Assessing linkages between stream water and bed sediment *E. coli* levels, and storm flow in agricultural watershed

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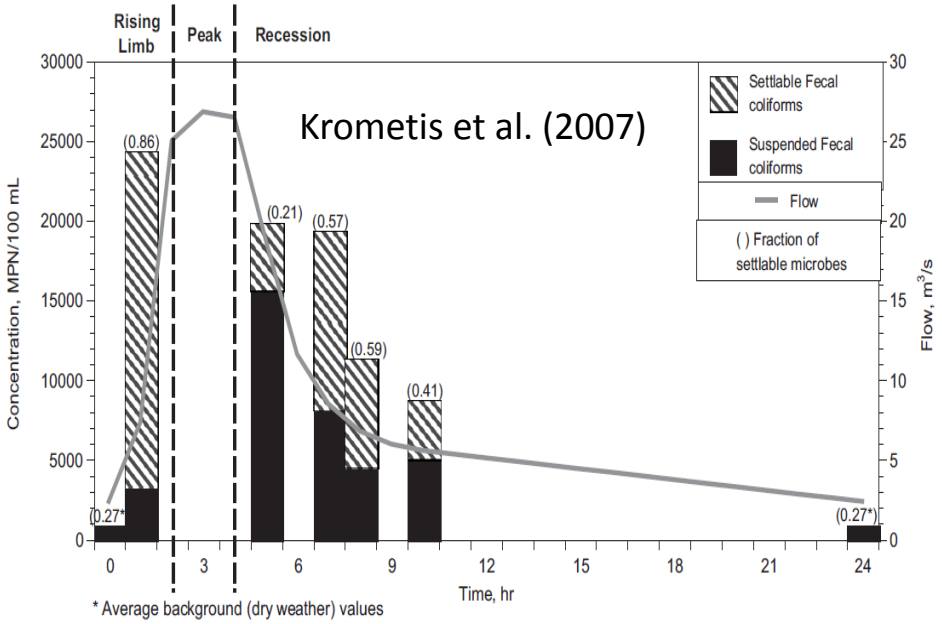
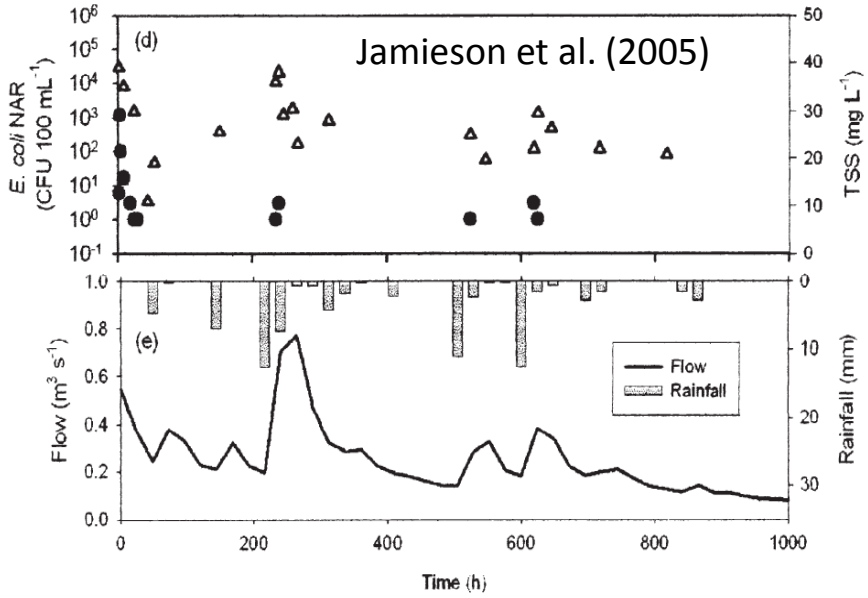
Introduction and review

- Elevated levels of pathogens or fecal indicator organisms (FIO) in streams are a major cause of water quality impairments.
- Pathogens impair more than 480,000 km of streams and 2 million ha of lakes in the United States (EPA, 2012).
- EPA's recommended geometric mean values of *E. coli* in fresh water are 126 CFU/100 ml.
- There is no criteria for *E. coli* levels during storrm flow.
- Information of *E. coli* levels in bed sediment is limited.
- Measured data of *E. coli* are are sporadic and limited.

Introduction and review

- Jamieson et al. (2005), Muirhead et al. (2004), and Krometis et al. (2007) studied *E. coli* levels during storm events.
- Muirhead et al. (2004) used artificial flooding
- Jamieson et al. (2005) used *E. coli* resistant to nalidixic acid.
- Krometis et al. (2007) studied water column *E. coli* variations





Goal and objectives

Goal

Improving understanding of *E. coli* levels in water column and bed sediment during storm events.

Objectives

- Quantifying *E. coli* levels in water column and bed sediment, and total suspended sediment (TSS) during storm flow
- Assessing relationships between *E. coli* levels in bed sediment and water column, TSS, and storm flow

Study Area

Total area: *592 sq km*

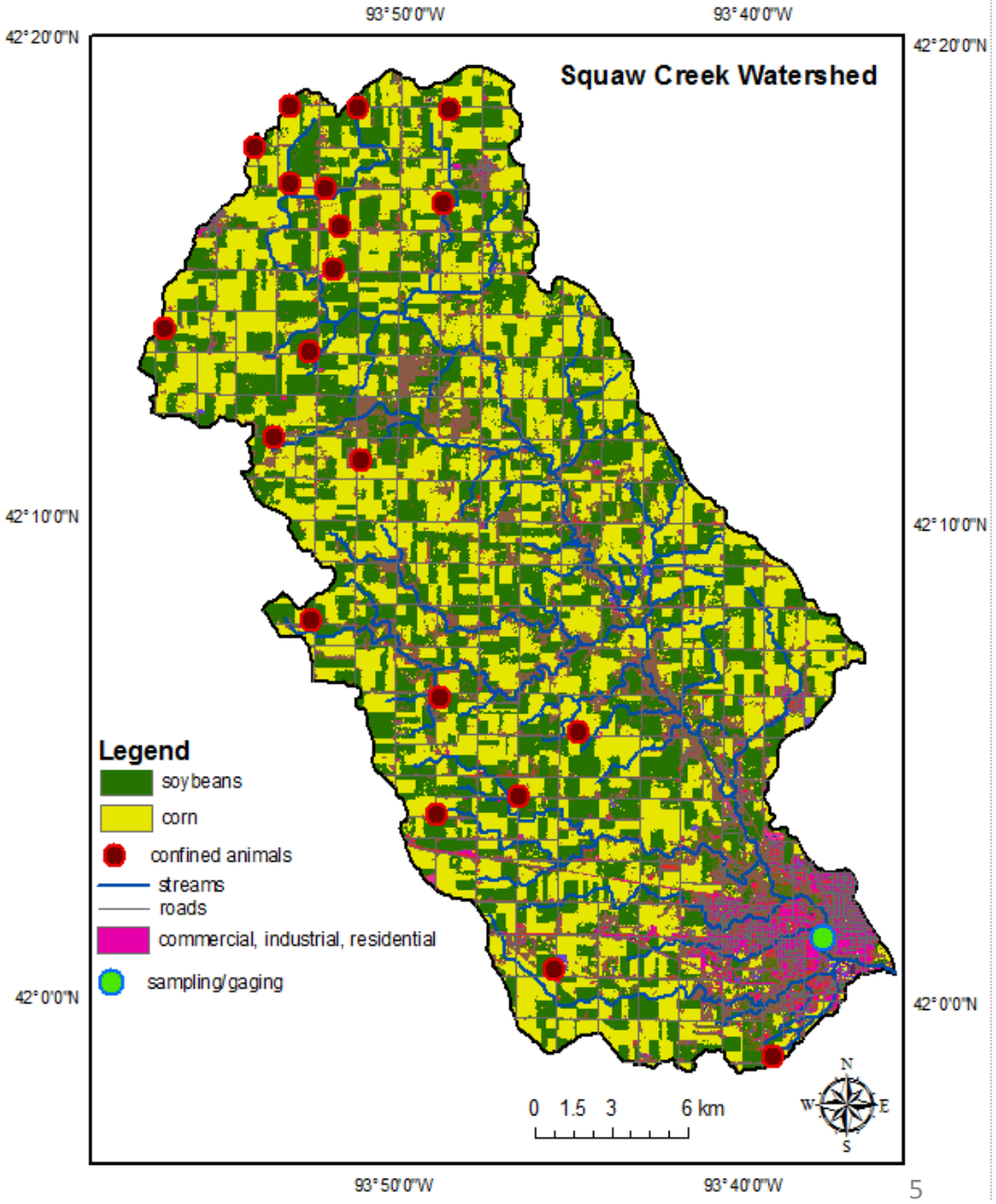
Basin perimeter: *134 km*

First order streams: *75*

Main channel length: *60 km*

Crop land area: *74%*

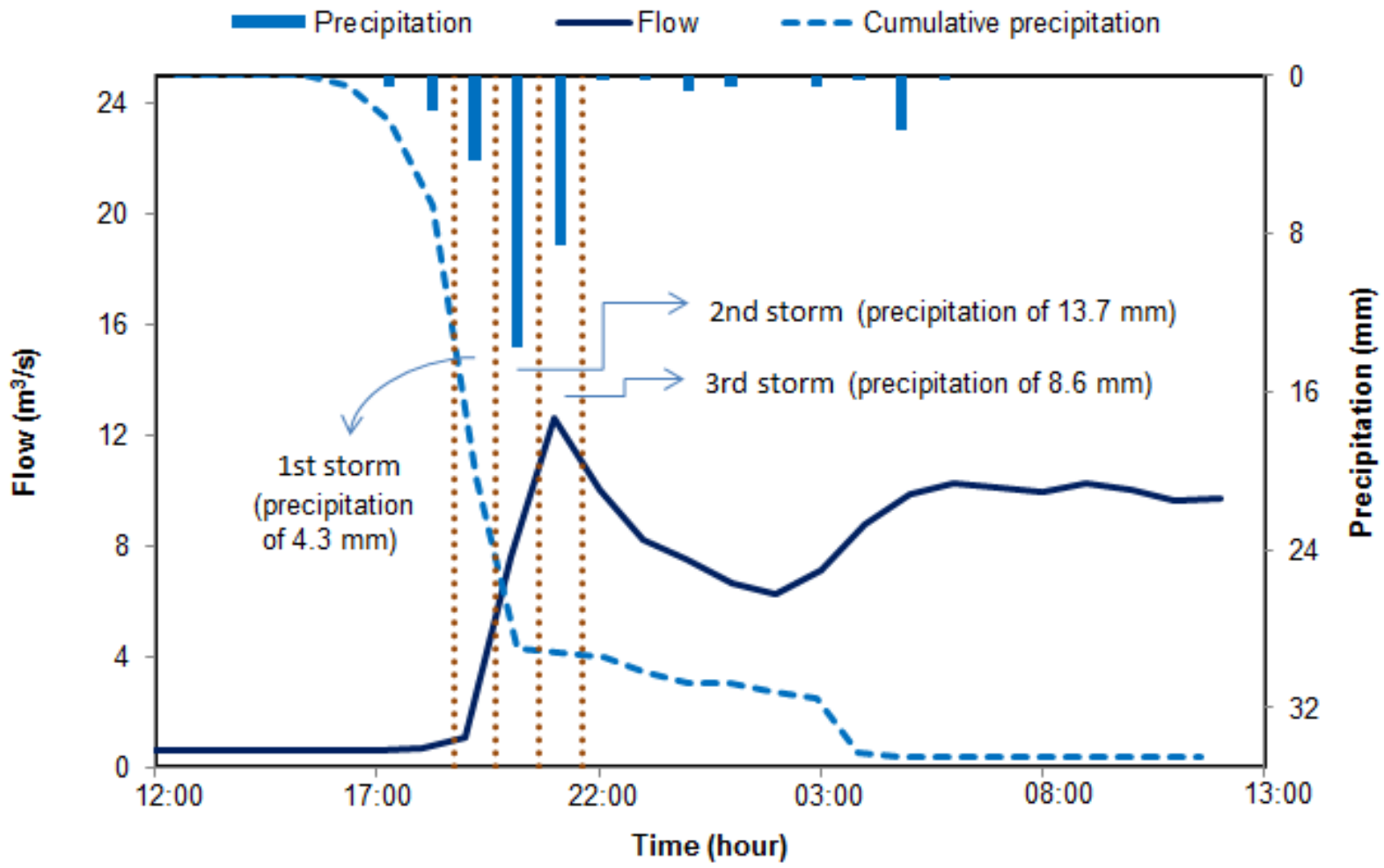
CAFO units: 20



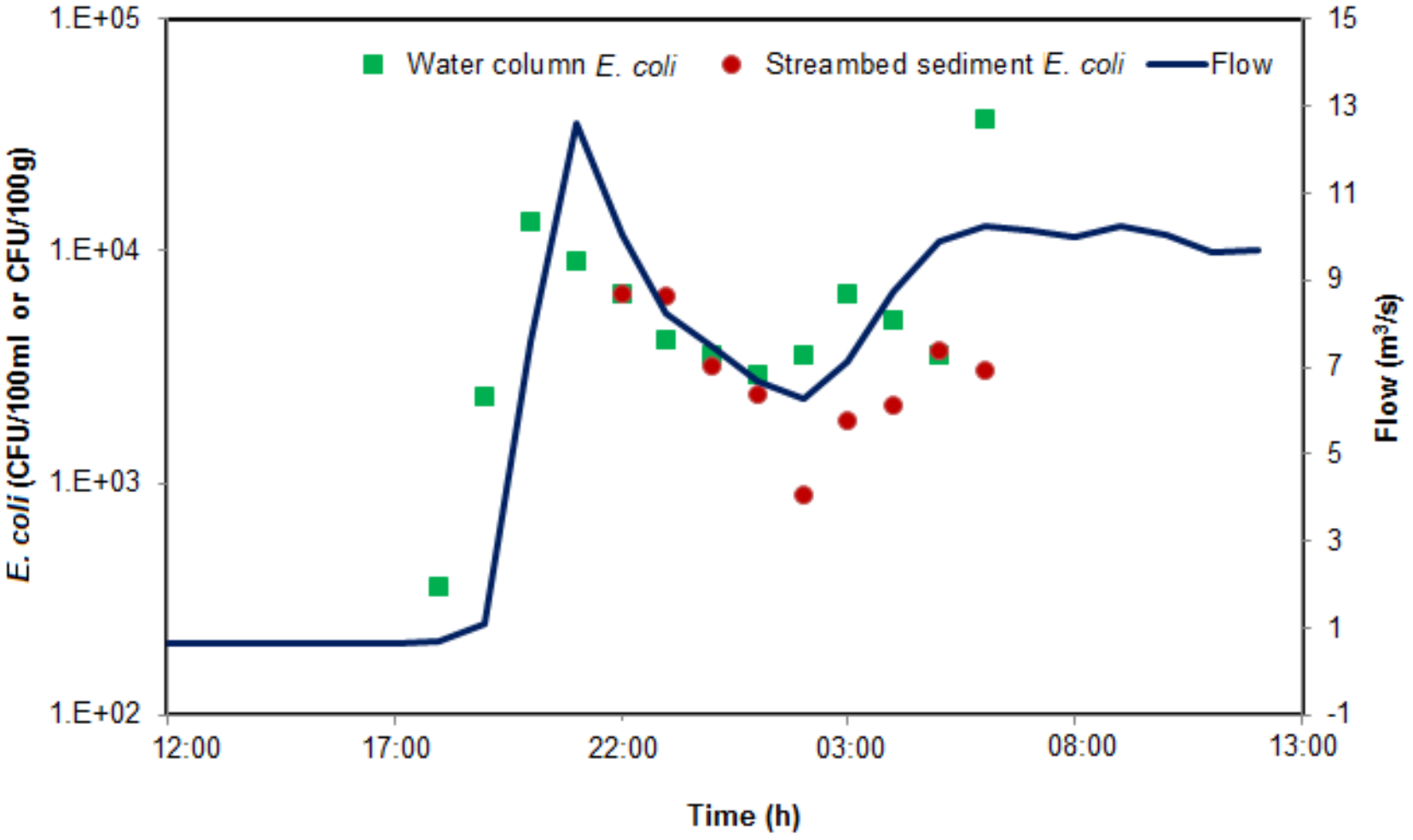
Measurements and data

1) E. coli levels in water column, 2) E. coli in sediment , 3) TSS, 4) grain size, 5) stream flow, and 6) precipitation

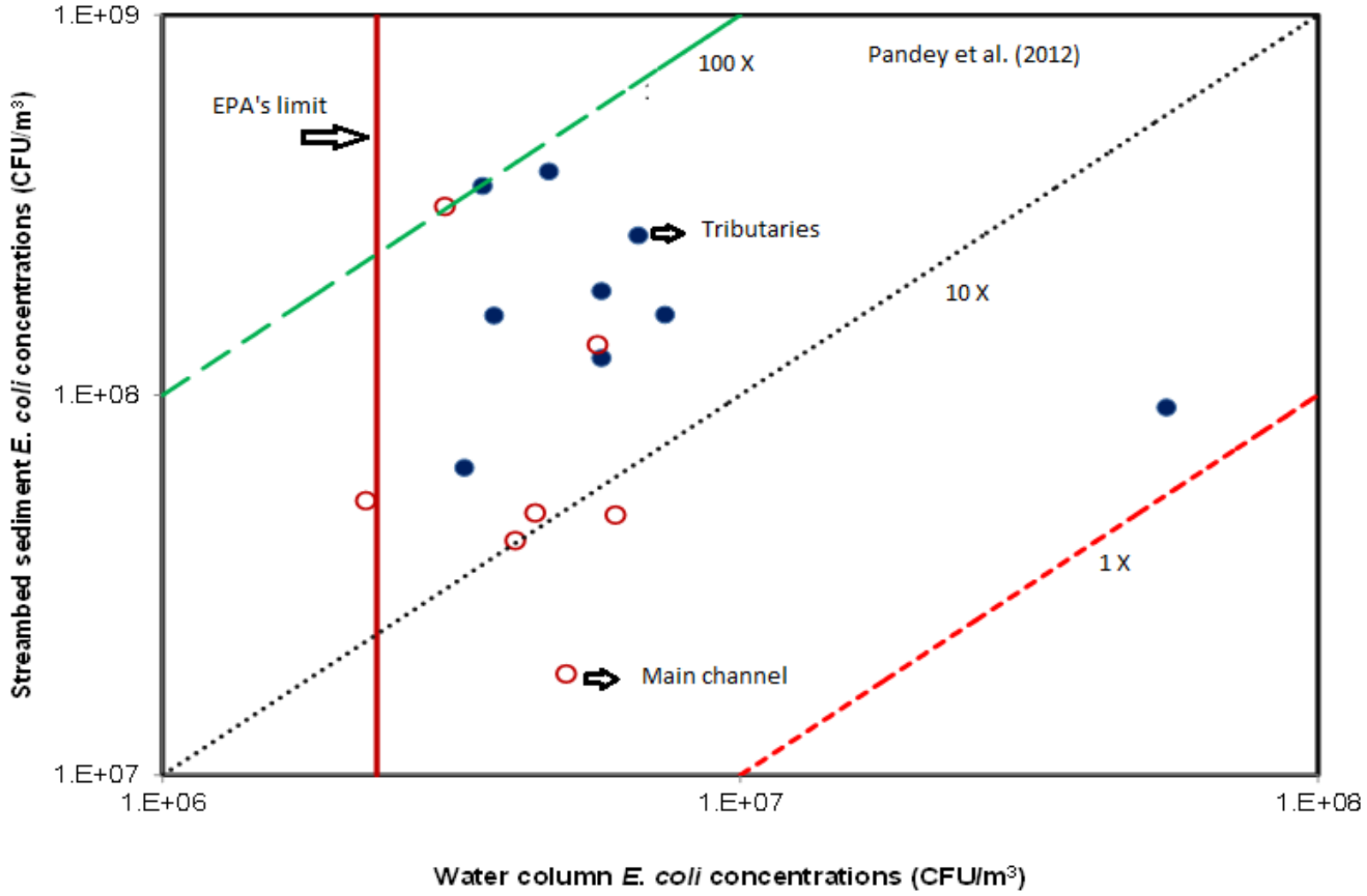
Results – flow and precipitation



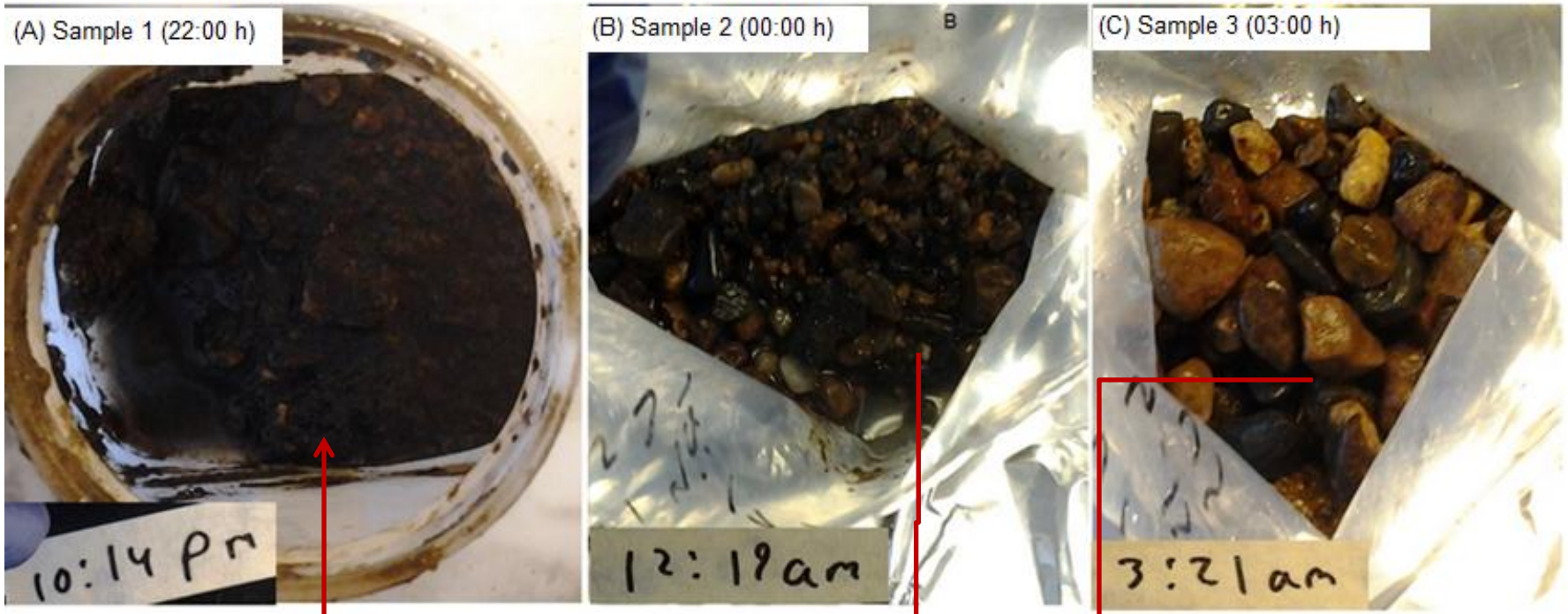
Results – *E. coli* levels in water and sediment



Results – *E. coli* ratio between water and sediment

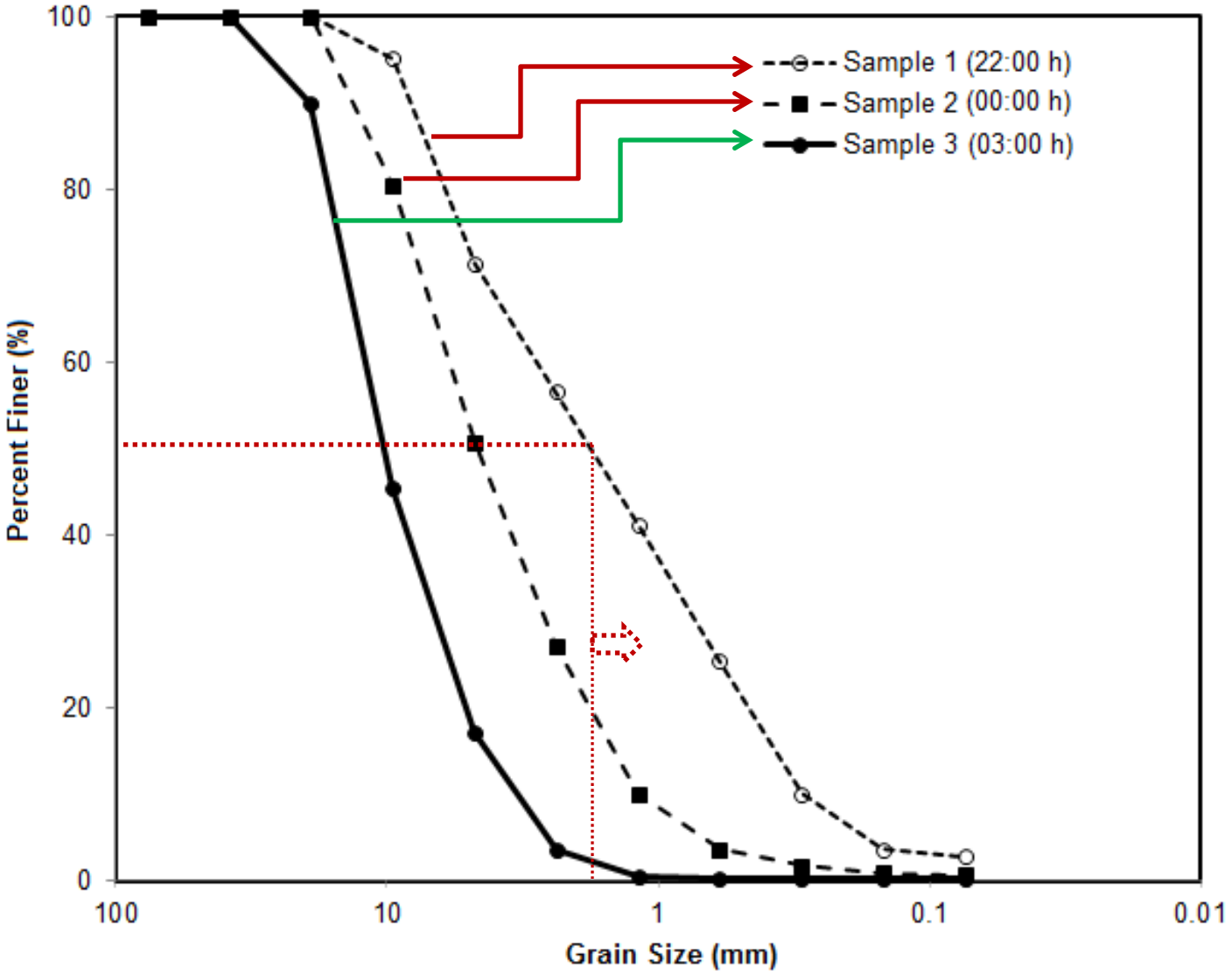


Results – Streambed sediment



Greater proportions of fine particles, and D_{10}

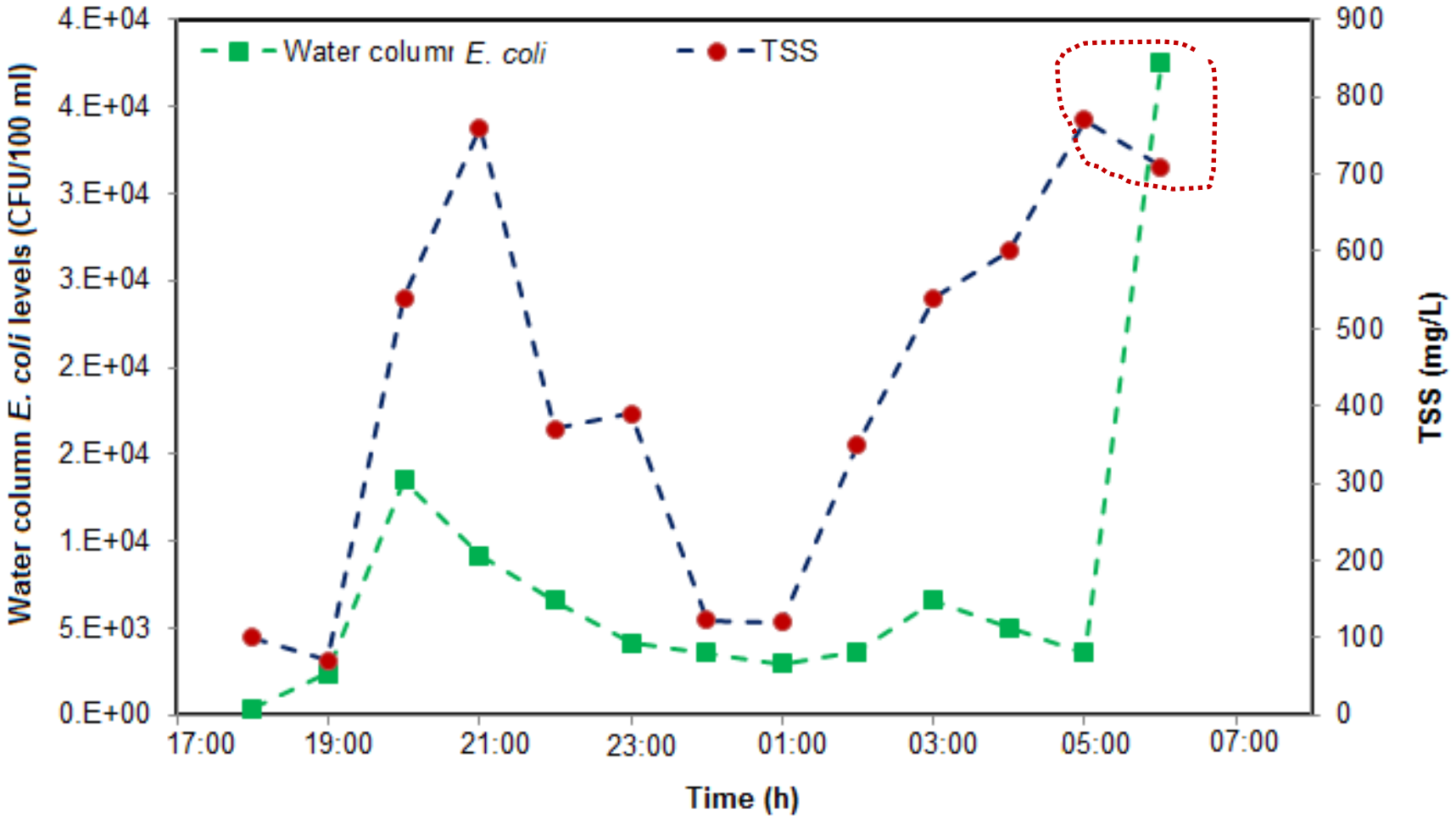
Results – Grain size



Results – Summary of water quality

Parameters	Mean	Median	S. dev.	Min.	Max.
Water E. coli (CFU/100 ml)	7598	4133	9593	360	37553
Bed sediment E. coli (CFU/100 g)	3355	3049	1955	897	6577
Stream flow (m^3/s)	7.4	7.5	3.4	0.68	12.6
Total suspended solids (TSS) (mg/L)	418	390	257	70	770

Results – relationships between *E. coli* levels and TSS



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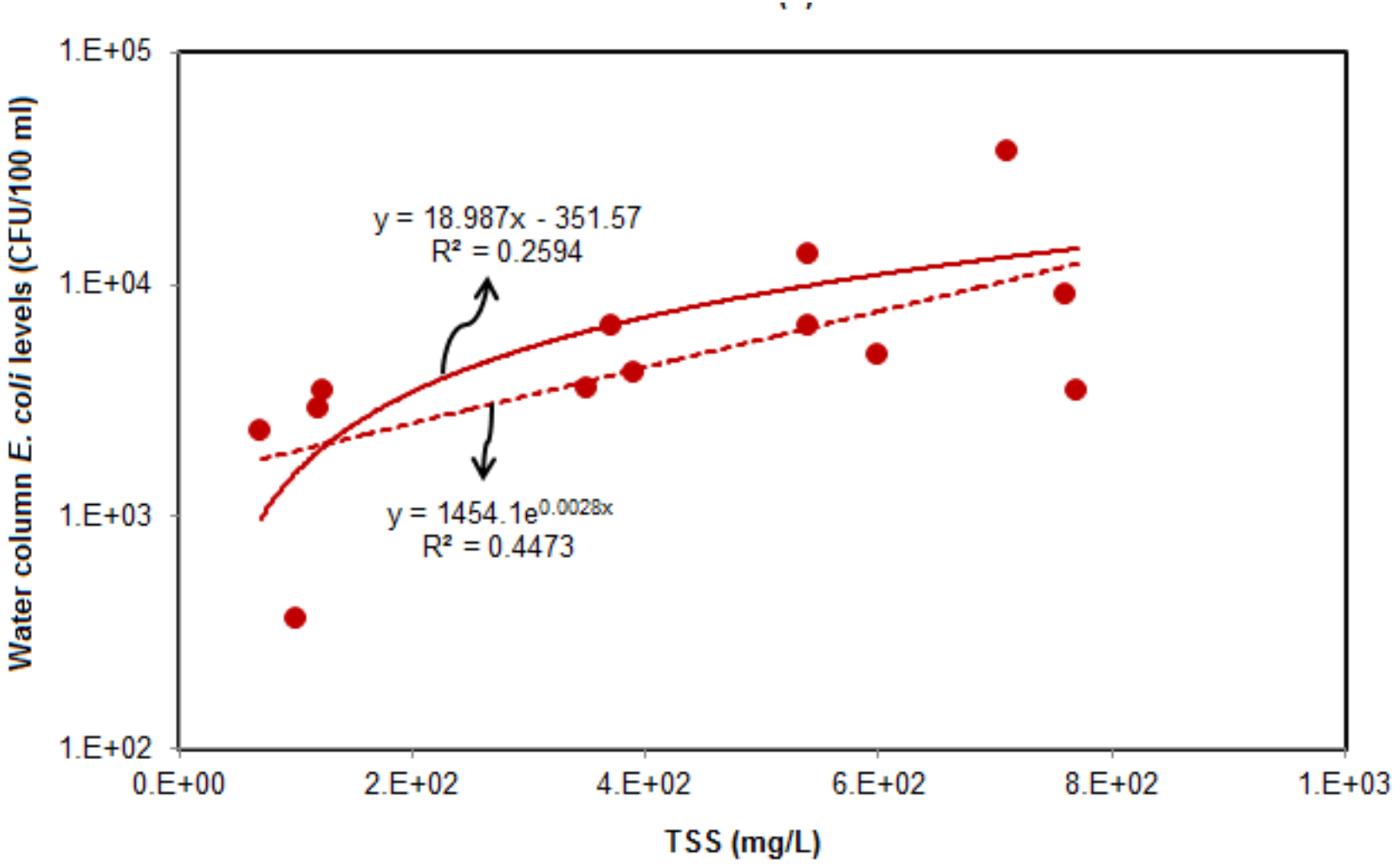
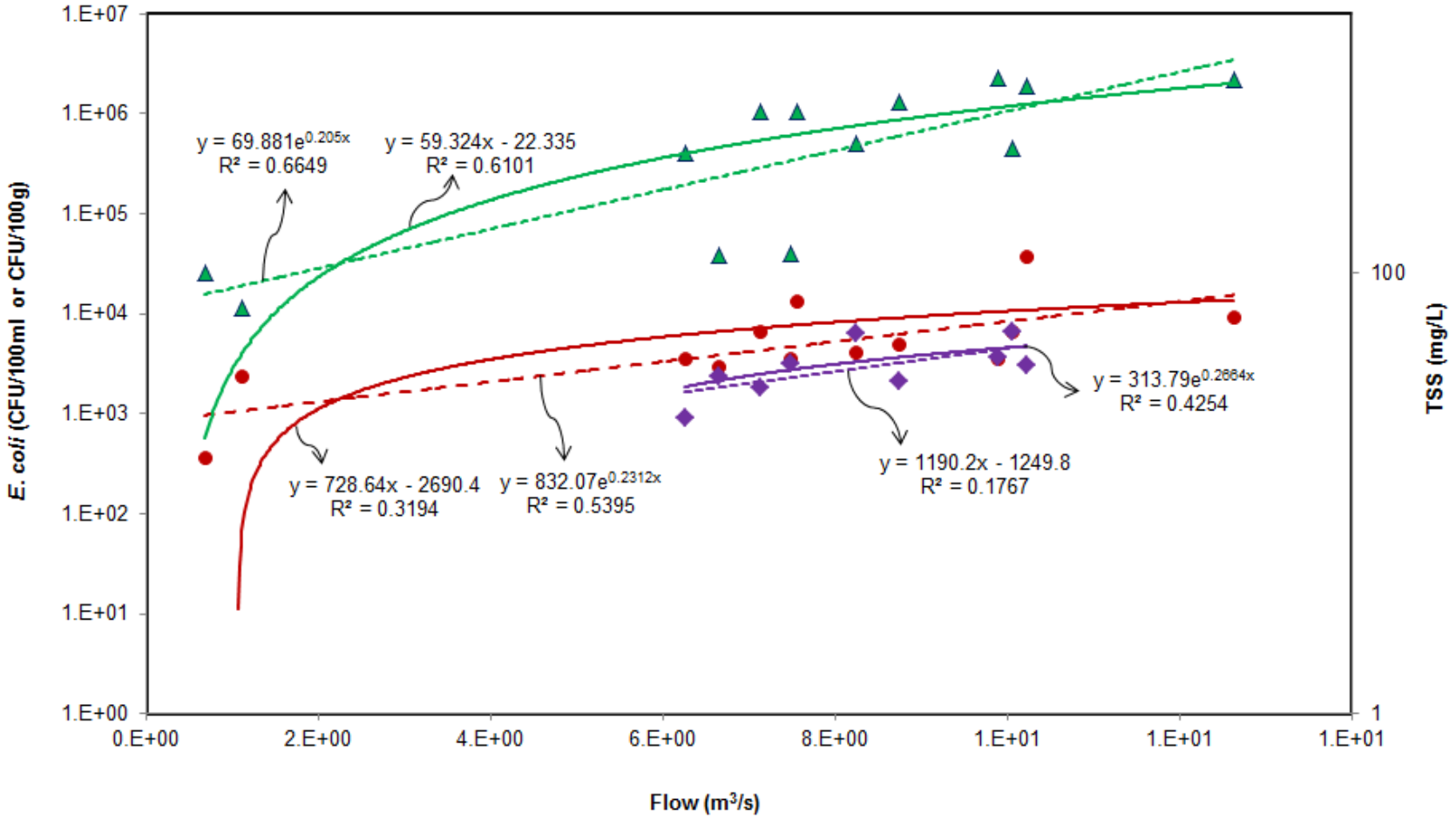


Results – relationships between *E. coli* levels,TSS, and strom flow



Conclusions

- *E. coli* levels in stream water column was considerable greater during storm flow (37,553 CFU/100 ml) compared to background *E. coli* levels (360 CFU/100 ml).
- The change in *E. coli* levels followed the flow pattern.
- Exponential regression yielded better R^2 compared to linear regression.
- Exponential regression between *E. coli* levels and TSS yielded R^2 of 0.45.
- Exponential regression between *E. coli* levels in water column and stream flow yielded R^2 of 0.54.
- Exponential regression between TSS and stream flow yielded R^2 of 0.66.

Limitations and future study

- The data is from a single storm event and from single watershed.
- Similar studies in multiple watersheds under various storm events can potentially yield improved relationships.

References

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THANK YOU

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