Real-time Water Quality Data and Applications in the Las Vegas Wash during Storm Events

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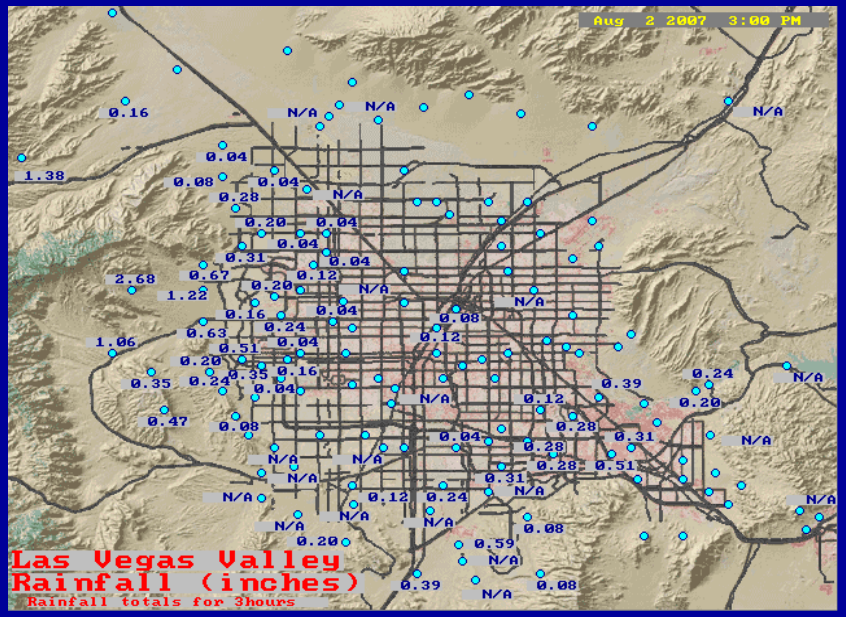
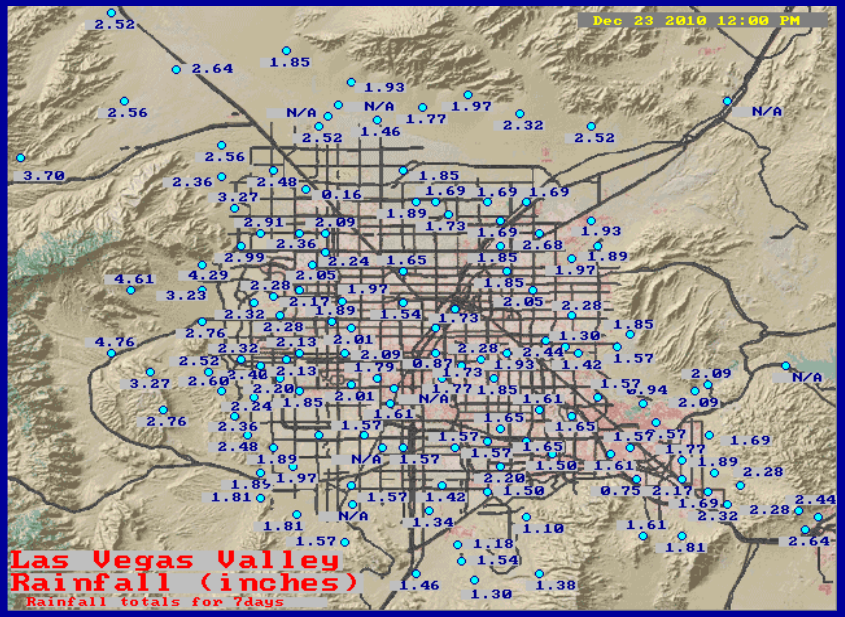
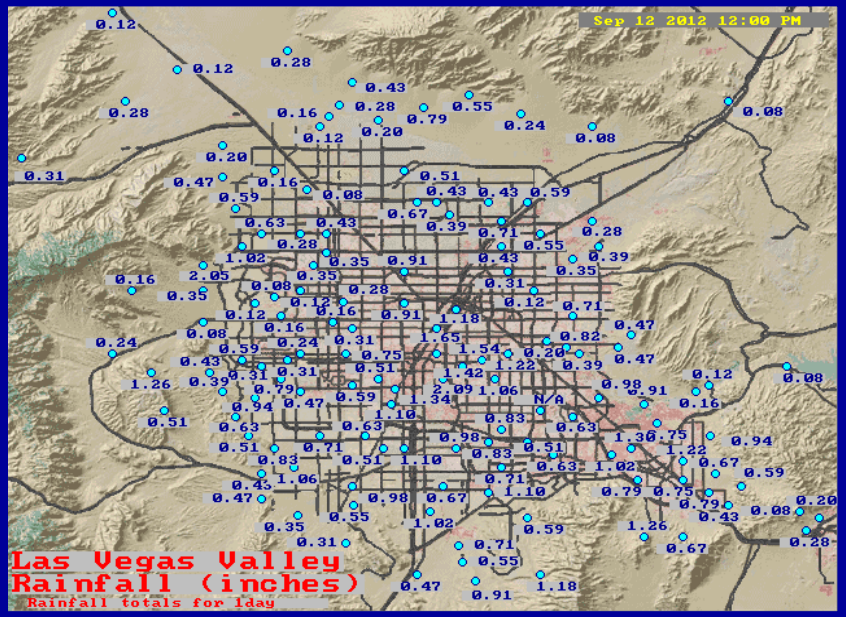
Presentation Outlines

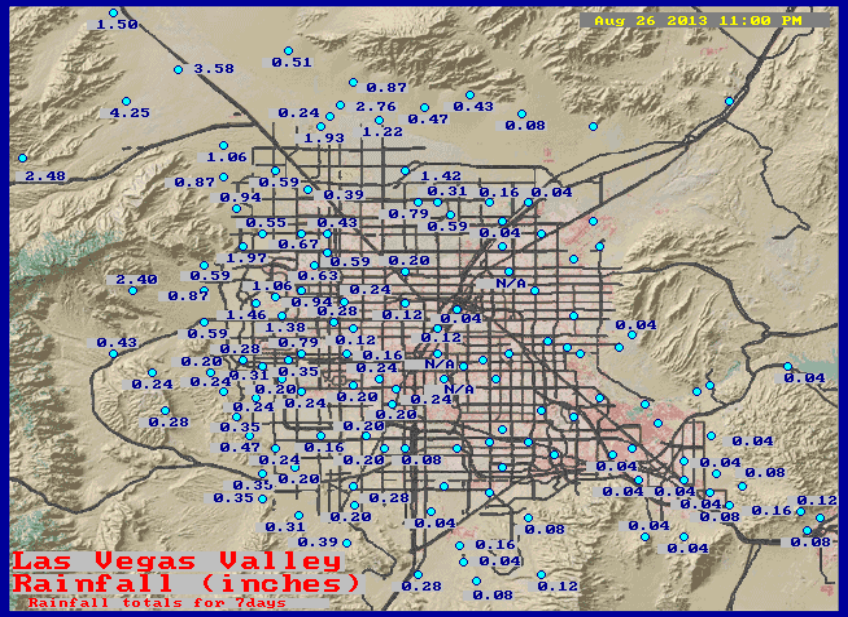
- Purpose of the study
- Rain (precipitation) and flow (discharge) data
- Real-time water quality program
- Water quality data recorded during storm events
  - In the Wash (LW 0.8)
  - In the tributaries (LW 12.1 and DC-1)
  - Parameters: temperature, pH, conductance, DO
  - 7 storm events between 2007 and 2013
- Applications and discussion
- Summary

Rainfall (inches) Maps in the Las Vegas Valley



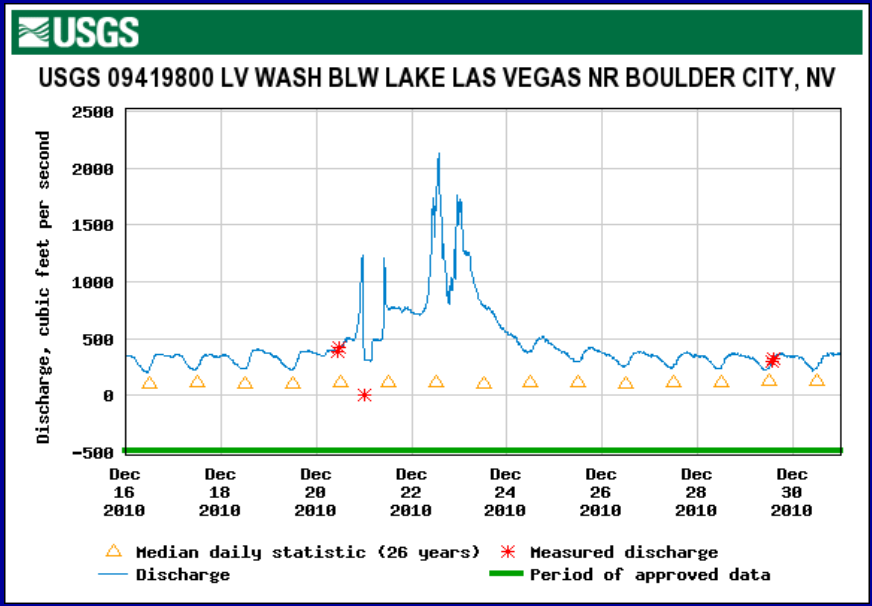


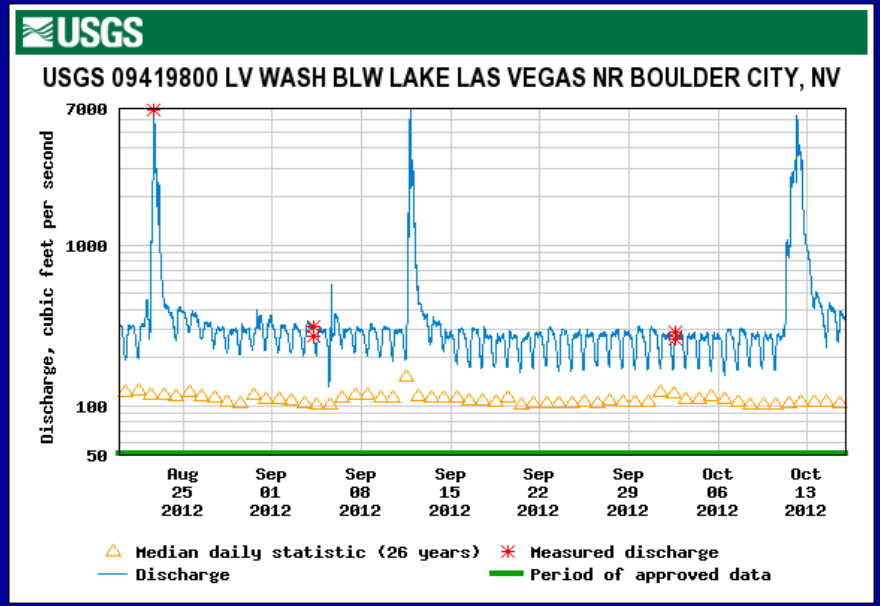


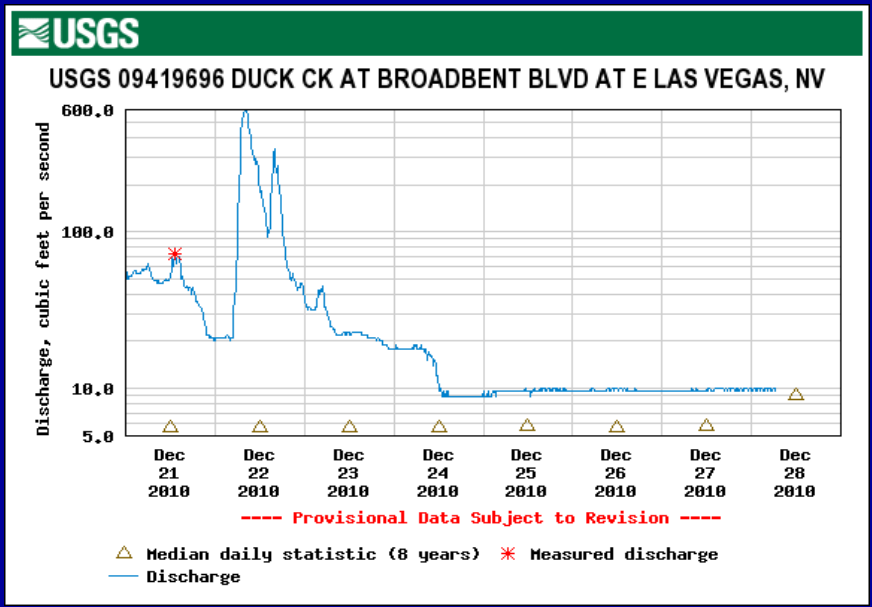


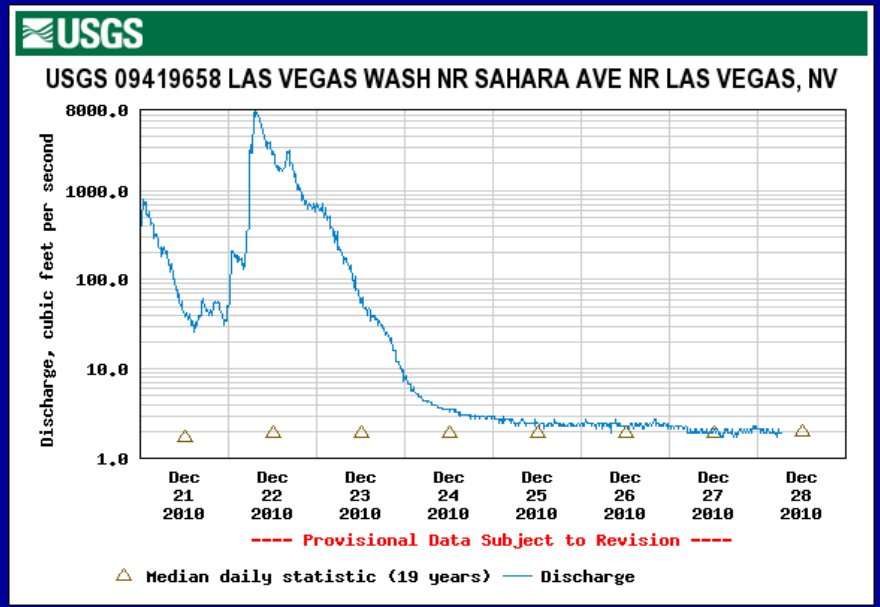
From CCRFCD website

Discharge Charts of the Wash and Tributaries During Storm Events

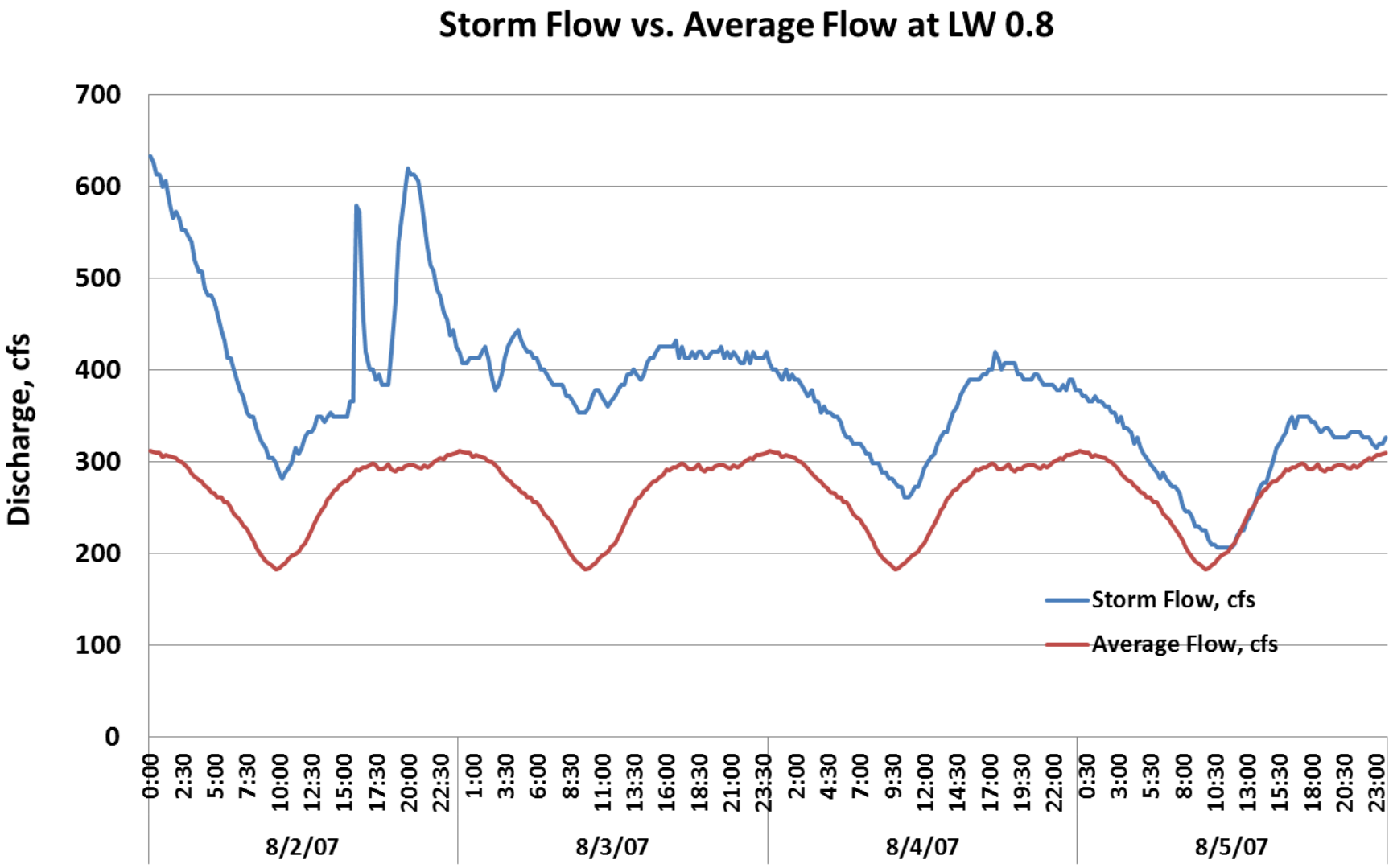


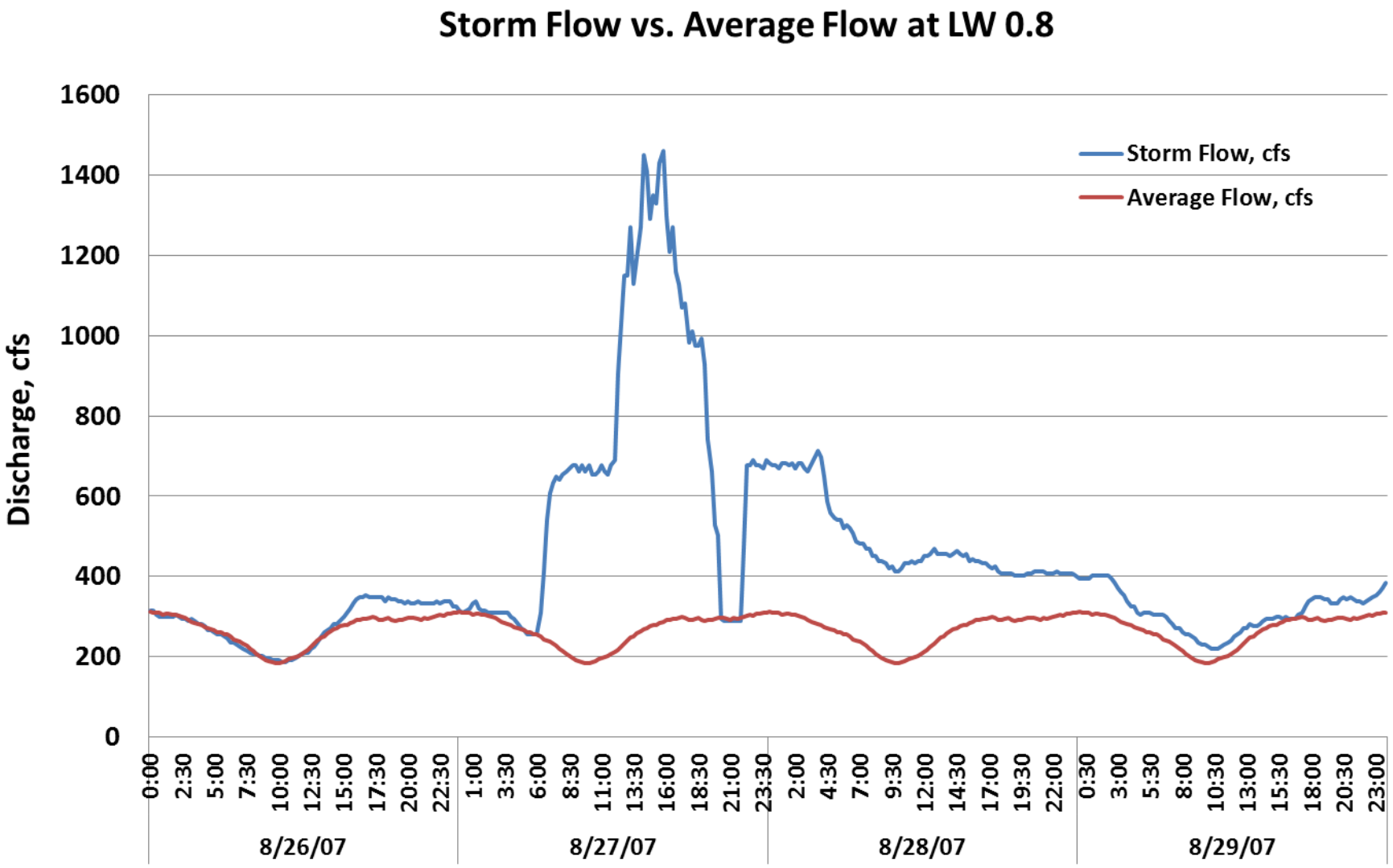






From USGS website

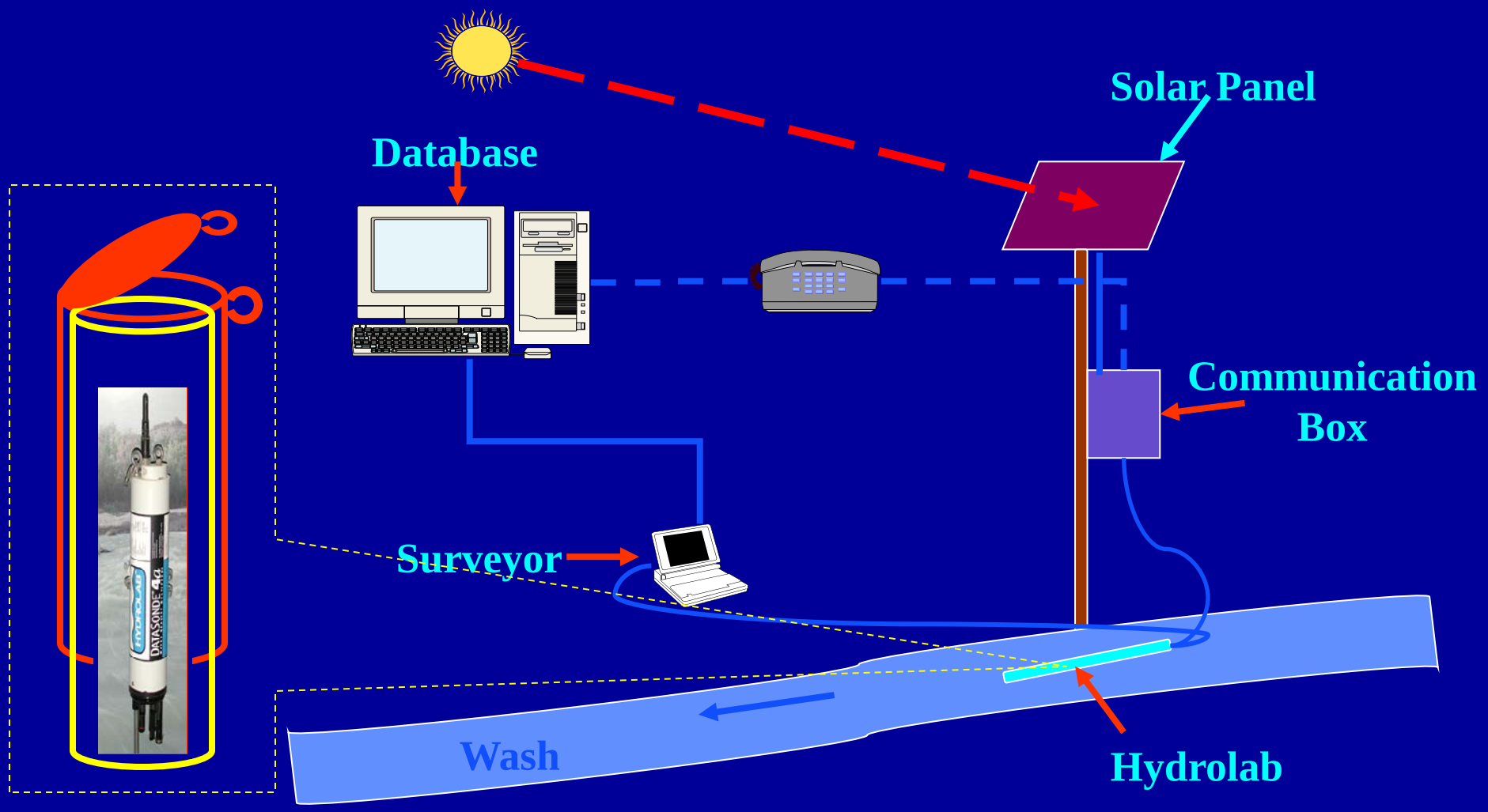

Storm Flow vs. Average Flow at LW 0.8
Discharge, cfs
700
600
500
400
300
200
100
0
0:00
2:30
5:00
7:30
10:00
12:30
15:00
17:30
20:00
22:30
1:00
3:30
6:00
8:30
11:00
13:30
16:00
18:30
21:00
23:30
2:00
4:30
7:00
9:30
12:00
14:30
17:00
19:30
22:00
0:30
3:00
5:30
8:00
10:30
13:00
15:30
18:00
20:30
23:00
8/2/07
8/3/07
8/4/07
8/5/07
Storm Flow, cfs
Average Flow, cfs

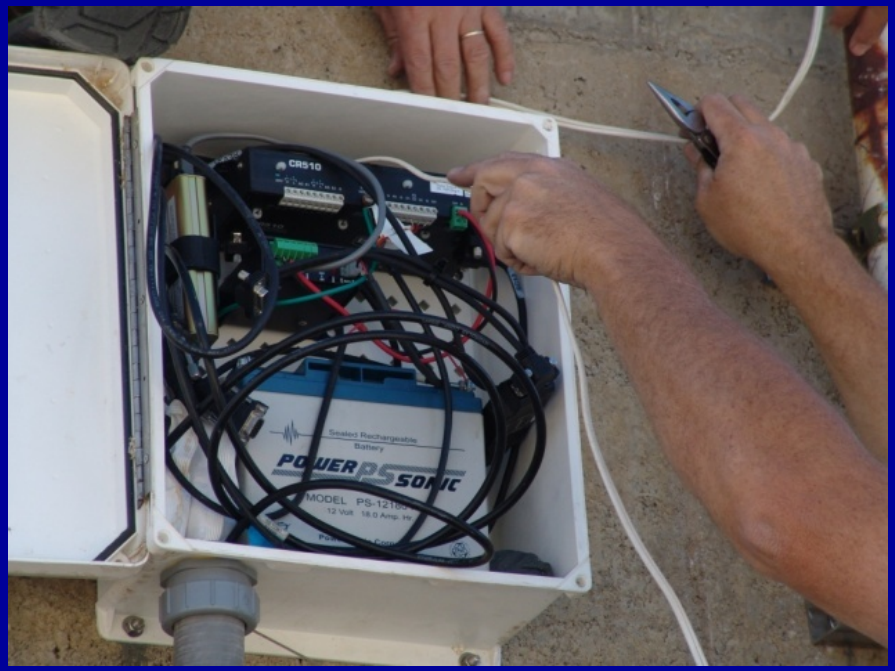

Storm Flow vs. Average Flow at LW 0.8
Discharge, cfs
1600
1400
1200
1000
800
600
400
200
0
Storm Flow, cfs
Average Flow, cfs
0:00
2:30
5:00
7:30
10:00
12:30
15:00
17:30
20:00
22:30
1:00
3:30
6:00
8:30
11:00
13:30
16:00
18:30
21:00
23:30
2:00
4:30
7:00
9:30
12:00
14:30
17:00
19:30
22:00
0:30
3:00
5:30
8:00
10:30
13:00
15:30
18:00
20:30
23:00
8/26/07
8/27/07
8/28/07
8/29/07

SNWA Real-time WQ Monitoring Program

- **Instrument:**
  - Hydrolab Units
- **Parameters:**
  - Temperature
  - pH
  - Dissolved Oxygen
  - Conductance
- **Data Recorded**
  - 24/7
  - Every 20 minutes

Telemetry Real-time Water Quality Monitoring Station




CR510
Sealed Rechargeable Battery
POWER PS SONIC
MODEL PS-12180
12 Volt 18.0 Amp. hr

Pabco Weir

Homestead Weir

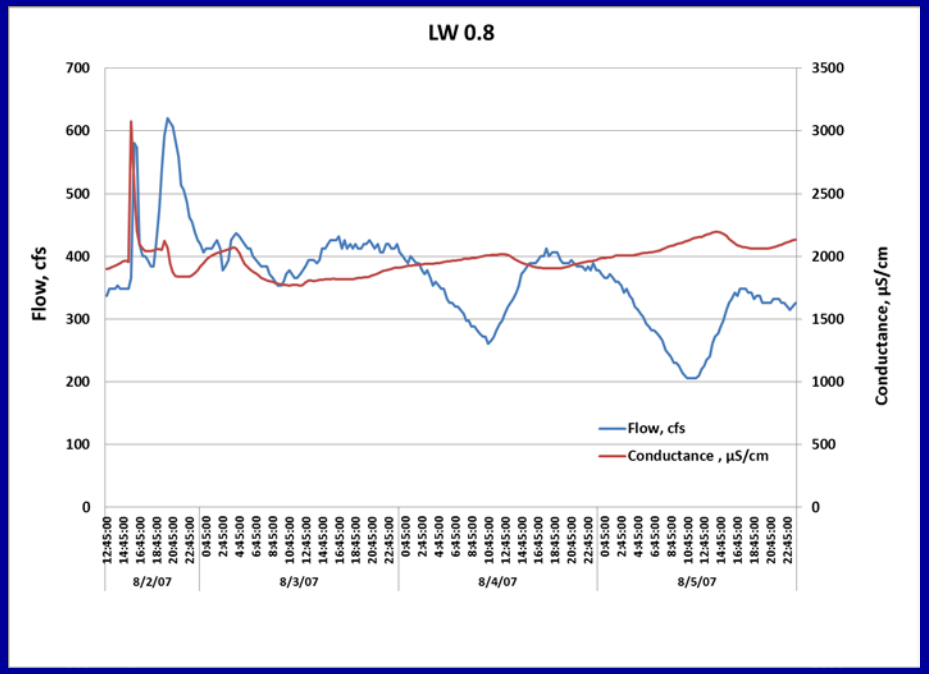
Duck Creek

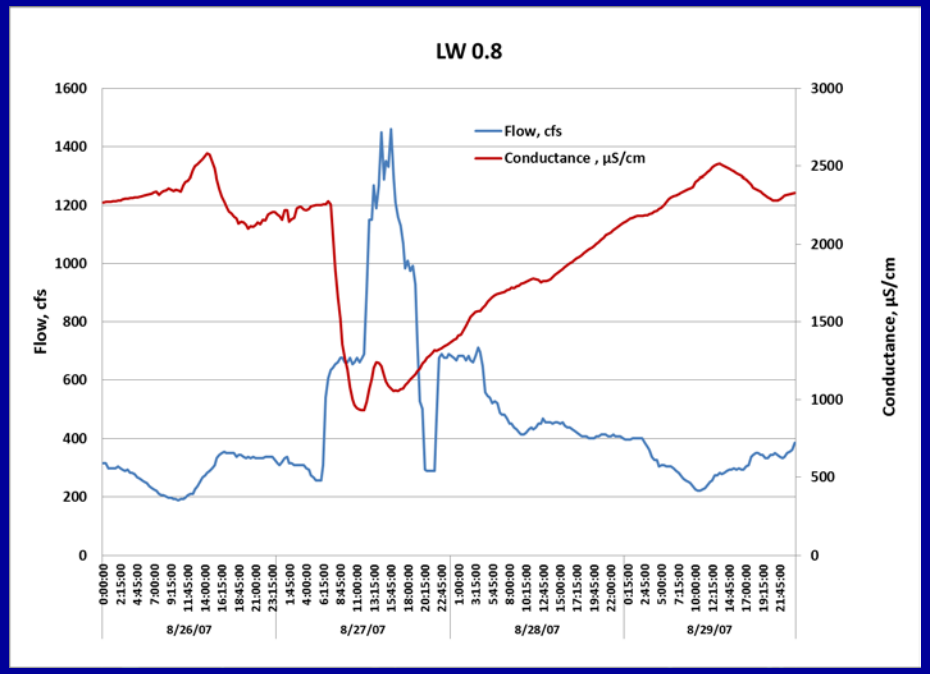
Rainbow Garden (LW 3.4)

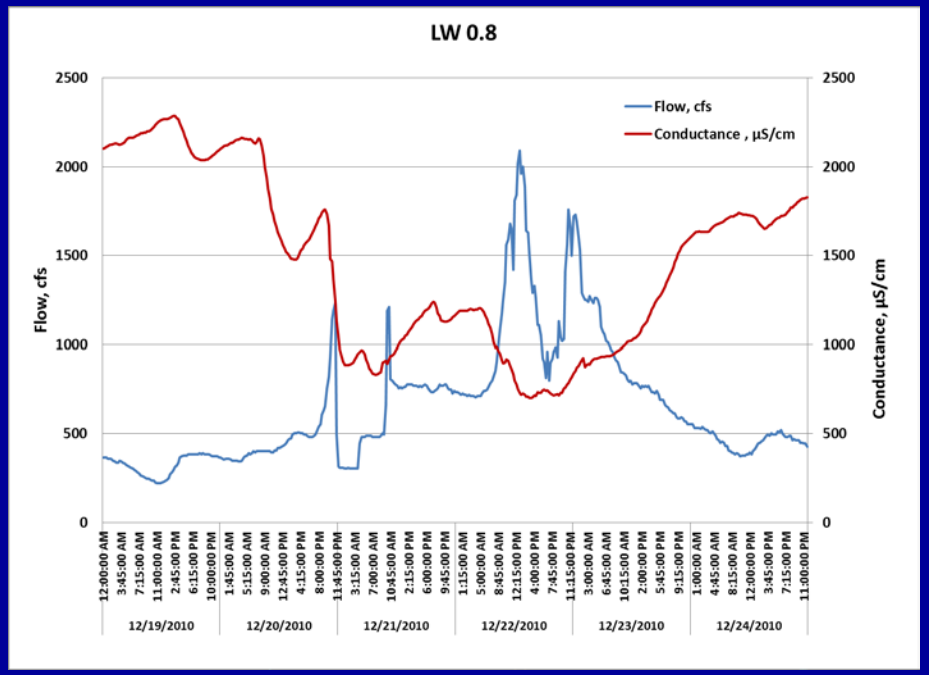
Flow and Water Quality Data from the Following Events and Stations:

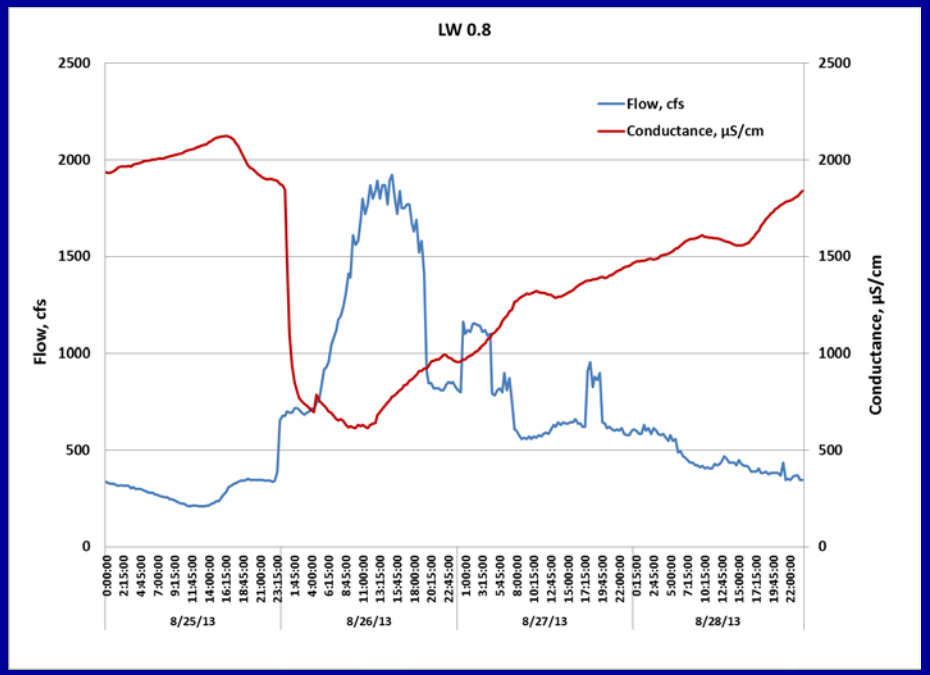
Storm Event	LW 0.8 (USGS 09419800)	DC_1 (USGS 09419696)	LW 12.1 (USGS: 09419658)
2007/08/02	✓	✓	✓
2007/08/27	✓	✓	✓
2010/12/17	✓	✓	✓
2012/08/21	✓		
2012/09/11	✓		
2012/10/11	✓	✓	
2013/08/25	✓	✓	

Specific Conductance at LW 0.8 (1)

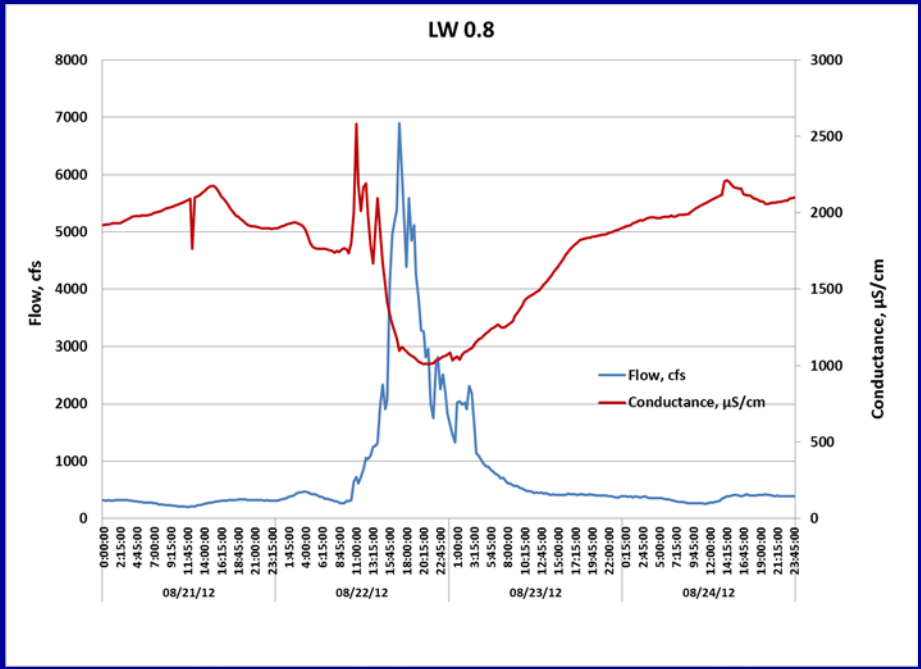


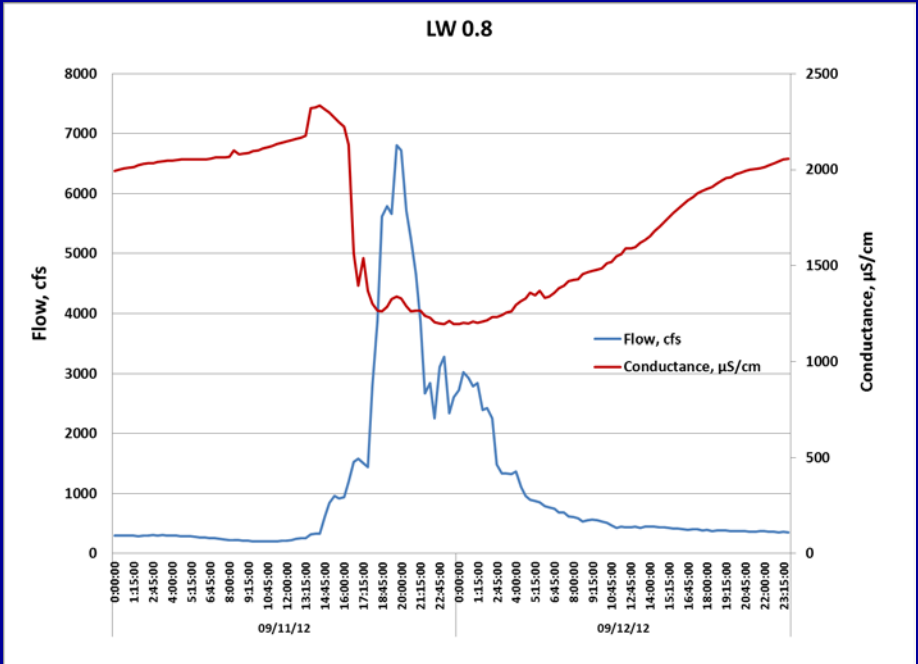


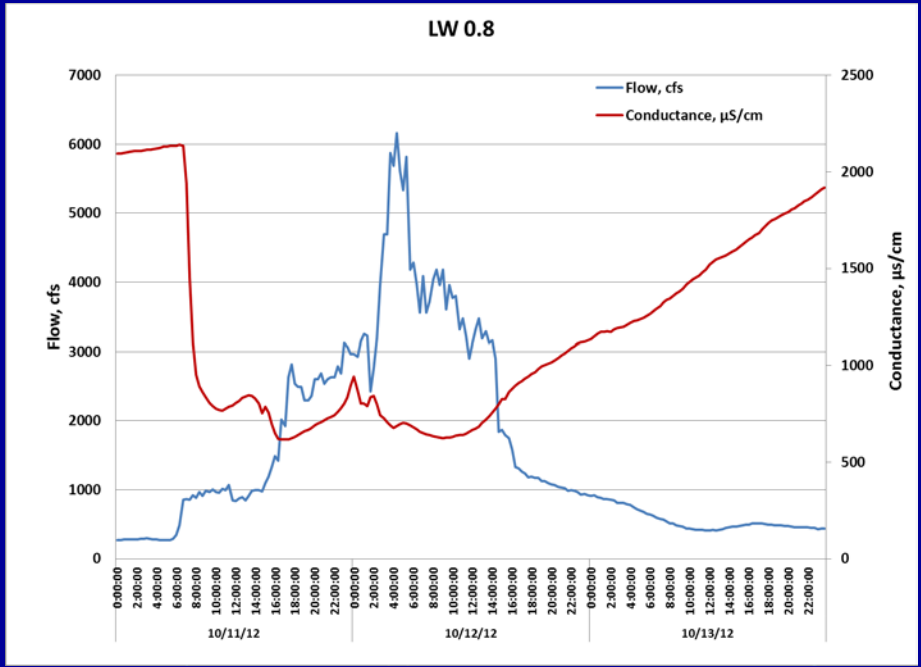




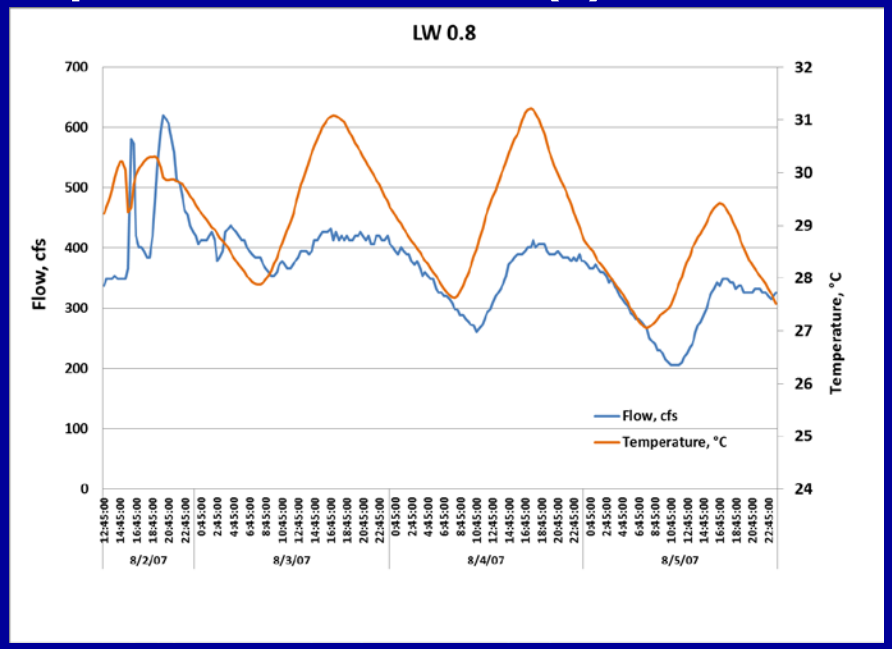
Specific Conductance at LW 0.8 (2)

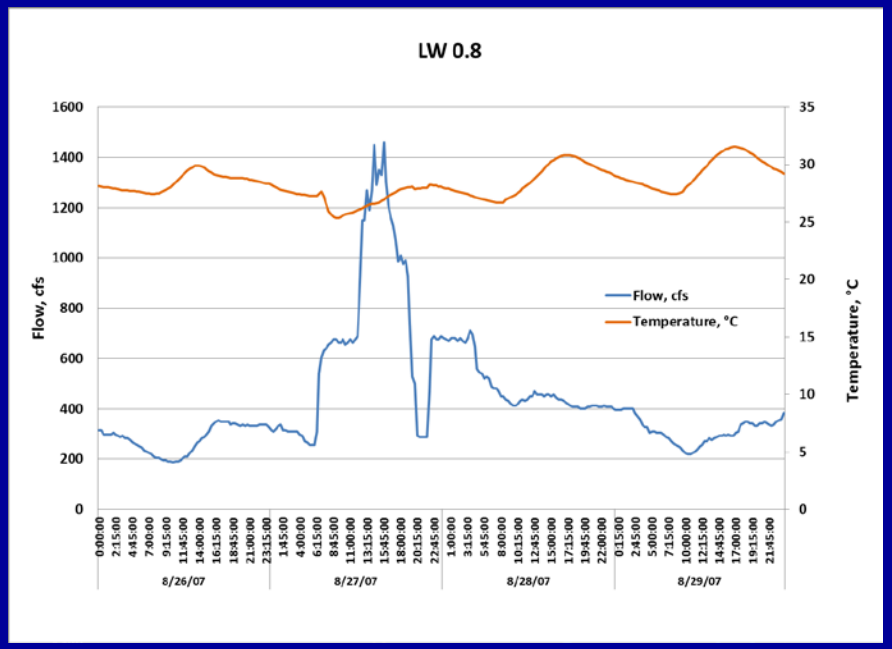


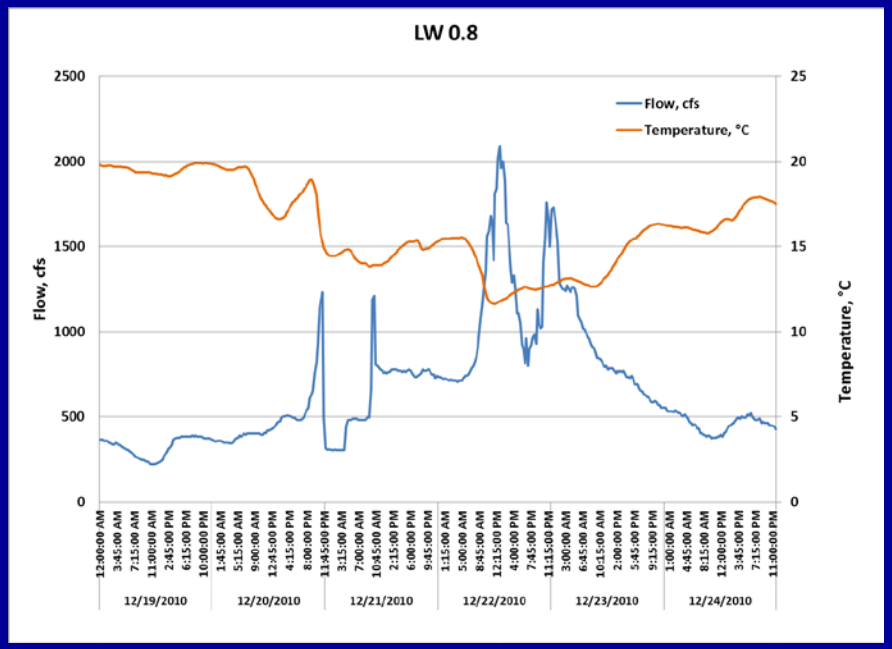


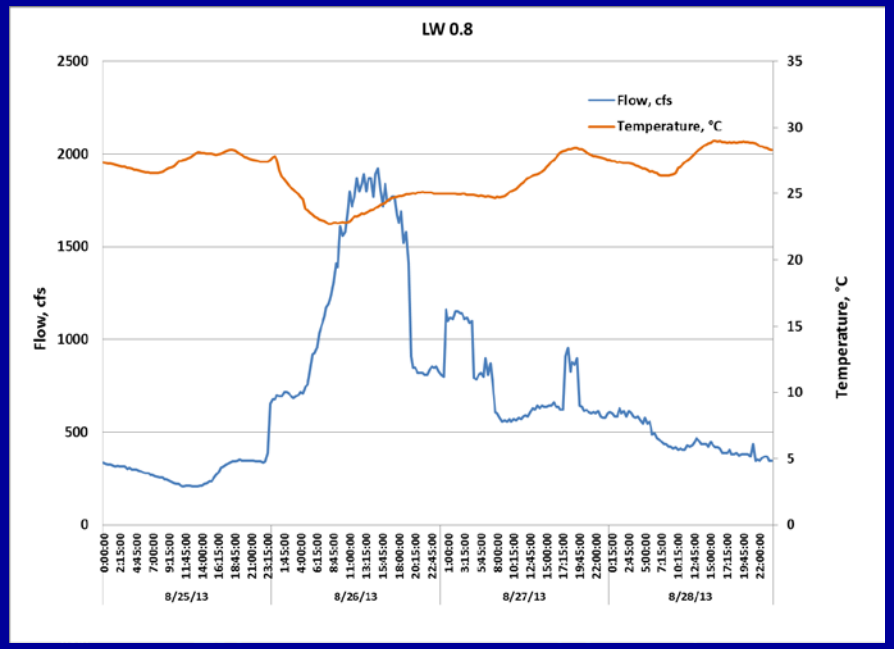


Temperature at LW 0.8 (1)

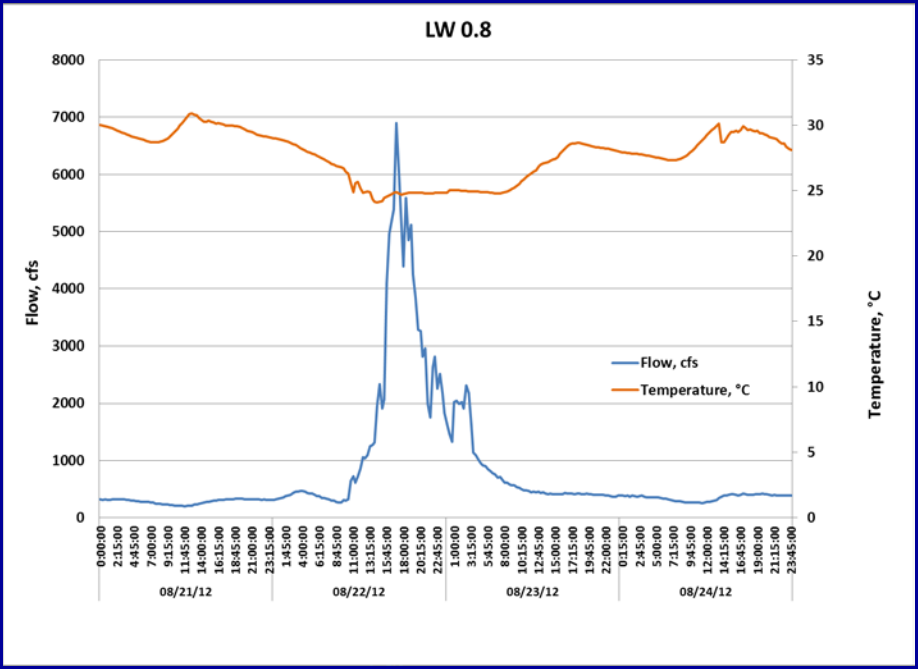


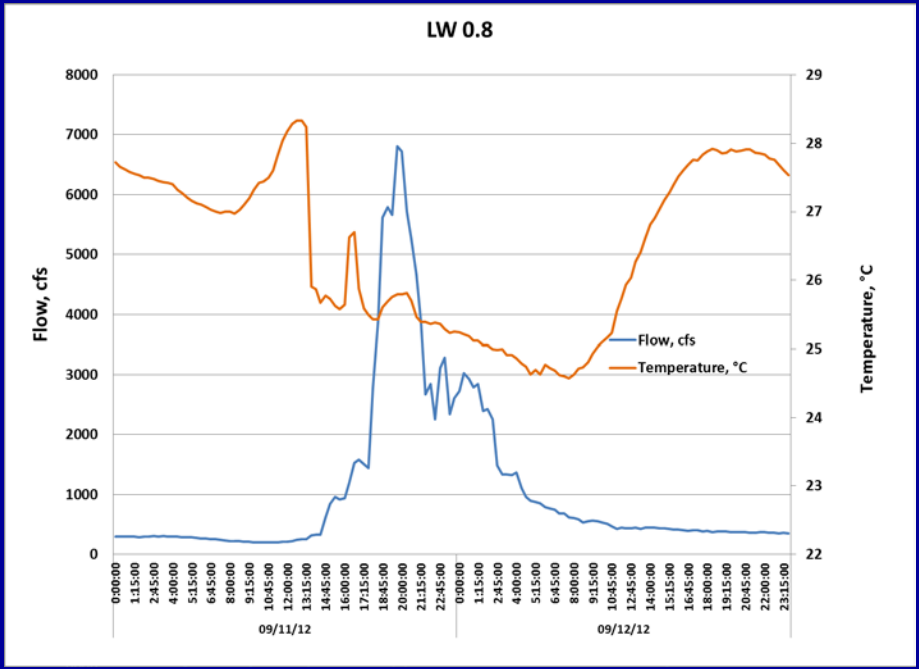


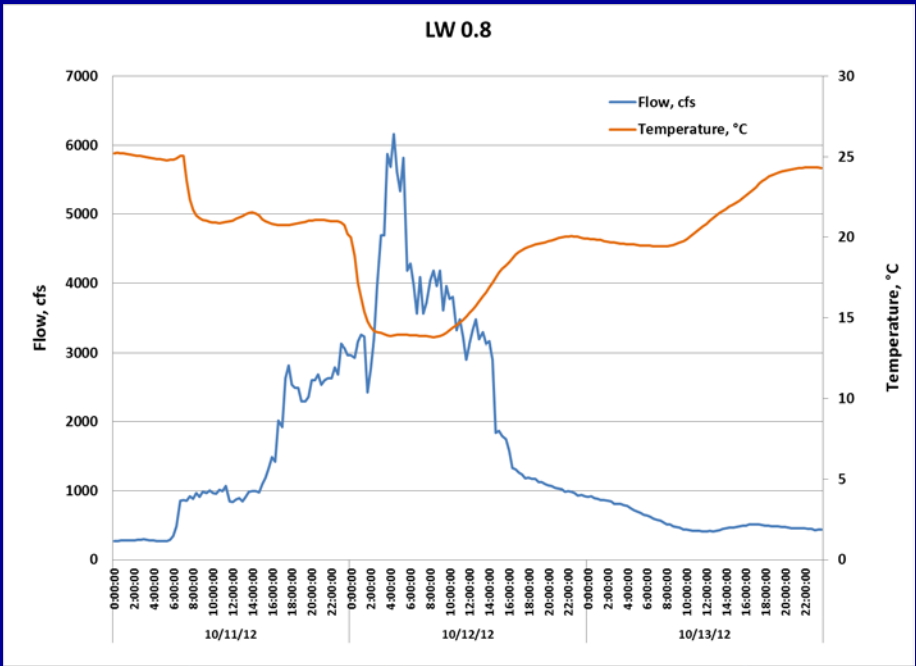




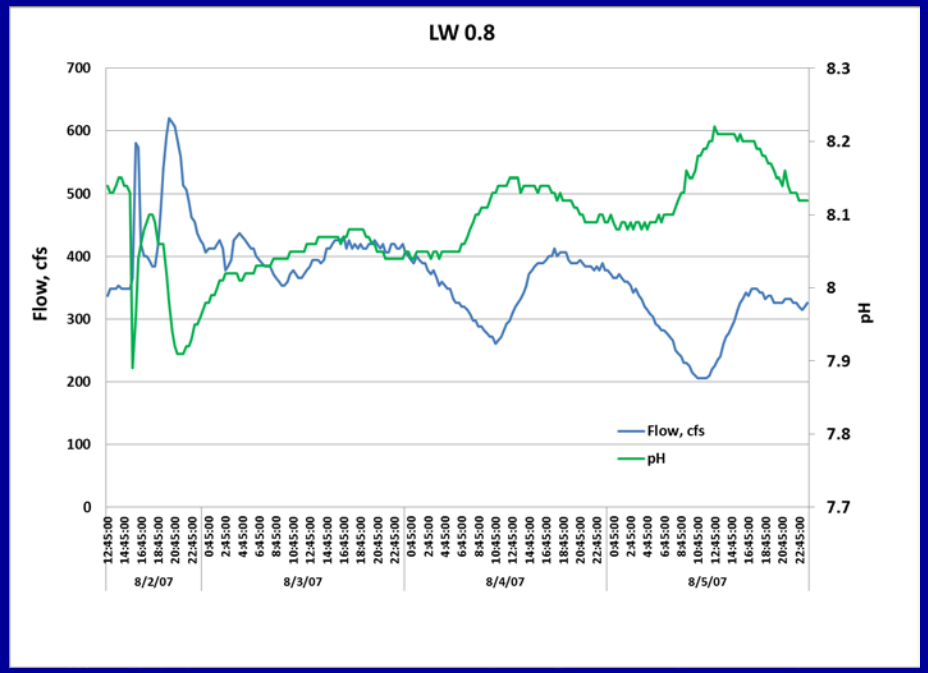
Temperature at LW 0.8 (2)

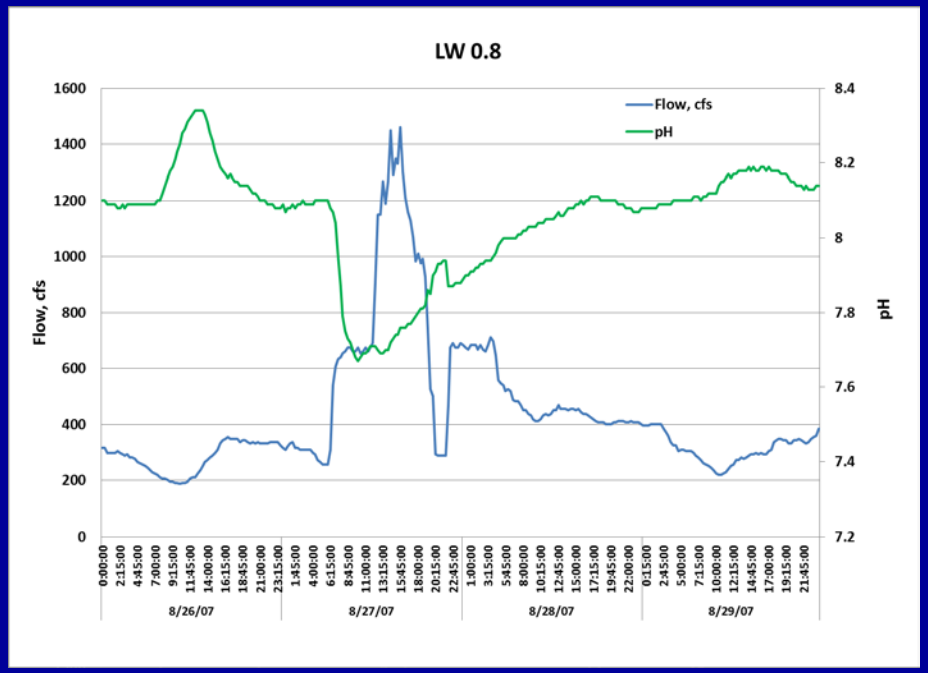


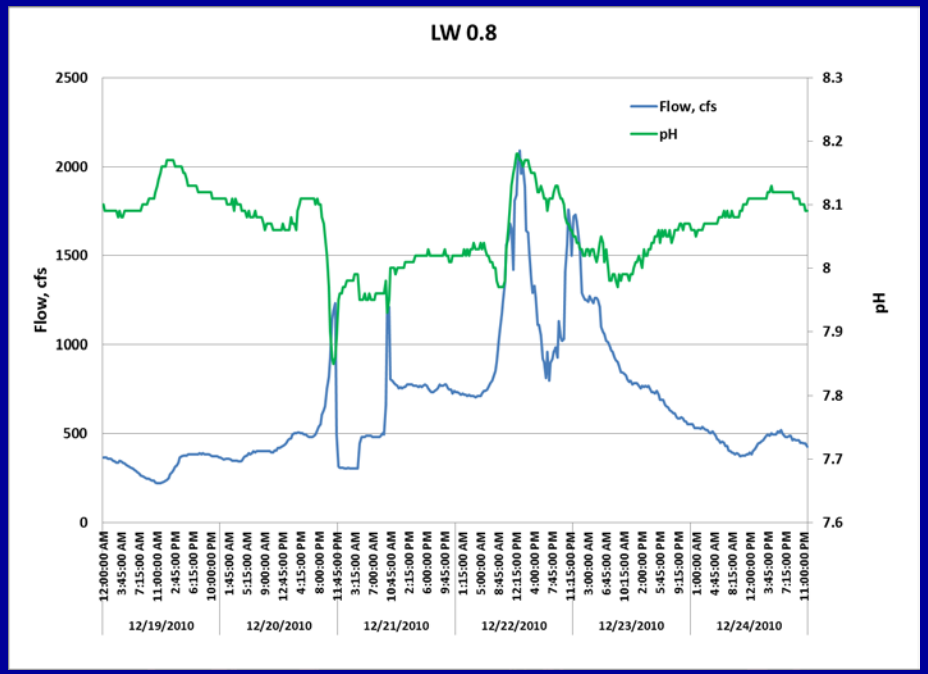


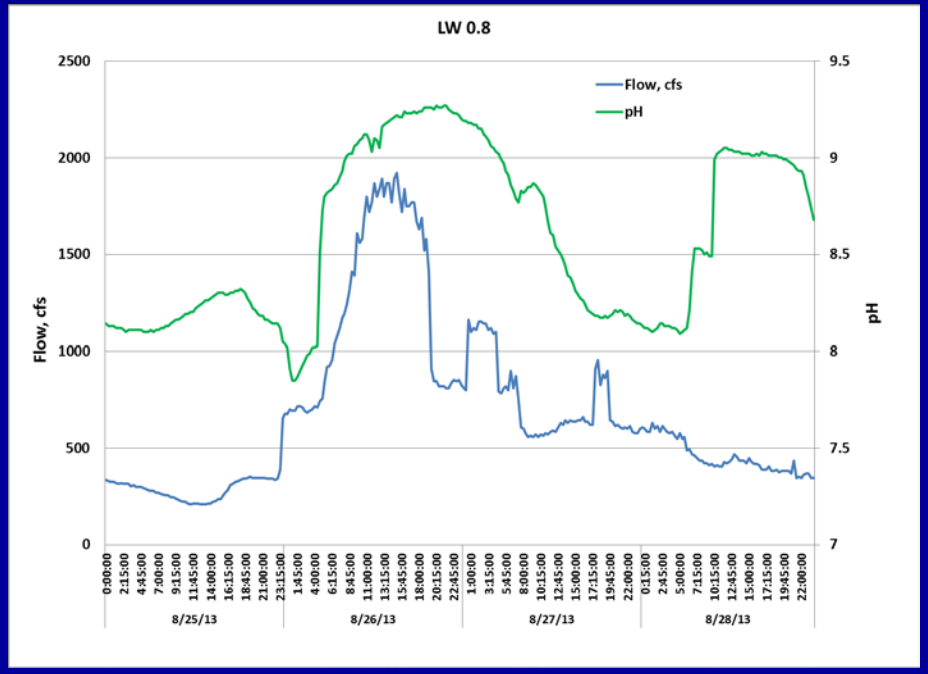


pH at LW 0.8 (1)

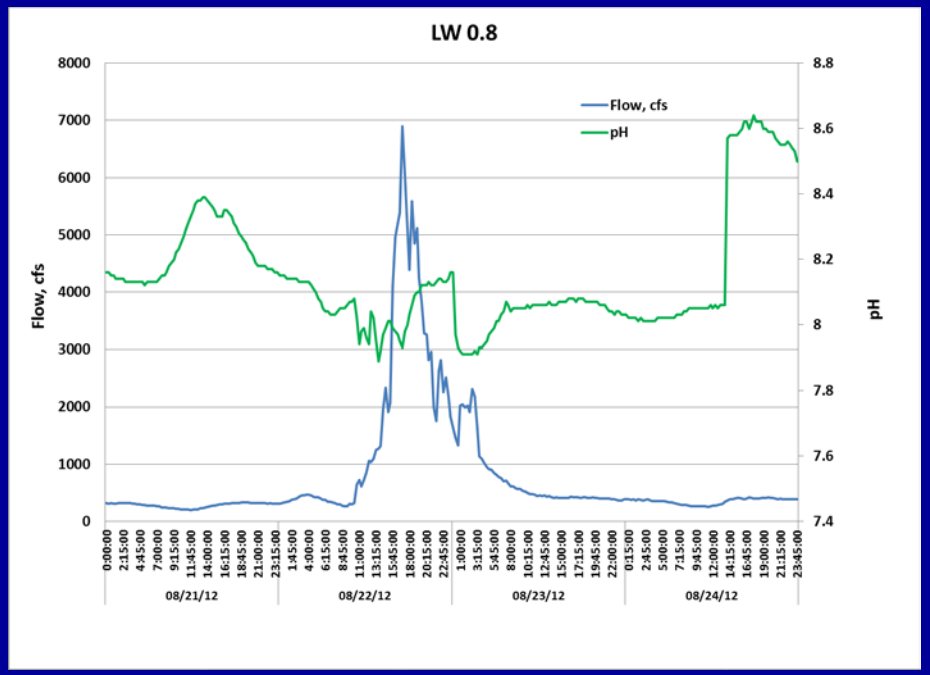

LW 0.8
Flow, cfs
pH
Flow, cfs
pH
8/2/07
8/3/07
8/4/07
8/5/07

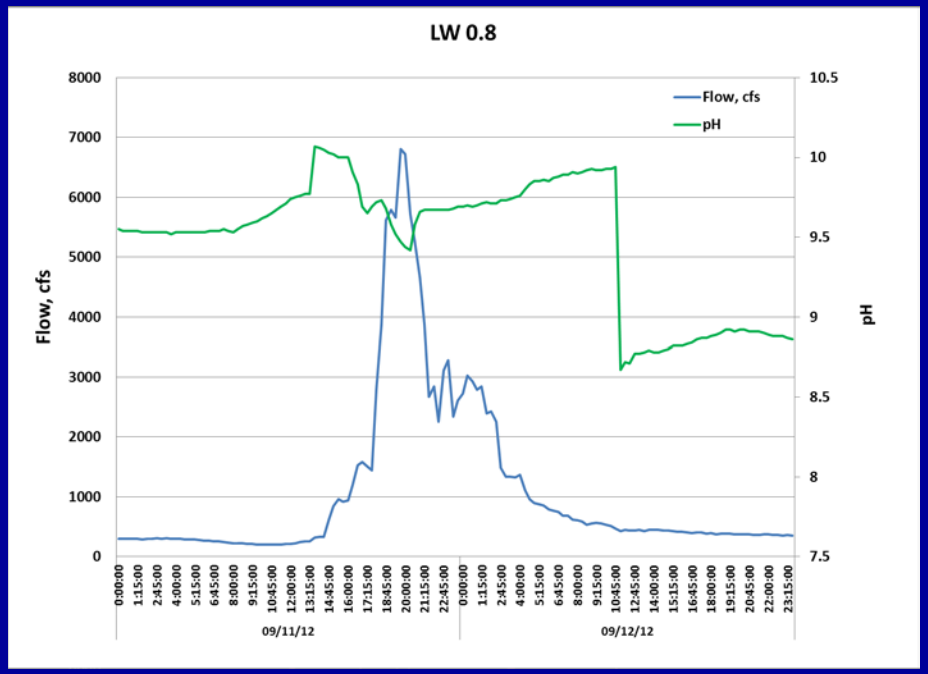

LW 0.8
Flow, cfs
pH
Flow, cfs
pH
8/26/07
8/27/07
8/28/07
8/29/07

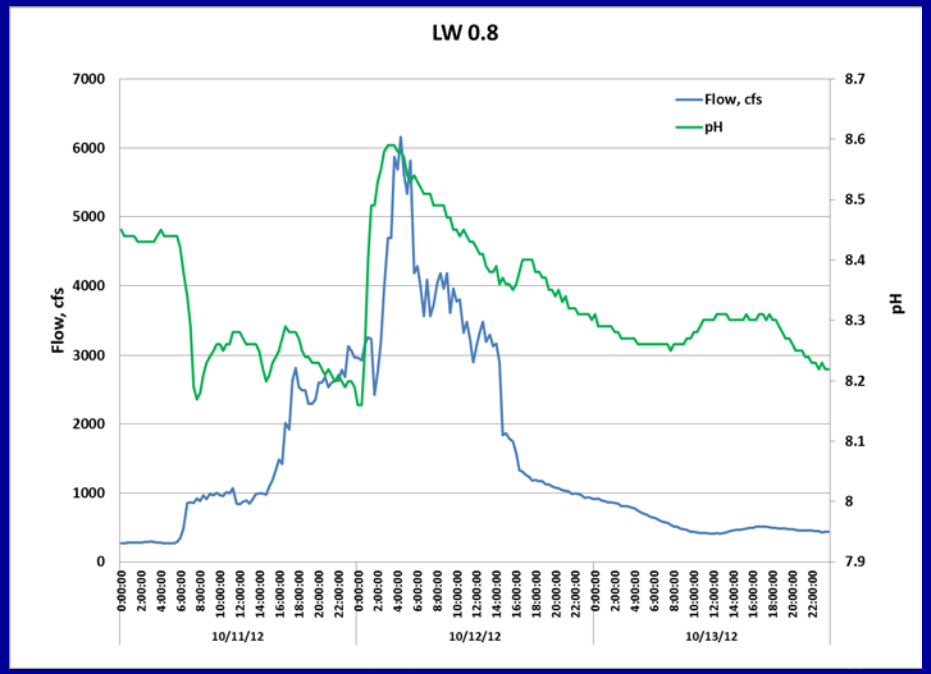

LW 0.8
Flow, cfs
pH
Flow, cfs
pH
12/19/2010
12/20/2010
12/21/2010
12/22/2010
12/23/2010
12/24/2010


LW 0.8
Flow, cfs
pH
Flow, cfs
pH
8/25/13
8/26/13
8/27/13
8/28/13

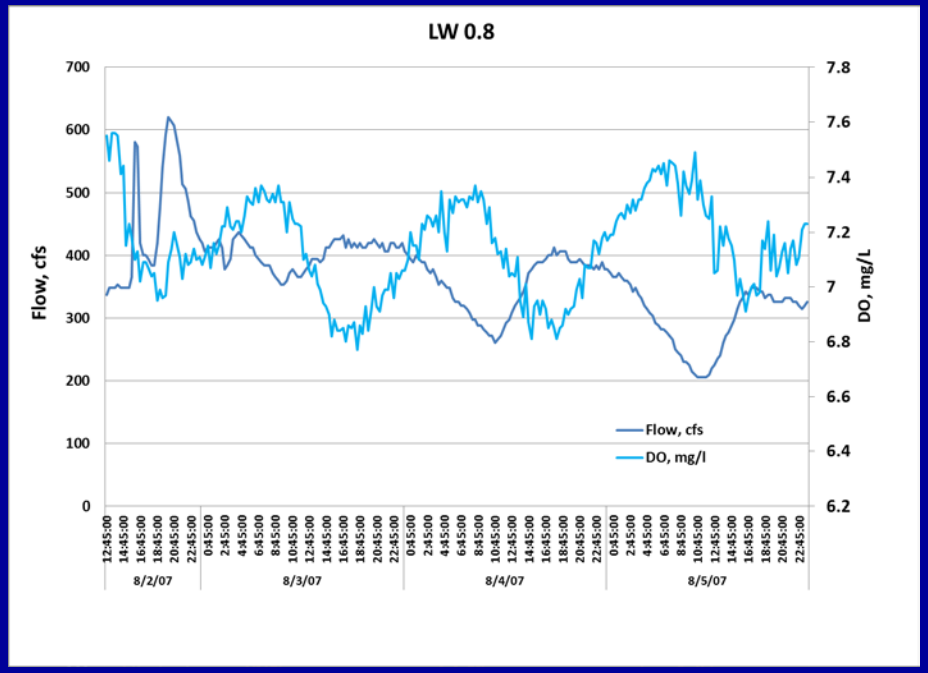
pH at LW 0.8 (2)

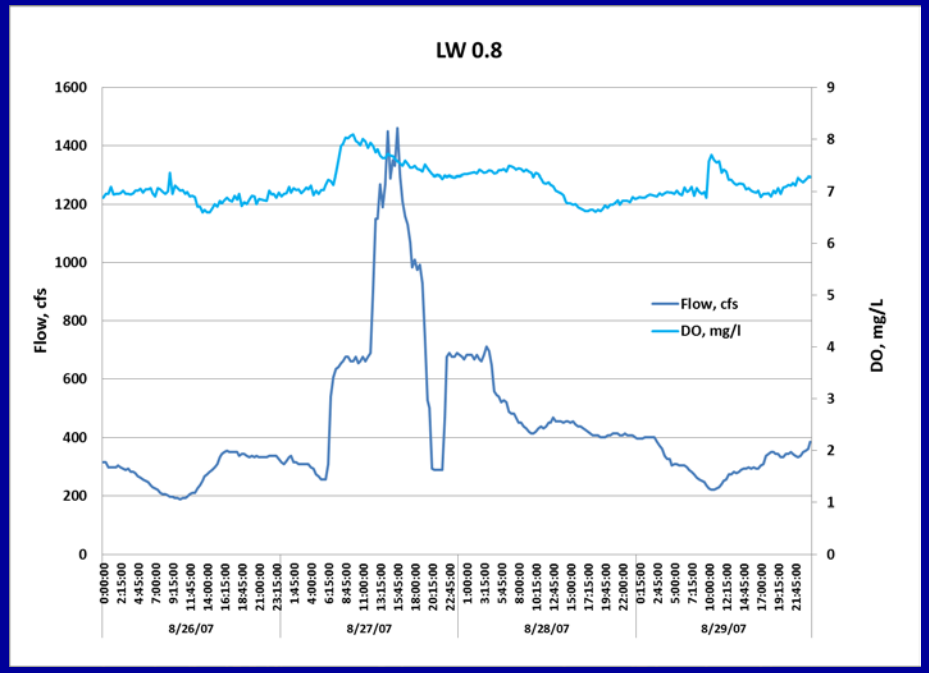

LW 0.8
Flow, cfs
pH
Flow, cfs
pH
08/21/12
08/22/12
08/23/12
08/24/12

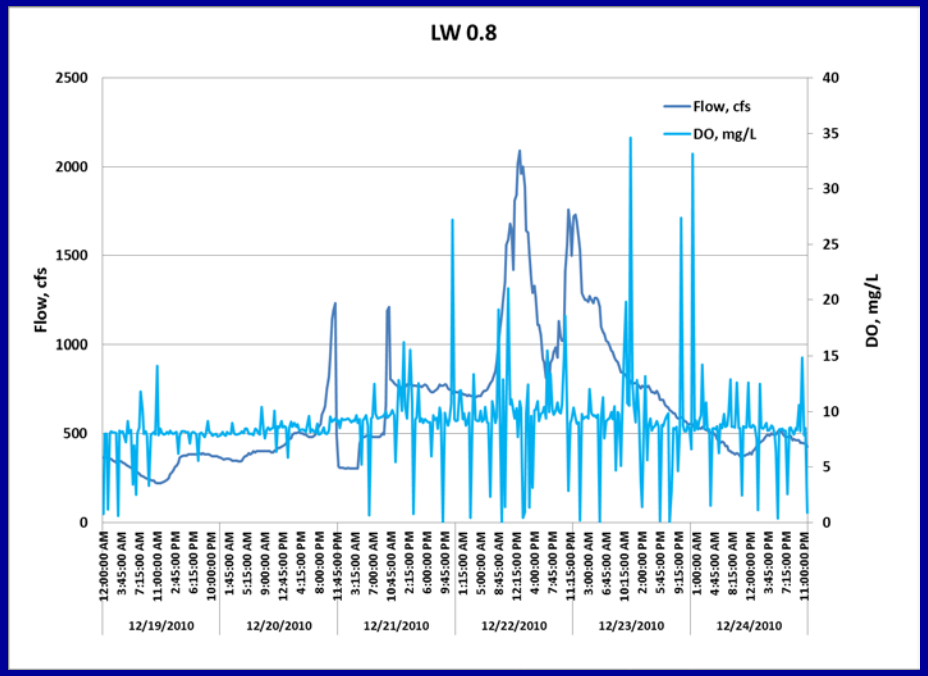

LW 0.8
Flow, cfs
pH
Flow, cfs
pH
09/11/12
09/12/12

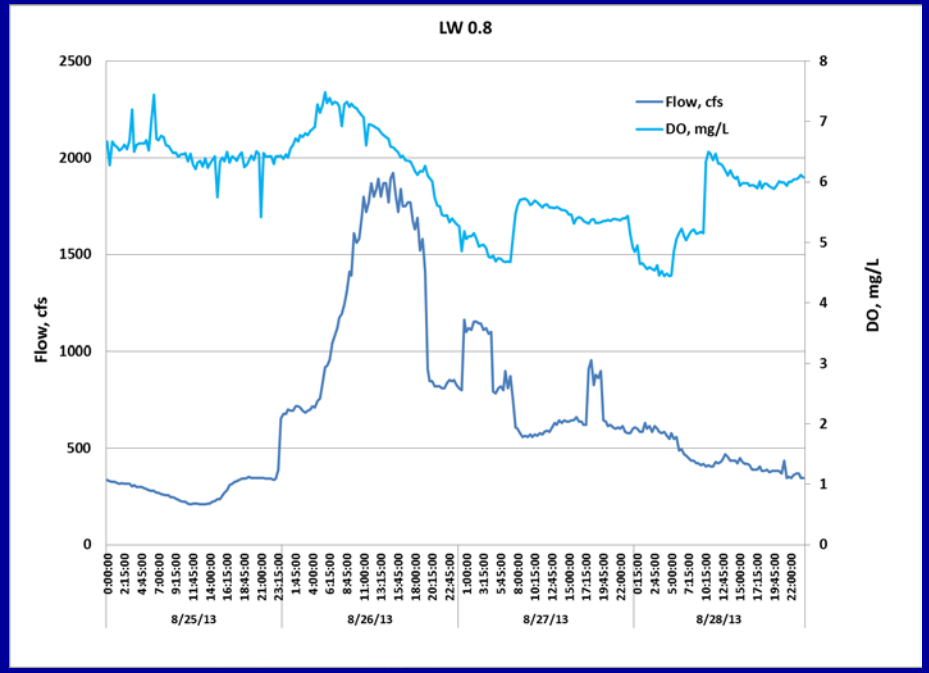

LW 0.8
Flow, cfs
pH
Flow, cfs
pH
10/11/12
10/12/12
10/13/12

Dissolved Oxygen (DO) at LW 0.8 (1)

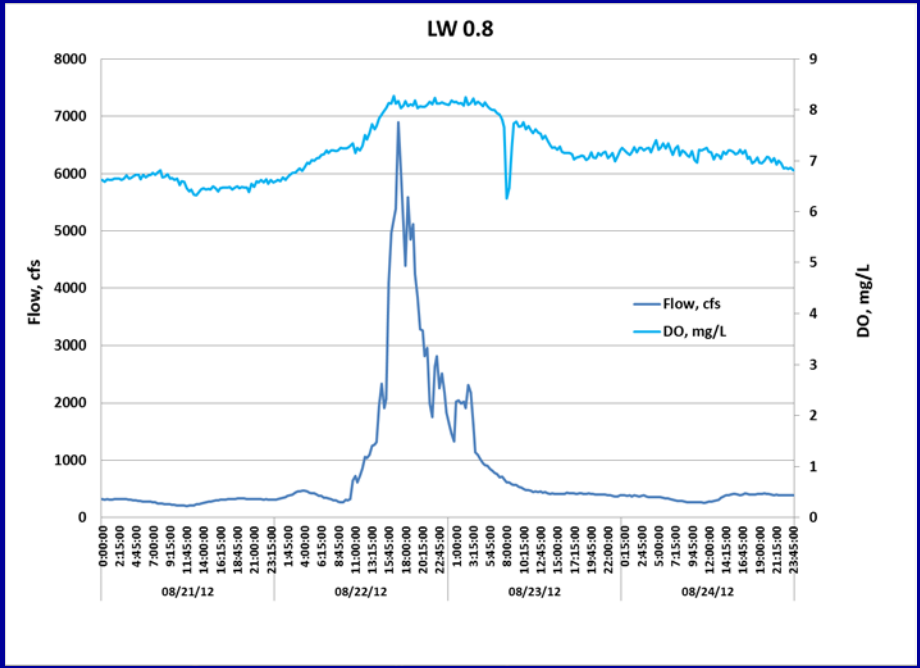


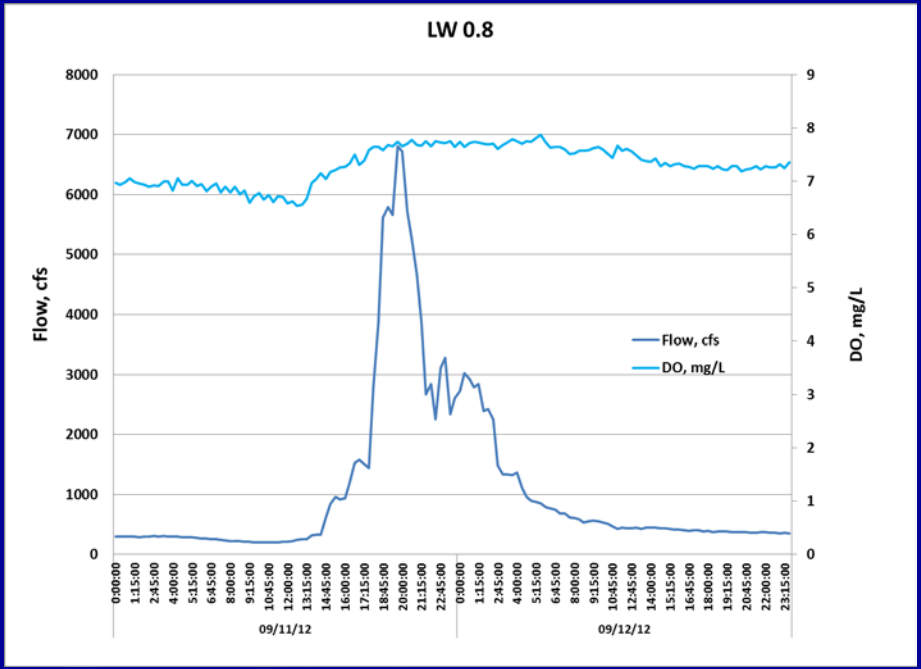


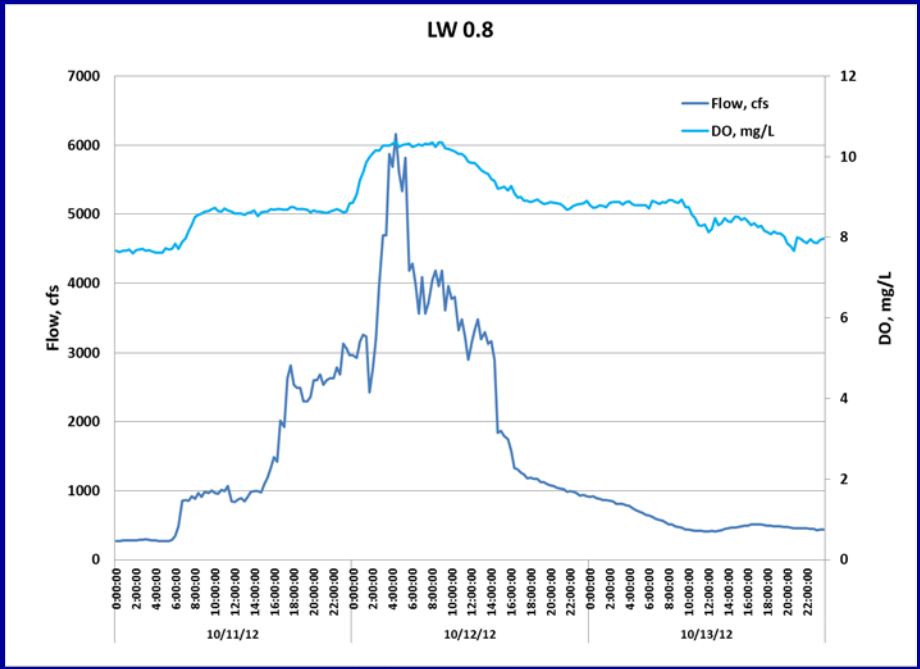




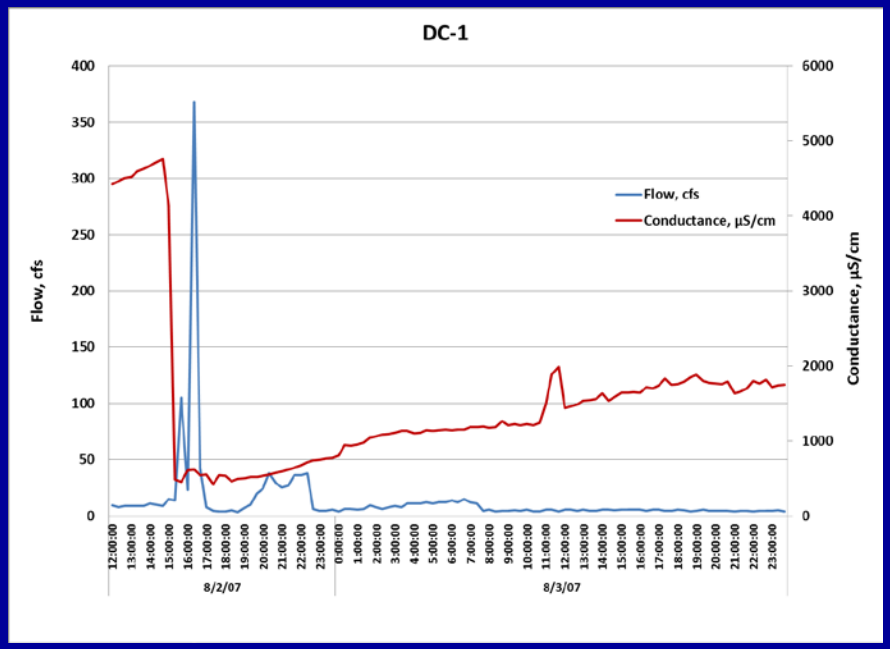
Dissolved Oxygen (DO) at LW 0.8 (2)

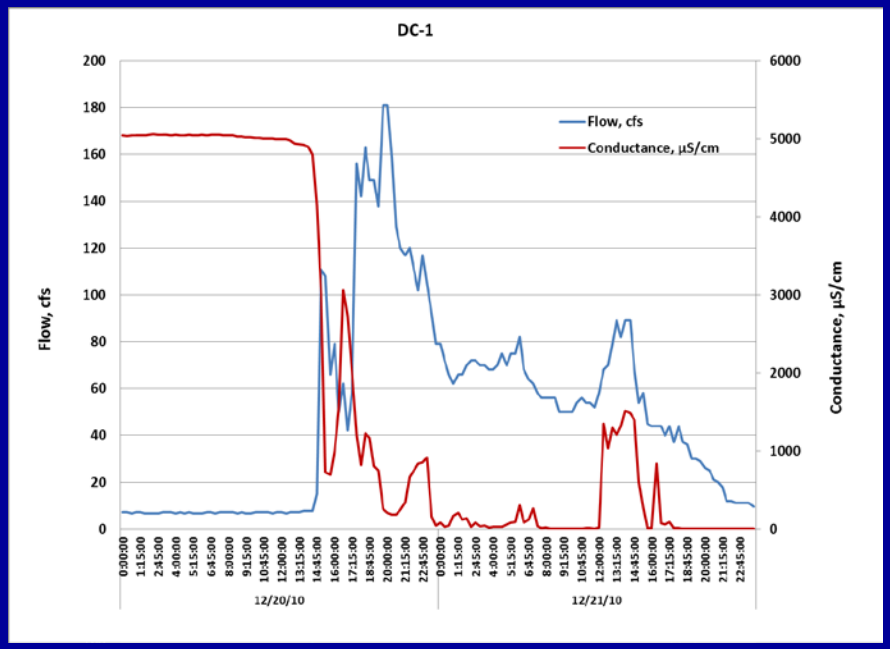


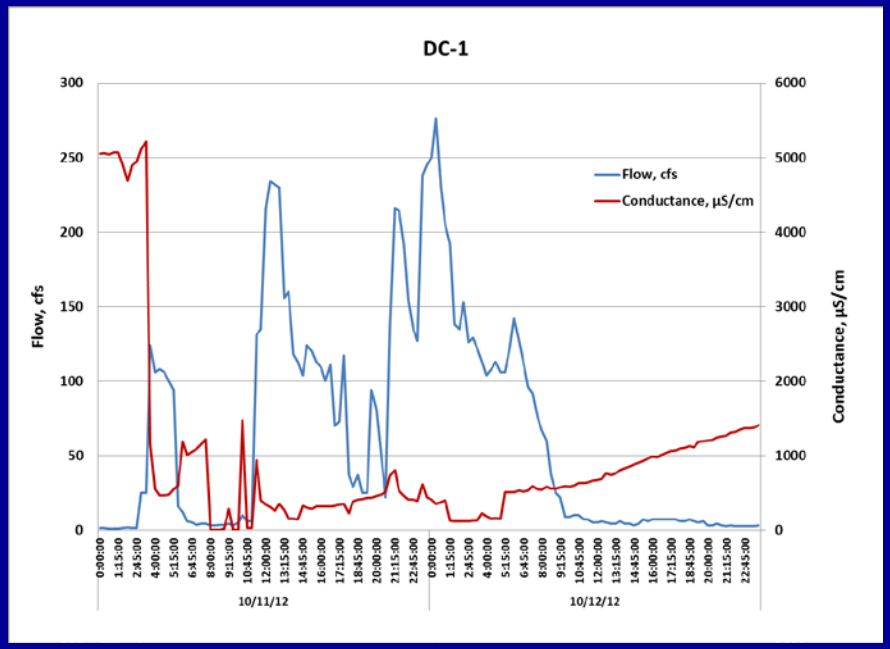


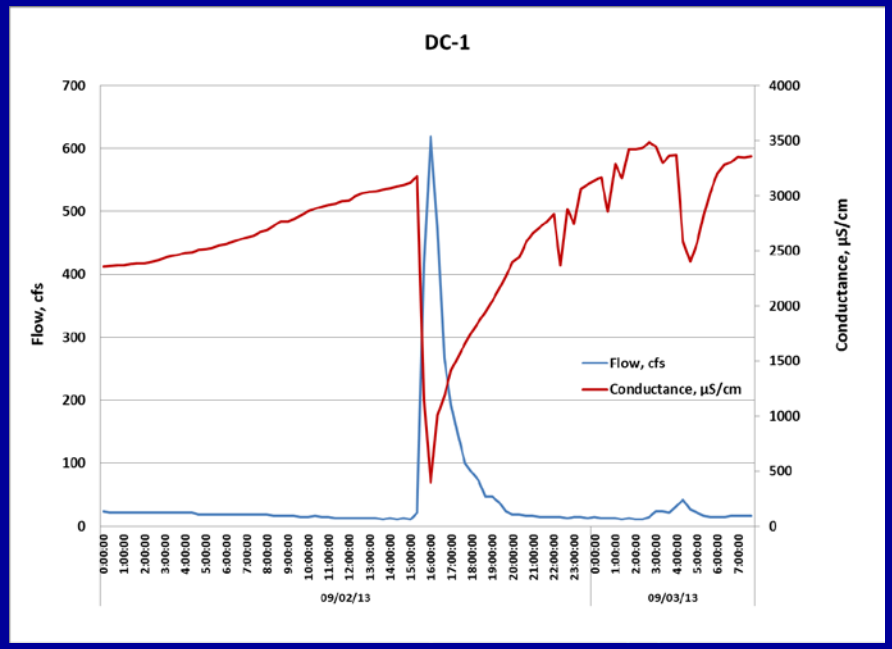


Specific Conductance at DC-1

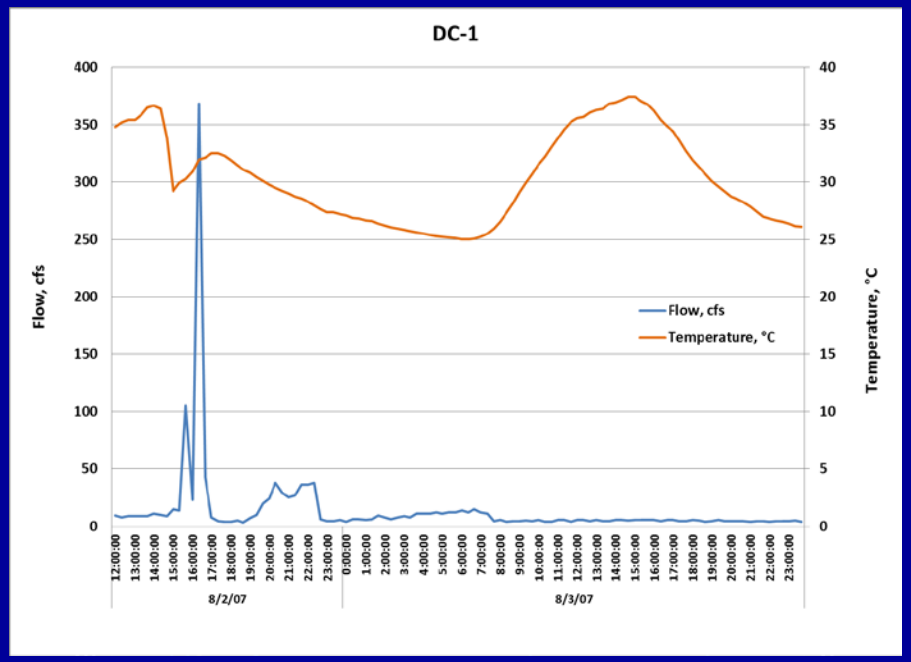


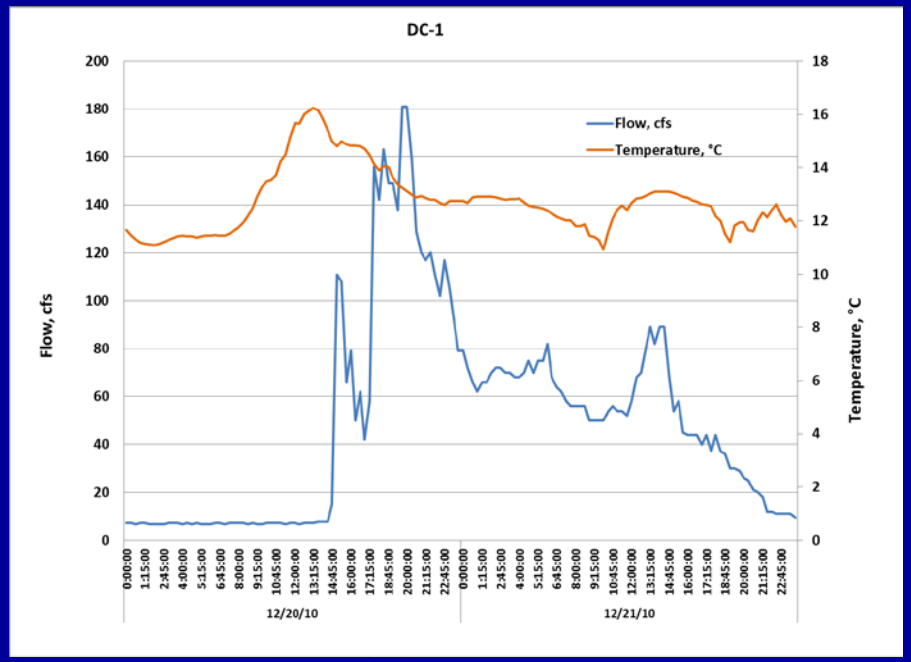


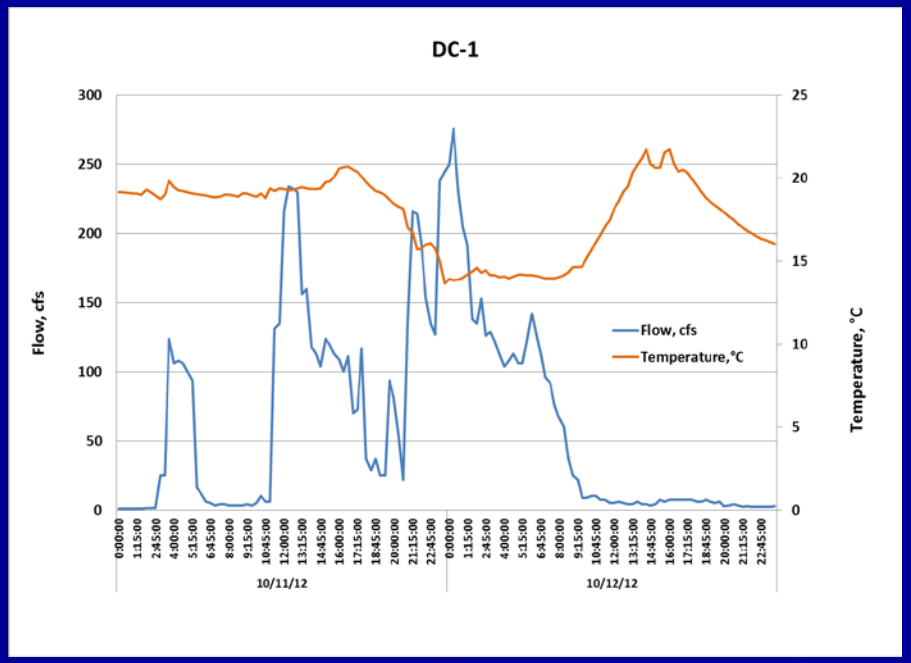


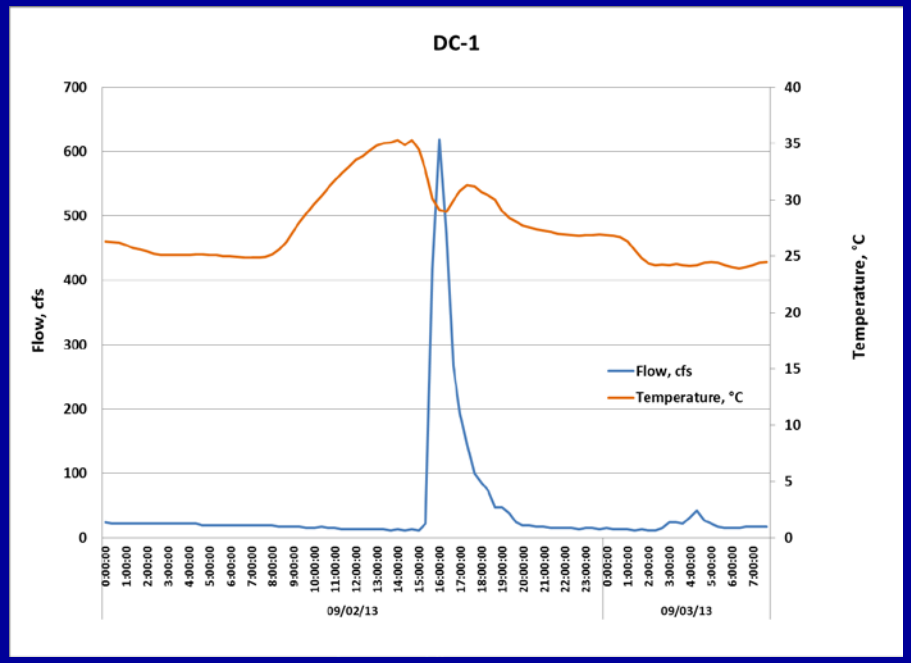


Temperature at DC-1

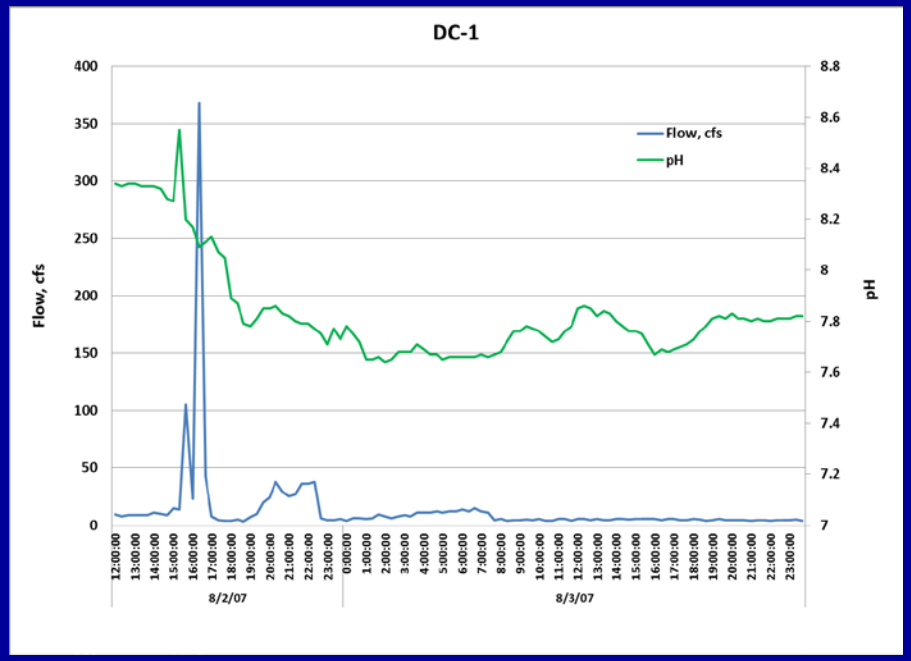


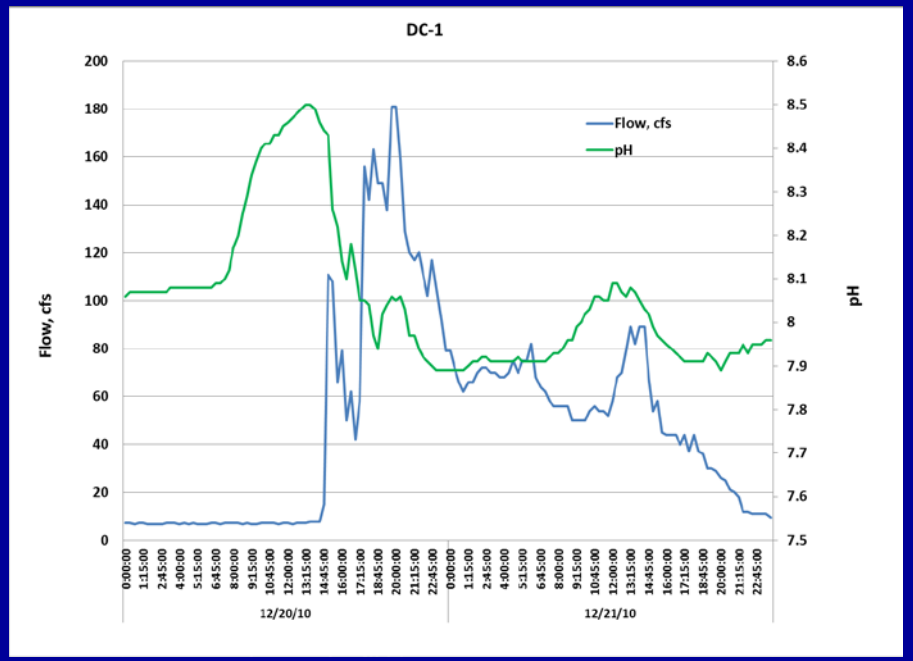


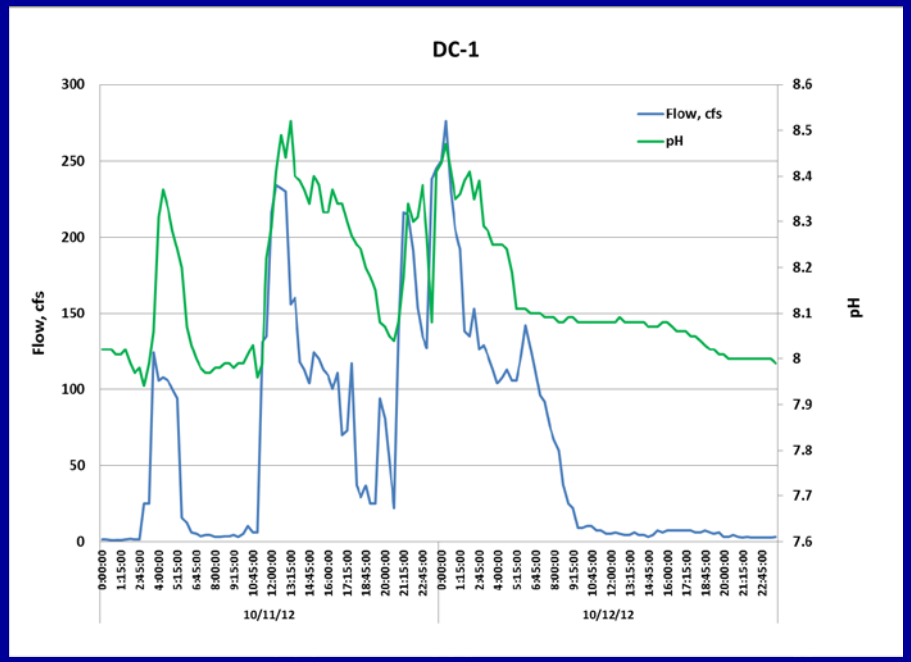


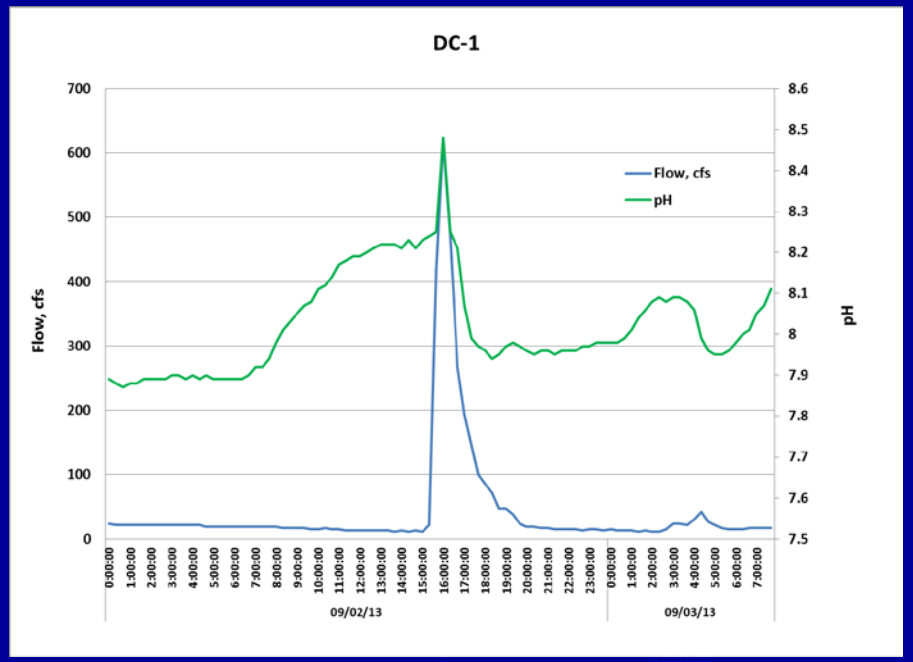


pH at DC-1

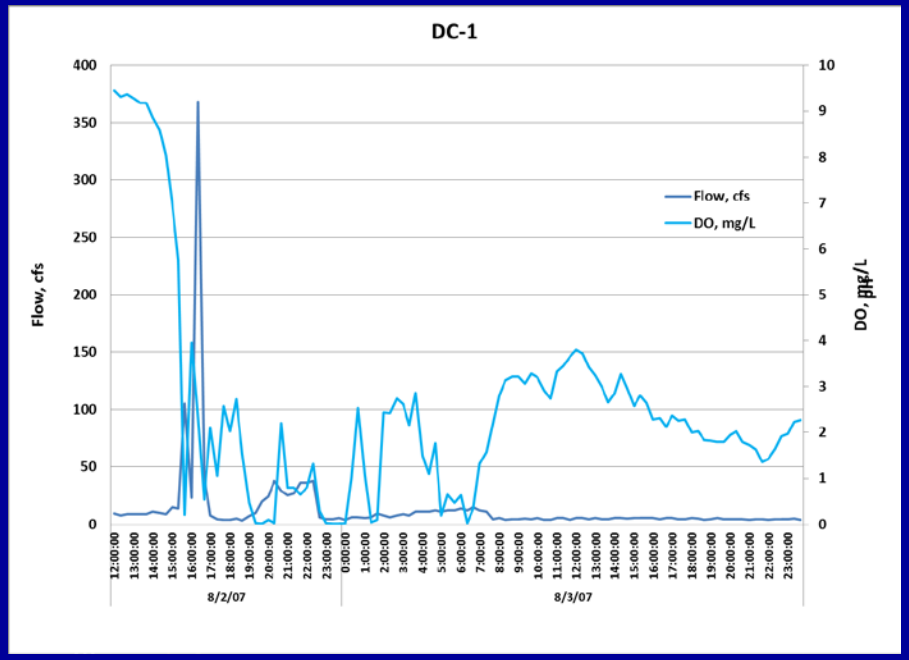

DC-1
Flow, cfs
pH
8/2/07
8/3/07

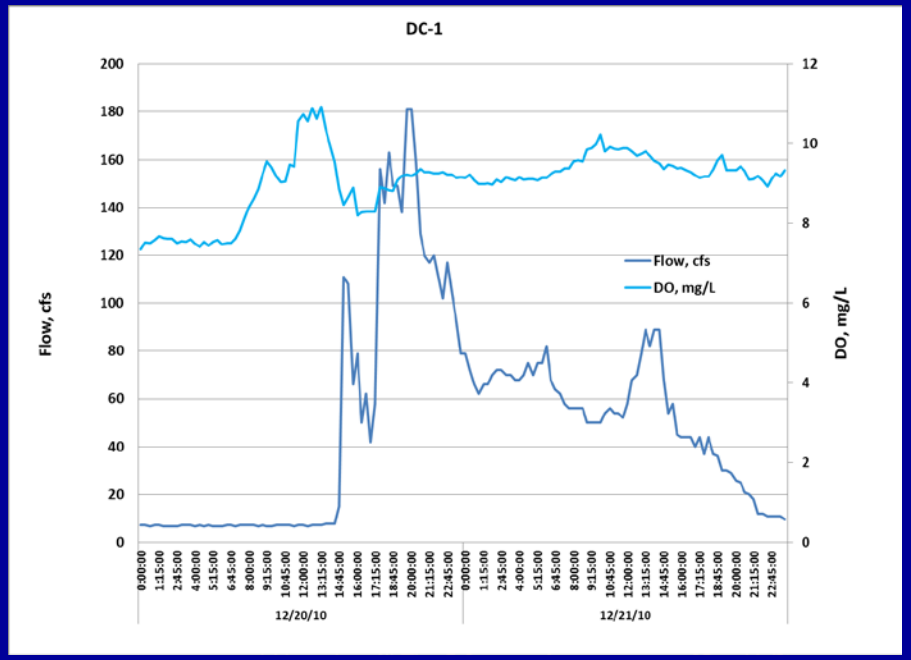

DC-1
Flow, cfs
pH
12/20/10
12/21/10

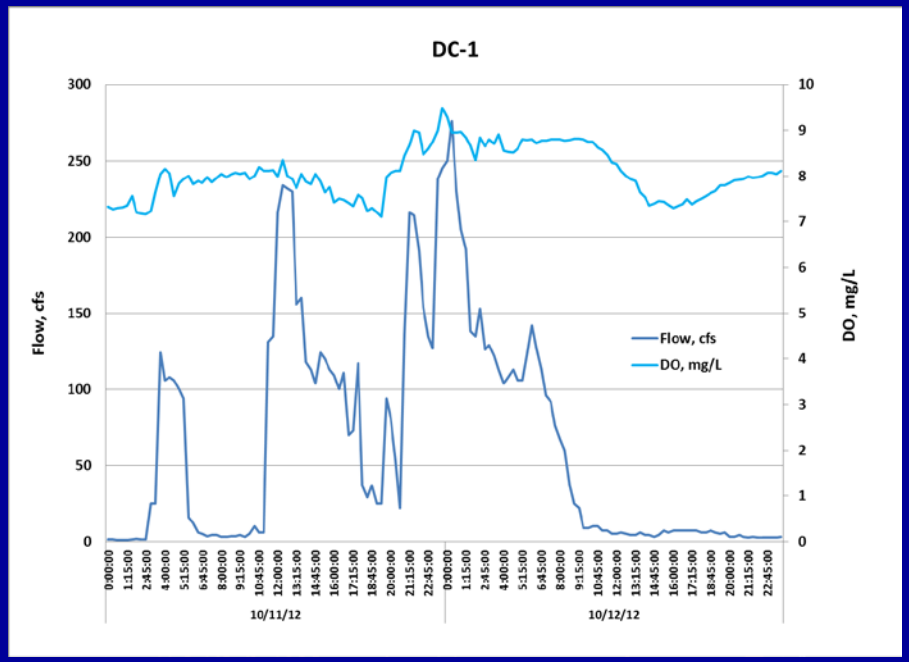

DC-1
Flow, cfs
pH
10/11/12
10/12/12

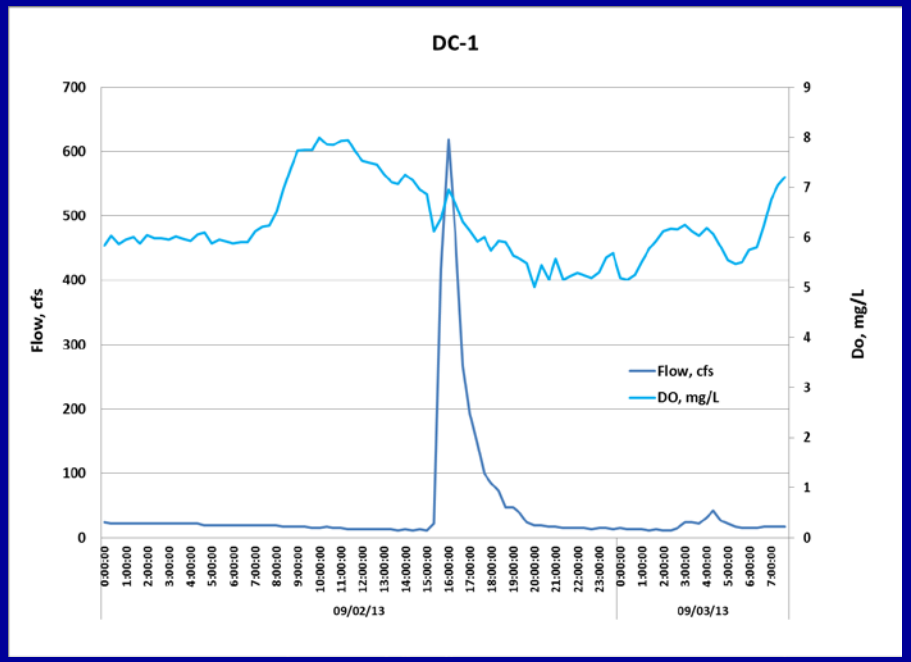

DC-1
Flow, cfs
pH
09/02/13
09/03/13

Dissolved Oxygen (DO) at DC-1

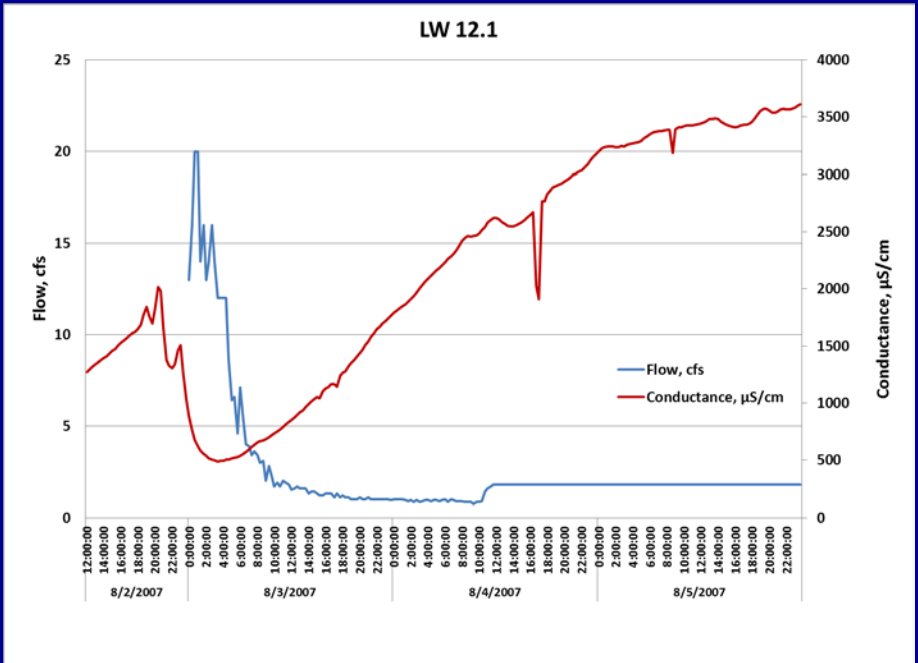


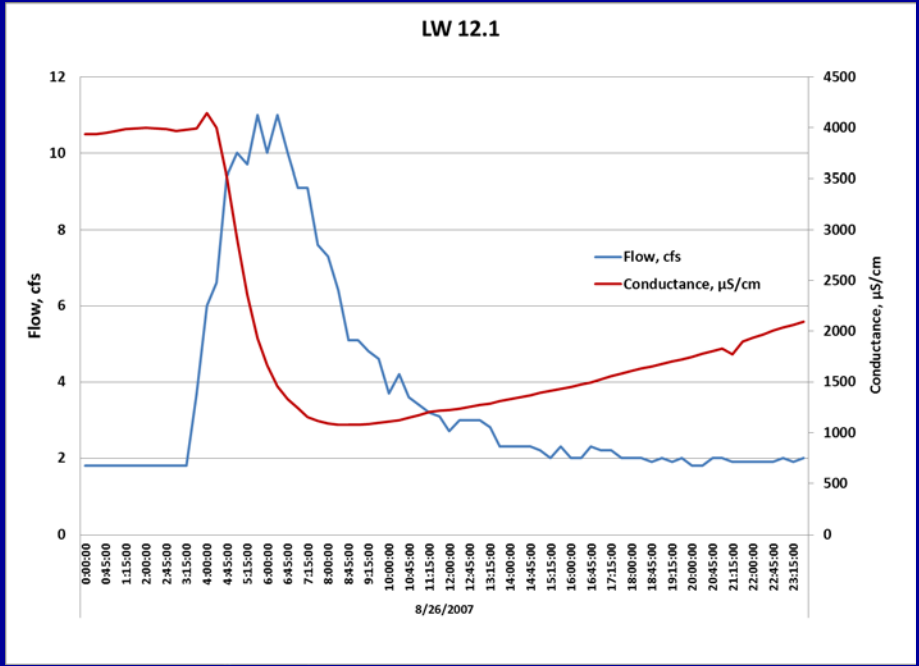


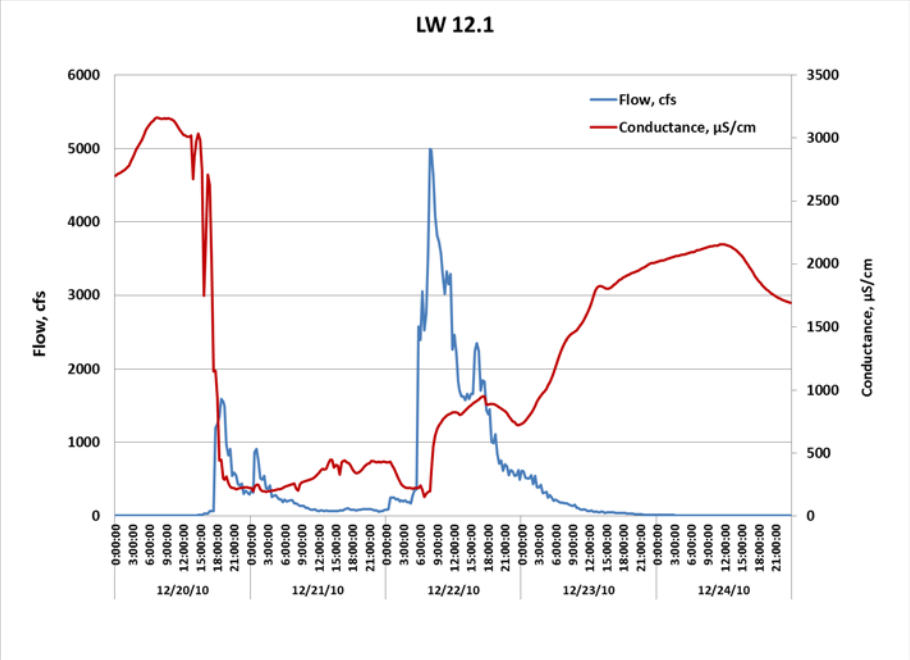




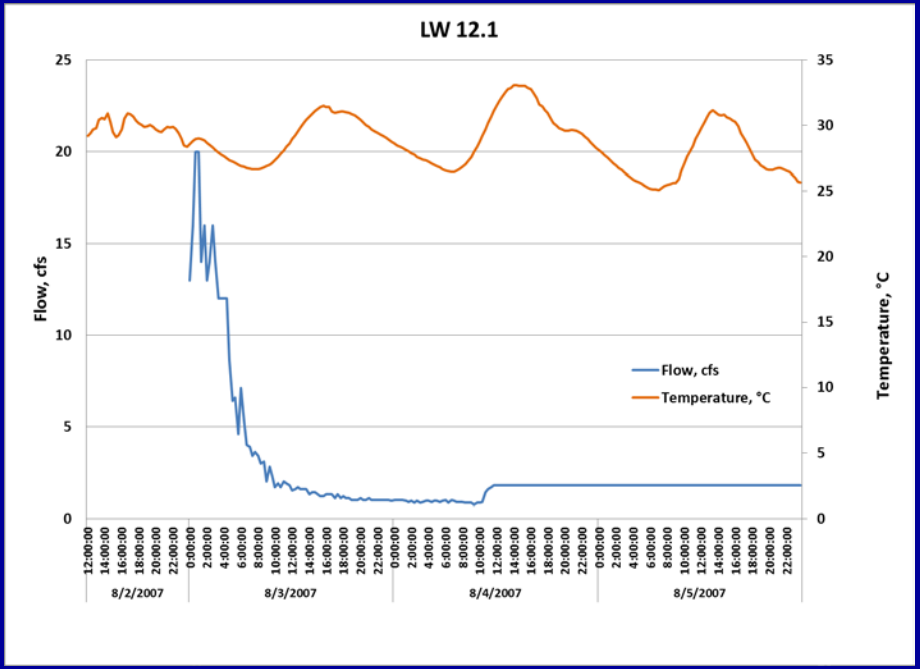
Specific Conductance At LW 12.1

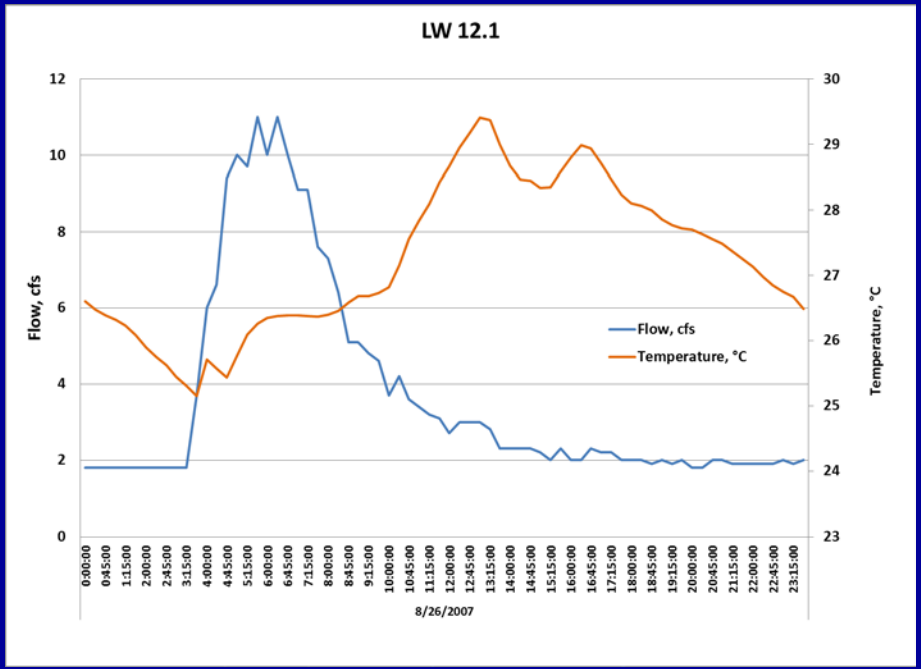


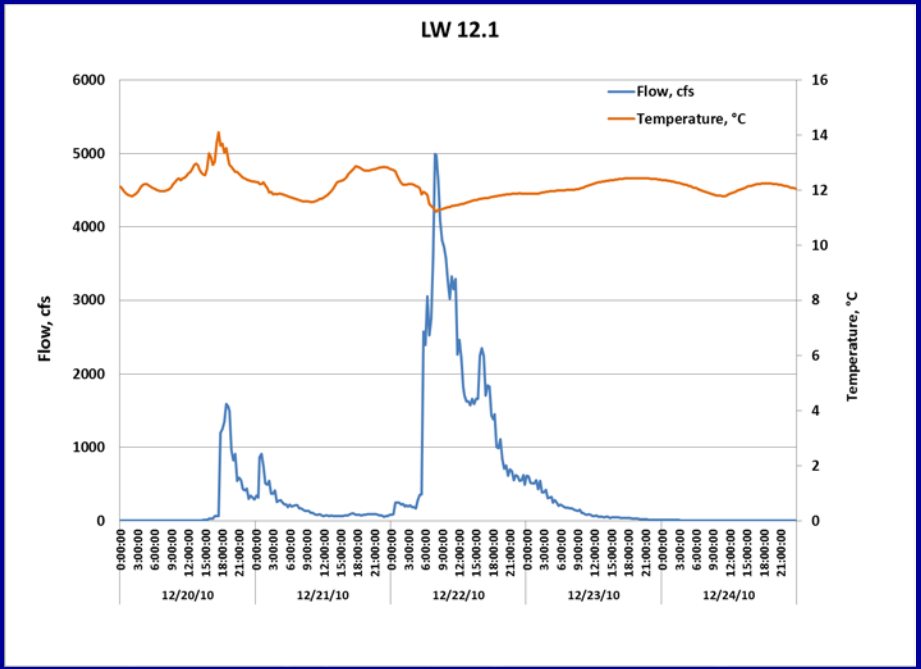




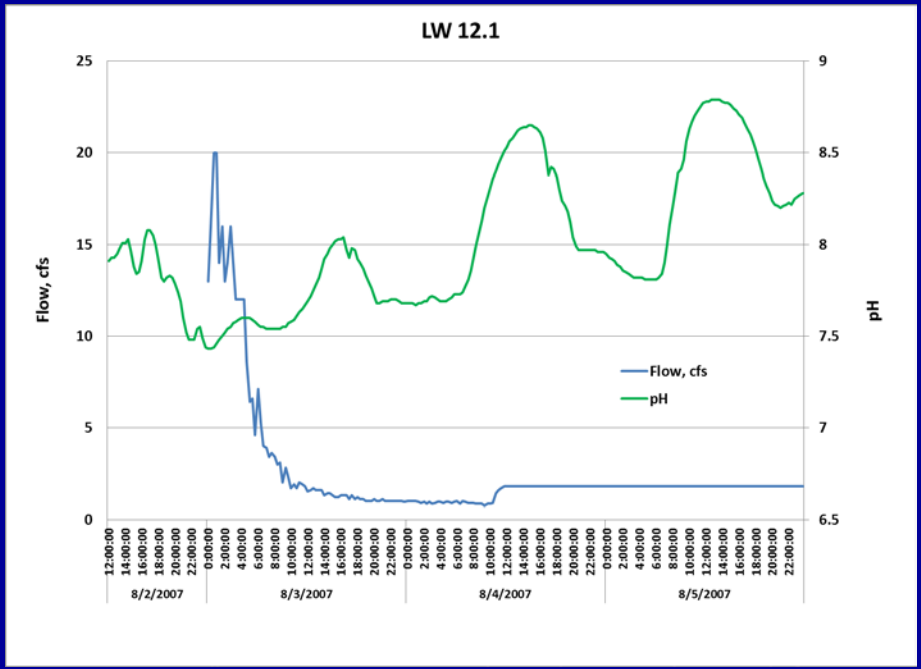
Temperature at LW 12.1

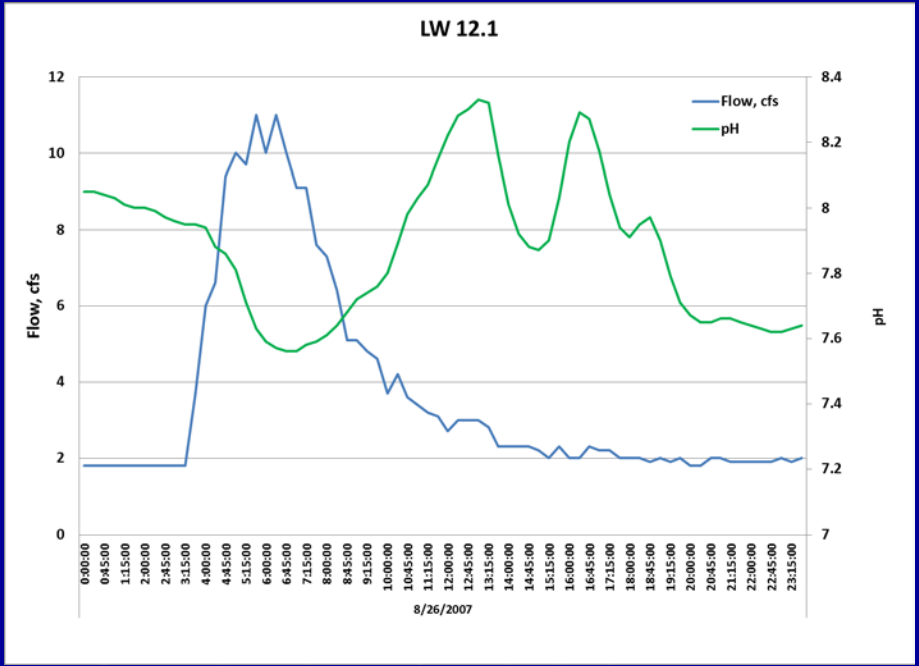


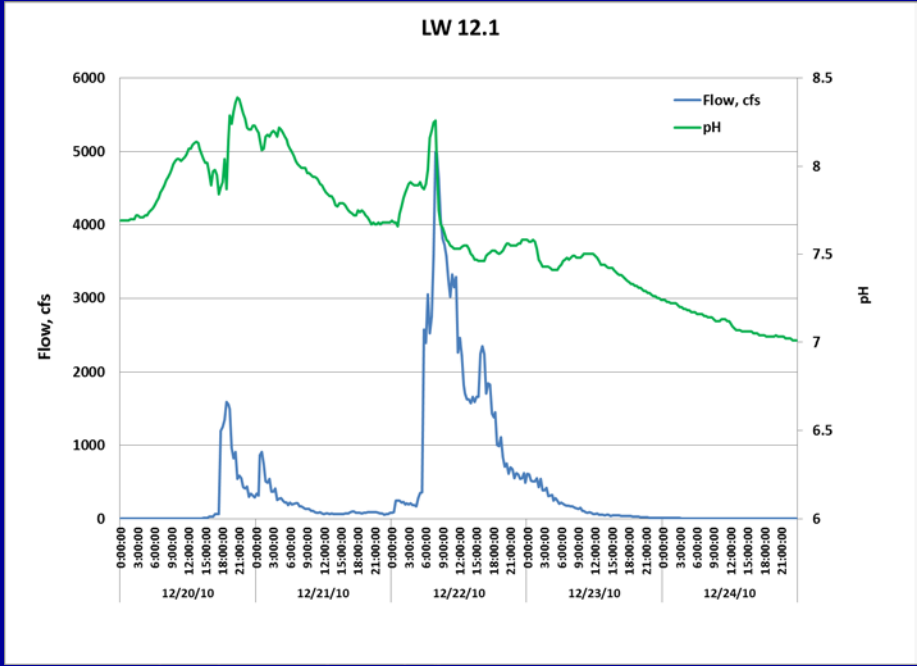




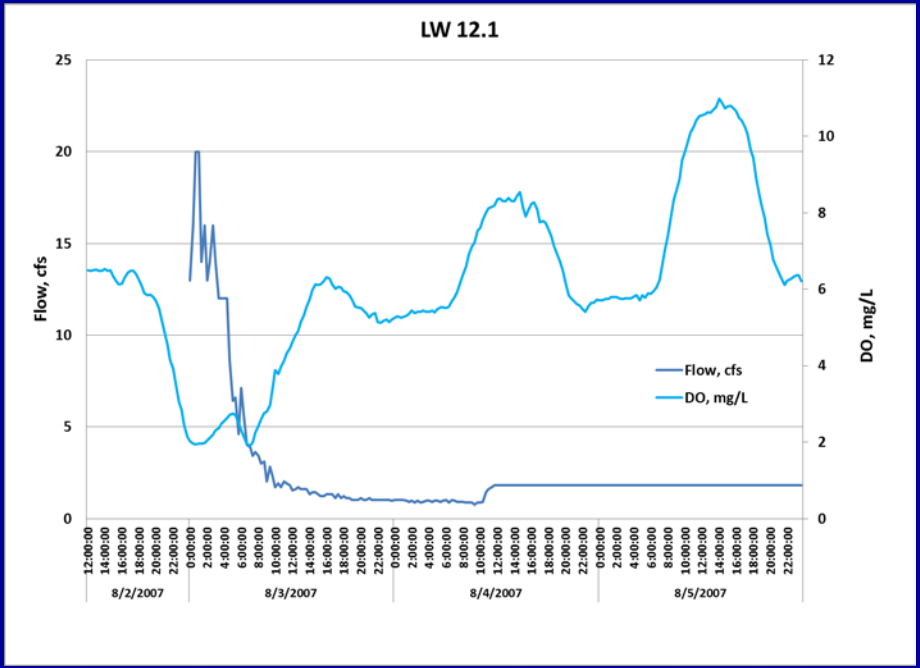
pH at LW 12.1

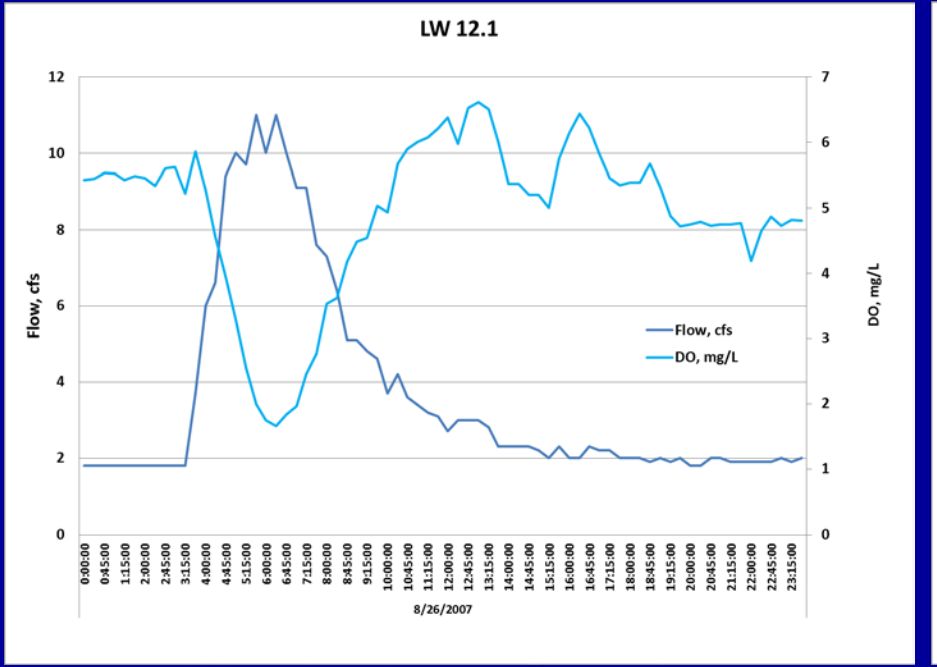

LW 12.1
Flow, cfs
pH
Flow, cfs
pH
8/2/2007
8/3/2007
8/4/2007
8/5/2007

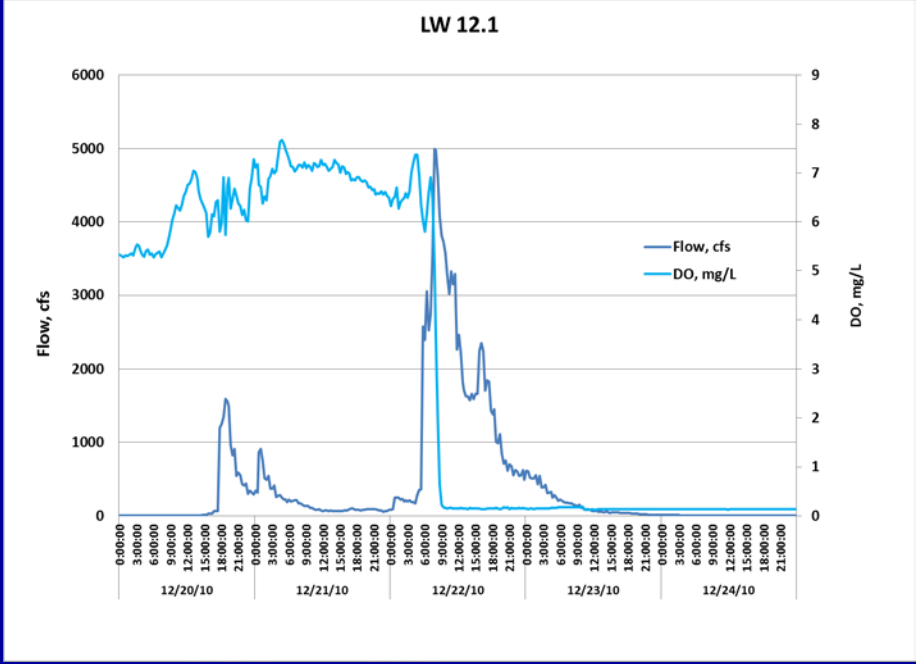

LW 12.1
Flow, cfs
pH
Flow, cfs
pH
8/26/2007


LW 12.1
Flow, cfs
pH
Flow, cfs
pH
12/20/10
12/21/10
12/22/10
12/23/10
12/24/10

Dissolved Oxygen (DO) at LW 12.1







Results

- **Specific Conductance**
  - **Diluted by rain water (DF varies)**
  - **Lag time b/w flow peak and lowest conductance**
  - **First flush (2007/8/2, 2012/8/21)**

- **Temperature**
  - **Cooling the water temperature**
  - **More significant impact during steady rains**
  - **Less impact on urban tributaries**

Results (cont.)

- **pH**
  - **Decreases for some storm events**
    i. **short rain**
    ii. **early stage of a steady rain**
  - **Coordinates with flow changes ( )**

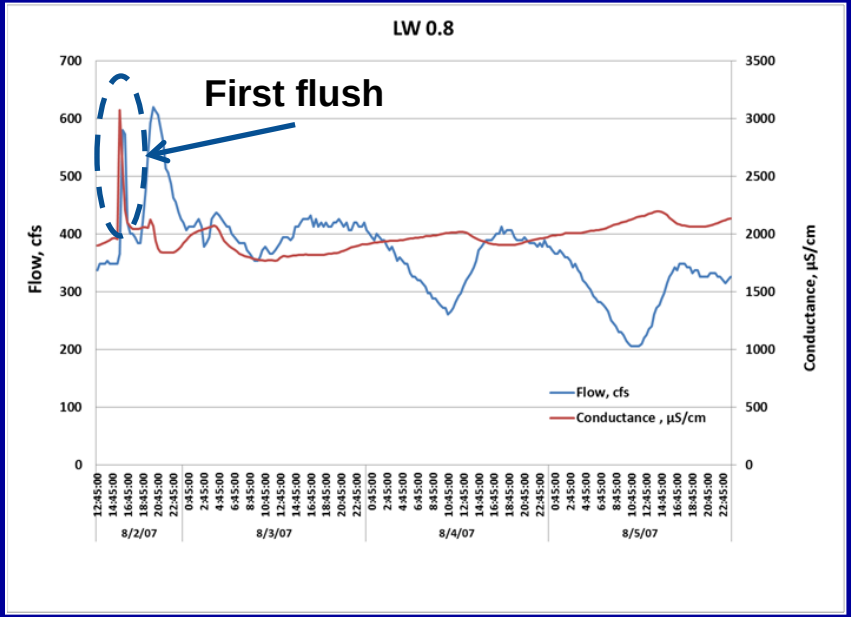
- **DO**
  - **Increases and decreases with flow**
    i. **More O_2 in rain water**
    ii. **Temperature controlled**
  - **Decreases at LW 12.1 during summer rains**
  - **Some bad data**

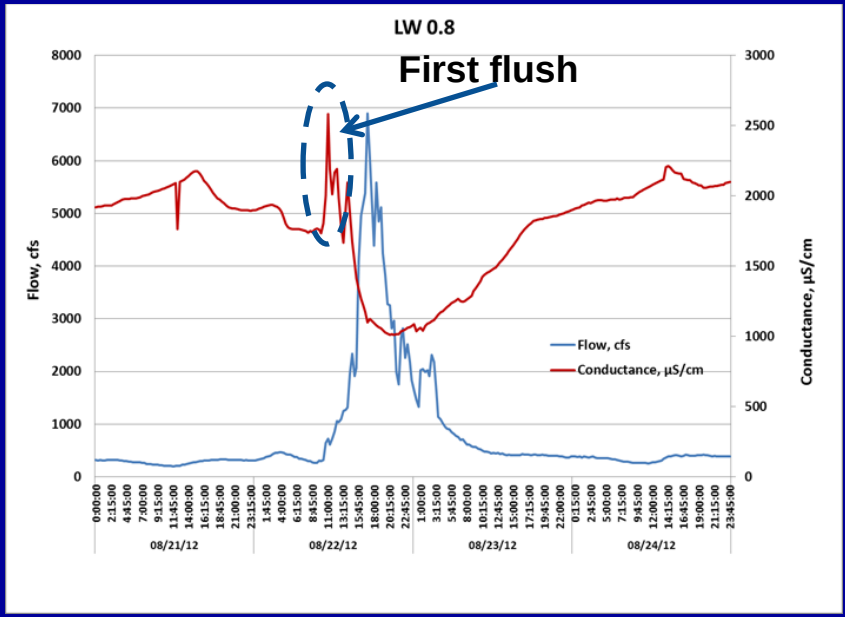
First Flush/Seasonal First Flush

First flush – pollutants are more concentrated at the beginning of a rainfall event than in the later parts of a rainfall event.

Seasonal first flush – pollutants are more concentrated in the runoff of the first few storms of a rainy season than in the later storms in the season.

Storm Event	Days Before Any Rain	Days Before Rain > 0.5 in.
2007/08/02	10	807
2012/08/21	20	387





Summary

- **Storm Water Quality Monitoring**
  - i. First-hand WQ data during storm events
  - ii. Real-time and continuous WQ variations
  - iii. Helping storm WQ sampling program design
- **Combining with Rain & Storm Data**
  - i. Showing WQ changes with discharge
  - ii. Various responses to different rain events
  - iii. Various responses at different stations
- **Impacts on Lake Mead WQ**
  - i. WQ entering Lake Mead during storm events
  - ii. Wash/Lake water interactions during storms
  - iii. Quantify extra salt loading from storms to Lake Mead

Question?

Acknowledgements

SNWA RWQ:	WQ data collection
USGS:	Flow (discharge) data
CCRFCD:	Rain (precipitation) data