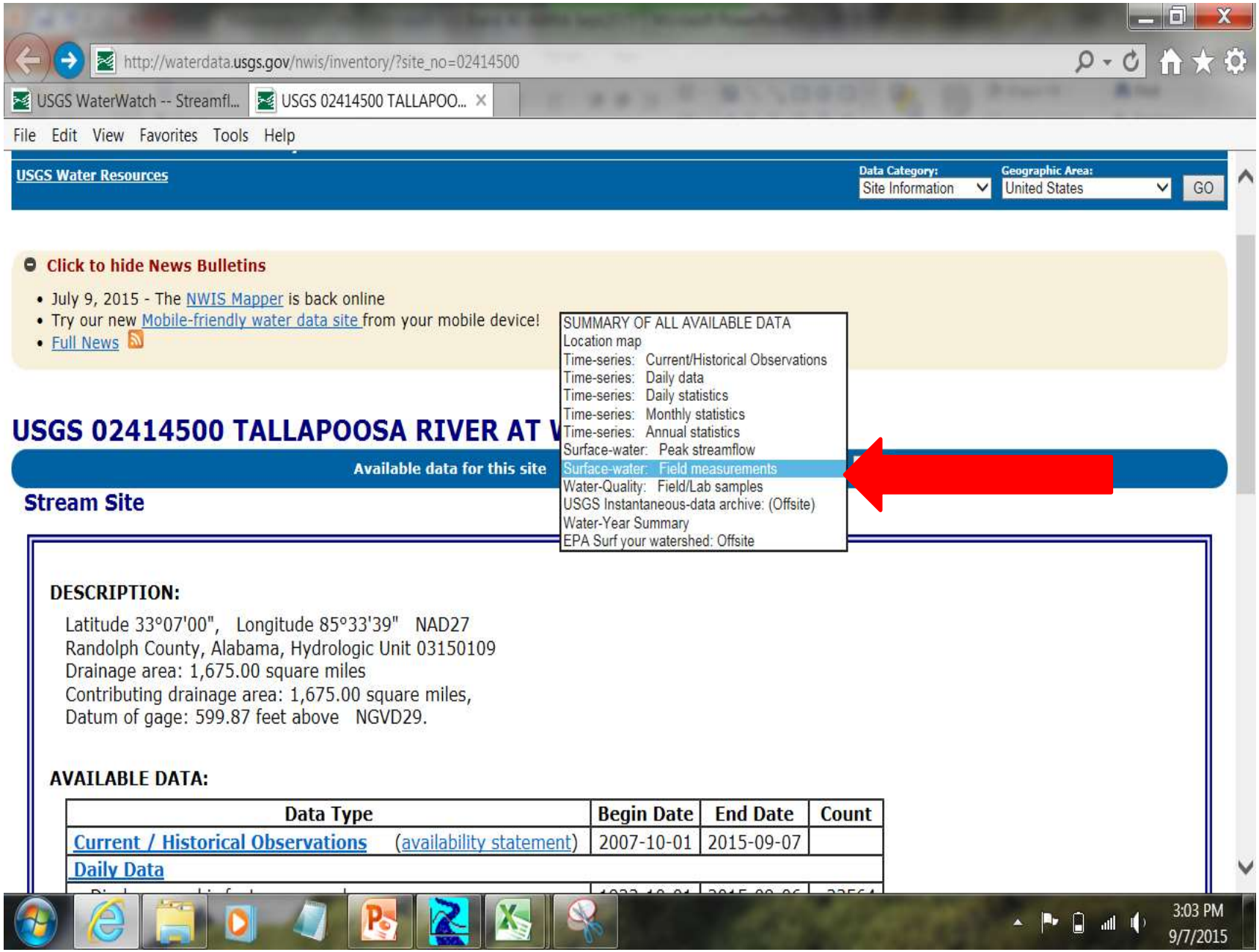
Stream Site

DESCRIPTION:

Latitude 33°07'00", Longitude 85°33'39" NAD27
Randolph County, Alabama, Hydrologic Unit 03150109
Drainage area: 1,675.00 square miles
Contributing drainage area: 1,675.00 square miles,
Datum of gage: 599.87 feet above NGVD29.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Current / Historical Observations (availability statement)	2007-10-01	2015-09-07	
Daily Data			
Discharge, cubic feet per second	1923-10-01	2015-09-06	33564
Gage height, feet	1971-10-01	2015-09-06	15882


http://waterdata.usgs.gov/nwis/inventory/?site_no=02414500
USGS WaterWatch -- Streamfl...
USGS 02414500 TALLAPOO...
File Edit View Favorites Tools Help
USGS Water Resources
Data Category:
Site Information
Geographic Area:
United States
GO
Click to hide News Bulletins
July 9, 2015 - The NWIS Mapper is back online
Try our new Mobile-friendly water data site from your mobile device!
Full News
SUMMARY OF ALL AVAILABLE DATA
Location map
Time-series: Current/Historical Observations
Time-series: Daily data
Time-series: Daily statistics
Time-series: Monthly statistics
Time-series: Annual statistics
Surface-water: Peak streamflow
Surface-water: Field measurements
Water-Quality: Field/Lab samples
USGS Instantaneous-data archive: (Offsite)
Water-Year Summary
EPA Surf your watershed: Offsite
USGS 02414500 TALLAPOOSA RIVER AT
Available data for this site
Stream Site
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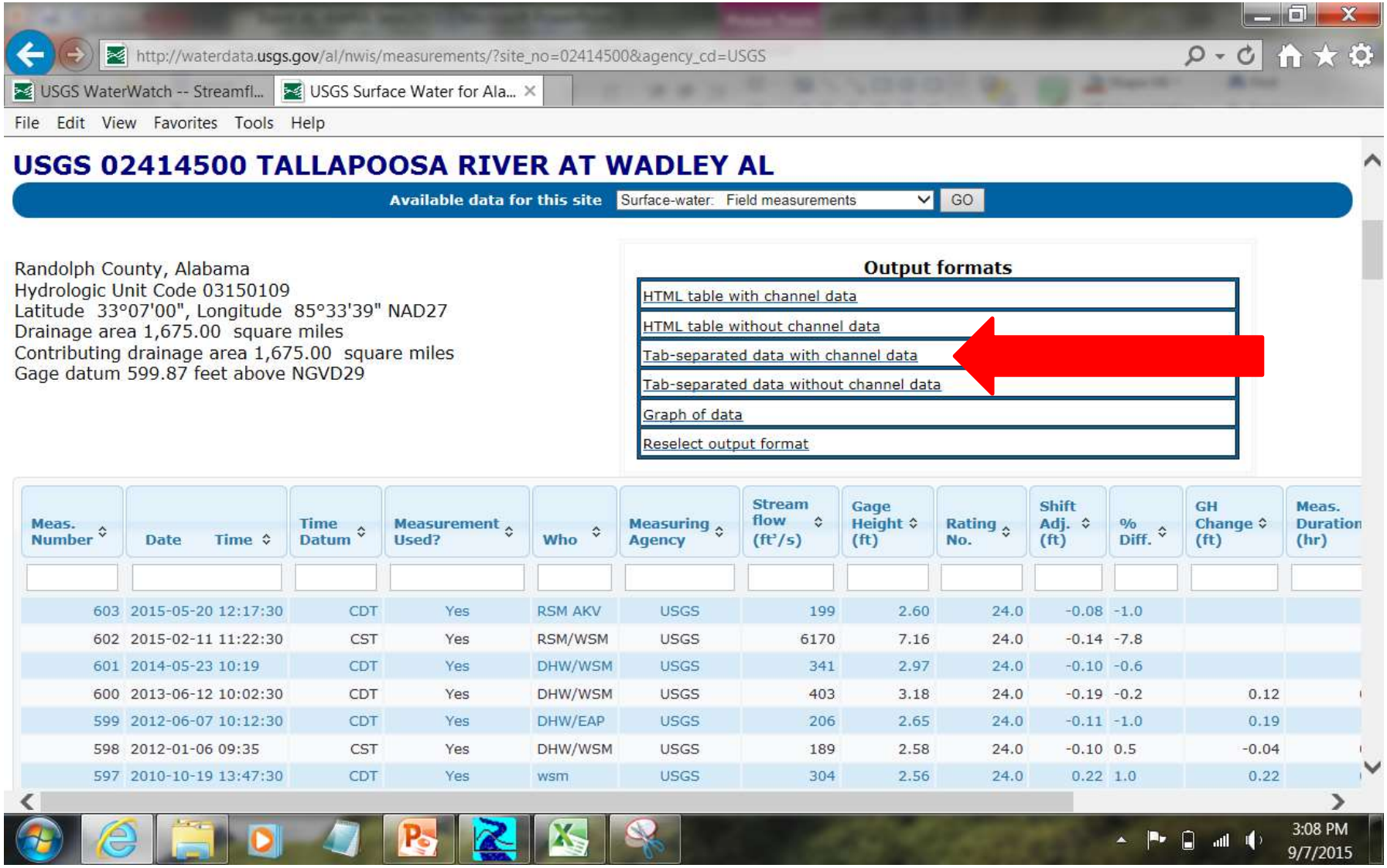
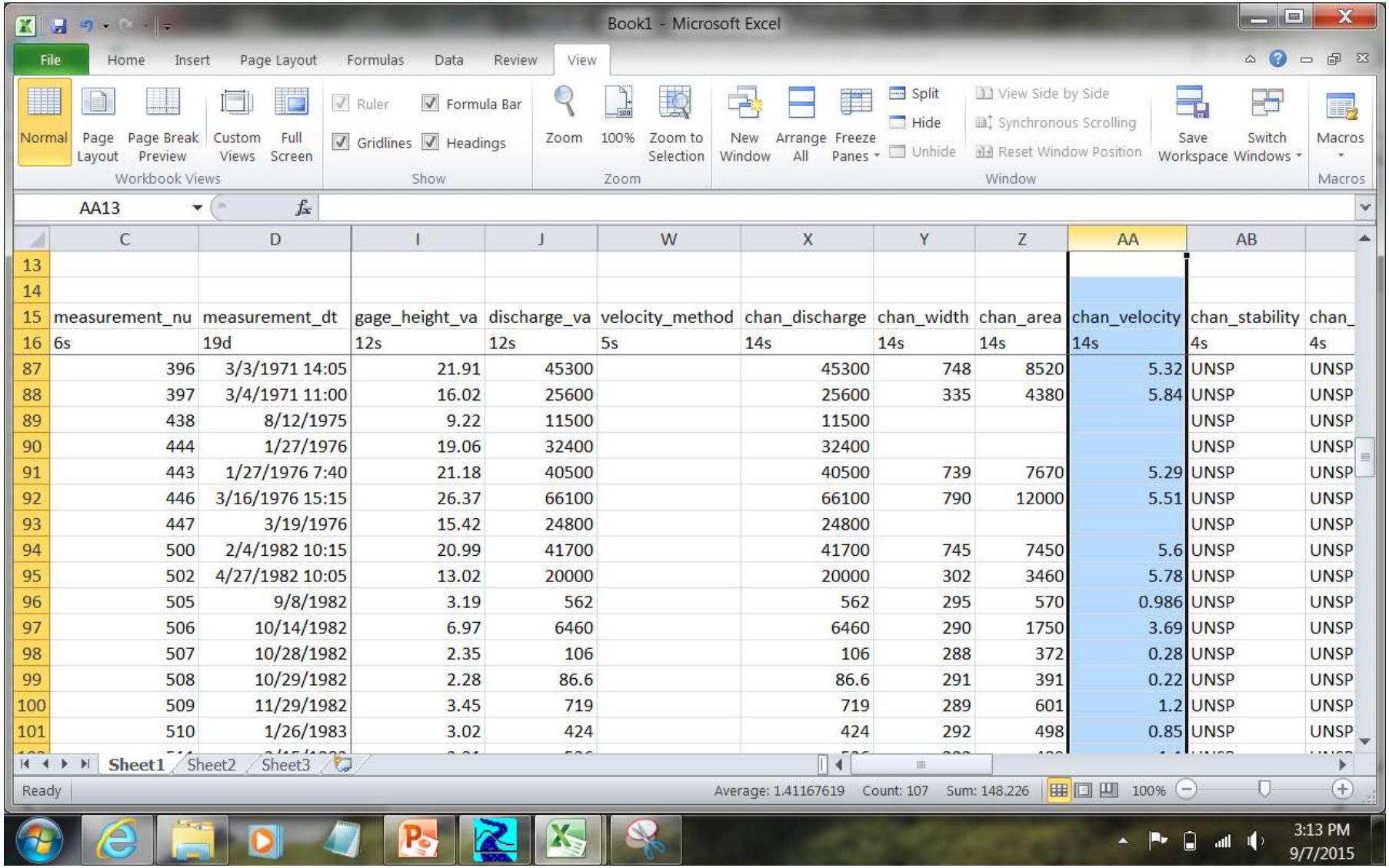
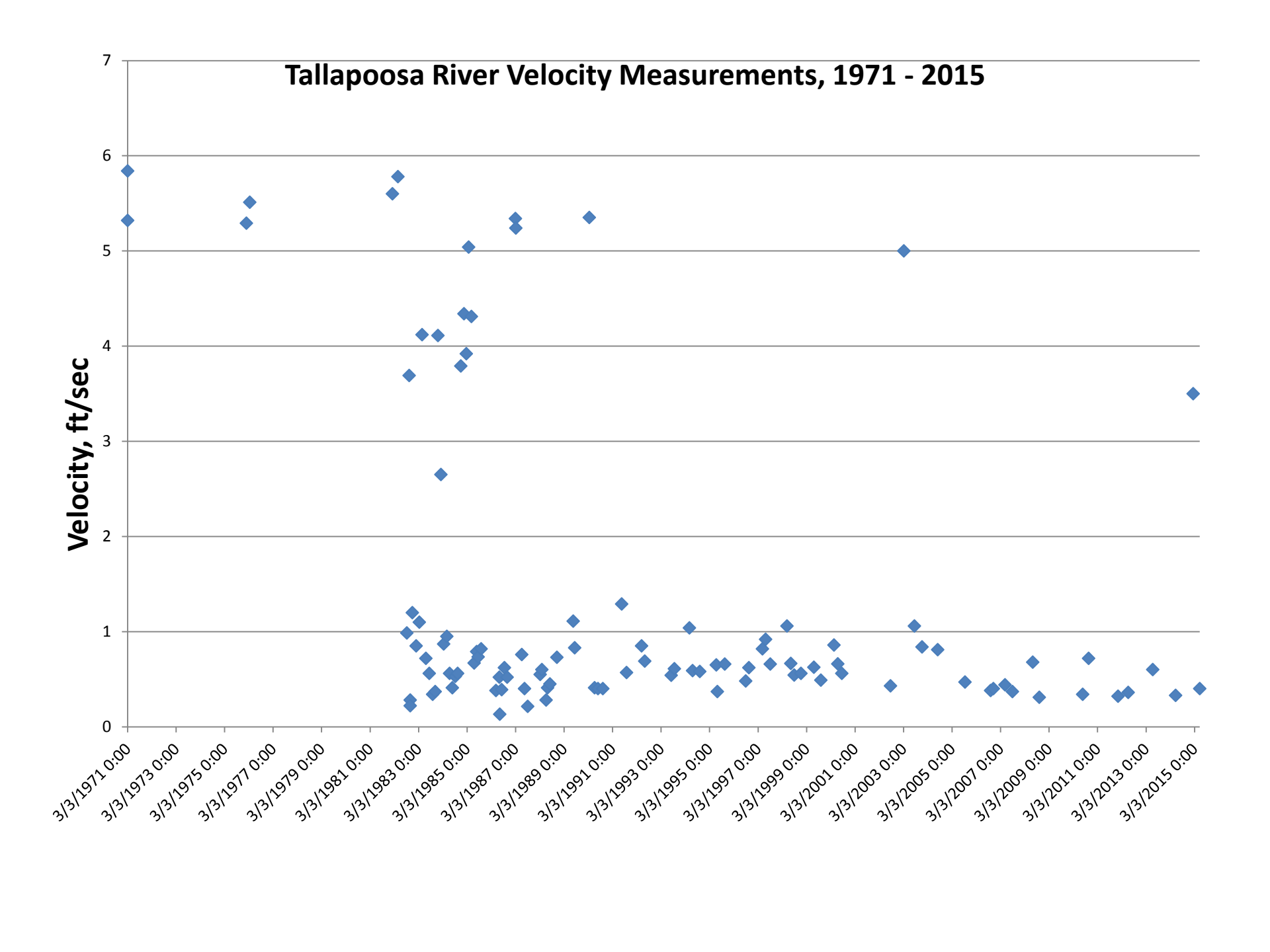
AVAILABLE DATA:
Data Type
Begin Date
End Date
Count
Current / Historical Observations (availability statement)
2007-10-01
2015-09-07
Daily Data
3:03 PM
9/7/2015

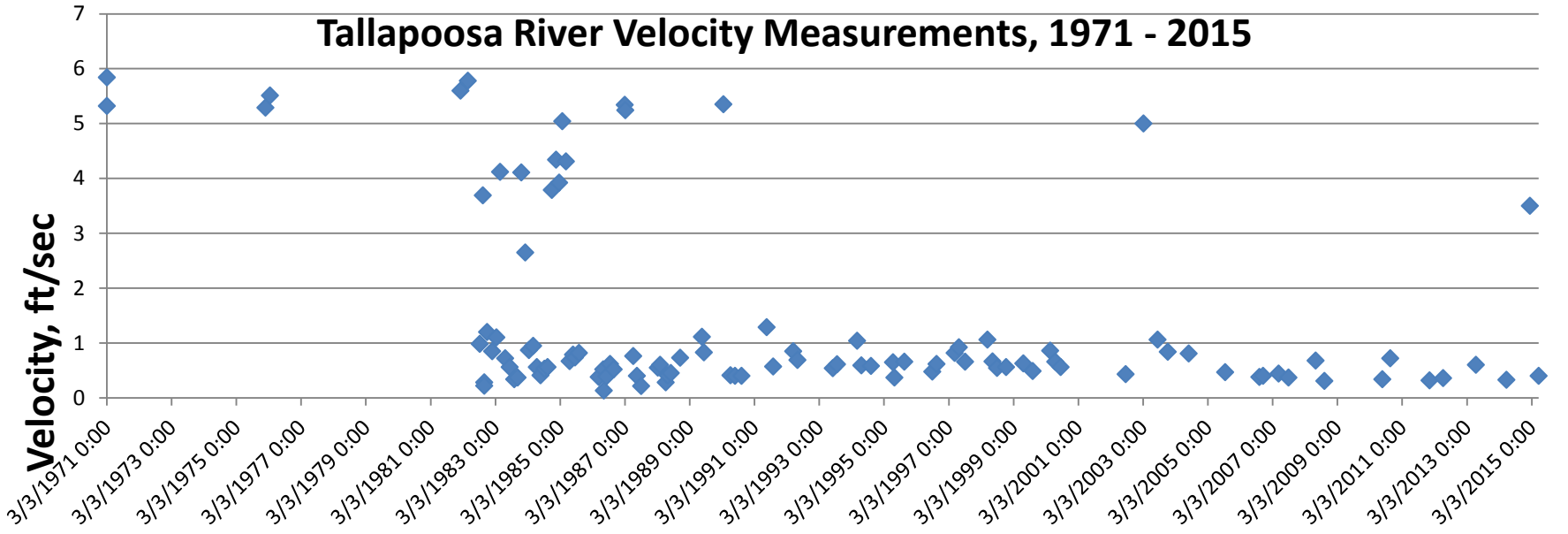


Velocity is included with **channel data** (more columns)



Exported to Excel - The archived value is channel velocity (Q / X-sec area)


Tallapoosa River Velocity Measurements, 1971 - 2015
Velocity, ft/sec
7
6
5
4
3
2
1
0
3/3/1971 0:00
3/3/1973 0:00
3/3/1975 0:00
3/3/1977 0:00
3/3/1979 0:00
3/3/1981 0:00
3/3/1983 0:00
3/3/1985 0:00
3/3/1987 0:00
3/3/1989 0:00
3/3/1991 0:00
3/3/1993 0:00
3/3/1995 0:00
3/3/1997 0:00
3/3/1999 0:00
3/3/2001 0:00
3/3/2003 0:00
3/3/2005 0:00
3/3/2007 0:00
3/3/2009 0:00
3/3/2011 0:00
3/3/2013 0:00
3/3/2015 0:00


Tallapoosa River Velocity Measurements, 1971 - 2015
Velocity, ft/sec
7
6
5
4
3
2
1
0
3/3/1971 0:00
3/3/1973 0:00
3/3/1975 0:00
3/3/1977 0:00
3/3/1979 0:00
3/3/1981 0:00
3/3/1983 0:00
3/3/1985 0:00
3/3/1987 0:00
3/3/1989 0:00
3/3/1991 0:00
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3/3/1997 0:00
3/3/1999 0:00
3/3/2001 0:00
3/3/2003 0:00
3/3/2005 0:00
3/3/2007 0:00
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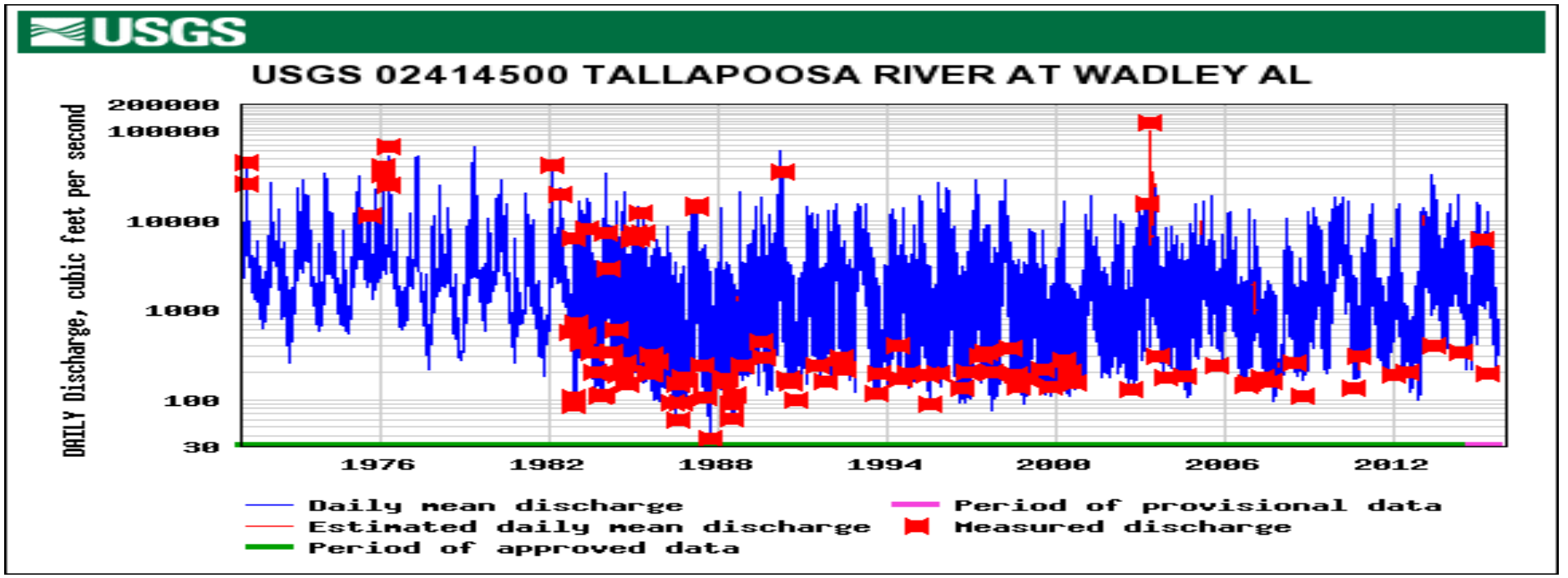
3/3/2011 0:00
3/3/2013 0:00
3/3/2015 0:00


USGS
USGS 02414500 TALLAPOOSA RIVER AT WADLEY AL
DAILY Discharge, cubic feet per second
200000
100000
10000
1000
100
30
1976
1982
1988
1994
2000
2006
2012
Daily mean discharge
Estimated daily mean discharge
Period of approved data
Period of provisional data
Measured discharge

Time series analysis of velocity using
SEFA (System for Environmental Flow)
on USGS record
at Blackwater Creek, AL

http://sefa.co.nz

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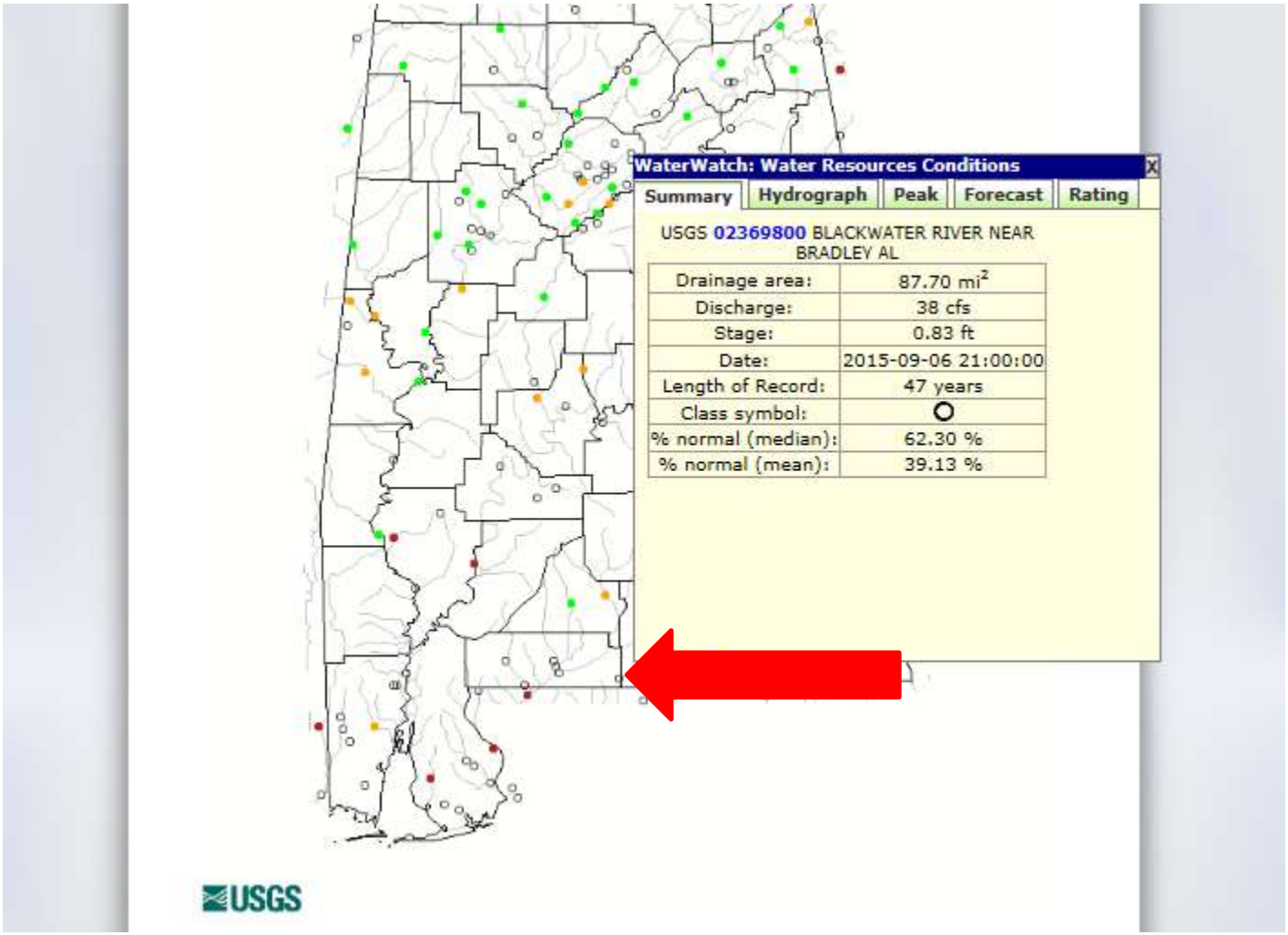
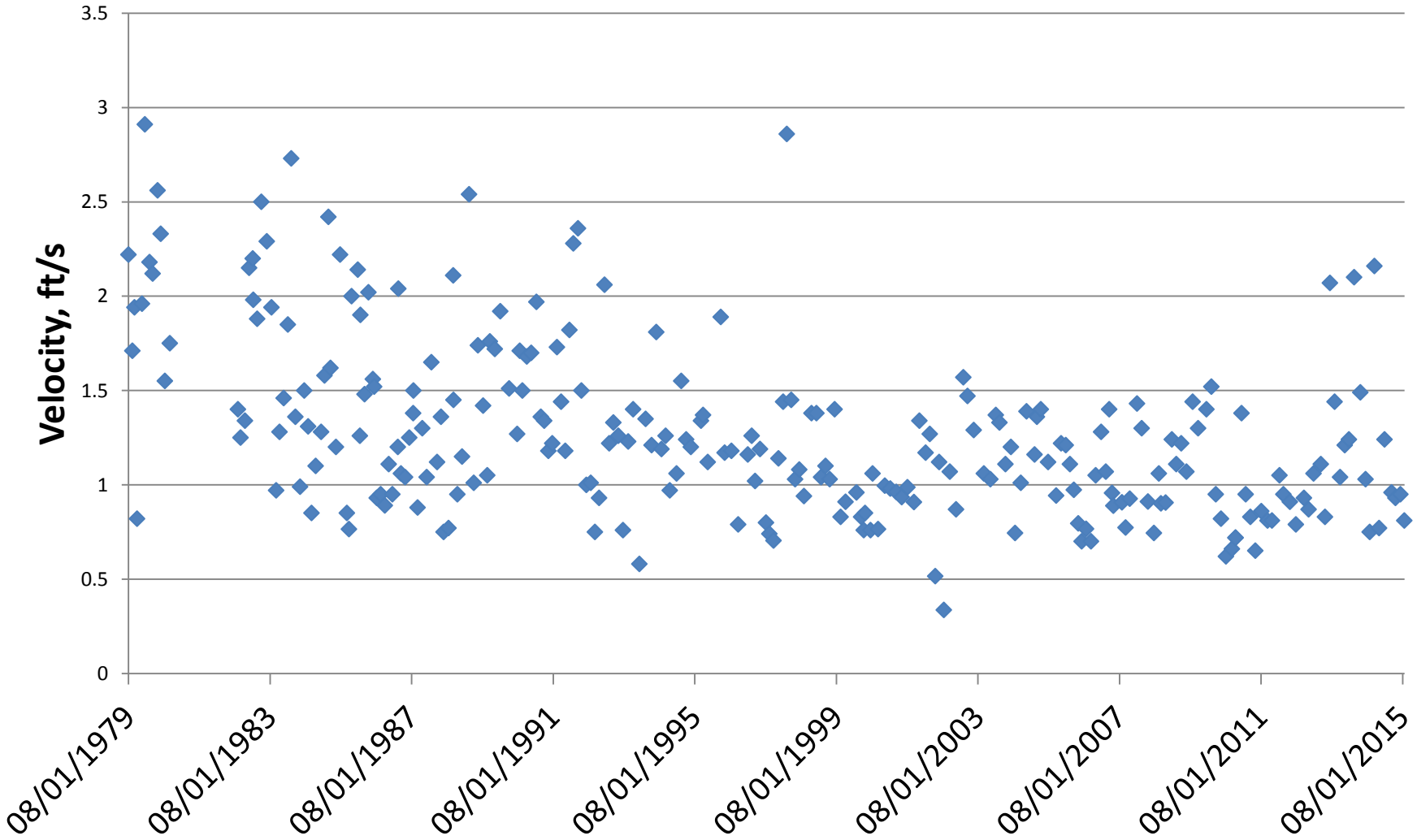
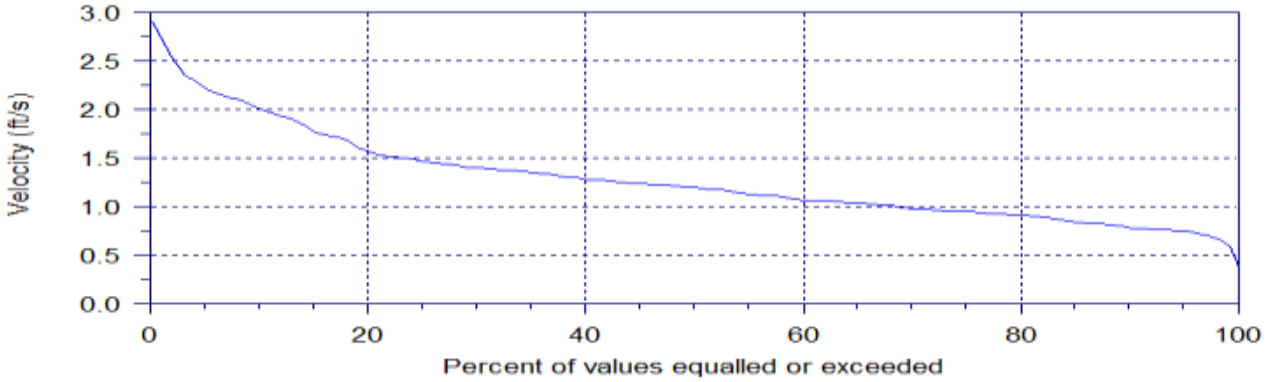
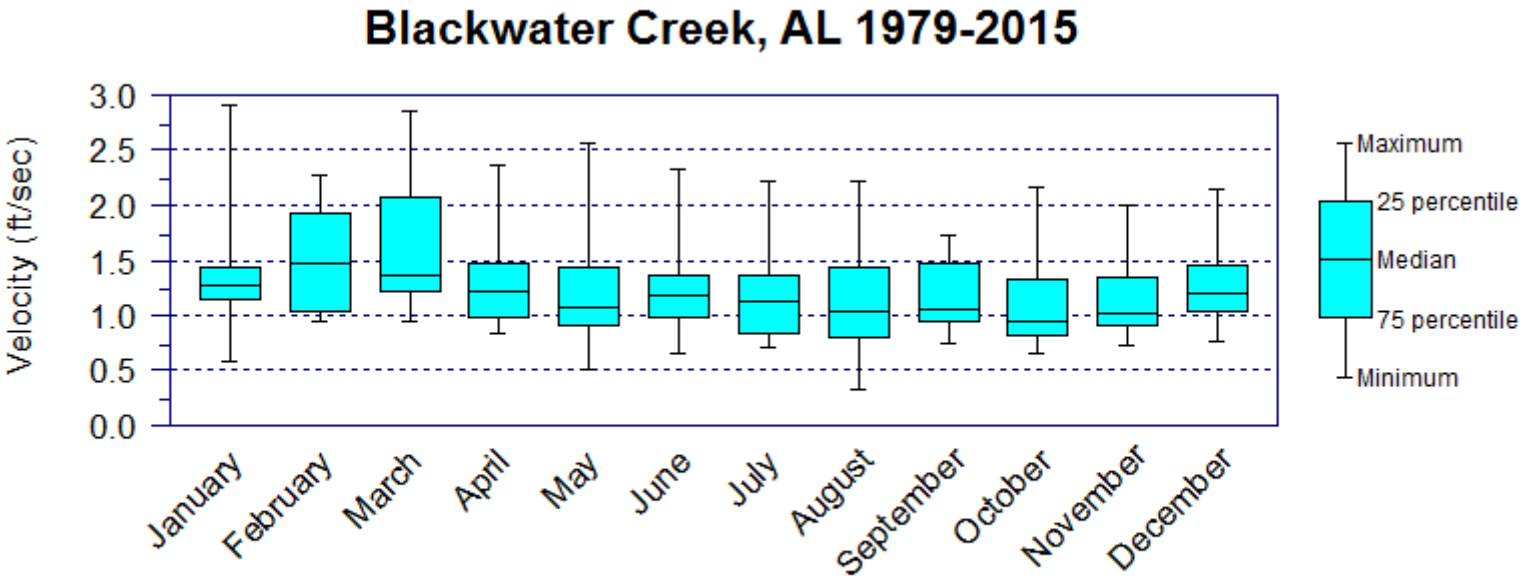

WaterWatch: Water Resources Conditions
Summary
Hydrograph
Peak
Forecast
Rating
USGS 02369800 BLACKWATER RIVER NEAR BRADLEY AL
Drainage area: 87.70 mi²
Discharge: 38 cfs
Stage: 0.83 ft
Date: 2015-09-06 21:00:00
Length of Record: 47 years
Class symbol: O
% normal (median): 62.30 %
% normal (mean): 39.13 %
USGS

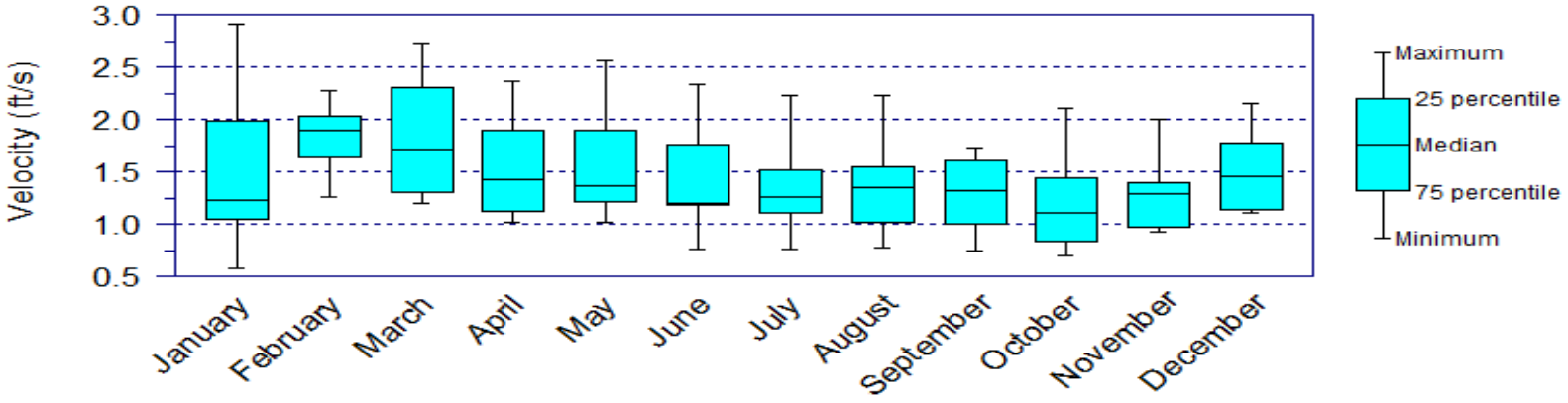
Blackwater Creek, AL
Measured cross-section average velocity 1979 - 2015



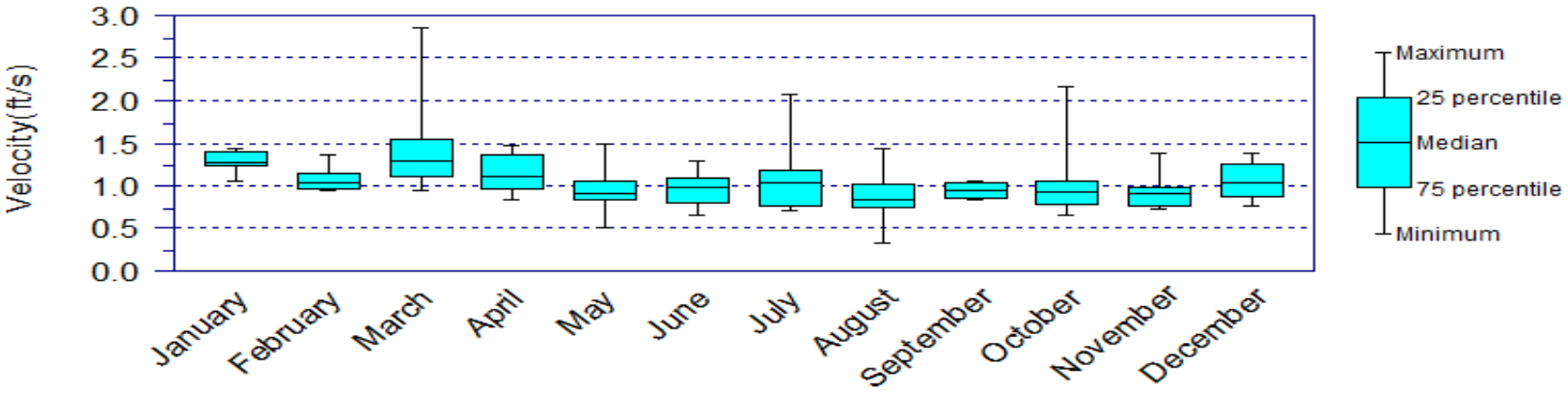

Velocity (ft/s)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
20
40
60
80
100
Percent of values equalled or exceeded


Blackwater Creek, AL 1979-2015
Velocity (ft/sec)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
January
February
March
April
May
June
July
August
September
October
November
December
Maximum
25 percentile
Median
75 percentile
Minimum

Blackwater Ck pre-1998



Blackwater Ck V 1998 - 2015



Concluding thoughts

Warning: Long-term data sets require detailed “forensics”

Cross-sectional velocity is probably a somewhat crude measure of instream conditions, but appropriate for looking at macro-level changes over time

Need to support continued acquisition of flow data at long-term sites

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