Hughes River TMDL Calibrations

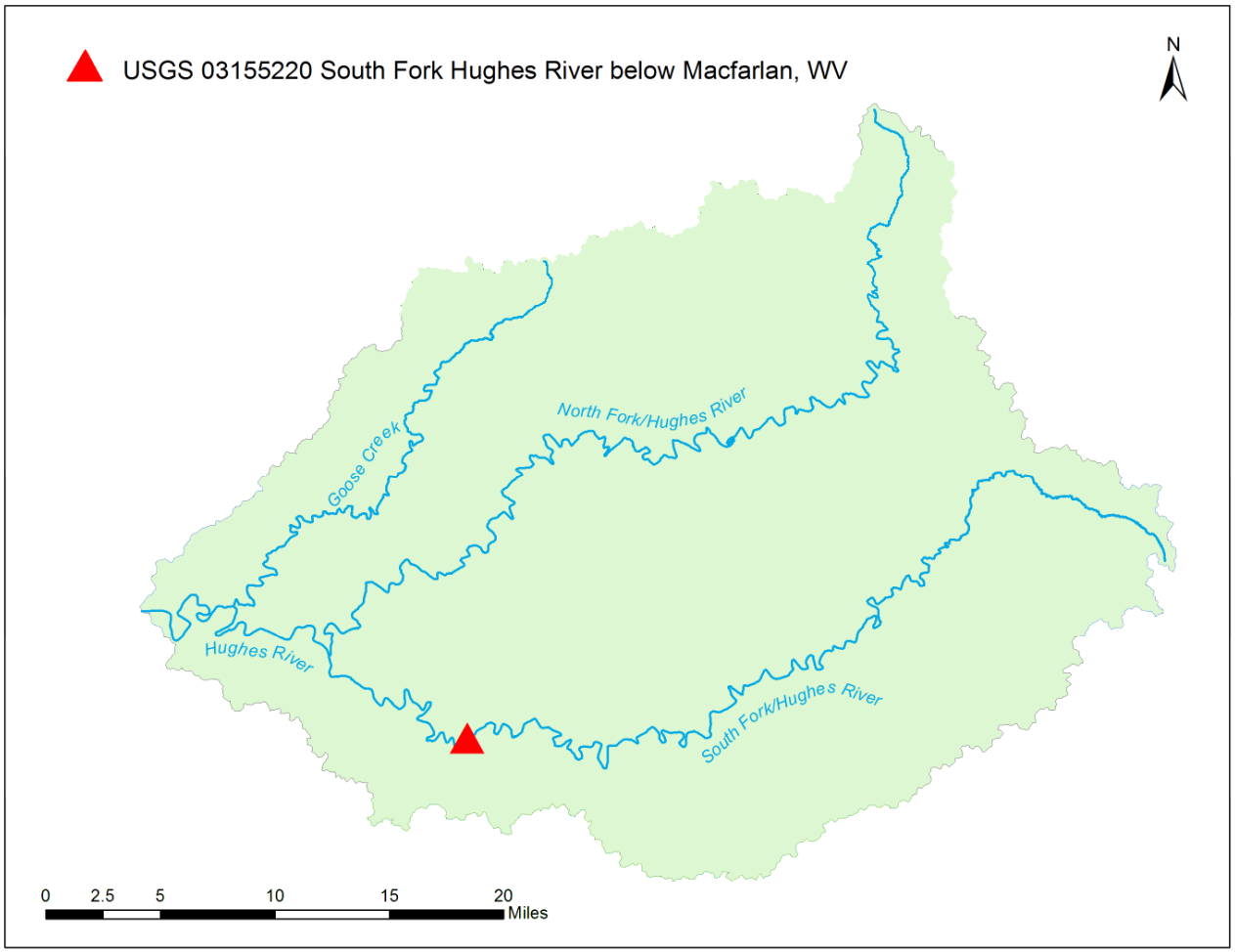
Hydrology Calibration

Fecal Coliform Water Quality Calibration

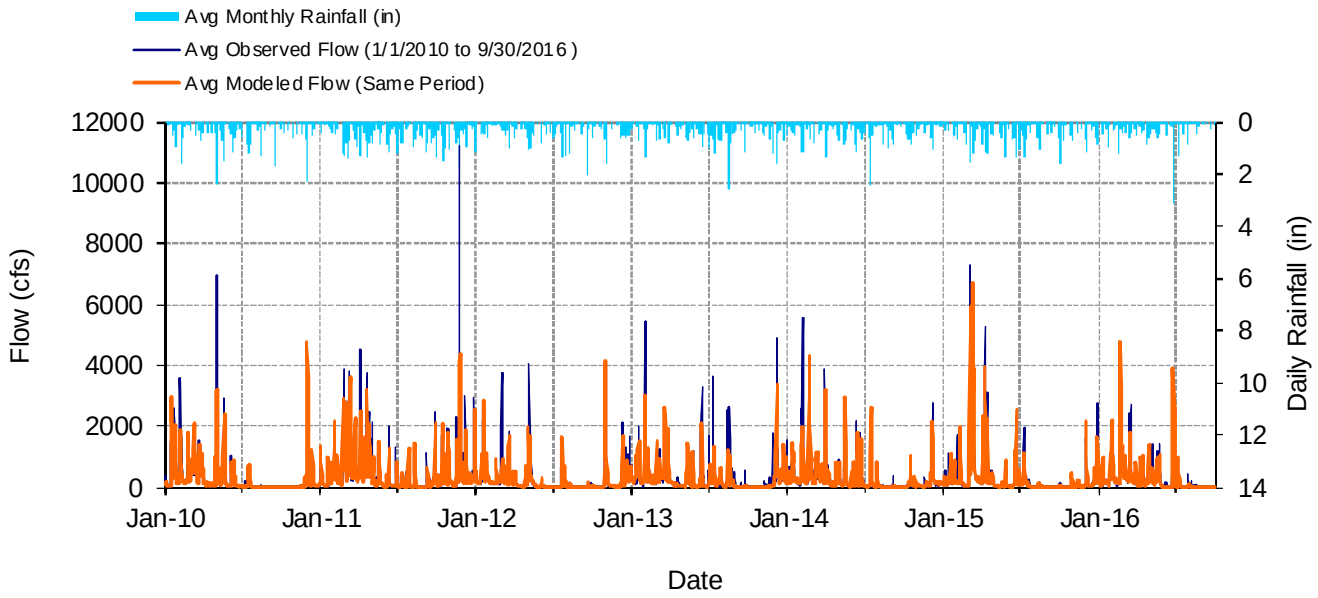
Iron Water Quality Calibration

Hydrology Calibration

Group D3 TMDL
Hughes River
Draft Model Hydrology Calibration
January 12, 2017

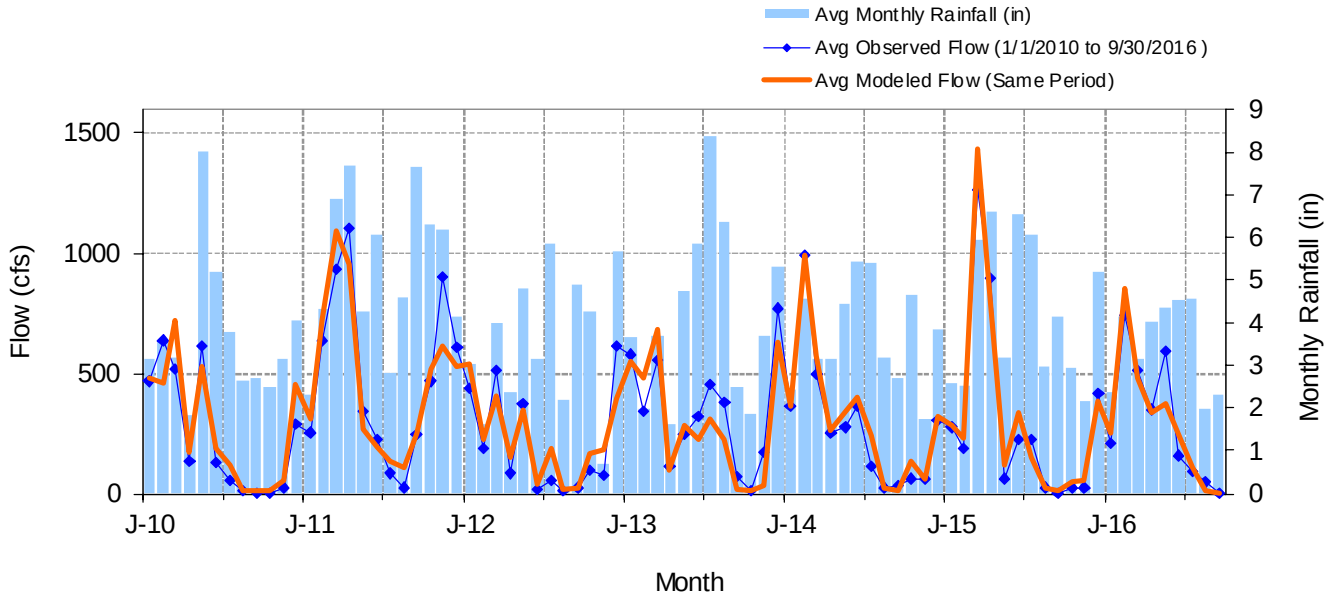

USGS 03155220 South Fork Hughes River below Macfarlan, WV
N
Goose Creek
North Fork/Hughes River
Hughes River
South Fork/Hughes River
0
2.5
5
10
15
20
Miles

Mean Daily Flow



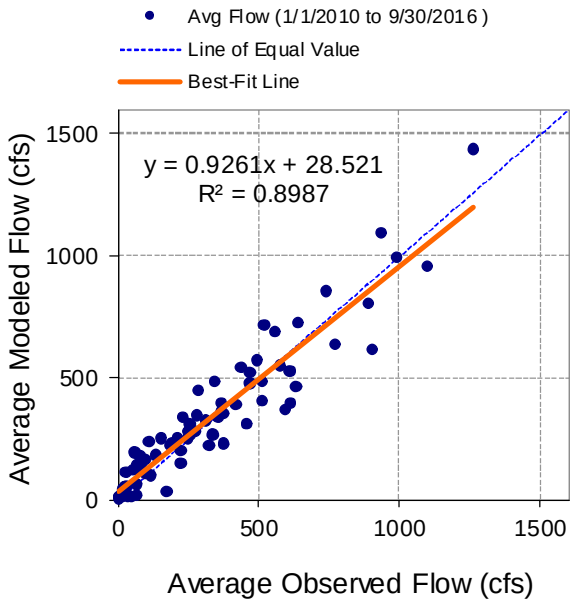
Model Outlet 216 vs. USGS 03155220 South Fork Hughes River Below Macfarlan, WV

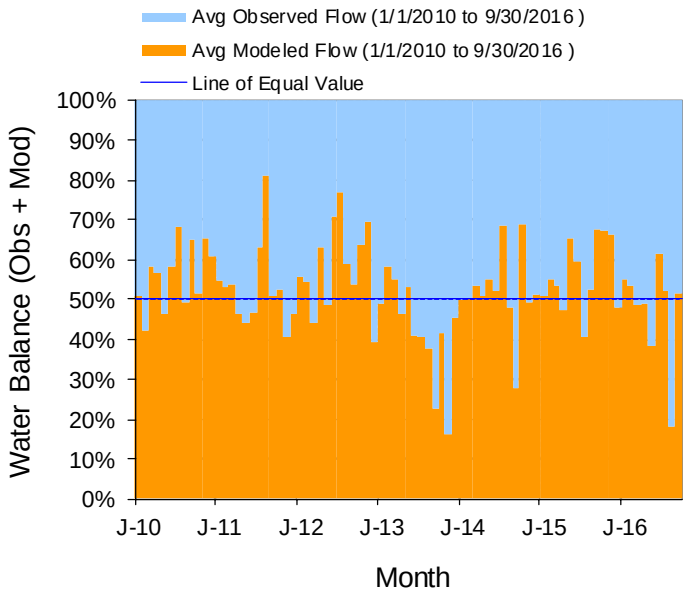
Mean Monthly Flow



Model Outlet 216 vs. USGS 03155220 South Fork Hughes River Below Macfarlan, WV

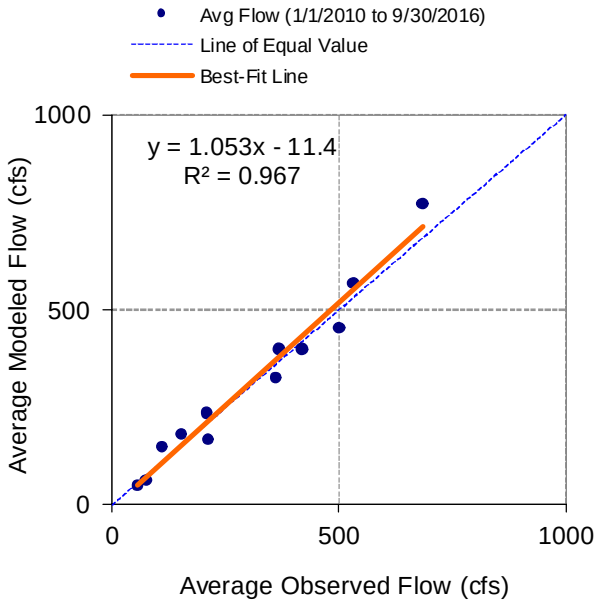
Monthly Regression and Temporal Variation

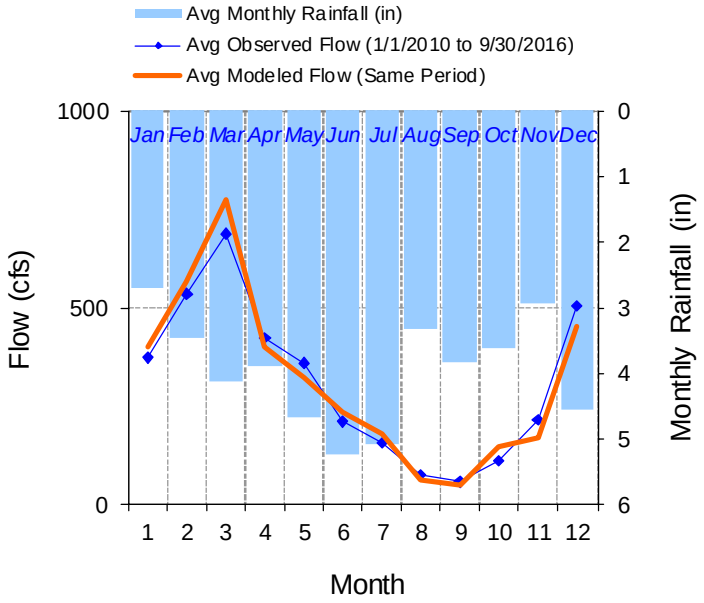




Model Outlet 216 vs. USGS 03155220 South Fork Hughes River Below Macfarlan, WV

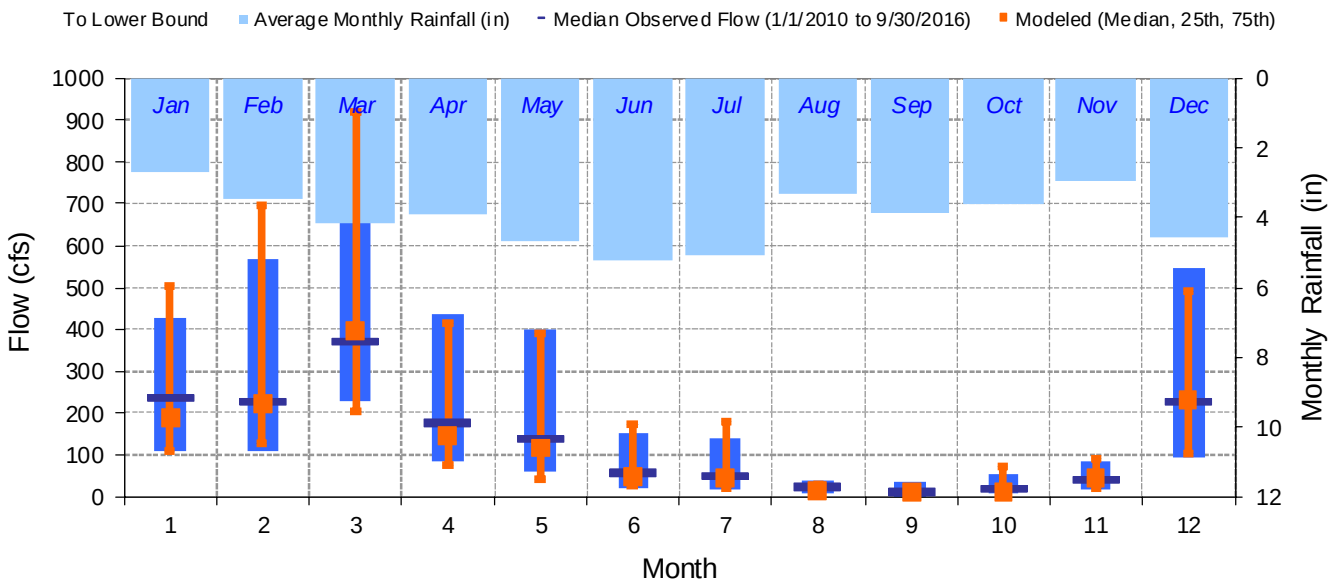
Seasonal Regression and Temporal Aggregate





Model Outlet 216 vs. USGS 03155220 South Fork Hughes River Below Macfarlan, WV

Seasonal Medians and Ranges

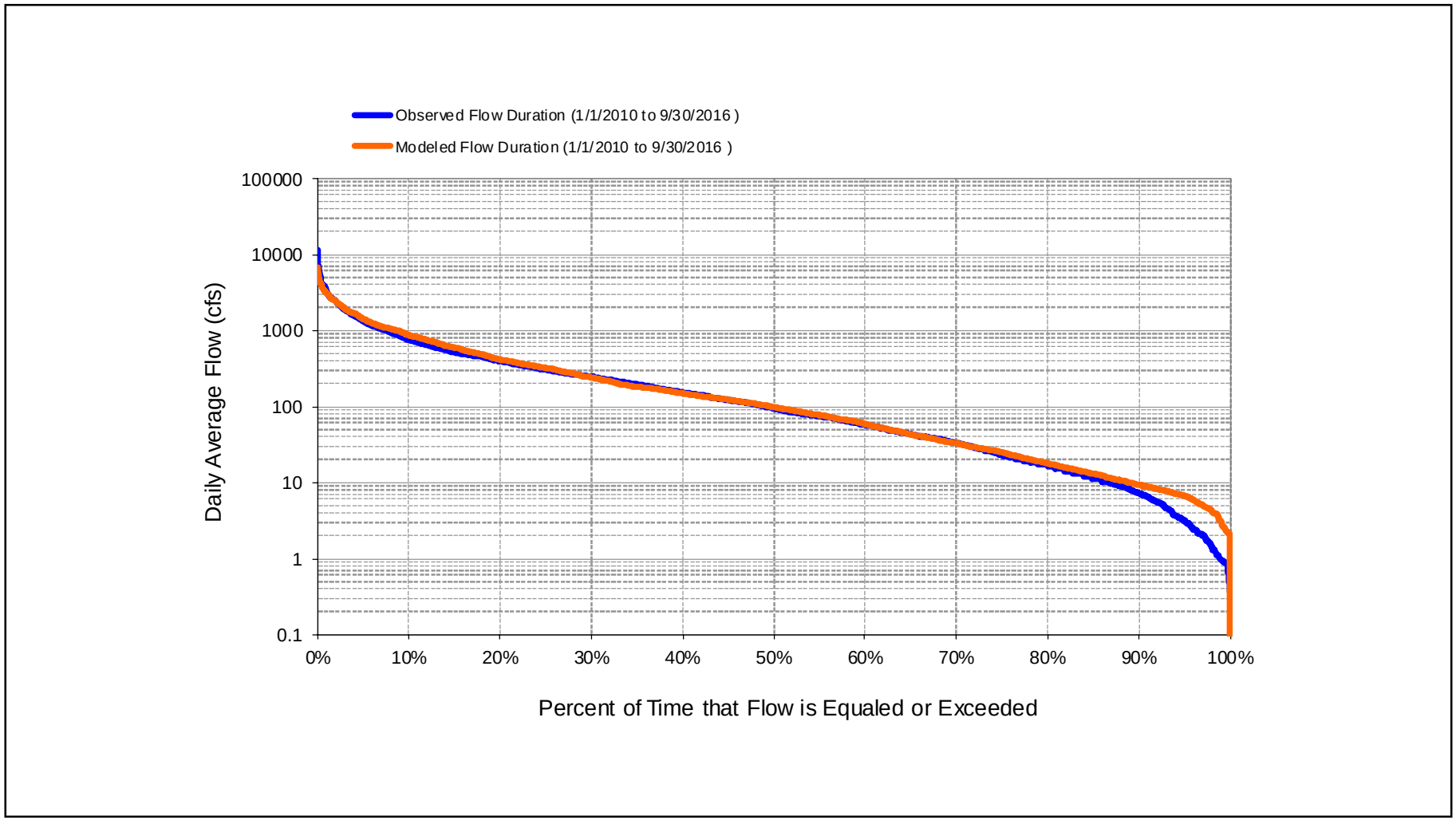


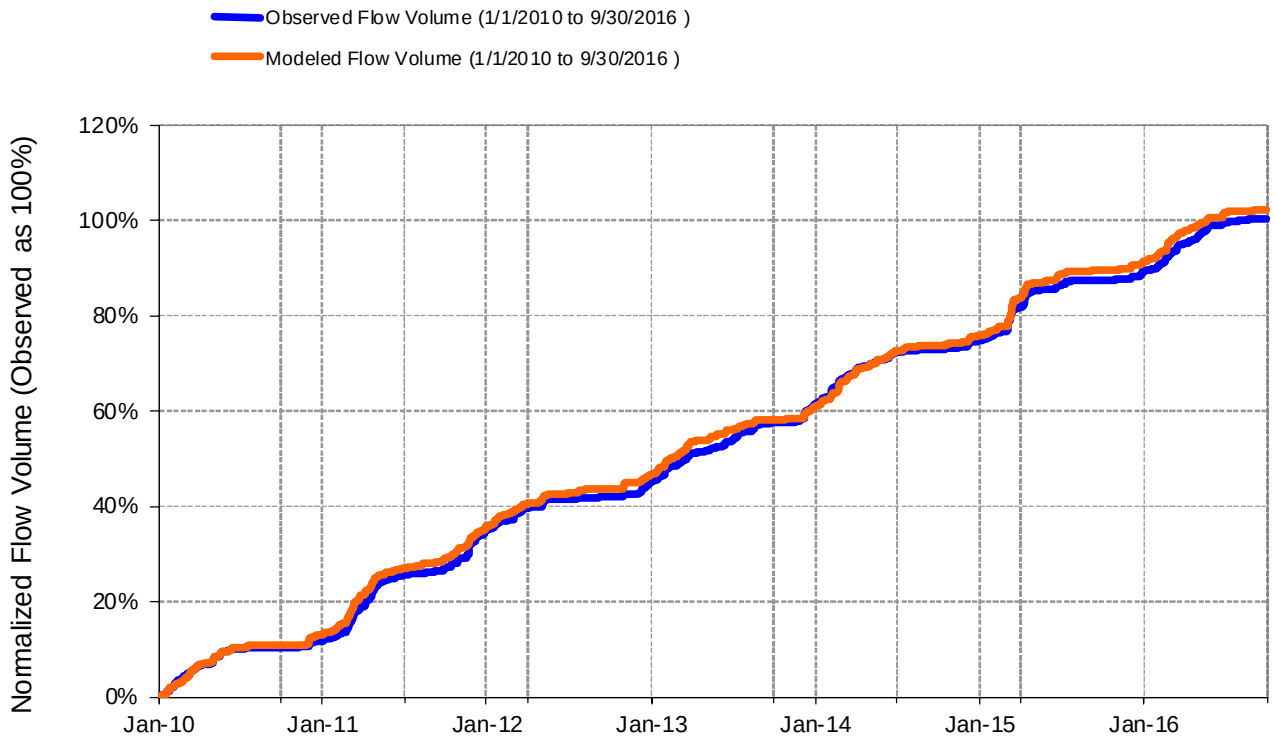
Model Outlet 216 vs. USGS 03155220 South Fork Hughes River Below Macfarlan, WV

Seasonal Summary

MONTH	OBSERVED FLOW (CFS)				MODELED FLOW (CFS)			
	MEAN	MEDIAN	25TH	75TH	MEAN	MEDIAN	25TH	75TH
Jan	369.97	230.00	109.00	427.00	397.22	188.92	109.77	503.36
Feb	532.04	222.00	109.00	566.75	566.82	222.82	126.29	694.86
Mar	684.79	365.00	227.00	657.00	770.44	395.54	203.56	919.79
Apr	420.40	172.00	84.00	435.50	396.82	146.21	77.93	416.04
May	359.48	134.00	58.00	398.00	323.10	116.81	43.42	387.98
Jun	207.21	52.00	21.25	150.75	232.78	48.88	25.94	172.77
Jul	154.21	44.00	16.00	139.00	178.99	44.13	19.66	177.08
Aug	75.56	18.00	7.50	40.00	61.62	15.18	9.74	28.21
Sep	54.89	6.20	2.10	33.75	47.78	9.59	5.18	20.10
Oct	112.20	13.50	6.63	56.00	148.39	11.49	7.31	70.00
Nov	212.99	38.00	18.00	86.00	167.14	44.52	20.87	88.99
Dec	501.70	220.50	91.25	547.50	452.85	233.05	100.28	493.27

Model Outlet 216 vs. USGS 03155220 South Fork Hughes River Below Macfarlan, WV


Observed Flow Duration (1/1/2010 to 9/30/2016)
Modeled Flow Duration (1/1/2010 to 9/30/2016)
Daily Average Flow (cfs)
100000
10000
1000
100
10
1
0.1
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time that Flow is Equaled or Exceeded


Observed Flow Volume (1/1/2010 to 9/30/2016)
Modeled Flow Volume (1/1/2010 to 9/30/2016)
Nomalized Flow Volume (Observed as 100%)
120%
100%
80%
60%
40%
20%
0%
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16

LSPC Simulated Flow		Observed Flow Gage	
REACH OUTFLOW FROM SUBBASIN 216		USGS 03155220 SOUTH FORK HUGHES RIVER BELOW MACFARLAN, WV	
6.75-Year Analysis Period: 1/1/2010 - 9/30/2016 Flow volumes are (inches/year) for upstream drainage area		Hydrologic Unit Code: 5030203 Latitude: 39.07896905 Longitude: -81.2123373 Drainage Area (sq-mi): 229	
Total Simulated In-stream Flow:	**18.58**	Total Observed In-stream Flow:	**18.24**
Total of simulated highest 10% flows:	**10.38**	Total of Observed highest 10% flows:	**10.49**
Total of Simulated lowest 50% flows:	**0.97**	Total of Observed Lowest 50% flows:	**0.93**
Simulated Summer Flow Volume (months 7-9):	**1.50**	Observed Summer Flow Volume (7-9):	**1.48**
Simulated Fall Flow Volume (months 10-12):	**3.41**	Observed Fall Flow Volume (10-12):	**3.67**
Simulated Winter Flow Volume (months 1-3):	**8.80**	Observed Winter Flow Volume (1-3):	**8.04**
Simulated Spring Flow Volume (months 4-6):	**4.87**	Observed Spring Flow Volume (4-6):	**5.05**
Total Simulated Storm Volume:	**11.25**	Total Observed Storm Volume:	**10.84**
Simulated Summer Storm Volume (7-9):	**1.03**	Observed Summer Storm Volume (7-9):	**1.01**

Errors (Simulated-Observed)	*Error Statistics*	*Recommended Criteria*	*last run*	
Error in total volume:	1.87	10		
Error in 50% lowest flows:	4.66	10		
Error in 10% highest flows:	-1.09	15		
Seasonal volume error - Summer:	1.40	30		
Seasonal volume error - Fall:	-6.96	30		
Seasonal volume error - Winter:	9.39	30		
Seasonal volume error - Spring:	-3.56	30		
Error in storm volumes:	3.77	20		
Error in summer storm volumes:	2.14	50		
Nash-Sutcliffe Coefficient of Efficiency, E:	0.431	Model accuracy increases		
Baseline adjusted coefficient (Garrick), E':	0.446	as E or E' approaches 1.0		

Fecal Coliform Water Quality Calibration

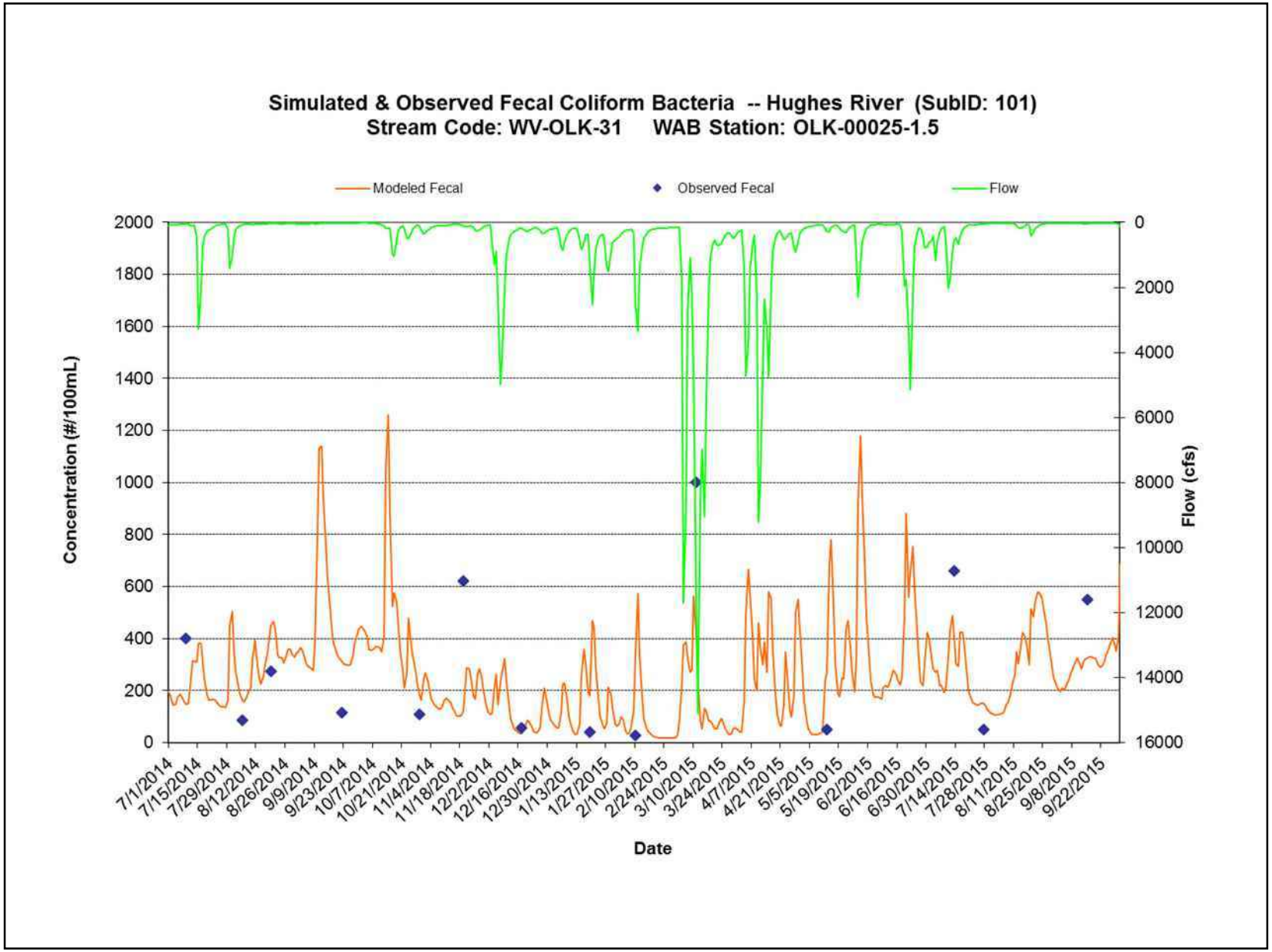
Group D3
Hughes River

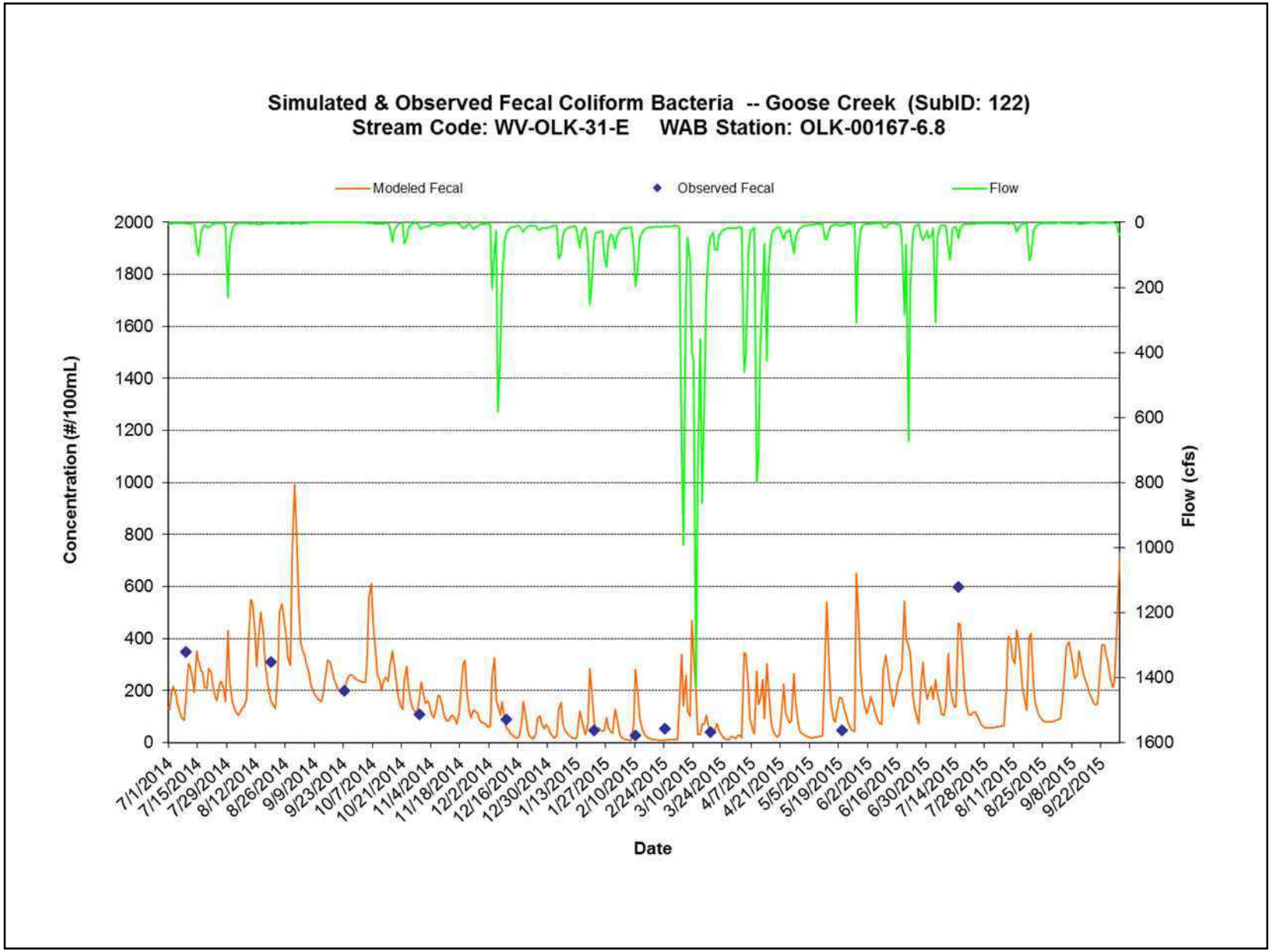
Fecal Coliform Water Quality Calibration Plots
March 21, 2017

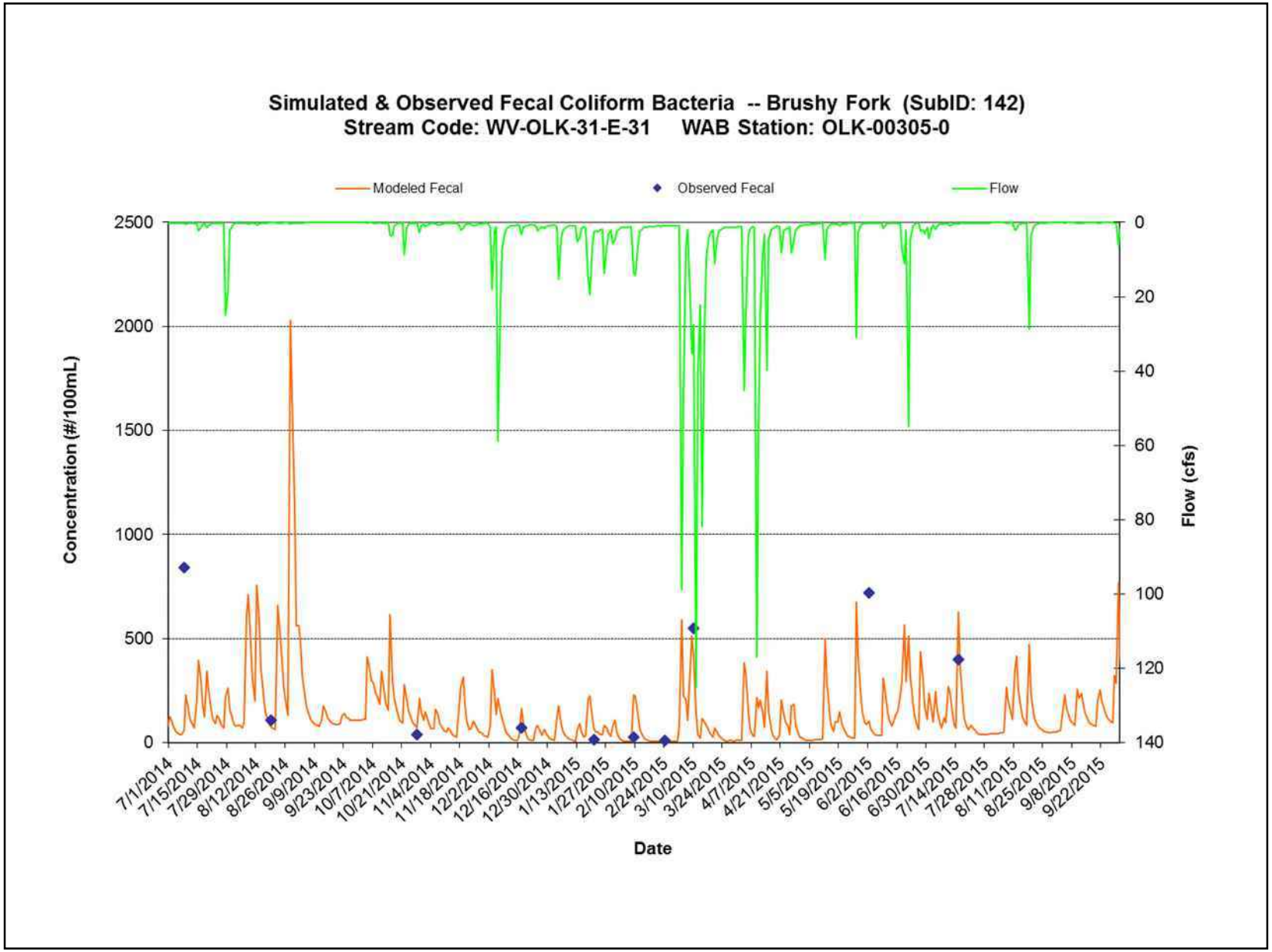
The TMDL model was run under baseline conditions with nonpoint sources, NPDES permitted point sources, and failing septics represented at 100% of loading rates.

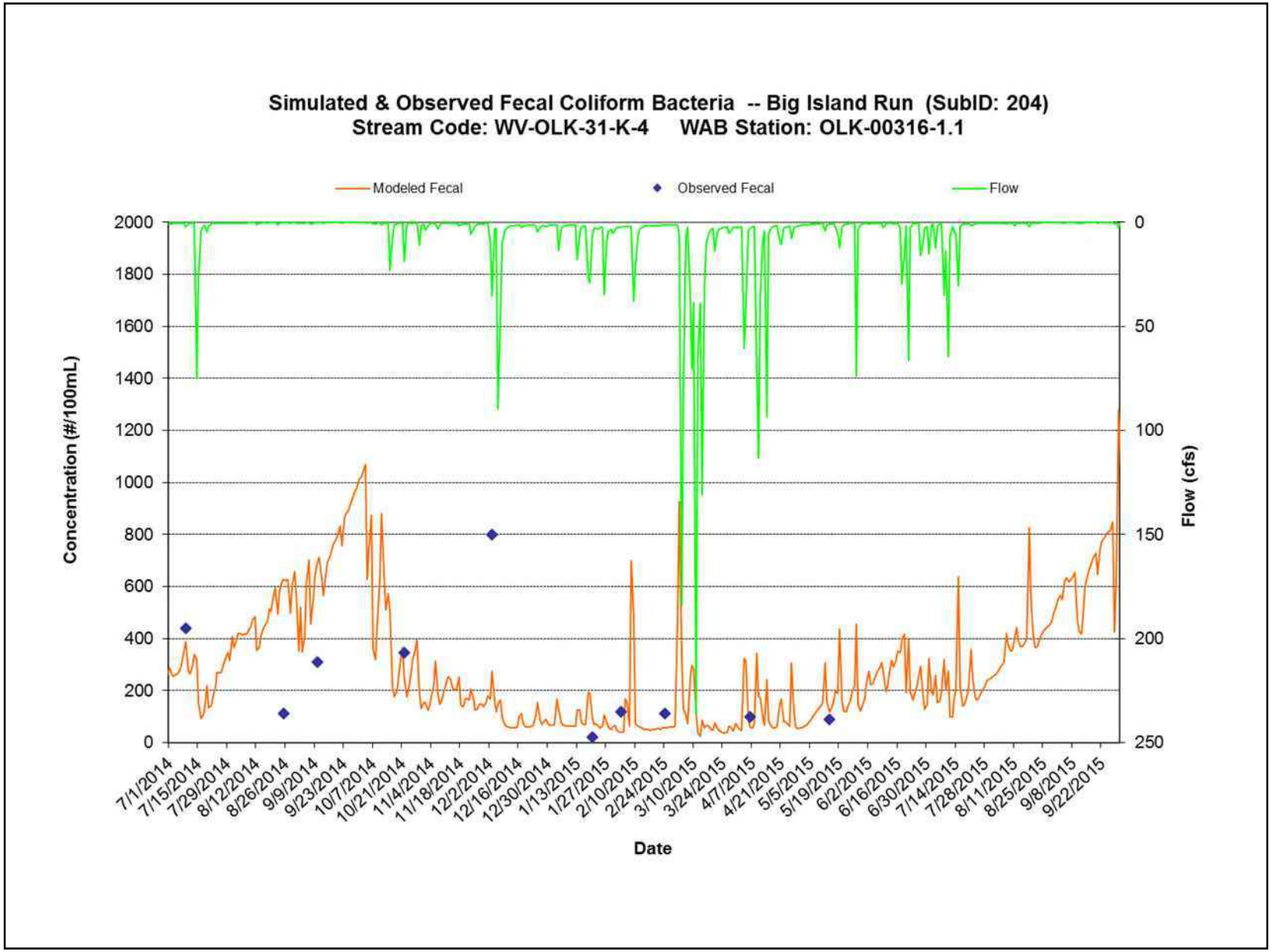
Watershed Characteristics for Calibration Plot Streams

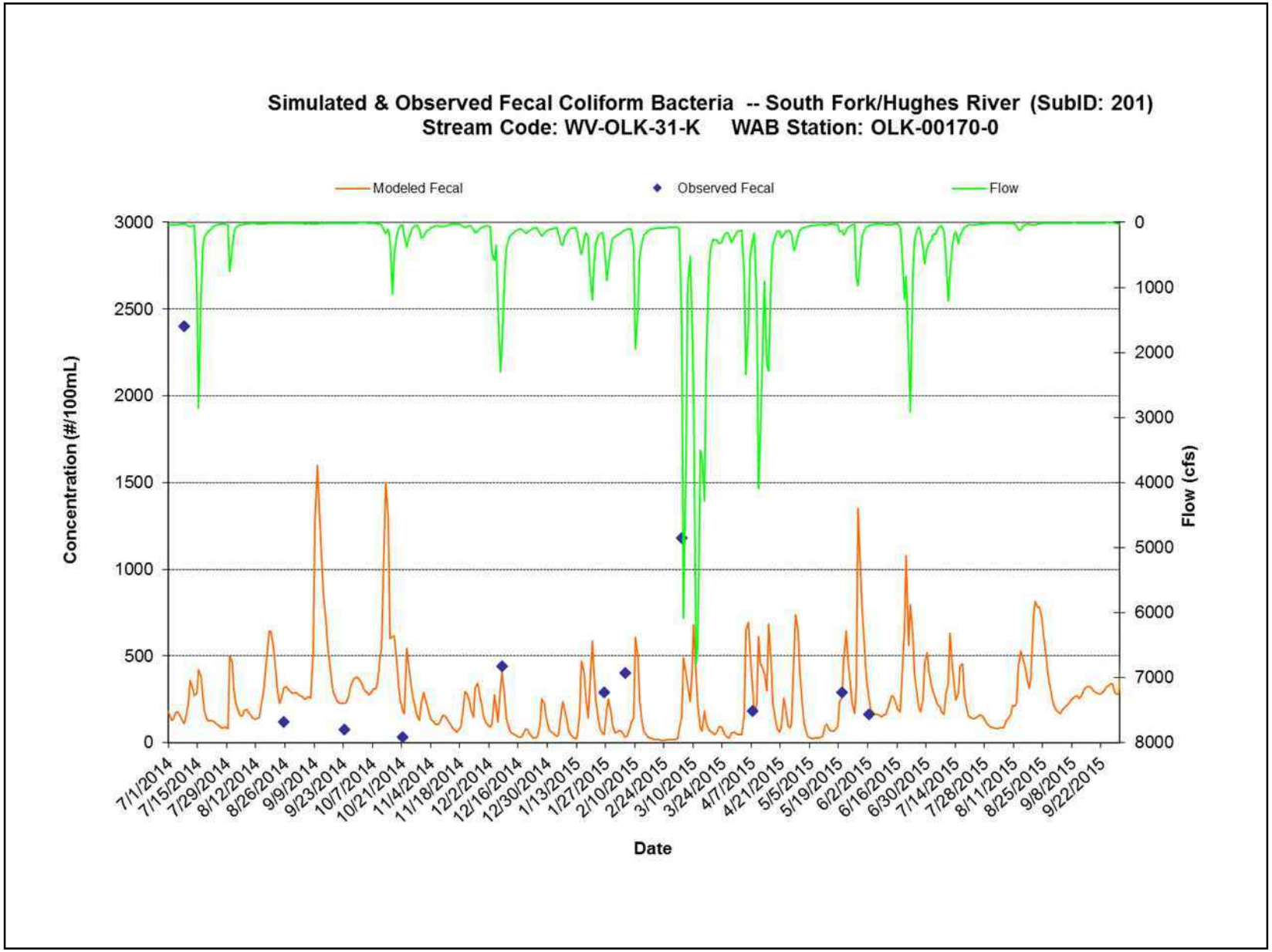
SUBID	Stream Name	Stream Size	Point Sources	Nonpoint Sources
101	Hughes River	Very Large	POTW, package plant, HAUs	Failing septics, pasture, residential
122	Goose Creek	Large	Package plant, HAUs	Failing septics, pasture, residential
142	Brushy Fork	Small		Failing septics, pasture, residential
201	South Fork/Hughes River	Large	Package plant, HAUs	Failing septics, pasture, residential
204	Big Island Run	Small		Failing septics dominant, residential
213	Louthers Run	Small		Failing septics, residential
274	Cedar Run	Small	None	Background only
325	Jesse Cain Run	Small		Failing septics, pasture, residential
331	Slab Creek	Large		Failing septics, pasture, residential
361	Turtle Run	Small		Failing septics, pasture, residential
363	Middle Fork/South Fork/Hughes River	Medium		Failing septics, pasture, residential
371	Upper Run	Small		Failing septics, pasture, residential
392	South Fork/Hughes River	Medium		Failing septics, pasture, residential
400	Sheep Run	Small	None	Failing septics, residential
501	North Fork/Hughes River	Large	Package plant, HAUs	Failing septics, pasture, residential
521	Devilhole Creek	Small		Failing septics, residential
557	Bonds Creek	Medium		Failing septics, pasture, residential
578	Whiskey Run	Small		Failing septics, residential
601	Back Run	Small		Pasture dominant, failing septics, residential
624	North Fork/Hughes River	Large		Failing septics, pasture, residential
645	Leason Run	Small		Pasture dominant, failing septics, residential
657	North Fork/Hughes River	Medium		Pasture dominant, failing septics, residential
666	Haddox Run	Small		Pasture dominant, failing septics, residential

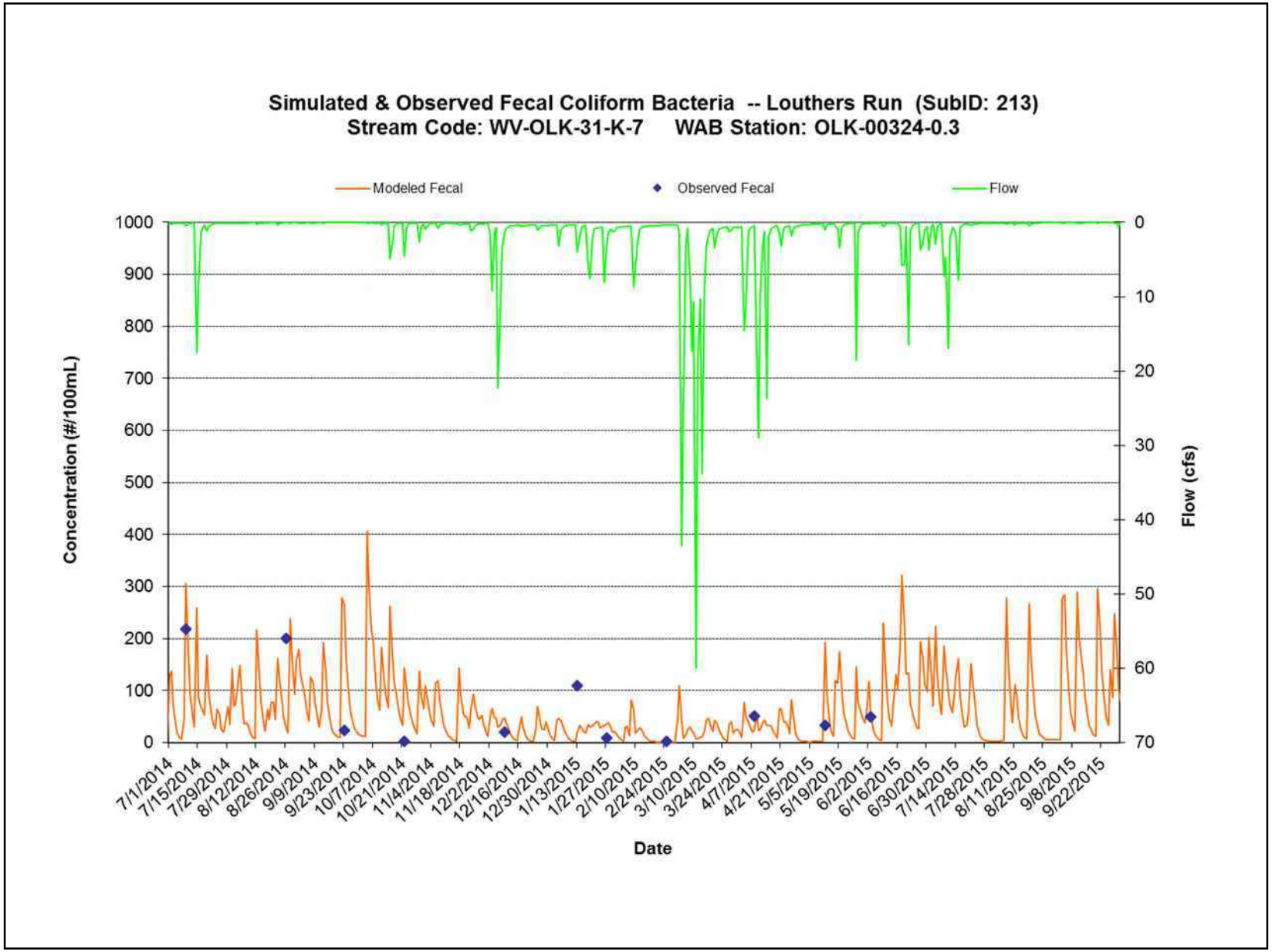

Simulated & Observed Fecal Coliform Bacteria -- Hughes River (SubID: 101)
Stream Code: WV-OLK-31 WAB Station: OLK-00025-1.5
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
2000
4000
6000
8000
10000
12000
14000
16000
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015

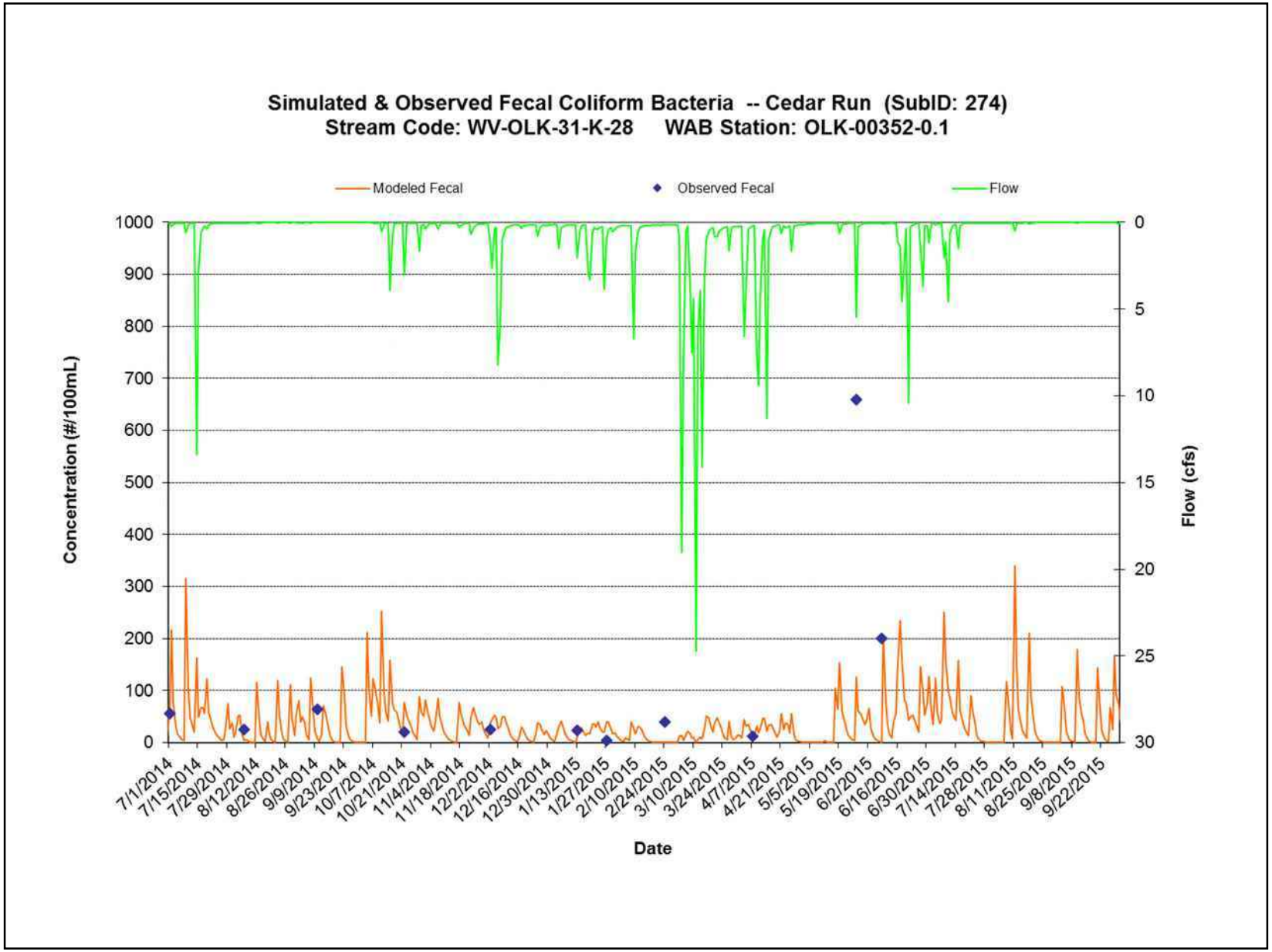

Simulated & Observed Fecal Coliform Bacteria -- Goose Creek (SubID: 122)
Stream Code: WV-OLK-31-E WAB Station: OLK-00167-6.8
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
1600
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015
Date

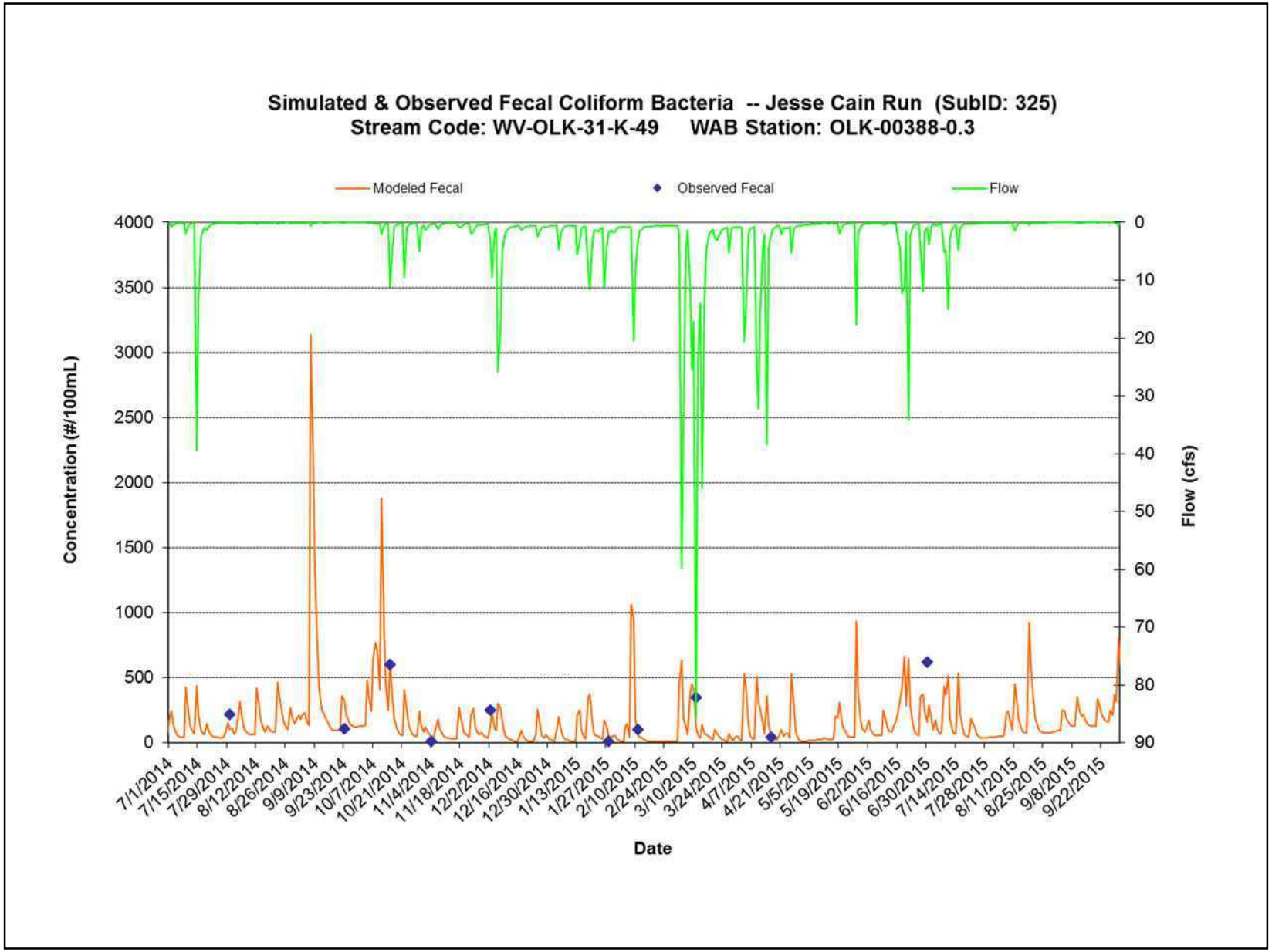

Simulated & Observed Fecal Coliform Bacteria -- Brushy Fork (SubID: 142)
Stream Code: WV-OLK-31-E-31 WAB Station: OLK-00305-0
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
2500
2000
1500
1000
500
0
0
20
40
60
80
100
120
140
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Big Island Run (SubID: 204)
Stream Code: WV-OLK-31-K-4 WAB Station: OLK-00316-1.1
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
250
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015
Date


Simulated & Observed Fecal Coliform Bacteria -- South Fork/Hughes River (SubID: 201)
Stream Code: WV-OLK-31-K WAB Station: OLK-00170-0
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
8000
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015
Date


Simulated & Observed Fecal Coliform Bacteria -- Louthers Run (SubID: 213)
Stream Code: WV-OLK-31-K-7 WAB Station: OLK-00324-0.3
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
1000
900
800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Cedar Run (SubID: 274)
Stream Code: WV-OLK-31-K-28 WAB Station: OLK-00352-0.1
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
1000
900
800
700
600
500
400
300
200
100
0
0
5
10
15
20
25
30
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Jesse Cain Run (SubID: 325)
Stream Code: WV-OLK-31-K-49 WAB Station: OLK-00388-0.3
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
4000
3500
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
60
70
80
90
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
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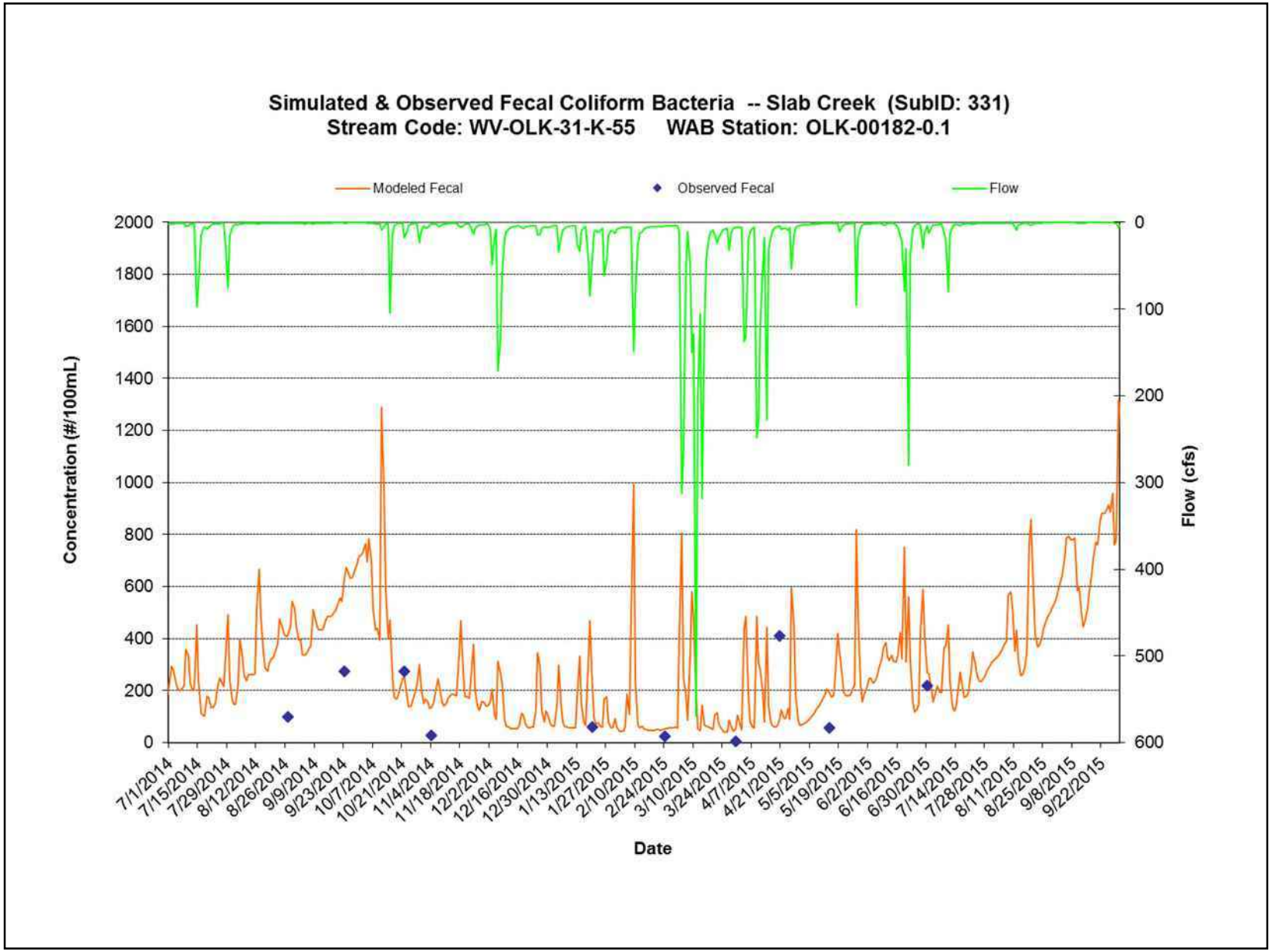
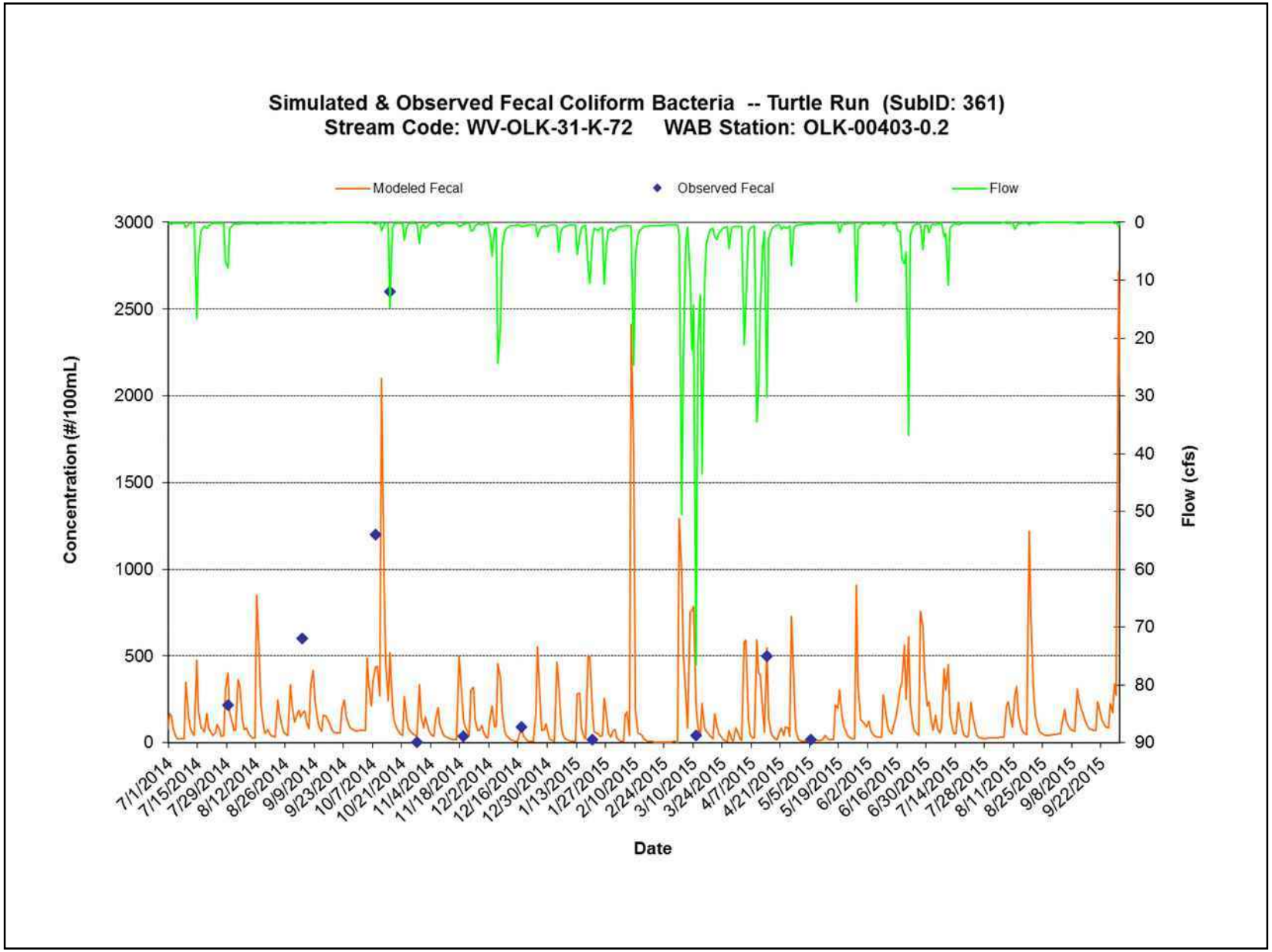
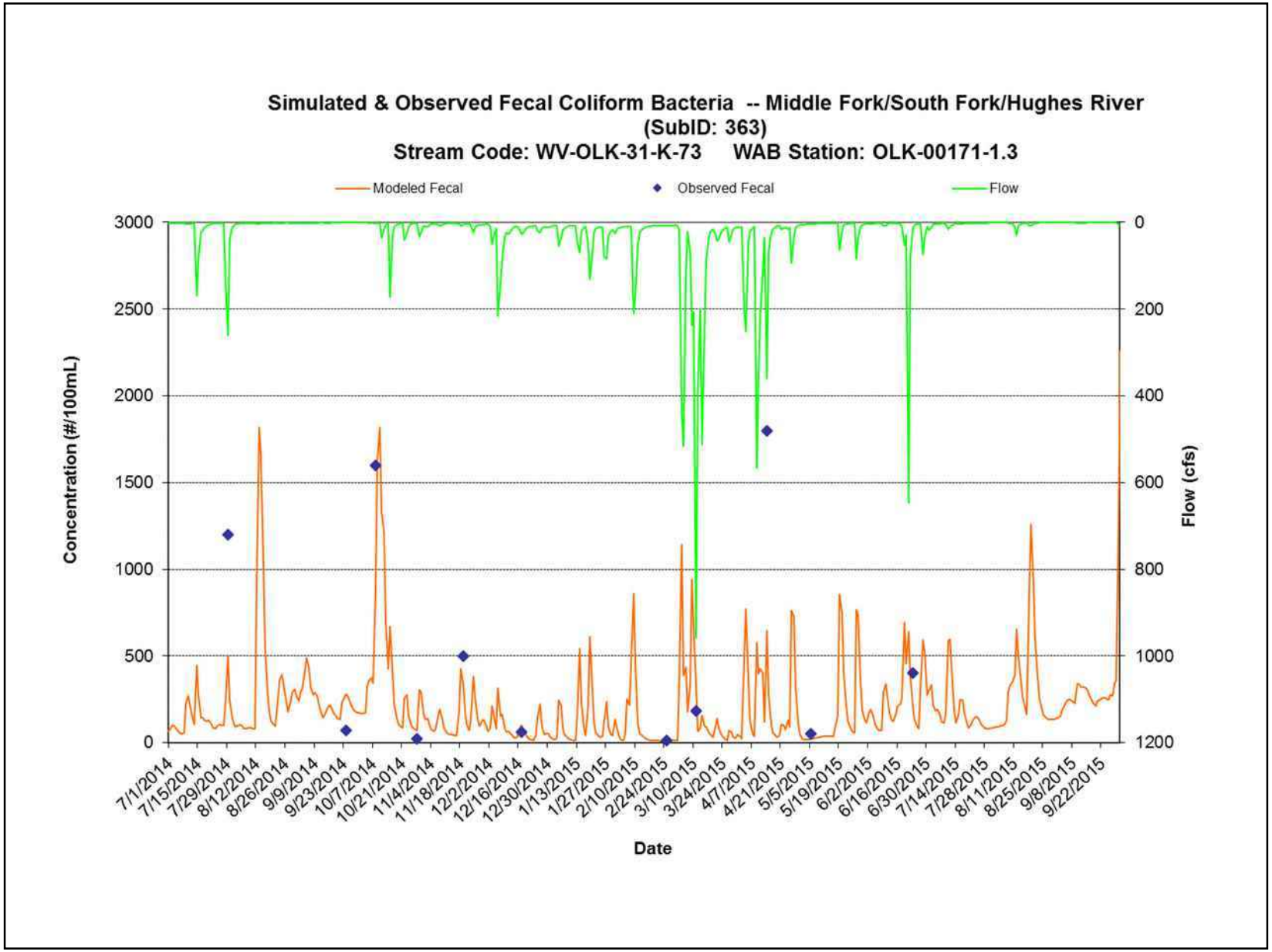
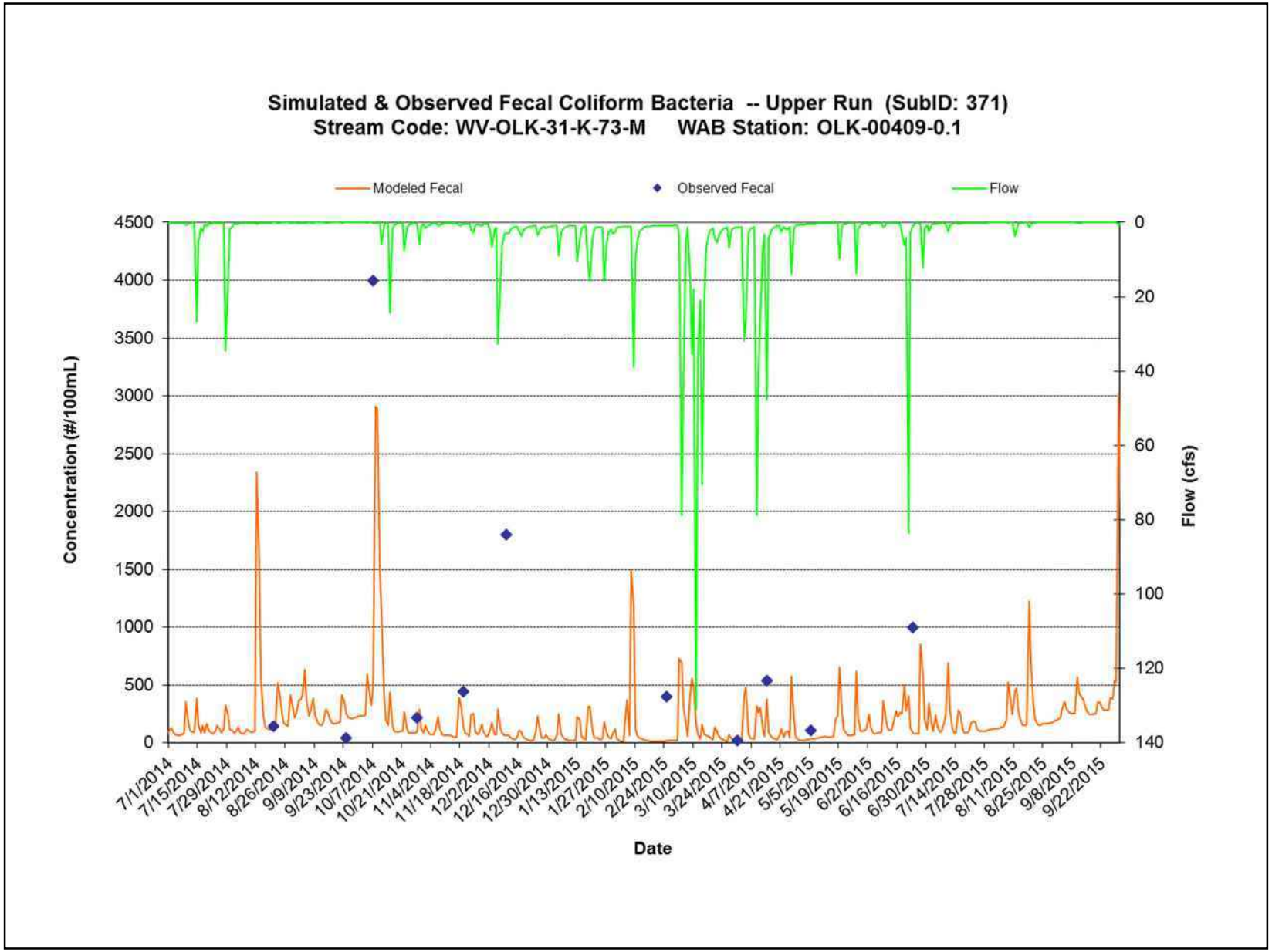
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Slab Creek (SubID: 331)
Stream Code: WV-OLK-31-K-55 WAB Station: OLK-00182-0.1
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
100
200
300
400
500
600
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Turtle Run (SubID: 361)
Stream Code: WV-OLK-31-K-72 WAB Station: OLK-00403-0.2
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
60
70
80
90
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Middle Fork/South Fork/Hughes River
(SubID: 363)
Stream Code: WV-OLK-31-K-73 WAB Station: OLK-00171-1.3
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
3000
2500
2000
1500
1000
500
0
0
200
400
600
800
1000
1200
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015
Date


Simulated & Observed Fecal Coliform Bacteria -- Upper Run (SubID: 371)
Stream Code: WV-OLK-31-K-73-M WAB Station: OLK-00409-0.1
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
20
40
60
80
100
120
140
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
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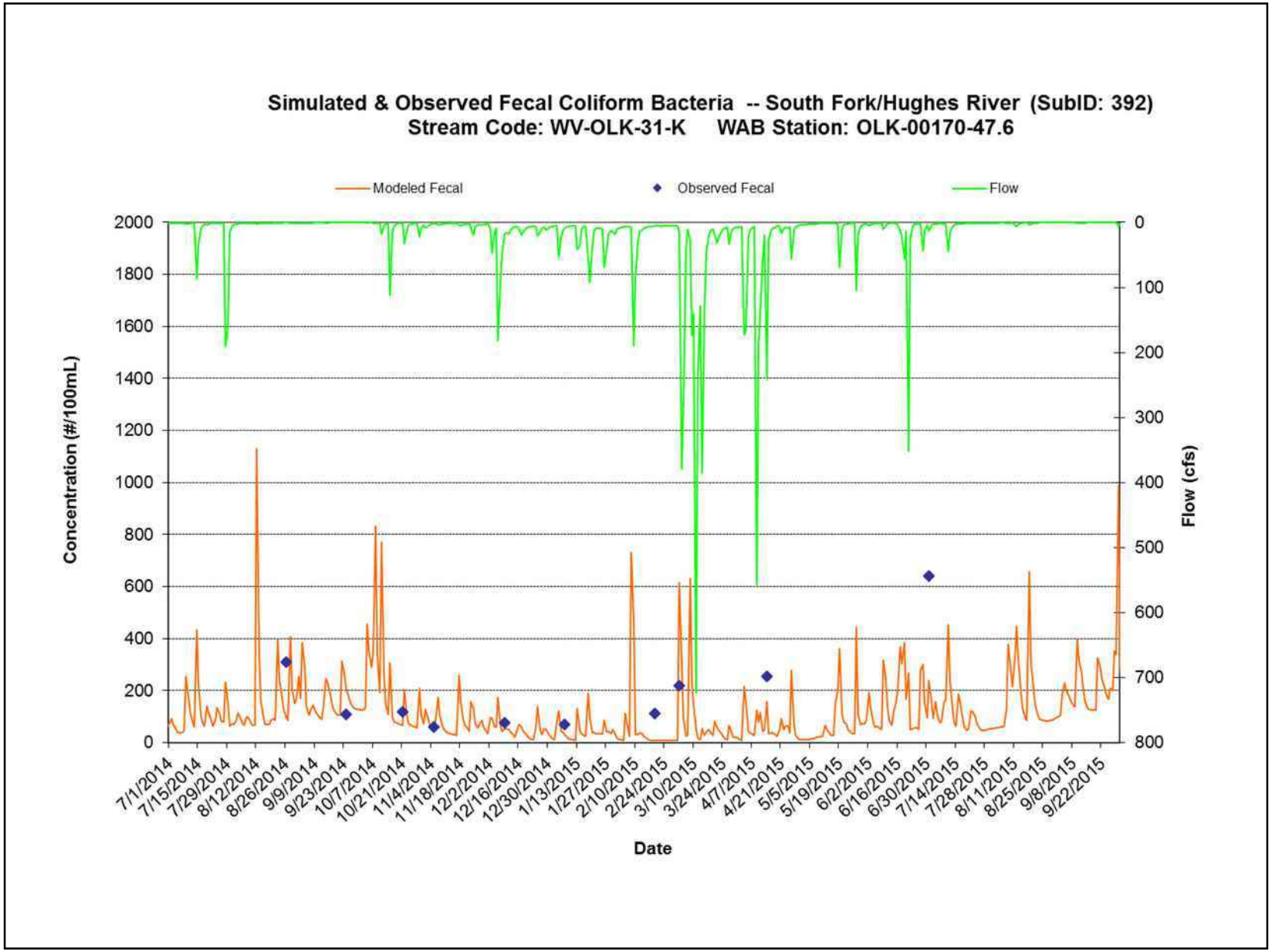
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- South Fork/Hughes River (SubID: 392)
Stream Code: WV-OLK-31-K WAB Station: OLK-00170-47.6
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
100
200
300
400
500
600
700
800
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
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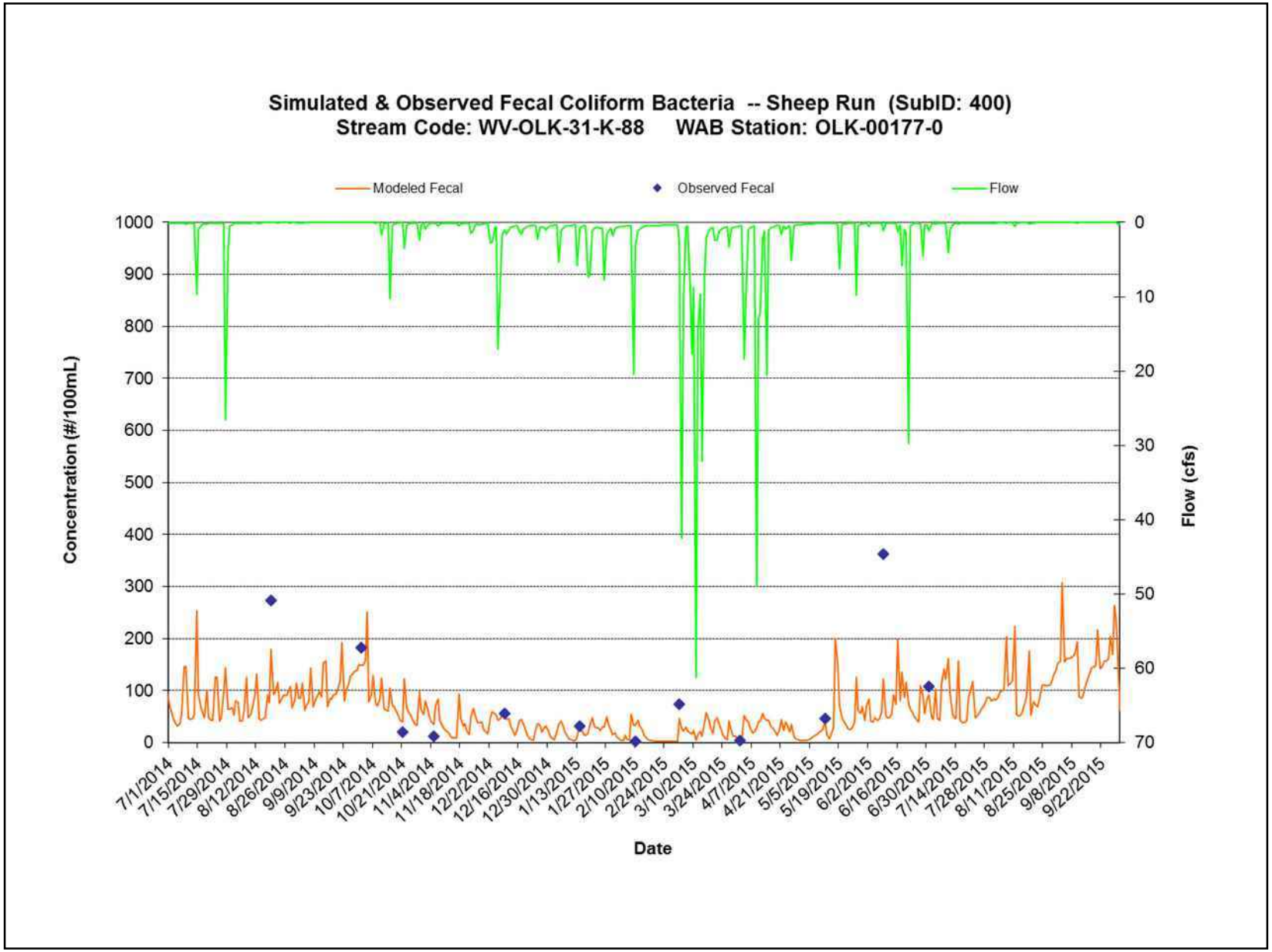
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Sheep Run (SubID: 400)
Stream Code: WV-OLK-31-K-88 WAB Station: OLK-00177-0
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
1000
900
800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
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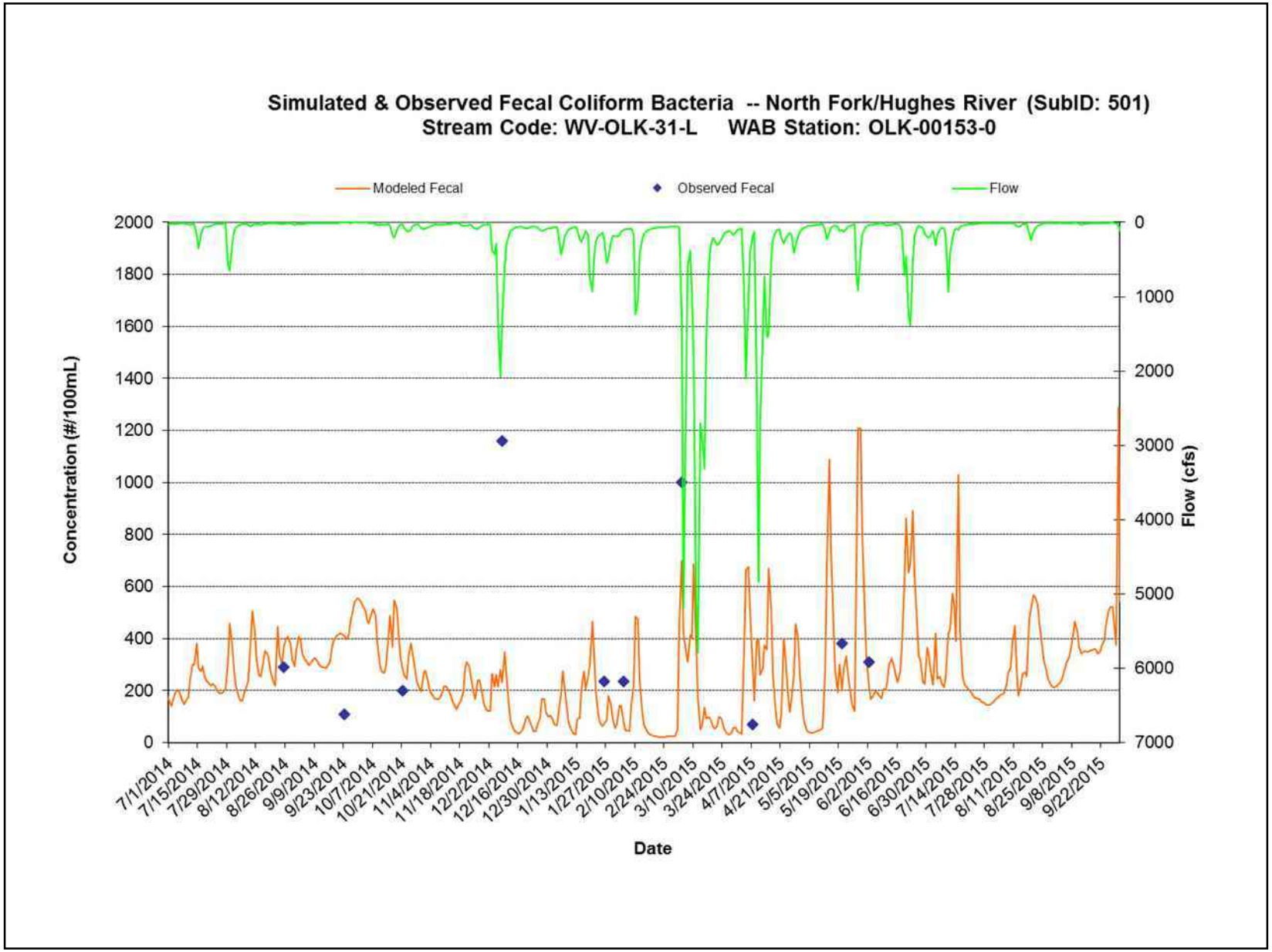
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- North Fork/Hughes River (SubID: 501)
Stream Code: WV-OLK-31-L WAB Station: OLK-00153-0
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
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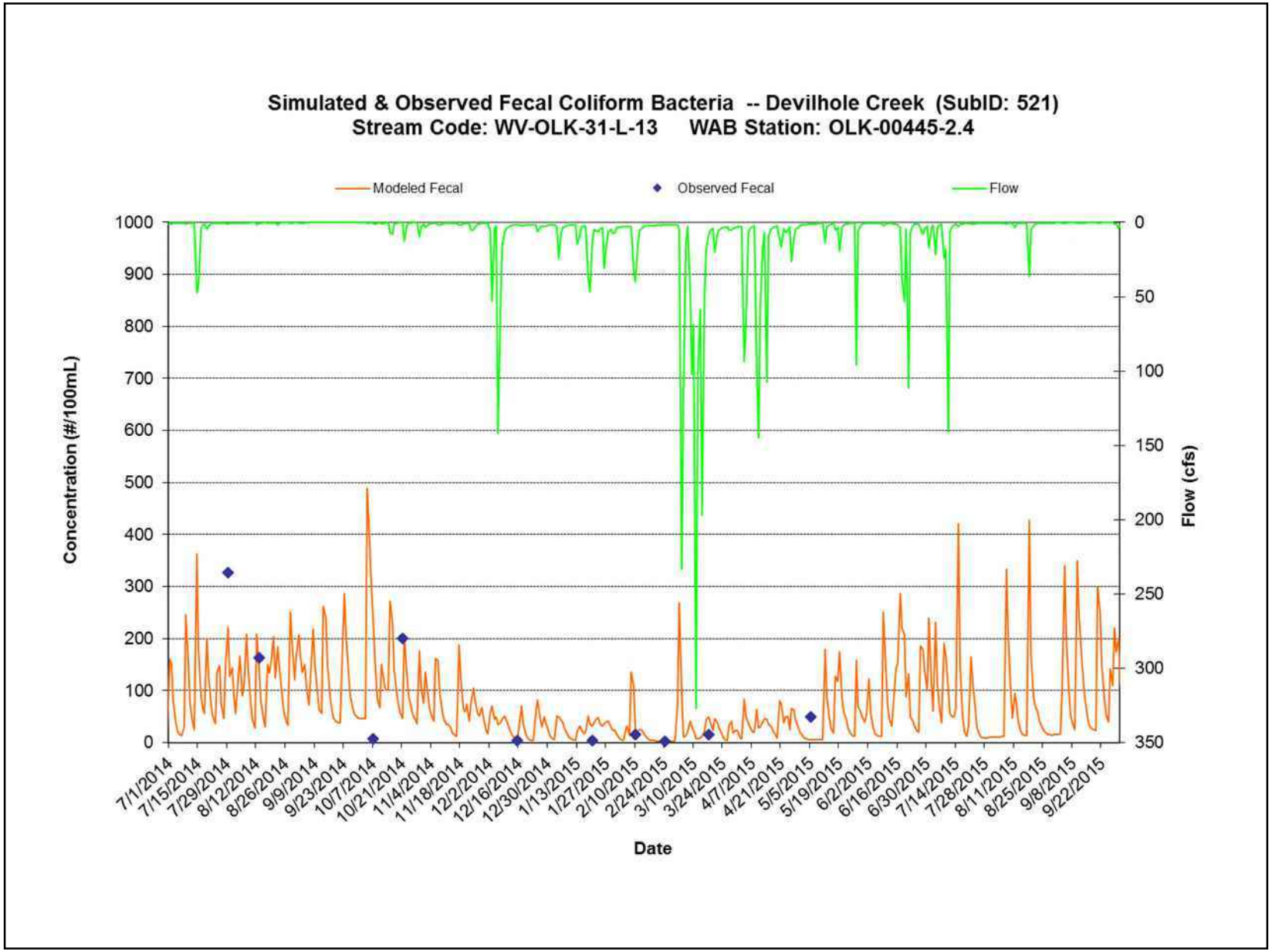
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Devilhole Creek (SubID: 521)
Stream Code: WV-OLK-31-L-13 WAB Station: OLK-00445-2.4
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
1000
900
800
700
600
500
400
300
200
100
0
0
50
100
150
200
250
300
350
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
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7/14/2015
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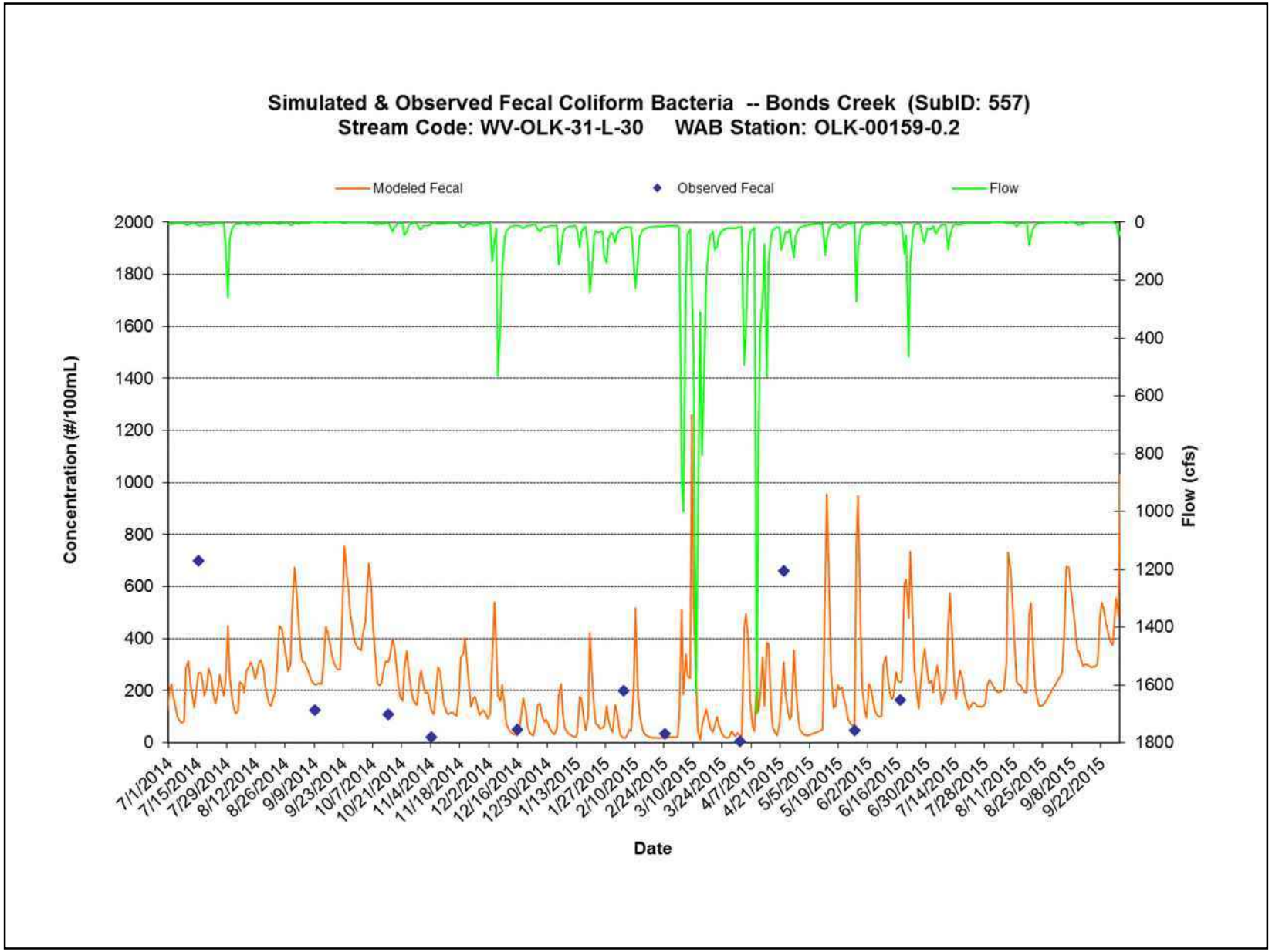
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Bonds Creek (SubID: 557)
Stream Code: WV-OLK-31-L-30 WAB Station: OLK-00159-0.2
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
2000
1800
1600
1400
1200
1000
800
600
400
200
0
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
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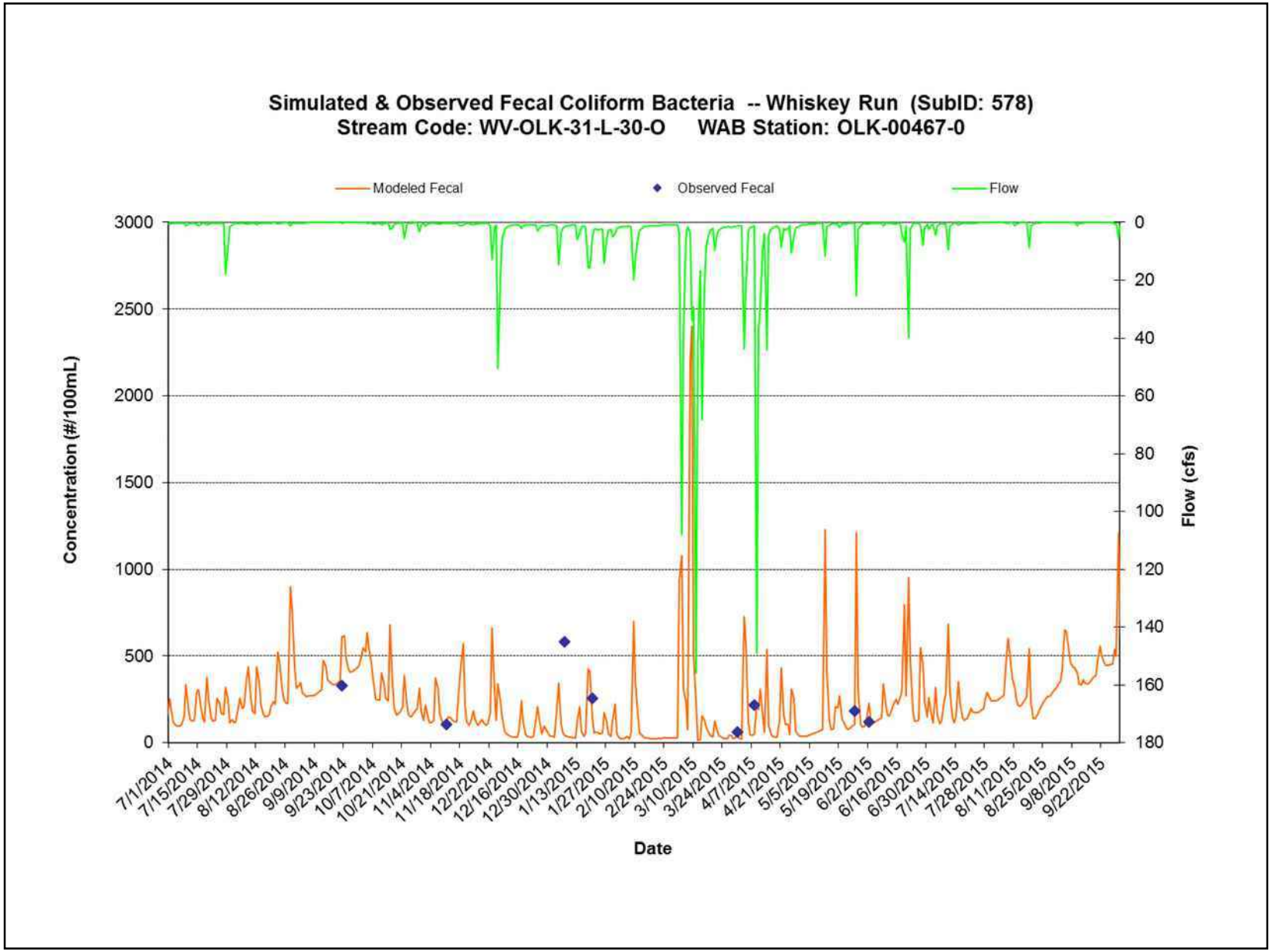
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Whiskey Run (SubID: 578)
Stream Code: WV-OLK-31-L-30-O WAB Station: OLK-00467-0
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
3000
2500
2000
1500
1000
500
0
0
20
40
60
80
100
120
140
160
180
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
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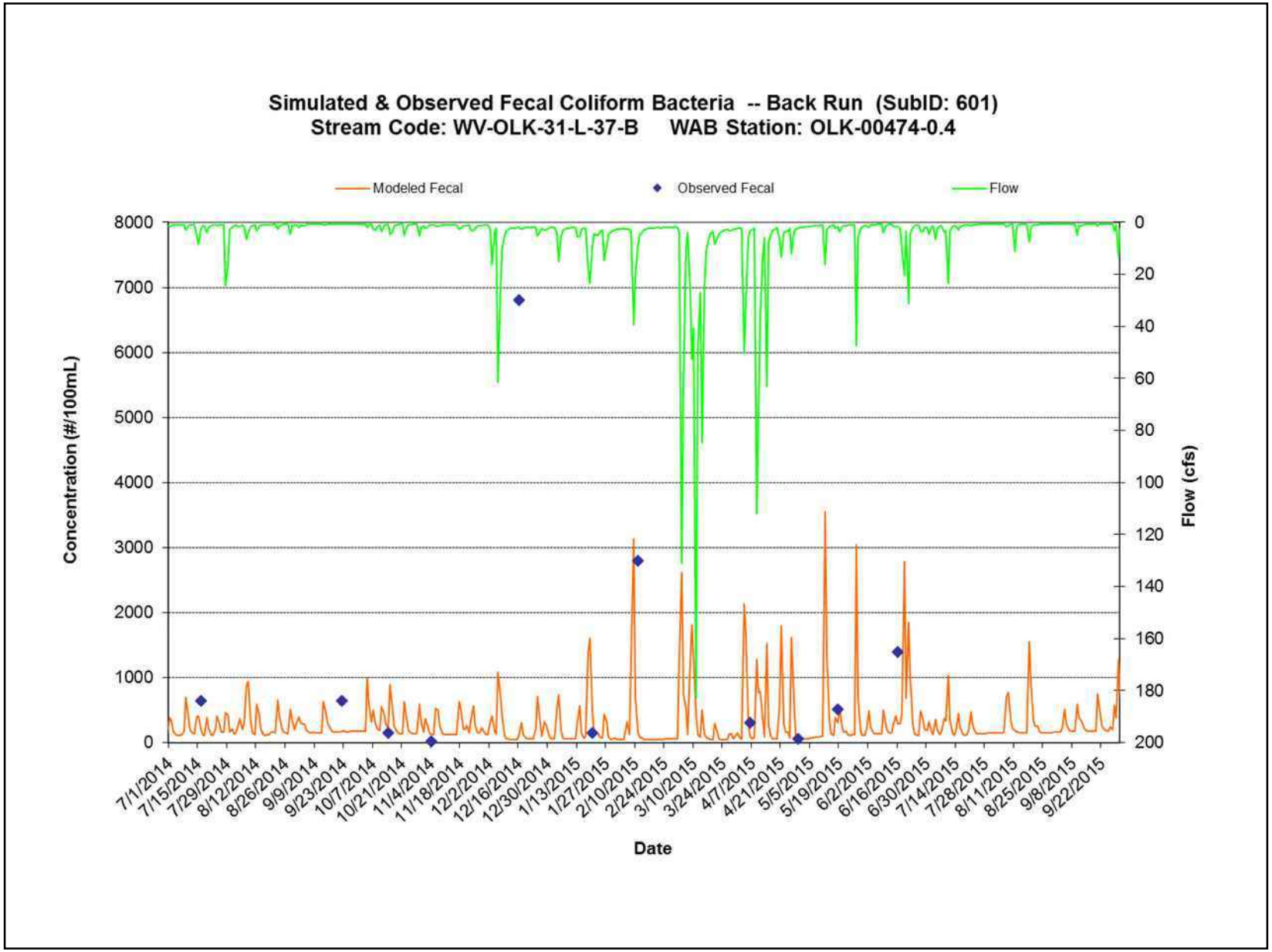
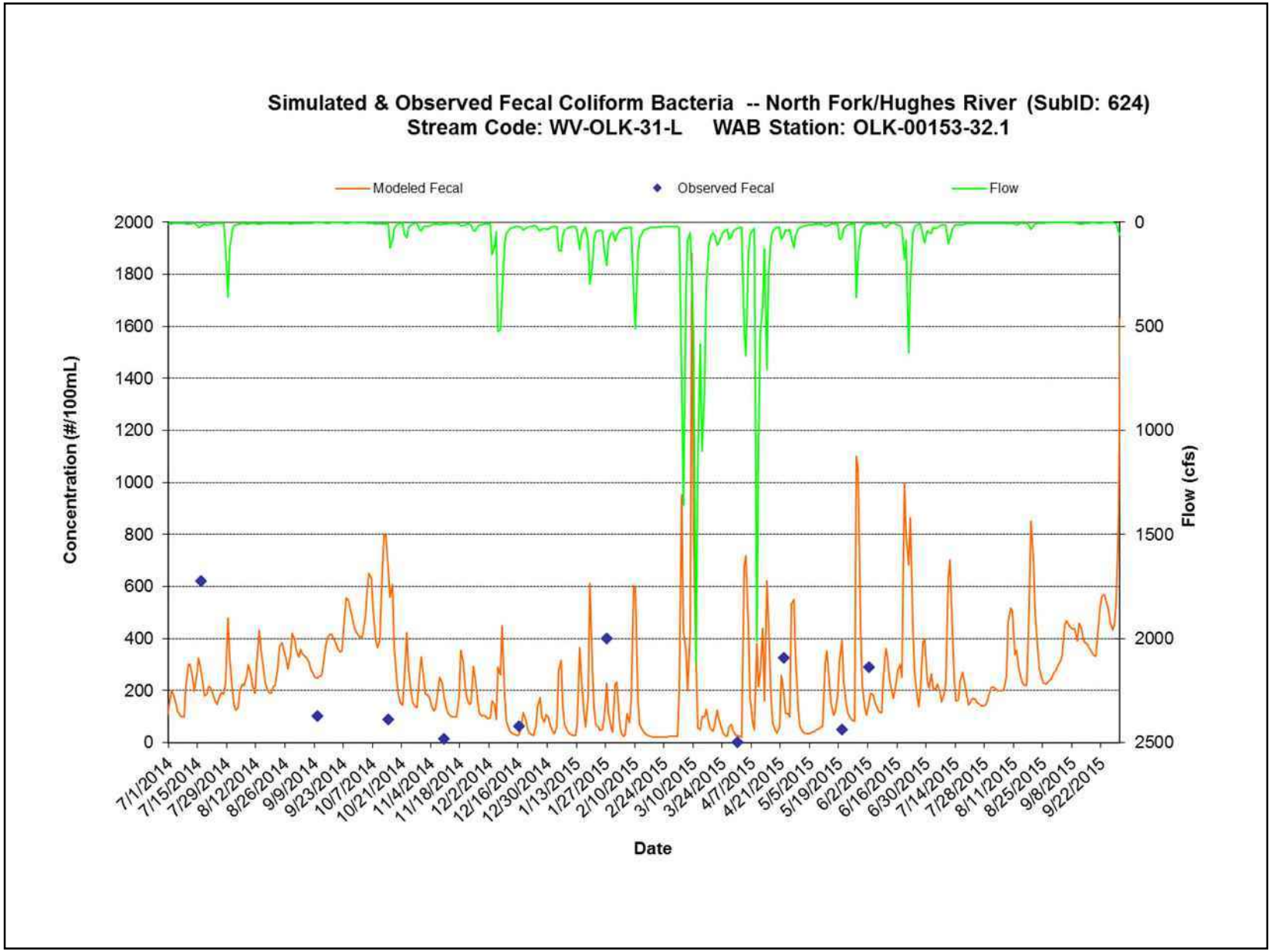
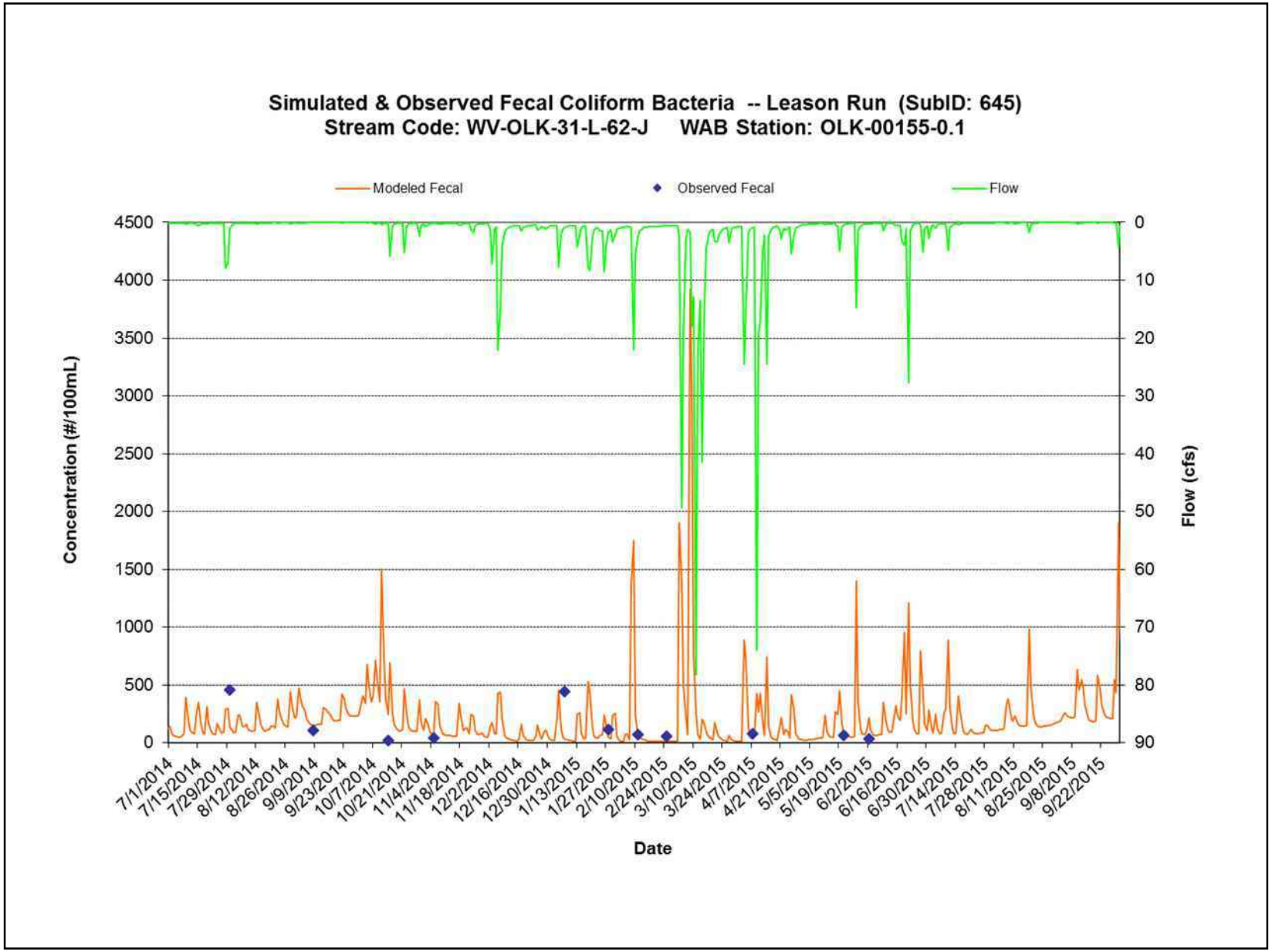
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015
Date


Simulated & Observed Fecal Coliform Bacteria -- Back Run (SubID: 601)
Stream Code: WV-OLK-31-L-37-B WAB Station: OLK-00474-0.4
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
8000
7000
6000
5000
4000
3000
2000
1000
0
0
20
40
60
80
100
120
140
160
180
200
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015
Date


Simulated & Observed Fecal Coliform Bacteria -- North Fork/Hughes River (SubID: 624)
Stream Code: WV-OLK-31-L WAB Station: OLK-00153-32.1
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015


Simulated & Observed Fecal Coliform Bacteria -- Leason Run (SubID: 645)
Stream Code: WV-OLK-31-L-62-J WAB Station: OLK-00155-0.1
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
60
70
80
90
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
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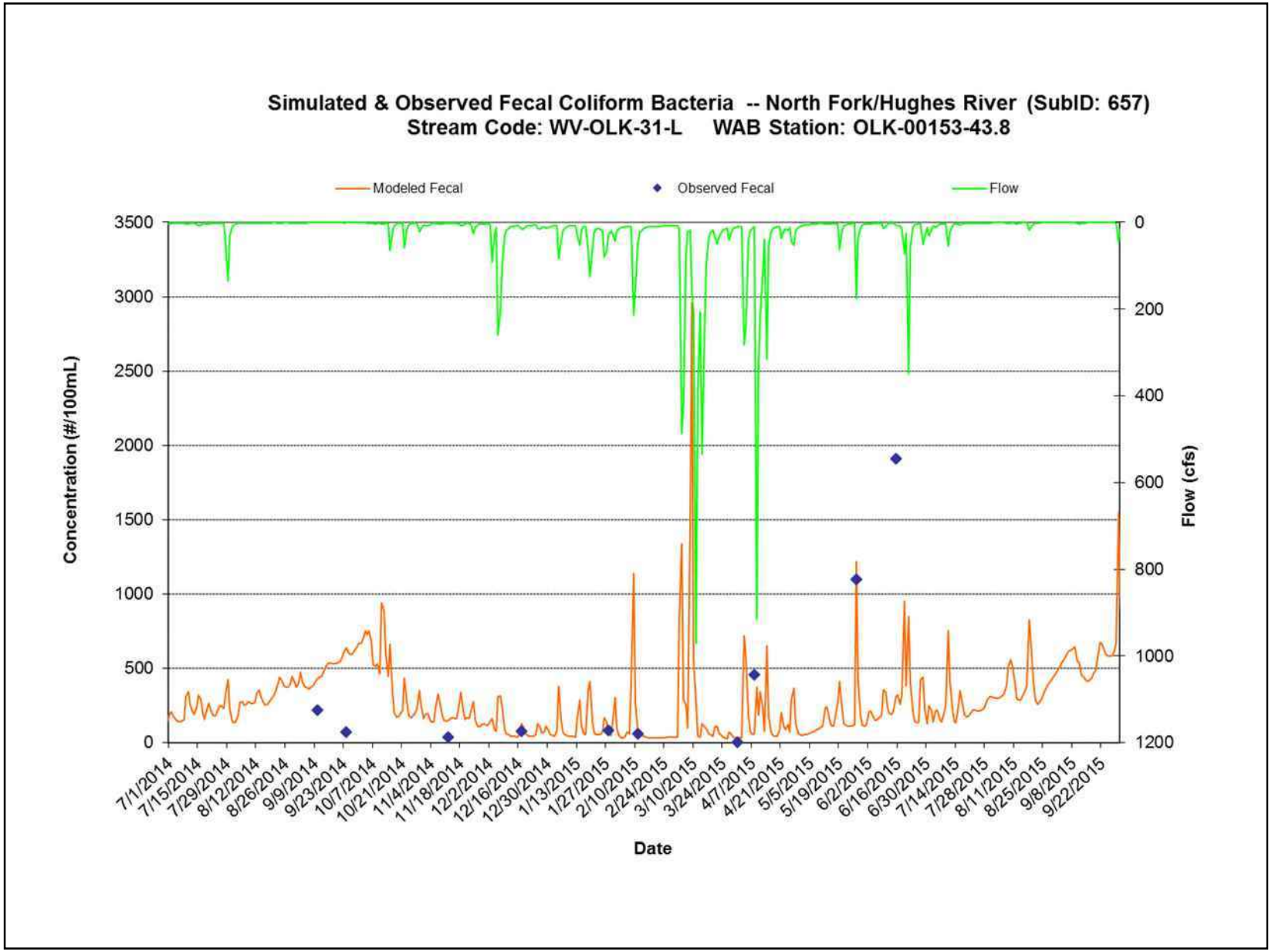
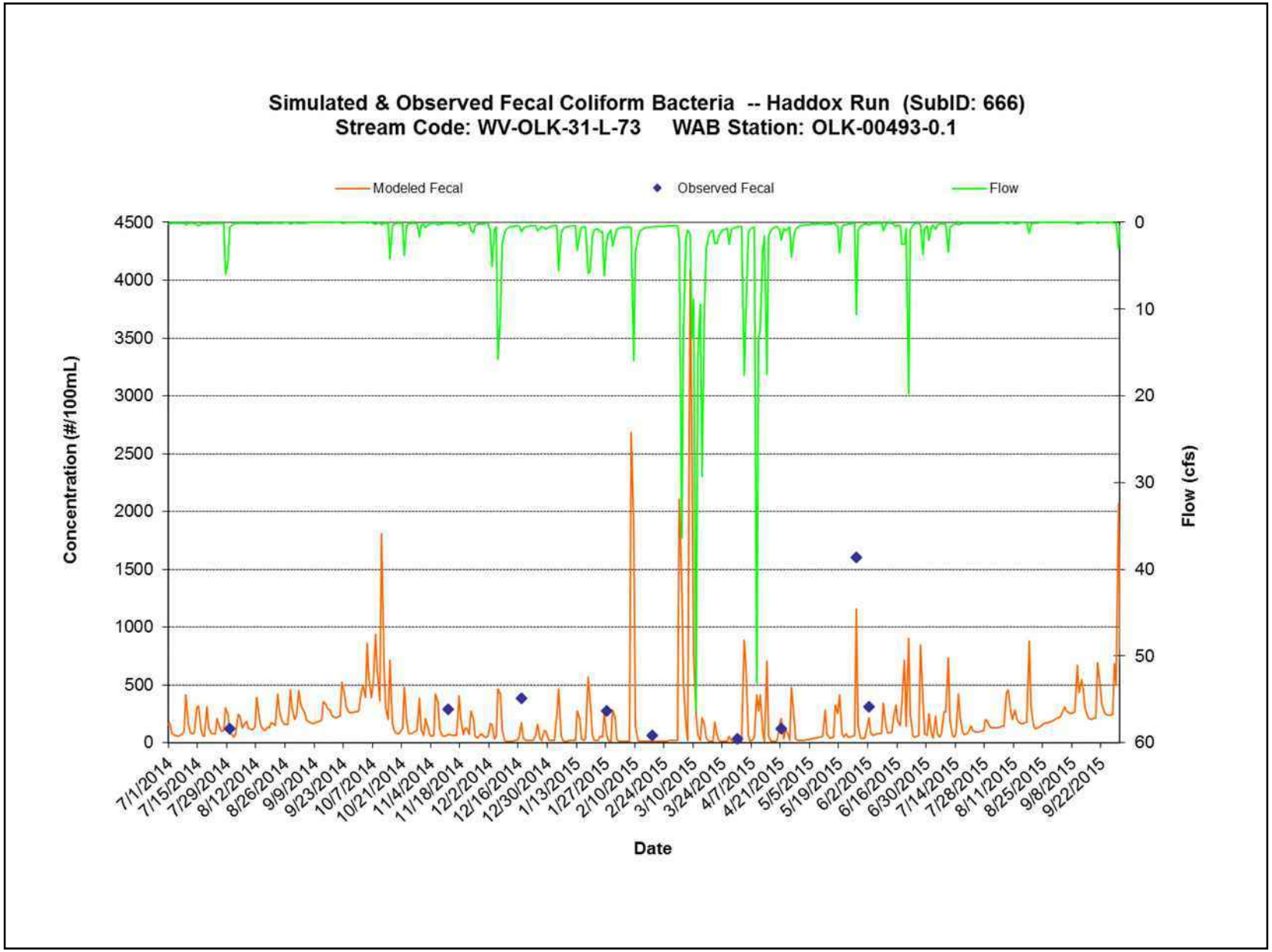
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015
Date


Simulated & Observed Fecal Coliform Bacteria -- North Fork/Hughes River (SubID: 657)
Stream Code: WV-OLK-31-L WAB Station: OLK-00153-43.8
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
Date
3500
3000
2500
2000
1500
1000
500
0
0
200
400
600
800
1000
1200
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015

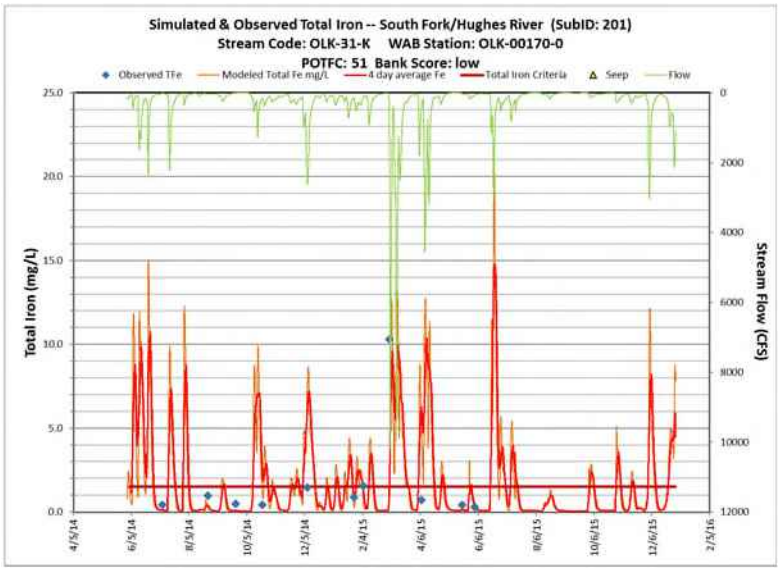

Simulated & Observed Fecal Coliform Bacteria -- Haddox Run (SubID: 666)
Stream Code: WV-OLK-31-L-73 WAB Station: OLK-00493-0.1
Modeled Fecal
Observed Fecal
Flow
Concentration (#/100mL)
Flow (cfs)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
60
7/1/2014
7/15/2014
7/29/2014
8/12/2014
8/26/2014
9/9/2014
9/23/2014
10/7/2014
10/21/2014
11/4/2014
11/18/2014
12/2/2014
12/16/2014
12/30/2014
1/13/2015
1/27/2015
2/10/2015
2/24/2015
3/10/2015
3/24/2015
4/7/2015
4/21/2015
5/5/2015
5/19/2015
6/2/2015
6/16/2015
6/30/2015
7/14/2015
7/28/2015
8/11/2015
8/25/2015
9/8/2015
9/22/2015
Date

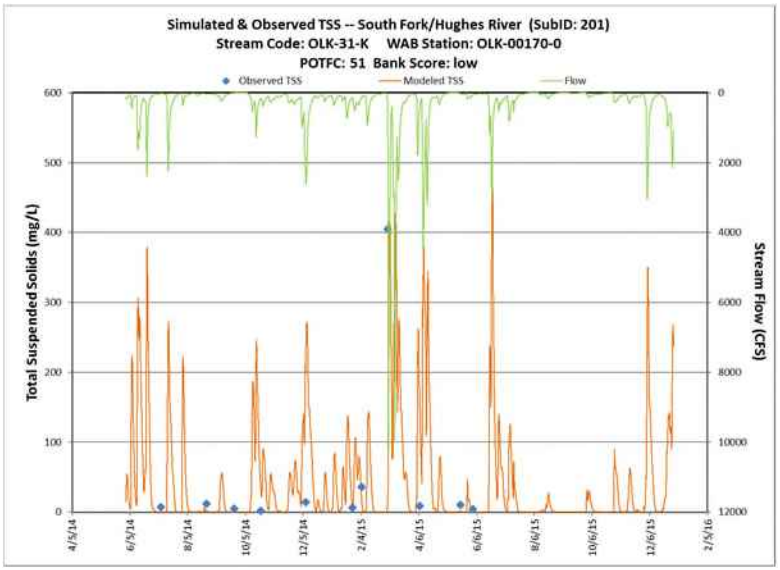
Iron Water Quality Calibration

D3 Hughes River Watershed

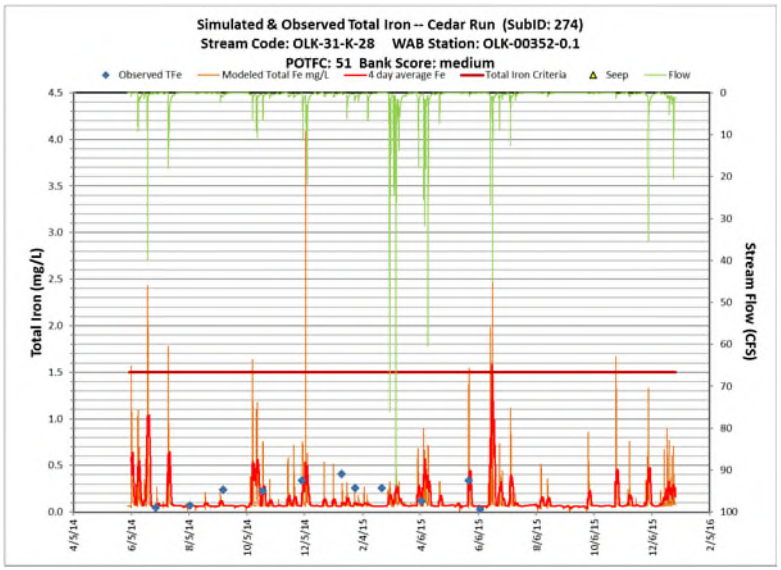
Iron and Sediment Water Quality Calibration

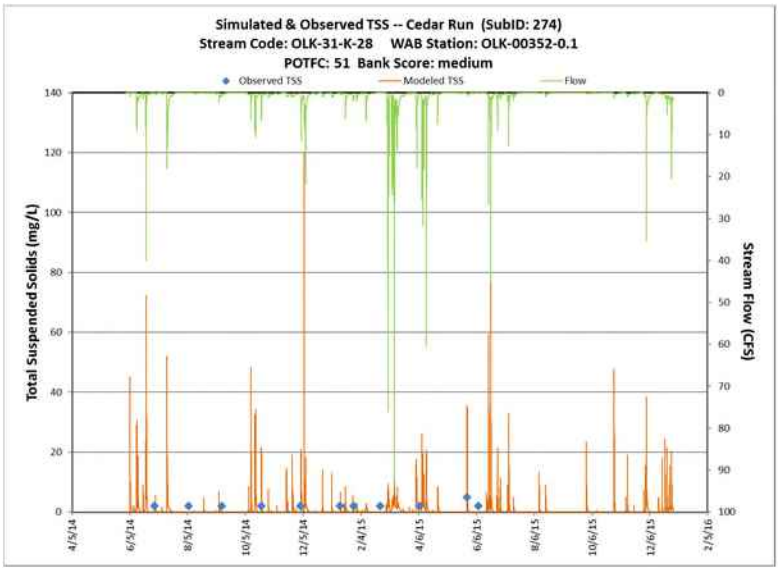
South Fork/Hughes River Watershed
South Fork/Hughes River OLK-31-K
Undisturbed impaired subwatershed – disturbance upstream



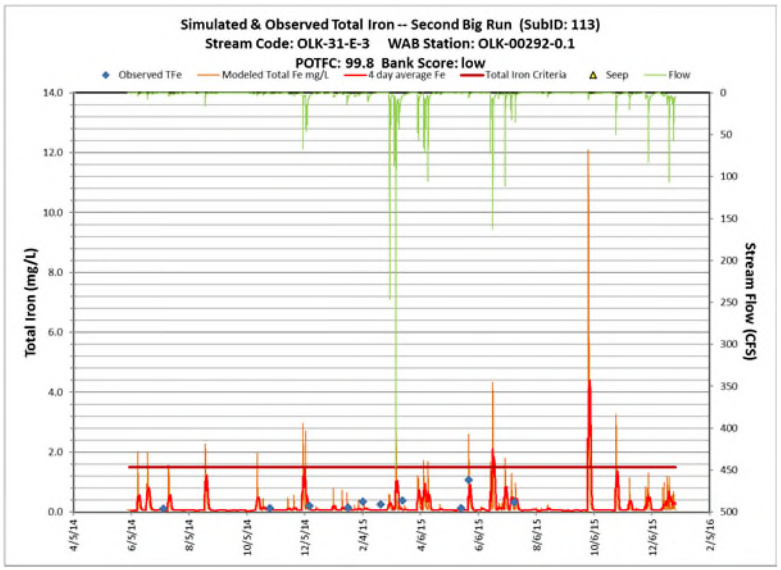


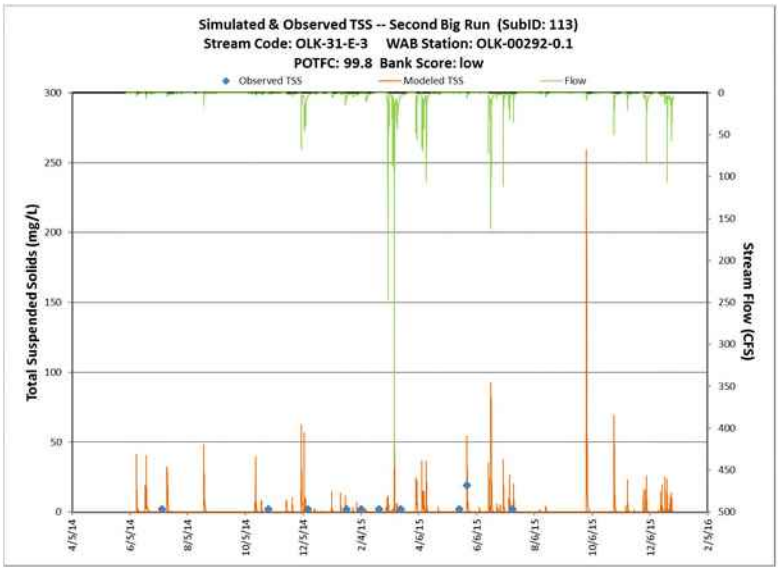
South Fork Hughes River Watershed
Cedar Run OLK-31-K-28
Unimpaired headwater
Minimal disturbance (0.8% Oil and Gas)



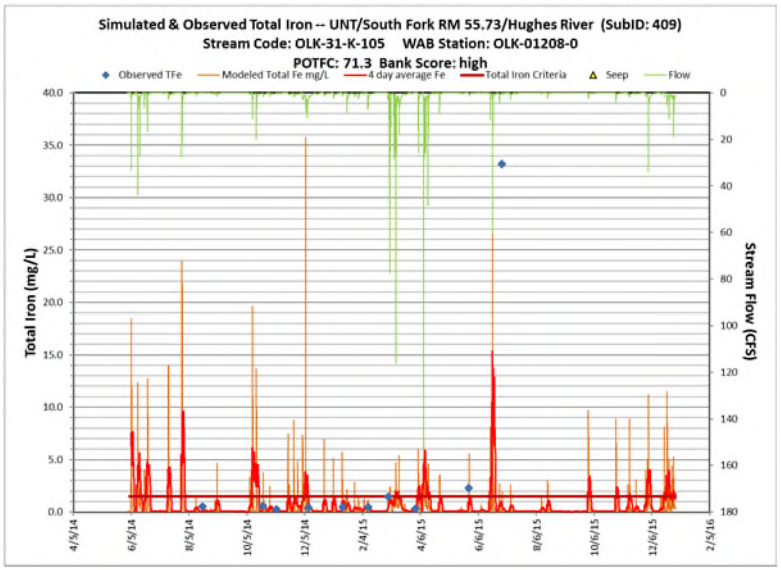


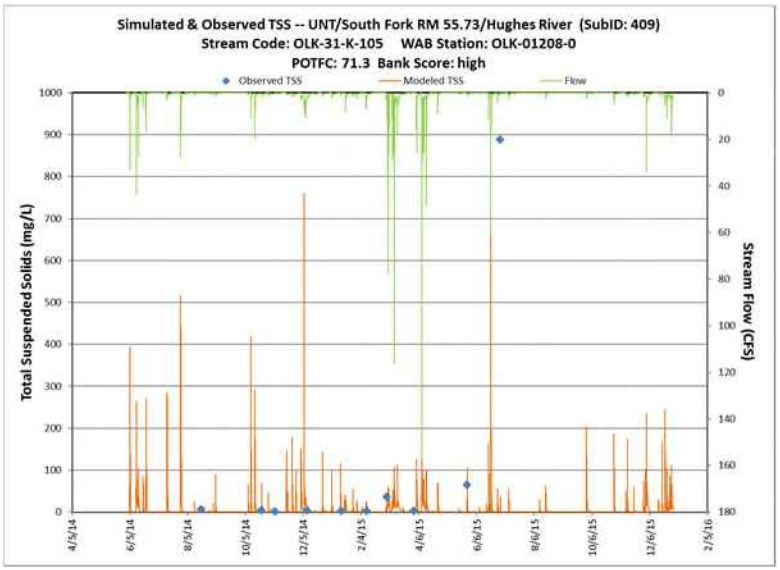
Goose Creek Watershed
Second Big Run OLK-31-E-3
Unimpaired headwater
Disturbance almost exclusively agricultural (7%)



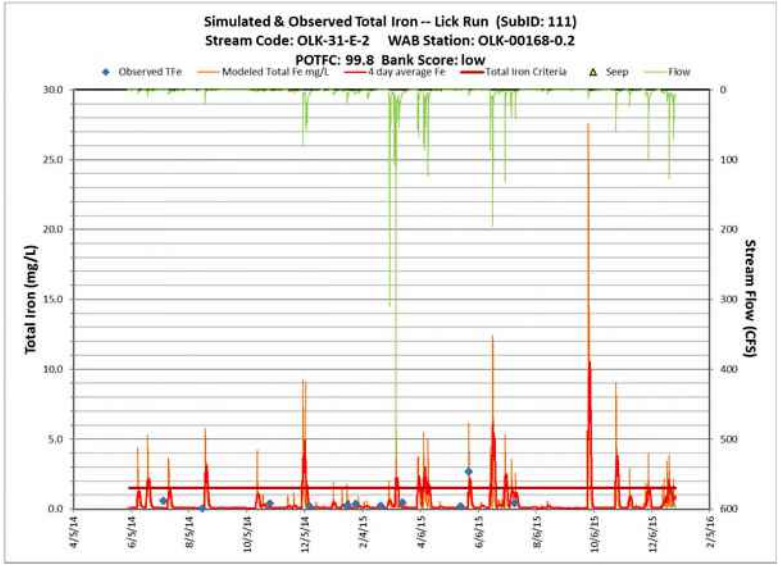


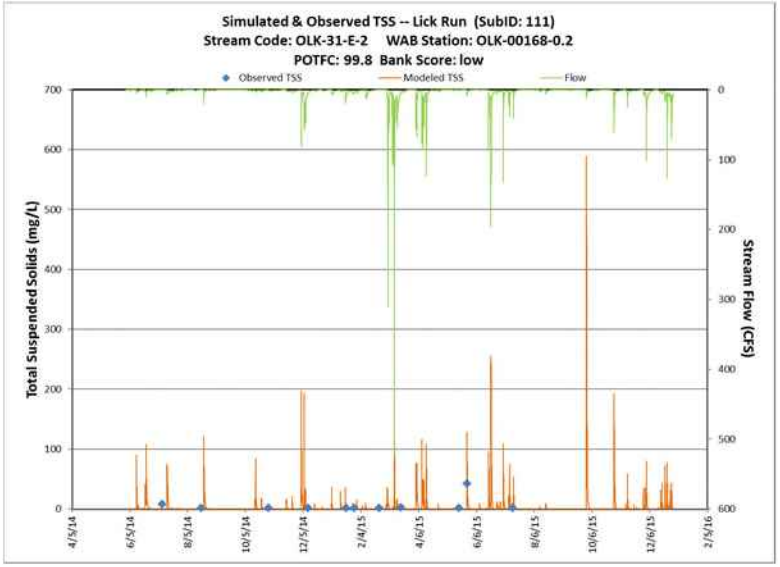
South Fork/Hughes River Watershed
UNT/South Fork RM 55.73/Hughes River OLK-31-K-105
Impaired headwater
Dominant disturbance: Oil and Gas and Pipeline Construction (8%)



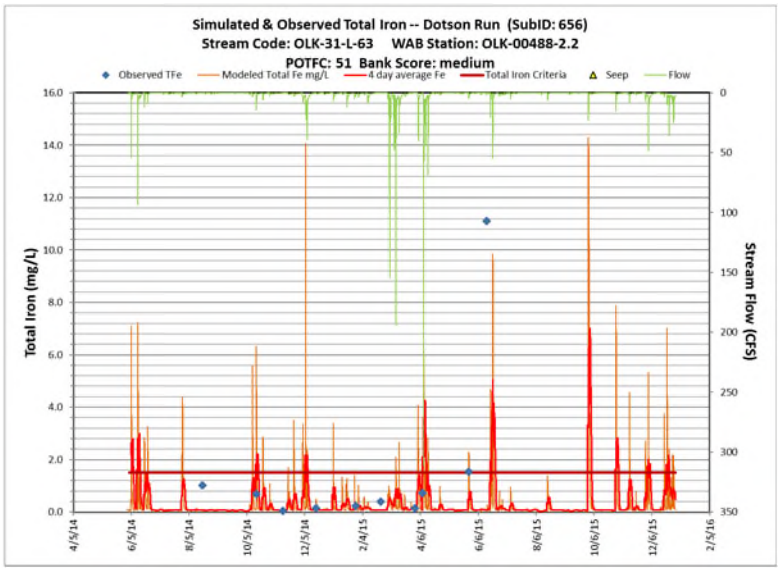


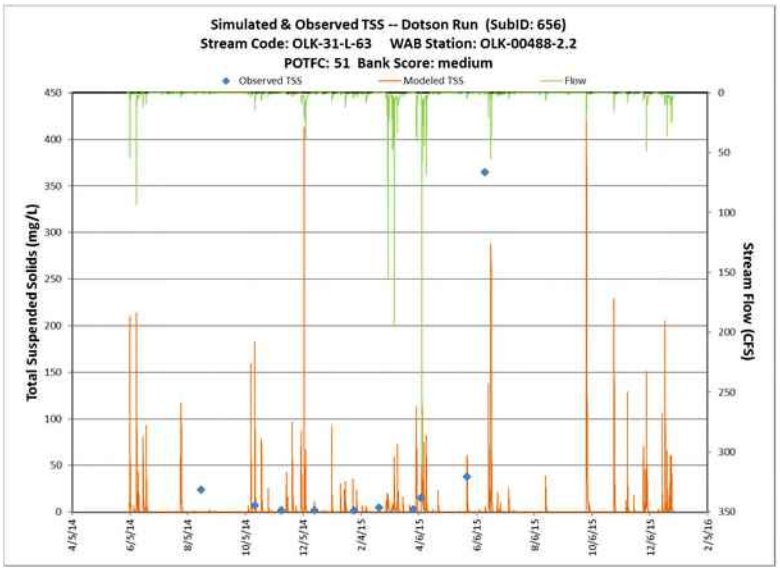
Goose Creek Watershed
Lick Run OLK-31-E-2
Unimpaired headwater
Dominant disturbance: 11% Harvested Forest





North Fork/Hughes River Watershed
Dotson Run OLK-31-L-63
Impaired headwater.
Mixed disturbance (agriculture 5%, harvested forest 3%, oil and gas 7%, pipeline construction 3%)





Goose Creek Watershed
Oil Spring Run OLK-31-E-11
Impaired headwater
Dominant disturbance: urban/residential (1.4%)