Summary of Alum Creek storm event,
Measured upstream above Steamboat Ditch influence and Downstream, just above the Truckee River confluence. November 28-29, 2012

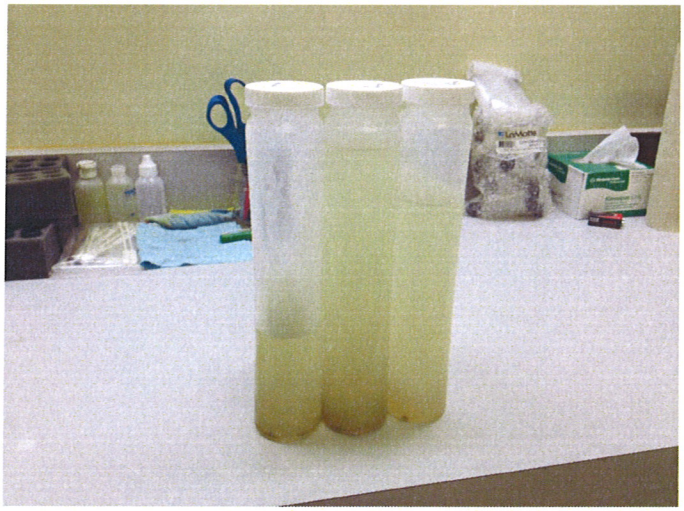
A storm moved through the Reno area on November 28-29, 2012 which discharged into Alum Creek and pulsed even at the elusive upstream sampling site above Caughlin Parkway and Steamboat Ditch (Alum upstream). The Alum Creek watershed is small at 2,426 acres, and at the upper sampling point, the discharge from a single snow-rain storm event was short and steep. Staff caught the discharge for both sampling points, both above urbanization and Steamboat Ditch (Alum upstream), and below development just above Alum Creek's terminus (Alum downstream) during the November 28-29 event.

Alum upstream hydrograph discharge: The upstream site on Alum Creek is located above the influence of Steamboat Ditch, most of the urbanized area, and also the top road crossing over Alum Creek. With the rationale of seeking an "unimpaired" site to bracket development on the creek and identify the effects of urbanization, this was selected as the upper sampling point on Alum Creek. The addition of Alum Creek to the NV 303(d) Impaired Waters list in 2006, with eight constituents listed for the impairment, made an upstream sampling point fairly relevant in identifying the effects of urbanization and irrigation waters to this creek.

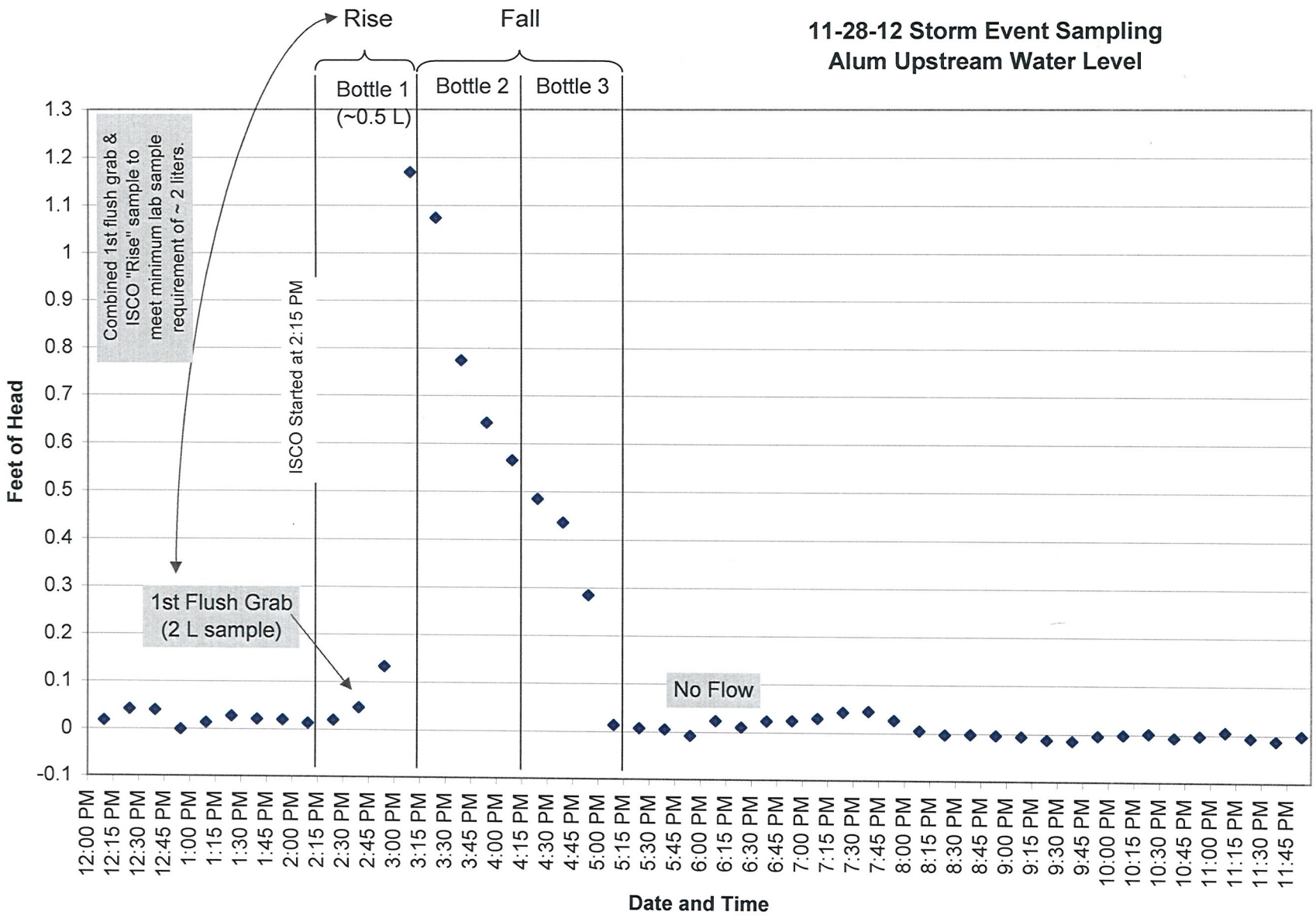
The Isco autosampler was located above the high water mark, above Caughlin Parkway and the Steamboat Ditch influence in the willows above the ambient upstream Alum Creek site. The actual site was selected for a deeper cross sectional area where autosampler wand would be submerged in the minimal amount of flow.

Looking at the discharge pattern, with 15 minute sampling intervals and a very short event response, staff were challenged to meet the 2L sample minimum for analytical needs. As a result, staff grabbed a "first flush" grab sample as soon as the channel started to flow, as the background flow was nonexistent. As soon as water ran down the channel, the Isco turned on to capture the hydrographic "rise" limb, which barely filled the sample bottle before the flows began abating. Staff combined these first flush and rise samples to make the 2L minimum for the "rise" sample. The "fall" sample was far easier to obtain, but the stream stopped discharging prior to the last time sequence and there was not a full 2L for this sample, either.

Staff also grabbed a representative sample from an outfall coming off Caughlin Parkway at the Rise limb (30 minutes into the discharge) and into the stream below Steamboat Ditch. This was analyzed as a grab sample to give a comparison for roadway and private property runoff, compared to forest discharge and runoff. These results are provided with the upstream results as the "outfall grab."



Upstream composite sample bottles.


11-28-12 Storm Event Sampling
Alum Upstream Water Level
Rise
Fall
Bottle 1
(~0.5 L)
Bottle 2
Bottle 3
Combined 1st flush grab & ISCO "Rise" sample to meet minimum lab sample requirement of ~ 2 liters.
ISCO Started at 2:15 PM
1st Flush Grab
(2 L sample)
No Flow
Feet of Head
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
12:00 PM
12:15 PM
12:30 PM
12:45 PM
1:00 PM
1:15 PM
1:30 PM
1:45 PM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
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9:00 PM
9:15 PM
9:30 PM
9:45 PM
10:00 PM
10:15 PM
10:30 PM
10:45 PM
11:00 PM
11:15 PM
11:30 PM
11:45 PM
Date and Time

Downstream hydrograph: The downstream site on Alum Creek is located above the pedestrian bridge at the bottom end of Alum Creek, just above its confluence with the Truckee River. This site was among the turf area of Caughlin Ranch HOA, above the City of Reno property line and the pedestrian footbridge. With an intention to bracket the urbanized area with sampling sites and identify the effects of urban runoff, this was selected as the downstream point on Alum Creek.

The Isco autosampler was located above the high water mark on Alum Creek, tethered to a large Spruce tree with the sampling line running across the turf. This site is upstream of the usual sampling site, but was more appropriate due to channel incision and a clean creek cross section for consistent water sampling by the Isco. The stilling well installed by UNR (at the usual ambient sampling site) has developed some issues as the stream has been widening and meandering around the staff gage plate/post over the last bit of time, rendering the gage useless for this event.

Again striving to meet the 2L minimum sample volume, staff combined bottles 8 and 9 for the Peak sample, sacrificing first flush contaminant accuracy that may have resulted from 8 being in the Rise sample for the volume needed. The photo speaks to the dilemma. Bottles 12-16 appeared to be a longer lasting discharge, and higher for background levels, and were not used. After the battery died in the Isco around 0200, staff decided to use bottles 17-19 for background 2 levels since bottles 20-24 were not filled.

Sample splits
Alum Creek upstream
11/28/2012
STORM

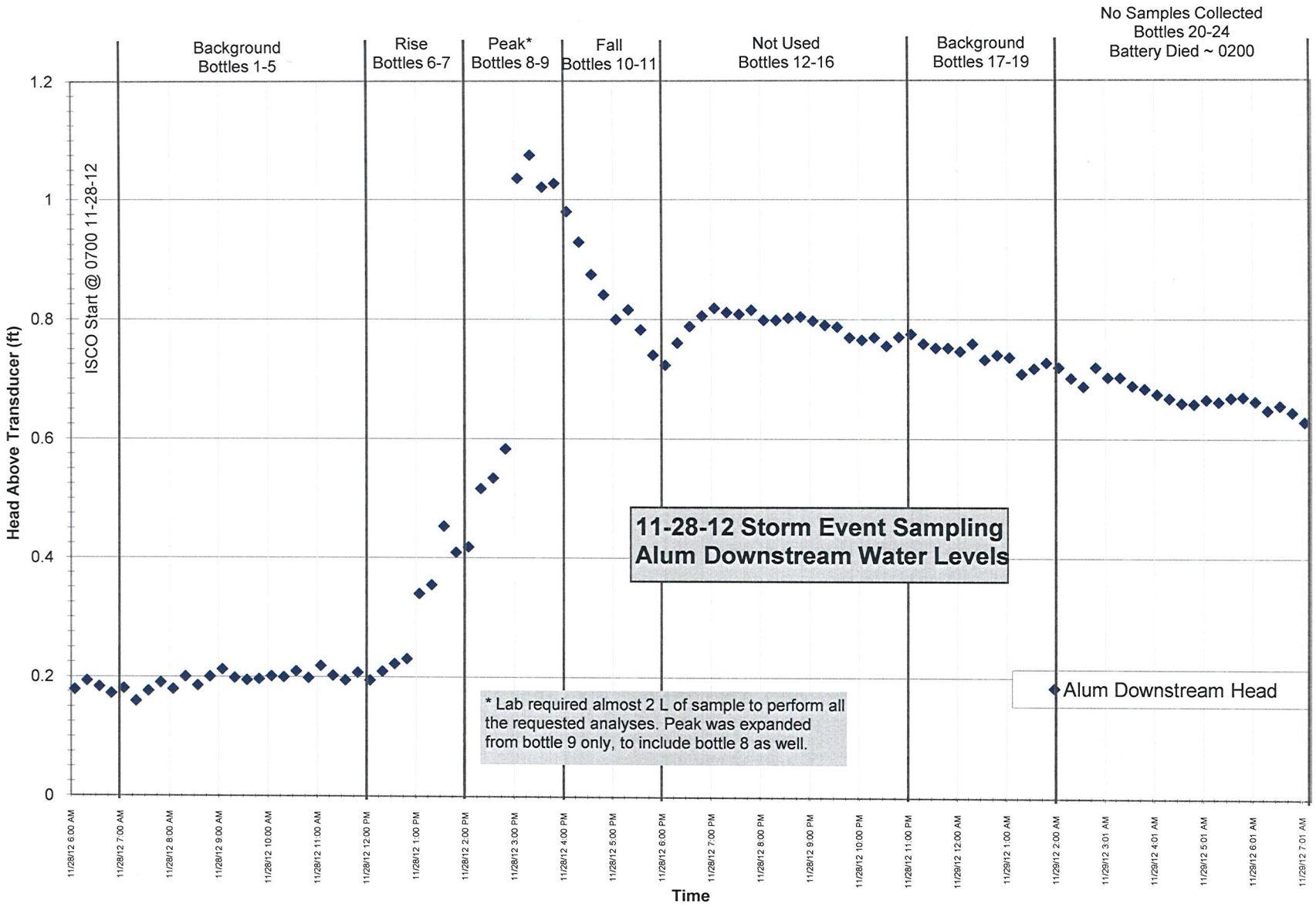
Lab Sample #	Hydrograph	Bottle #	Time Range	Day and Date	Notes	
	Background: no flow	0	1:00 pm - 2:00 pm	Weds 11/28/12	Started ISCO 11/28/12 12:00 pm	
1	First flush grab	1a	2:45 PM		grab sample	1a & 1b were combined to meet 2L sample vol. required by lab
	Rise	1b	2:15-3:15 pm		Isco sample (.5L)	
2	Fall	2	3:15-4:15 pm			
		3	4:15 pm - 5:15 pm			

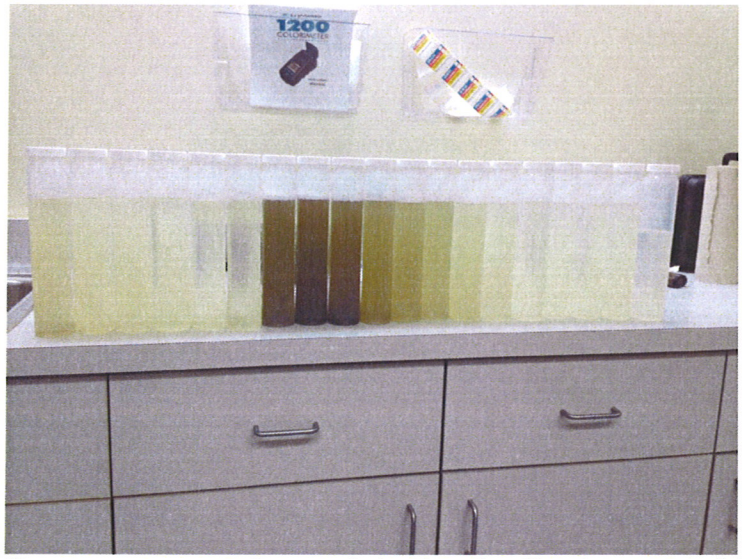
*First flush-rise: Lab required almost 2L of sample to perform requested analyses.
Grab sample and rise (isco) were combined to meet 2L sample required by lab.

Alum Creek up, upstream Outfall
11/28/2012
STORM

Lab Sample #	Hydro Limb	Bottle #	Time Range	Day and Date	Notes
Outfall grab	Rise: from SW		245 pm	Weds 11/28/12	

This sample was taken at an outfall from Caughlin Parkway at its highest reach crossing the creek.
Our goal was to attempt to qualify the effects of street storm water quality against background open space runoff water quality.


Background
Bottles 1-5
Rise
Bottles 6-7
Peak*
Bottles 8-9
Fall
Bottles 10-11
Not Used
Bottles 12-16
Background
Bottles 17-19
No Samples Collected
Bottles 20-24
Battery Died ~ 0200
ISCO Start @ 0700 11-28-12
Head Above Transducer (ft)
1.2
1
0.8
0.6
0.4
0.2
0
11-28-12 Storm Event Sampling
Alum Downstream Water Levels
* Lab required almost 2 L of sample to perform all the requested analyses. Peak was expanded from bottle 9 only, to include bottle 8 as well.
Alum Downstream Head
11/28/12 6:00 AM
11/28/12 7:00 AM
11/28/12 8:00 AM
11/28/12 9:00 AM
11/28/12 10:00 AM
11/28/12 11:00 AM
11/28/12 12:00 PM
11/28/12 1:00 PM
11/28/12 2:00 PM
11/28/12 3:00 PM
11/28/12 4:00 PM
11/28/12 5:00 PM
11/28/12 6:00 PM
11/28/12 7:00 PM
11/28/12 8:00 PM
11/28/12 9:00 PM
11/28/12 10:00 PM
11/28/12 11:00 PM
11/29/12 12:00 AM
11/29/12 1:00 AM
11/29/12 2:00 AM
11/29/12 3:01 AM
11/29/12 4:01 AM
11/29/12 5:01 AM
11/29/12 6:01 AM
11/29/12 7:01 AM
Time



Downstream composite sample bottles visualize the nature of the hydrograph with regards to pollutants. Results of the splits and composites showed high TDS in the Rise sample (bottles 6-7) compared to the high TSS levels in the Peak sample (bottles 8-9).

Sample splits
Alum Creek downstream
11/28/12-11/29/12
STORM

Lab Sample #	Hydrograph	Bottle #	Time Range	Day and Date	Notes
1	Background	1	7:00 am - 8:00 am	Weds 11/28/12	Started ISCO 11/28/12 7:00 am
		2	8:00 am - 9:00 am		
		3	9:00 am - 10:00 am		
		4	10:00 am - 11:00 am		
		5	11:00 am - 12:00 pm		
2	Rise	6	12:00 pm - 1:00 pm	11/28/2012	
		7	1:00 pm - 2:00 pm		
3	Peak*	8	2:00 pm - 3:00 pm		
		9	3:00 pm - 4:00 pm		
4	Fall	10	4:00 pm - 5:00 pm		
		11	5:00 pm - 6:00 pm		
	Unused	12	6:00 pm - 7:00 pm	11/28/2012	
		13	7:00 pm - 8:00 pm		
		14	8:00 pm - 9:00 pm		
		15	9:00 pm - 10:00 pm		
		16	10:00 pm - 11:00 pm		
5	Background 2	17	11:00 pm - 12:00 am	11/29/2012	
		18	12:00 am - 1:00 am		
		19	1:00 am - 2:00 am		
		20		11/29/2012	Battery died around 2am, no samples collected in bottles 20-24.
		21			
		22			
		23			
		24			

*Peak: Lab required almost 2L of sample to perform requested analyses. Peak was expanded to include bottles 8 and 9.

Sample results
Alum Creek upstream
11/28/12-11/29/12

Lab Sample #	Hydro Limb	Turbidity (NTU)	TSS (mg/L)	TDS (mg/L)	E. Coli ** (mpn/100 mL)	Total Coliform ** (mpn/100 mL)	Iron (Fe) (mg/L)	SO4 (mg/L)	Nitrite (N02) (mg/L)	Nitrate (NO3) (mg/L)	Ortho-P (mg/L)	TKN (mg/L)	TN (mg/L)
1	Rise	20	590	240	>2419.2	>2419.2	17	33	<0.25	<0.25	<0.50	4	5.4
2	Fall	26	170	46	>2419.2	>2419.2	7.3	11	<0.25	<0.25	<0.50	0.94	0.94

** Bacterial tests have a limited holding time and samples were received outside of holding time. Coliform tests shall be considered qualitative.

Alum Creek upstream outfall (near Steamboat Ditch input, runoff coming from upper Caughlin Parkway as nps background)
11/28/2012

Lab Sample #	Hydro Limb	Turbidity (NTU)	TSS (mg/L)	TDS (mg/L)	E. Coli ** (mpn/100 mL)	Total Coliform ** (mpn/100 mL)	Iron (Fe) (mg/L)	SO4 (mg/L)	Nitrite (N02) (mg/L)	Nitrate (NO3) (mg/L)	Ortho-P (mg/L)	TKN (mg/L)	TN (mg/L)
Outfall grab	245 pm	6.5	74	20	41.9	>2419.2	1.6	1.3	<0.25	<0.25	<0.50	0.78	0.78

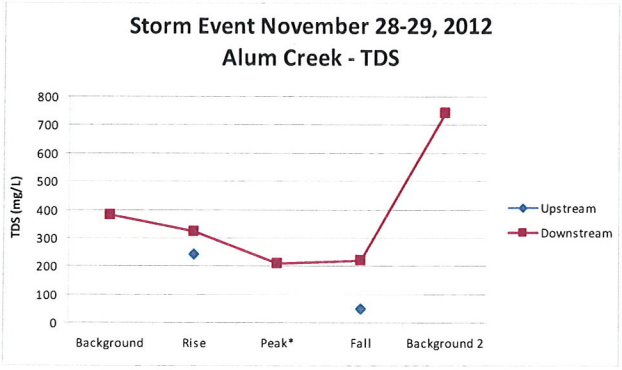
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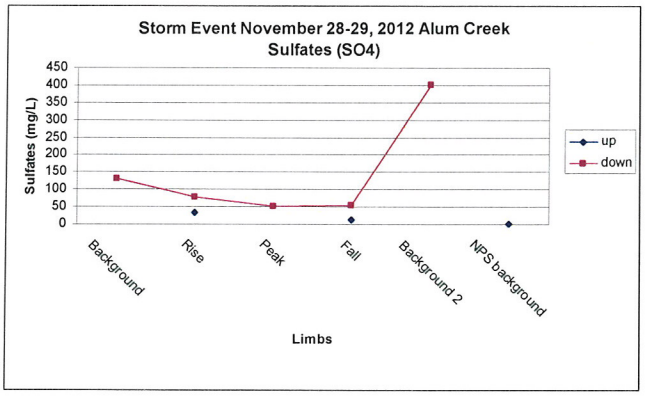
Sample results
Alum Creek downstream
11/28/12-11/29/12

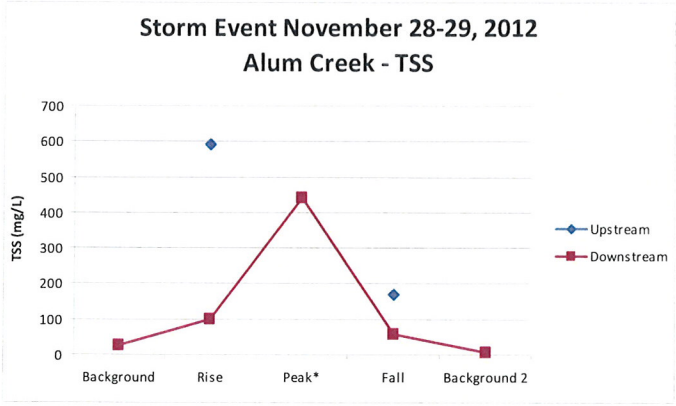
Lab Sample #	Hydro Limb	Turbidity (NTU)	TSS (mg/L)	TDS (mg/L)	E. Coli ** (mpn/100 mL)	Total Coliform ** (mpn/100 mL)	Iron (Fe) (mg/L)	SO4 (mg/L)	Nitrite (N02) (mg/L)	Nitrate (NO3) (mg/L)	Ortho-P (mg/L)	TKN (mg/L)	TN (mg/L)
1	Background	4.1	26	380	38.2	1553.1	2.3	130	<0.25	<0.25	<0.50	0.46	0.46
2	Rise	14	100	320	209.8	>2419.2	3.3	77	<0.25	<0.25	<0.50	1.6	1.6
3	Peak*	22	440	210	1732.9	>2419.2	20	49	<0.25	0.35	<0.50	1.7	2
4	Fall	15	57	220	1046.2	>2419.2	2.1	52	<0.25	2.1	<0.50	2	4
5	Background 2	3	5.6	740	115.3	2419.2	0.95	400	<0.25	<0.25	<0.50	0.52	0.52

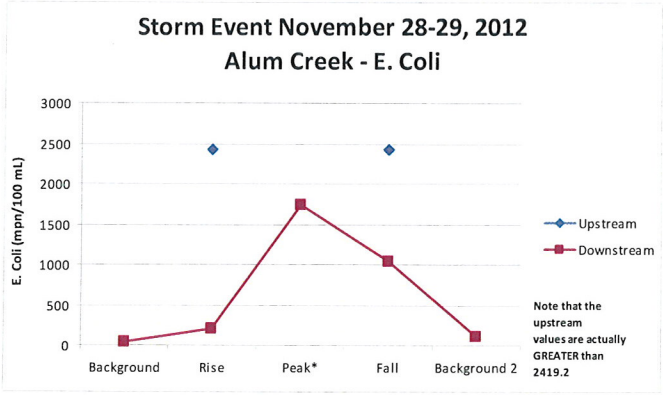
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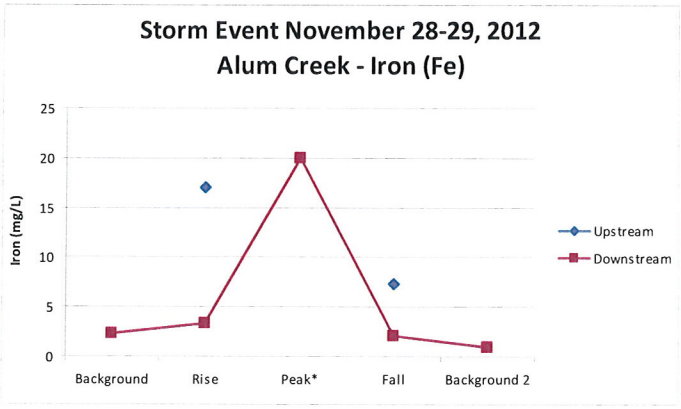
Comparative storm discharge water quality results

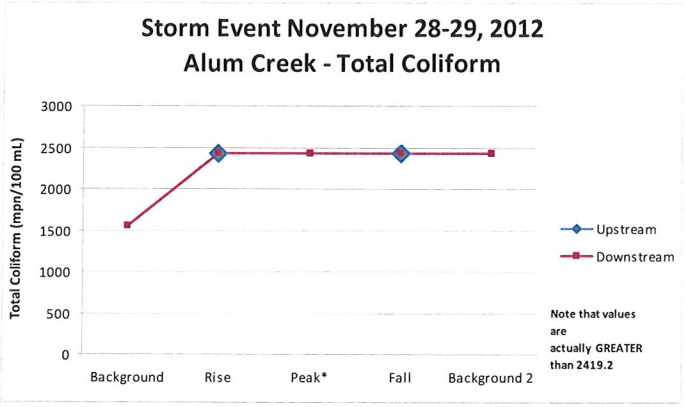


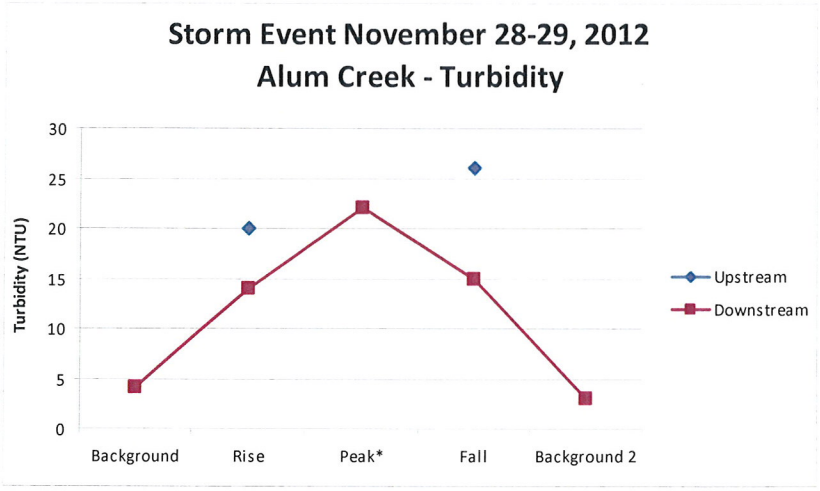


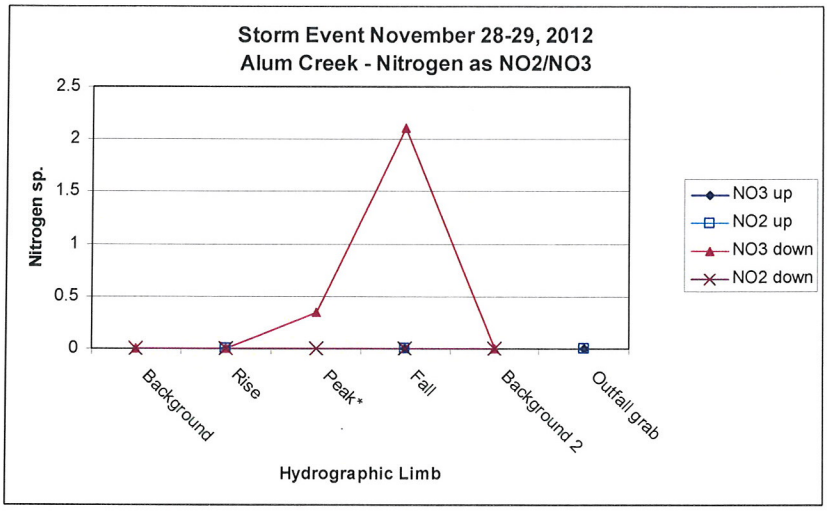

Storm Event November 28-29, 2012
Alum Creek - TSS
TSS (mg/L)
700
600
500
400
300
200
100
0
Background
Rise
Peak*
Fall
Background 2
Upstream
Downstream

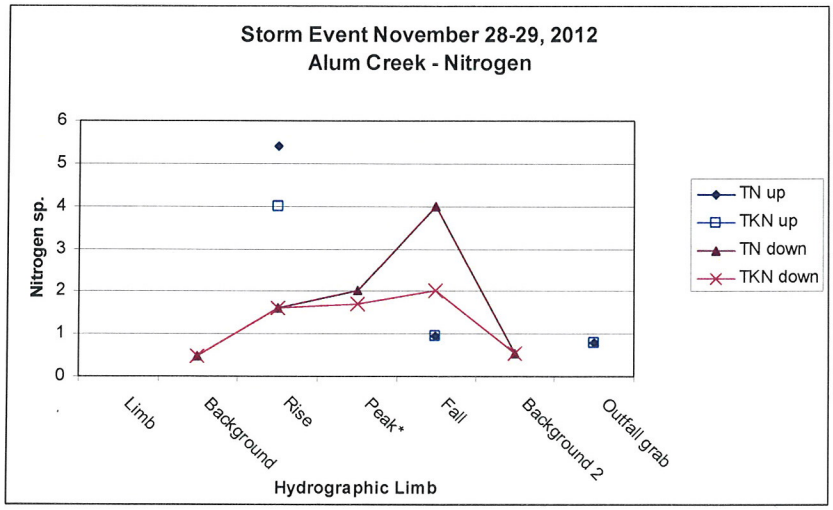

Storm Event November 28-29, 2012
Alum Creek - E. Coli
E. Coli (mpn/100 mL)
3000
2500
2000
1500
1000
500
0
Background
Rise
Peak*
Fall
Background 2
Upstream
Downstream
Note that the upstream values are actually GREATER than 2419.2

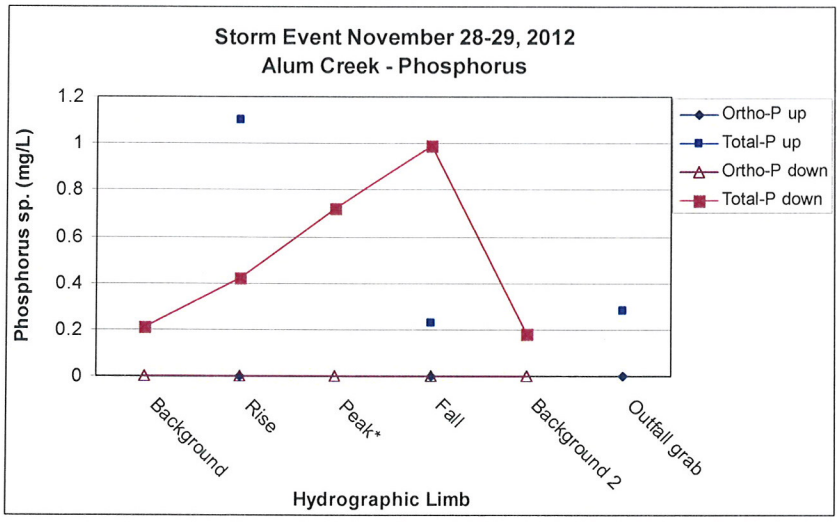

Storm Event November 28-29, 2012
Alum Creek - Iron (Fe)
Iron (mg/L)
25
20
15
10
5
0
Background
Rise
Peak*
Fall
Background 2
Upstream
Downstream


Storm Event November 28-29, 2012
Alum Creek - Total Coliform
Total Coliform (mpn/100 mL)
3000
2500
2000
1500
1000
500
0
Background
Rise
Peak*
Fall
Background 2
Upstream
Downstream
Note that values are actually GREATER than 2419.2


Storm Event November 28-29, 2012
Alum Creek - Turbidity
Turbidity (NTU)
30
25
20
15
10
5
0
Background
Rise
Peak*
Fall
Background 2
Upstream
Downstream


Storm Event November 28-29, 2012
Alum Creek - Nitrogen as NO2/NO3
Nitrogen sp.
2.5
2
1.5
1
0.5
0
Background
Rise
Peak*
Fall
Background 2
Outfall grab
Hydrographic Limb
NO3 up
NO2 up
NO3 down
NO2 down


Storm Event November 28-29, 2012
Alum Creek - Nitrogen
Nitrogen sp.
6
5
4
3
2
1
0
Limb
Background
Rise
Peak*
Fall
Background 2
Outfall grab
Hydrographic Limb
TN up
TKN up
TN down
TKN down


Storm Event November 28-29, 2012
Alum Creek - Phosphorus
Phosphorus sp. (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
Ortho-P up
Total-P up
Ortho-P down
Total-P down
Background
Rise
Peak*
Fall
Background 2
Outfall grab
Hydrographic Limb