Bacteria Fate and Movement

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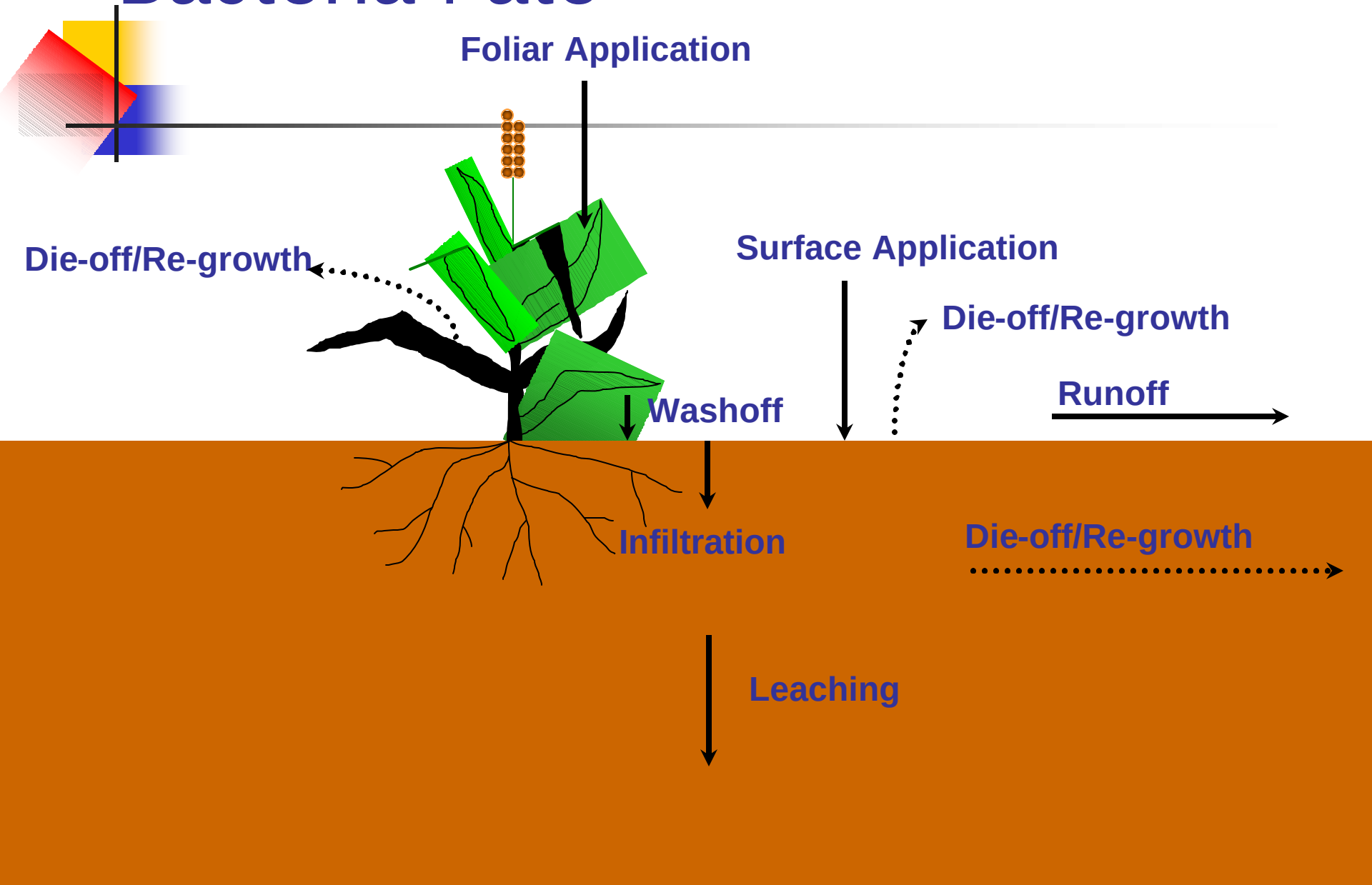
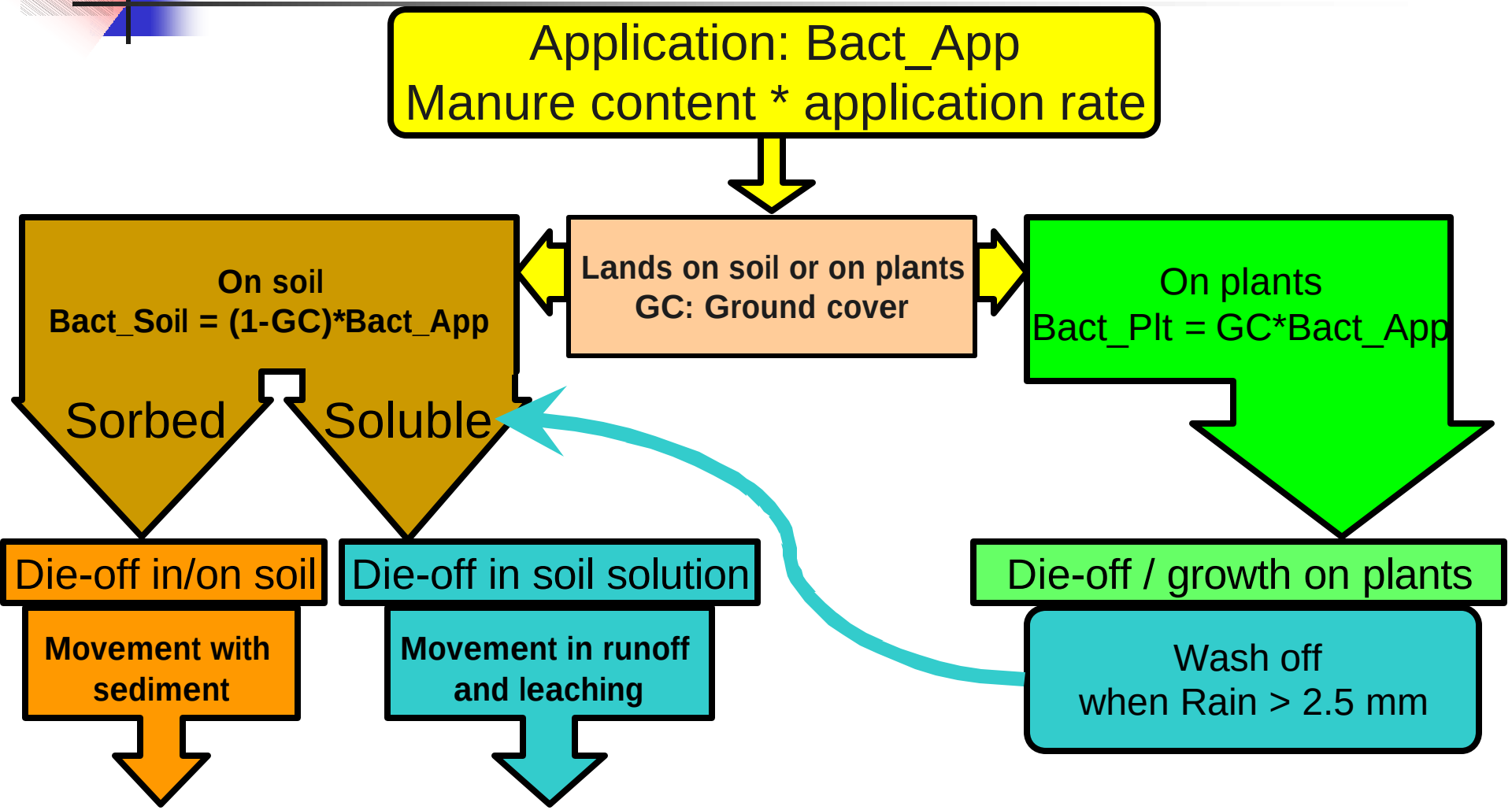
Bacteria Fate



Bacteria Processes



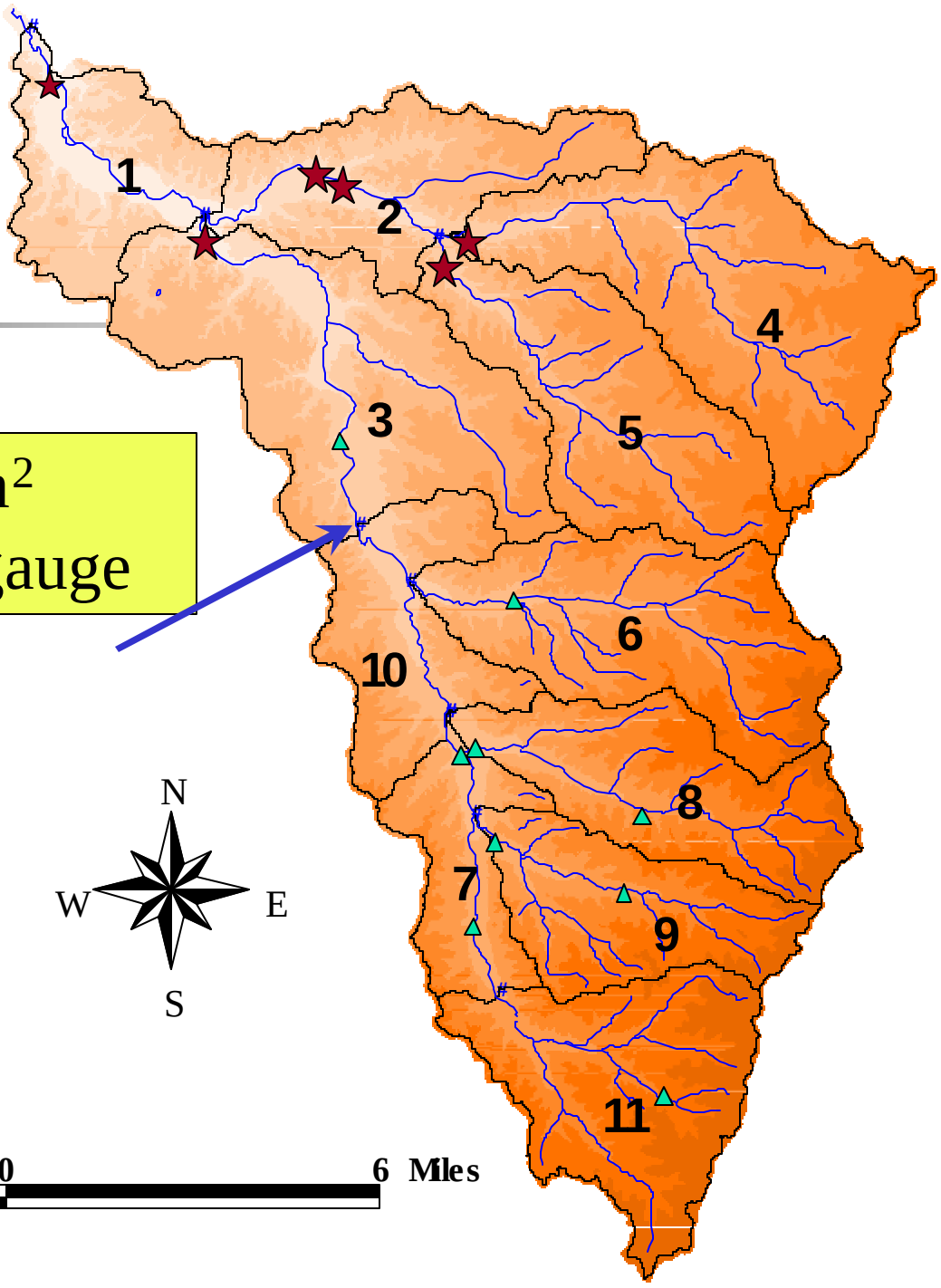
Degradation

- First-order kinetics
- Temperature adjusted
- Three different degradation rates:
  - In the soil, attached to sediment: $K_{sediment}$
  - In soil solution: K_q
  - On foliage (i.e. when exposed to air): K_{plant}

What happens after that?

- Bacteria arrives in the stream.
- There is more decay, at a rate characteristic of the stream.

Shoal Creek Watershed



Total area: 366 km^2
169 km^2 at this flow gauge

Sampling site
Streams
Subbasins
319 site
SALT site

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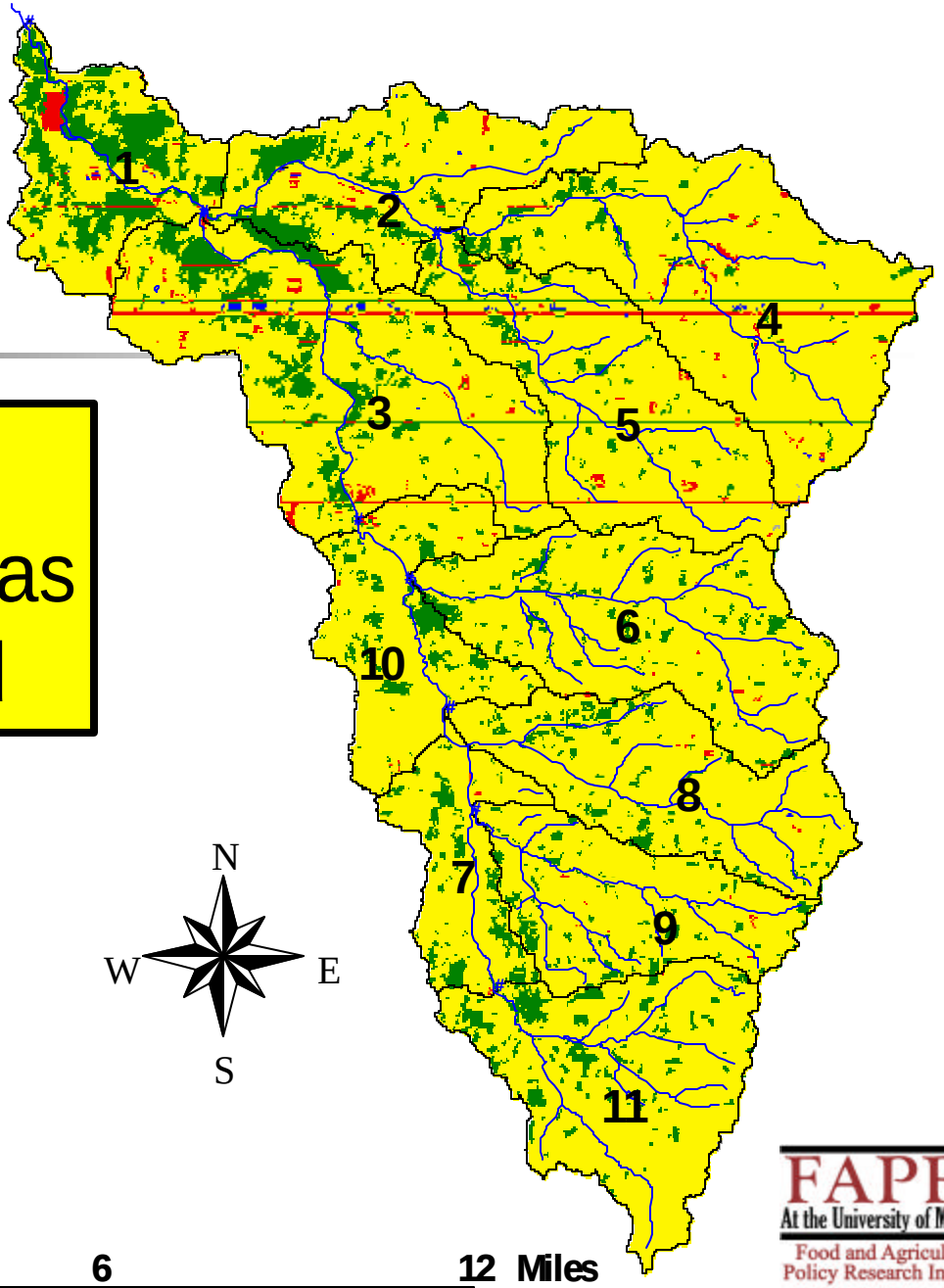
Land Use

90 % pasture
10 % wooded areas
< 1 % crop land



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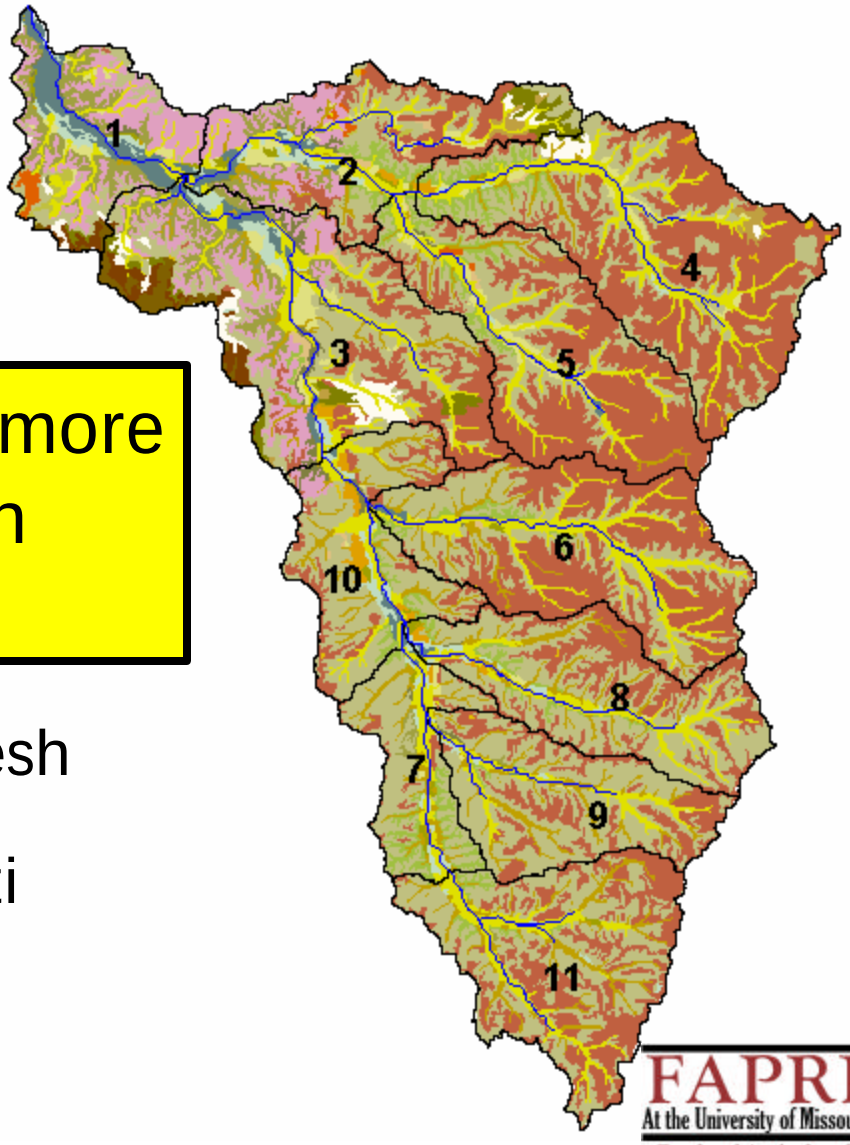
Soils

- High rock content: 30% or more
- Restrictive layer at 24-25” in Scholten and Tonti Series



Nixa

Secesh

Scholten

Tonti

Scholten-Tonti

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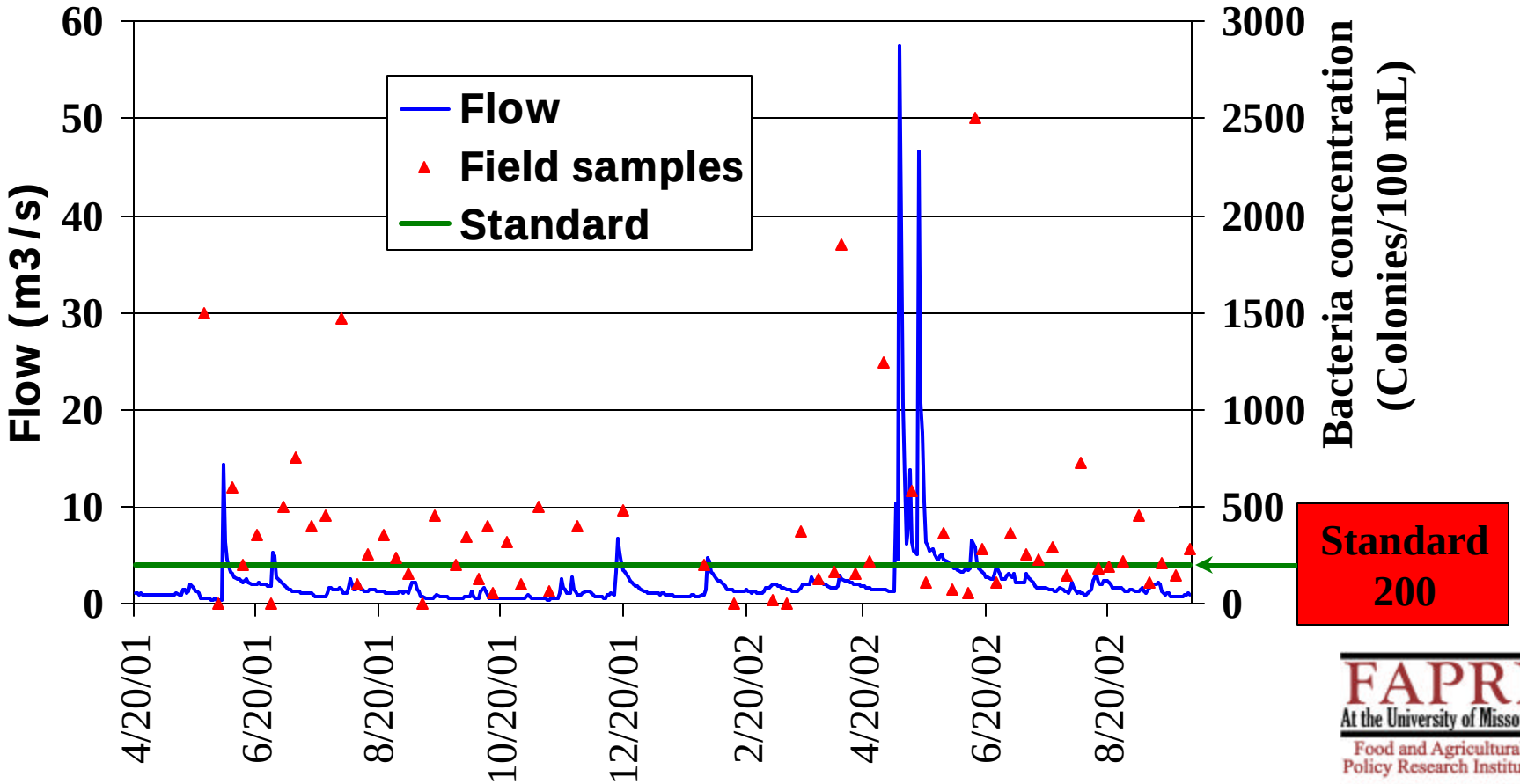
Weekly Monitoring: Bacteria



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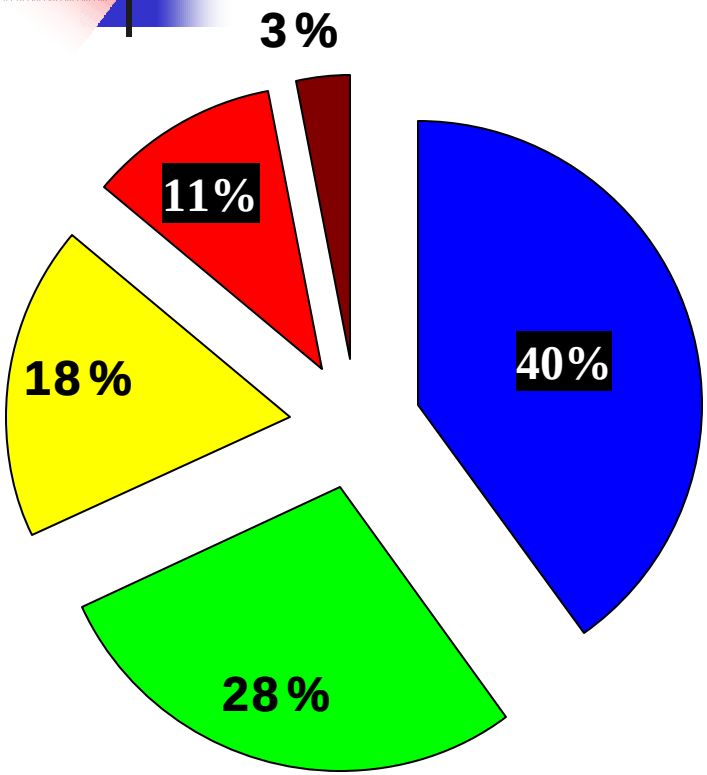
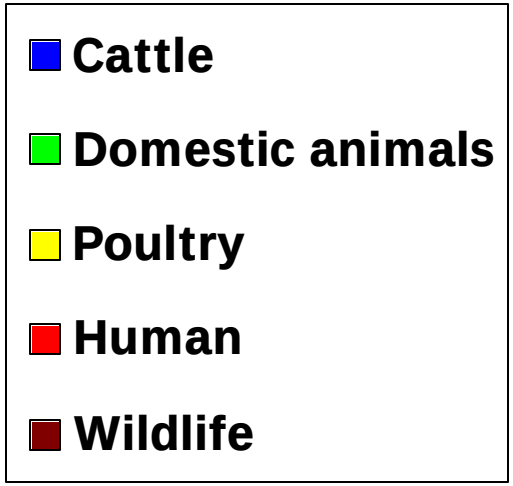
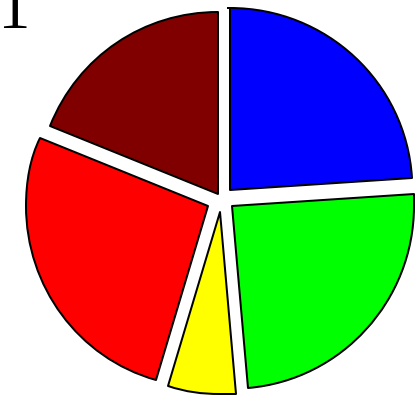
Fecal E. Coli Sources



SUMMER 2002

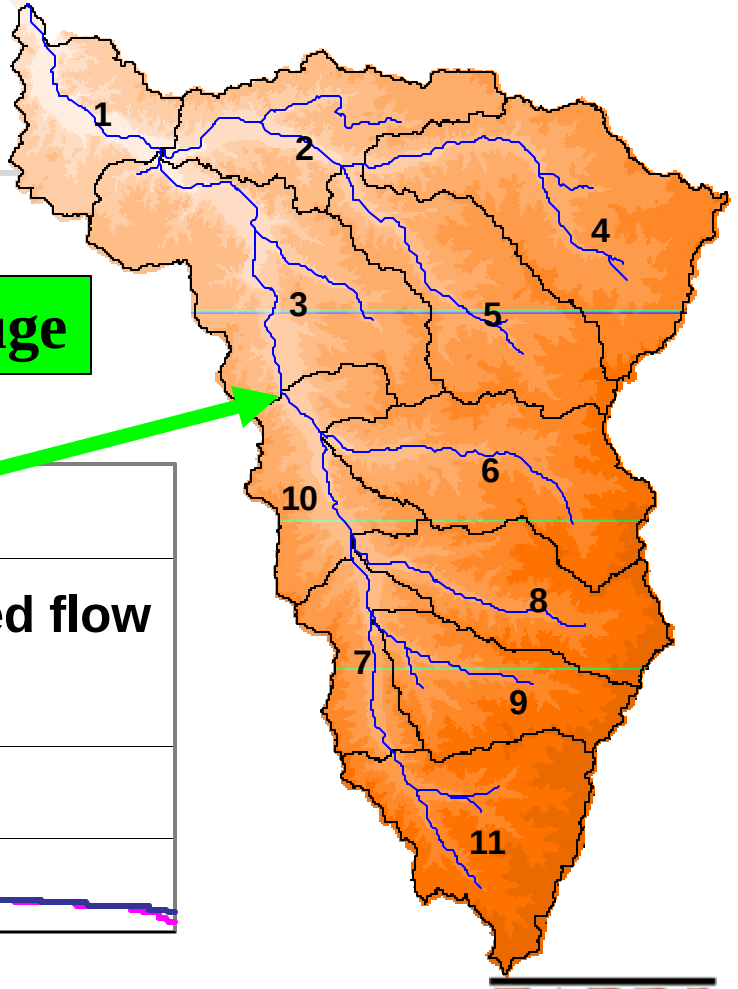


WINTER 01

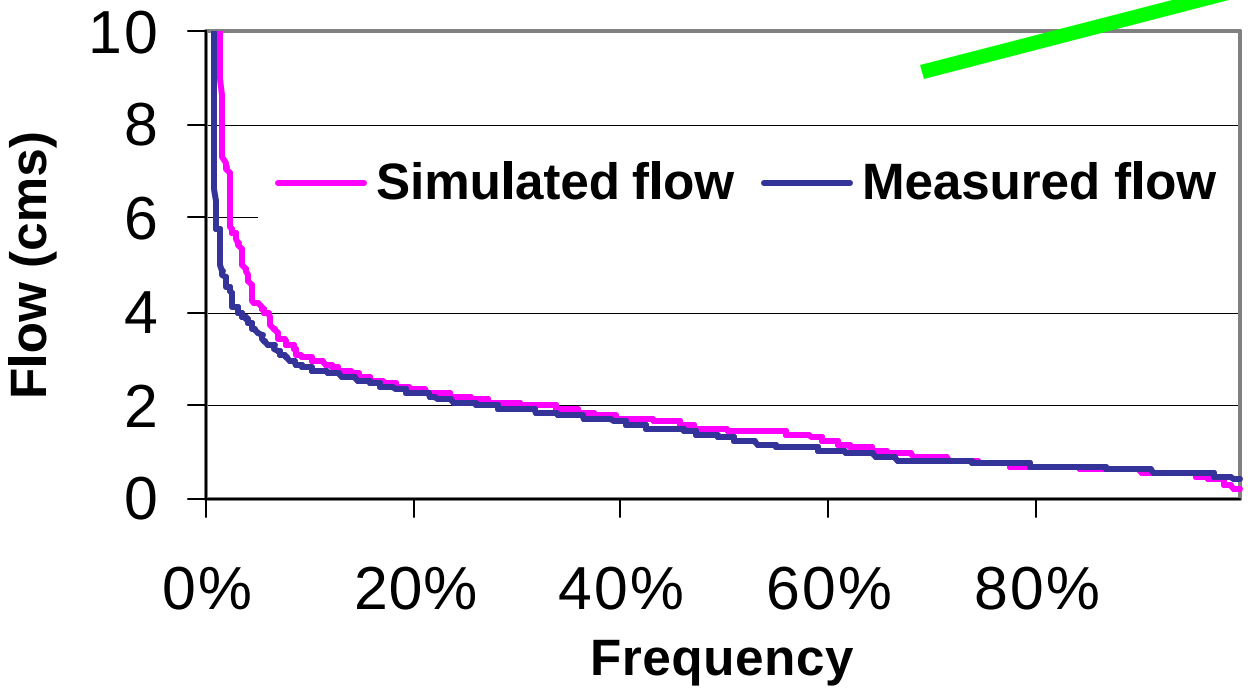


WINTER 02

Flow Frequency Curve
1999 - 2001



USGS Gauge



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Bacteria Modeling Hypotheses

- Land Applied Non Point Sources
  - Poultry litter spread on pastures
  - Manure from grazing cows
- Direct Non Point Sources
  - Cows in the streams
  - Failing septic tanks

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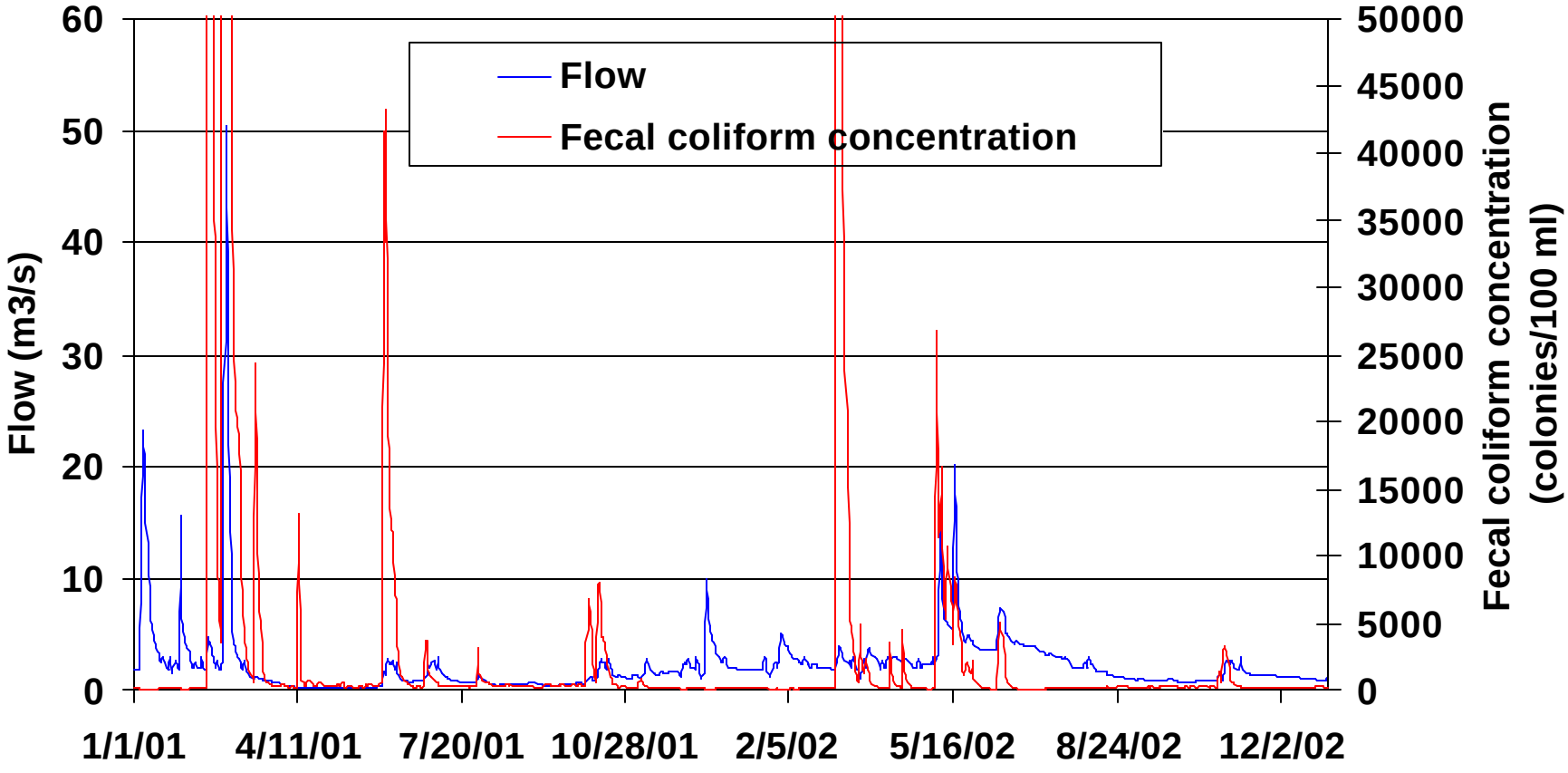
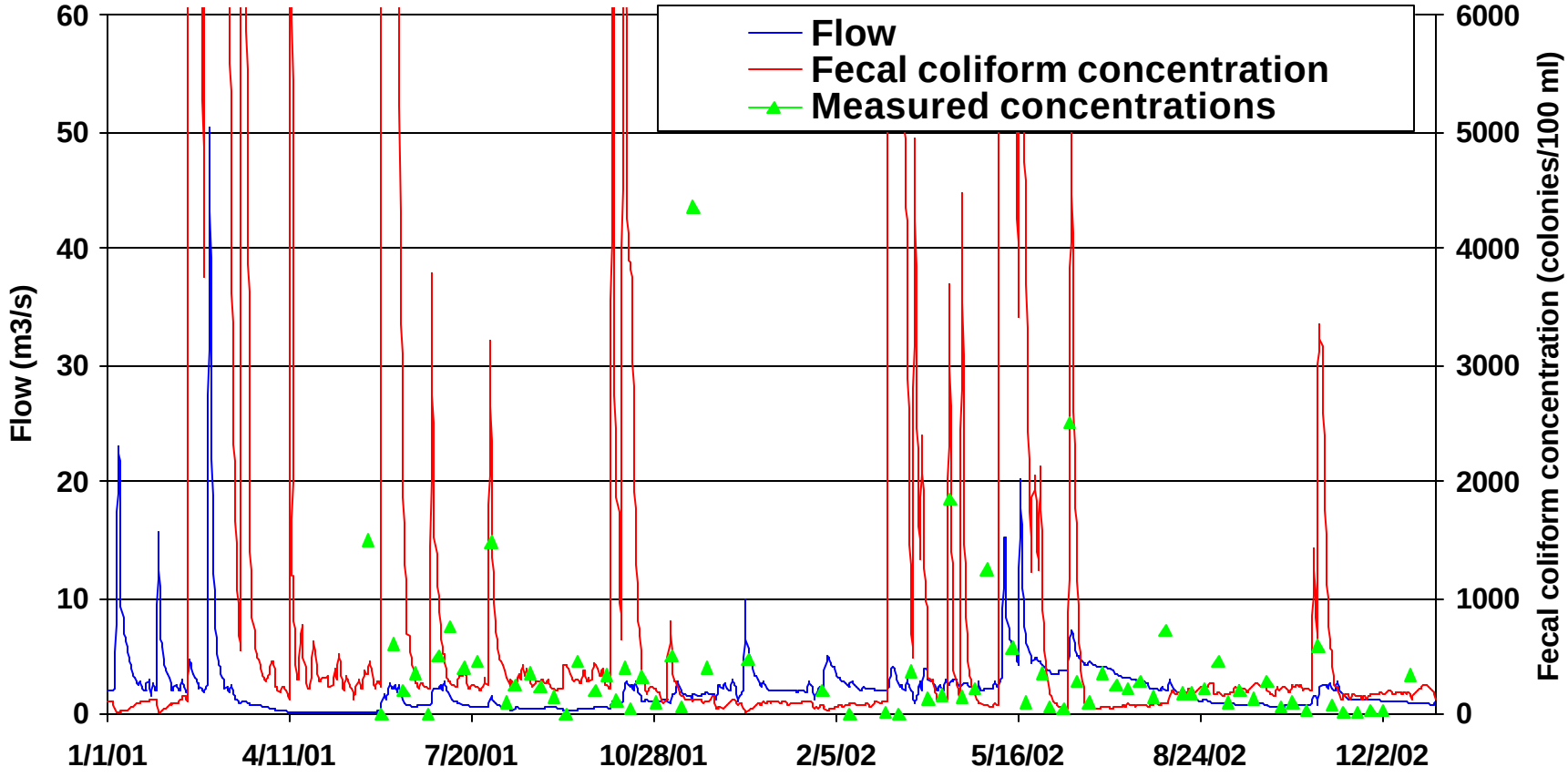
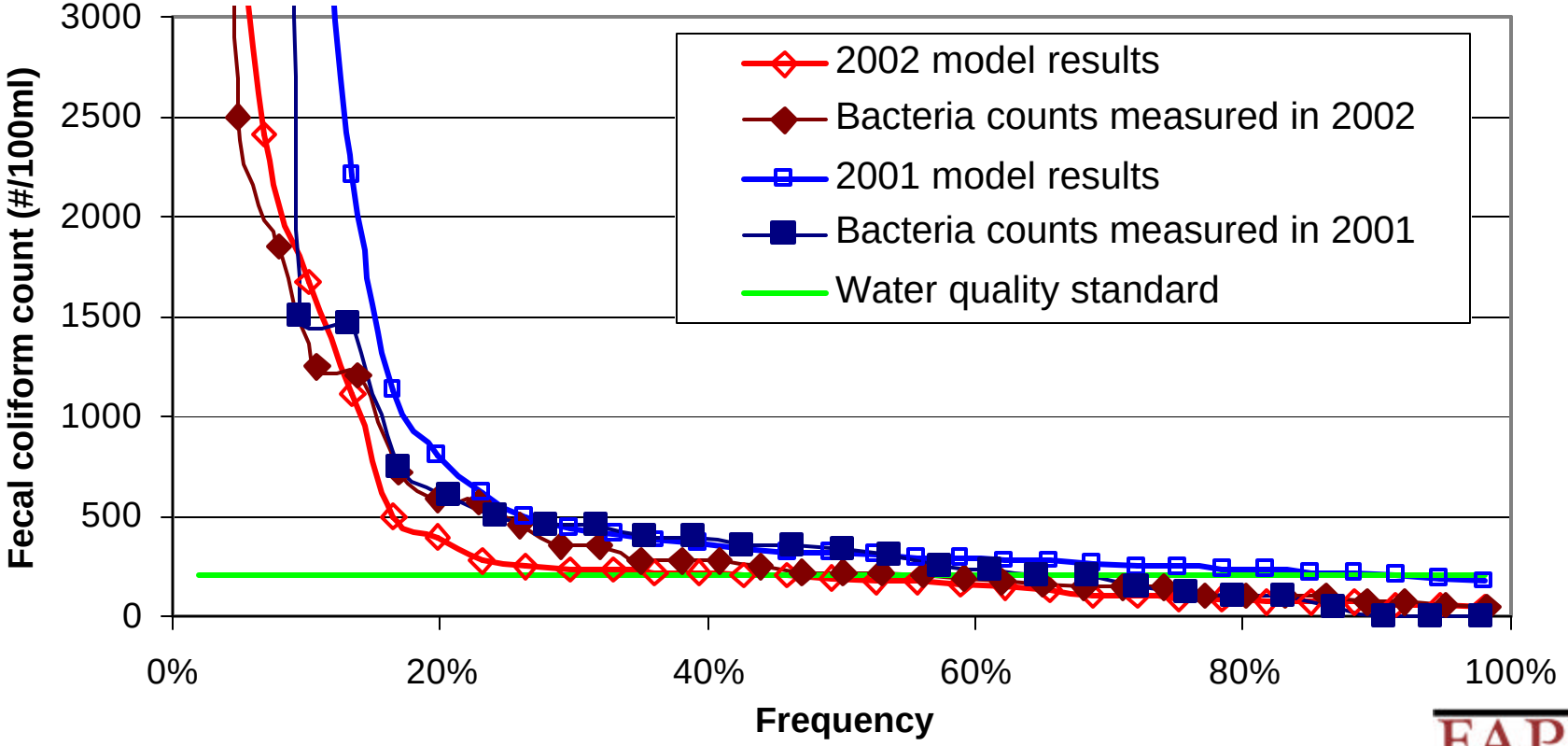
Results


Flow
Fecal coliform concentration
Flow (m3/s)
Fecal coliform concentration (colonies/100 ml)
60
50
40
30
20
10
0
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
1/1/01
4/11/01
7/20/01
10/28/01
2/5/02
5/16/02
8/24/02
12/2/02

Results


Flow
Fecal coliform concentration
Measured concentrations
Flow (m3/s)
Fecal coliform concentration (colonies/100 ml)
0
10
20
30
40
50
60
0
1000
2000
3000
4000
5000
6000
1/1/01
4/11/01
7/20/01
10/28/01
2/5/02
5/16/02
8/24/02
12/2/02

How are we doing?



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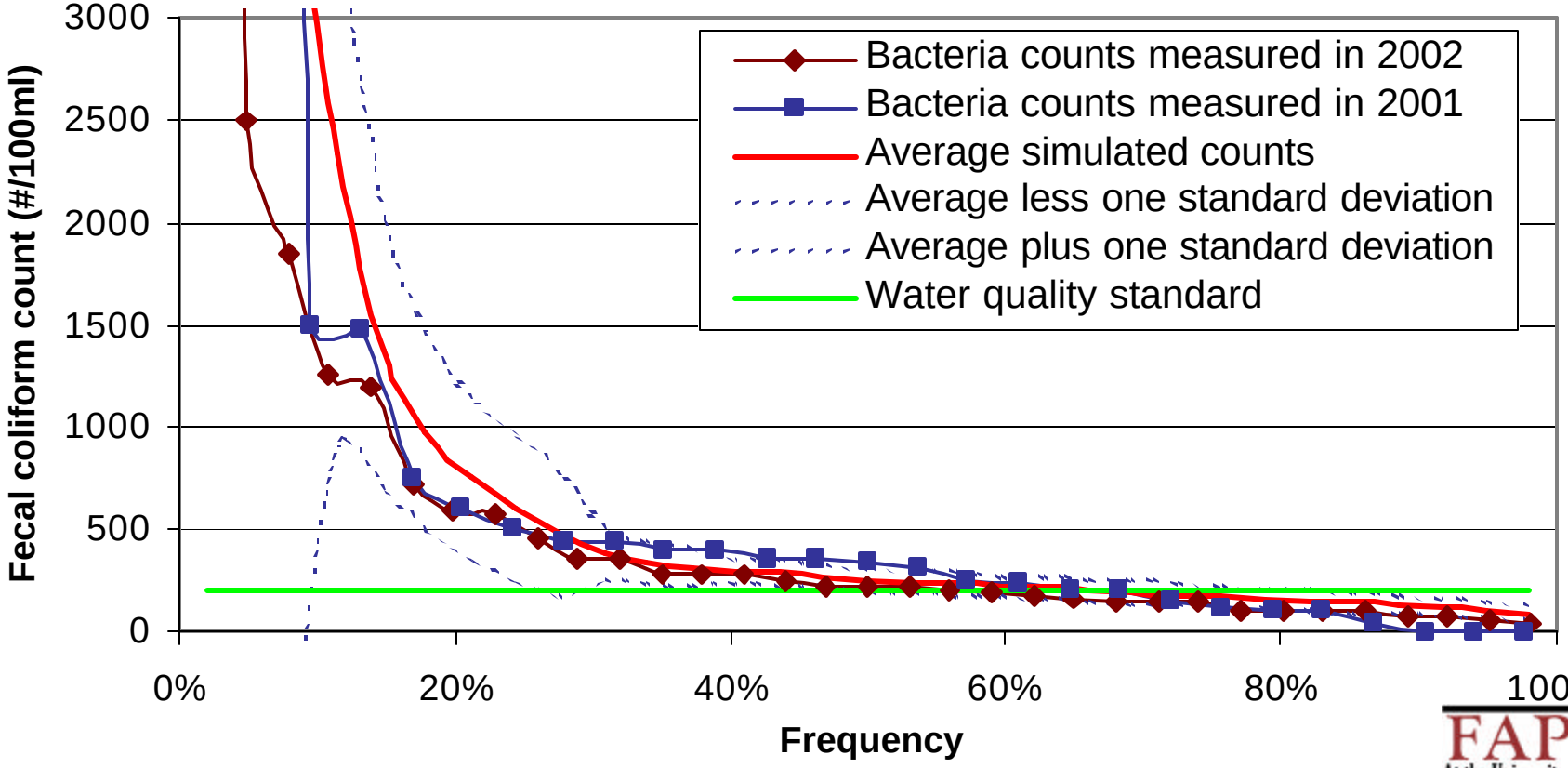
Bacteria Concentration Frequency Curve



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Conclusions

- Correct Range of fecal coliform concentrations.
- Correct frequencies of fecal coliform concentrations.
- A tool we can use to determine:
  - The contribution from each source.
  - The impact of alternative management practices on water quality.