Bacteria TMDLs for Mill Swamp, Darden Mill Run, Three Creek, Tarrara Creek and Flat Swamp

Second Technical Advisory Committee Meeting

January 23, 2012

Overview of Presentation

- Review of Modeling Terminology
- Calibration & Validation Results
- Preliminary Allocation Scenarios

Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Review of Modeling Terminology

- **Calibration** – the process of adjusting model parameters within physically defensible ranges until the resulting predictions give a best possible good fit to observed data
- **Validation** – demonstrating that the model continues to perform adequately for a period outside the calibration period
- **Allocation** – determine how much bacteria from various sources can enter the stream without causing water quality violations

Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Calibration & Validation - Overview

- Looking for observed bacteria concentrations falling within the min-max simulated range of values
- Give more weight to stations with longer periods of record and larger contributing areas
- Give more weight to fecal coliform than *E. coli*
- Try to maintain uniform parameters across the 5 watersheds
- Difficulties:
  - Short periods of record
  - Lots of data at minimum detection limit
  - Dry streams/swamps

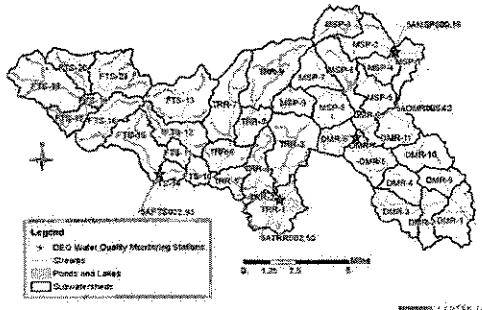
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Summary of Parameter Changes

- Low Flow Cutoffs implemented for wildlife and livestock
- Muskrat populations decreased from initial estimates
- Migratory bird populations decreased from initial estimates
- In-stream die-off rates increased
- Surface washoff increased

Biological Systems Engineering VirginiaTech Center for Watershed Studies at Virginia Tech

Monitoring Station Locations



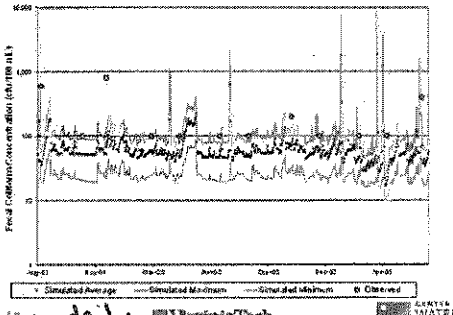
Biological Systems Engineering VirginiaTech Center for Watershed Studies at Virginia Tech

Calibration Information

- Mill Swamp
  - MSP000.16
  - Only fecal coliform data for 3 years
- Darden Mill Run
  - DMR008.42 – **small** drainage area
  - Fecal coliform & *E. coli* data for several years
- Flat Swamp
  - FTS002.93
  - Only fecal coliform data for 3 years
- Tarrara Creek
  - TRR002.50
  - Fecal coliform & *E. coli* data for several years

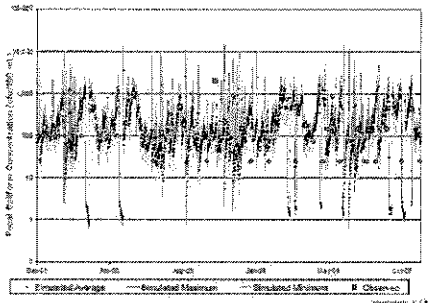
Biological Systems Engineering VirginiaTech Center for Watershed Studies at Virginia Tech

Mill Swamp – Calibration Only



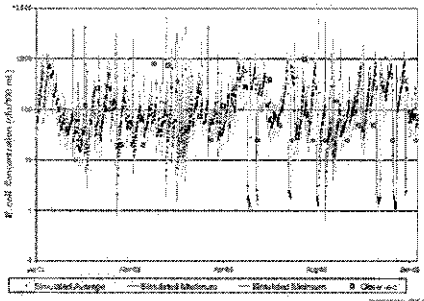
Biological Systems Engineering daily VirginiaTech Center for Watershed Studies at Virginia Tech

Darden Mill Run – Calibration – FC



Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

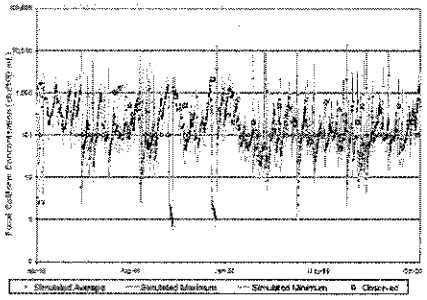
Darden Mill Run – Calibration – EC



Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

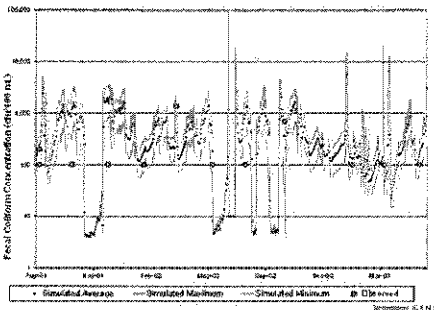
Darden Mill Run - Validation

FC only



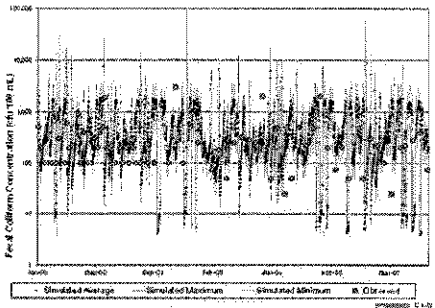
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Flat Swamp – Calibration Only



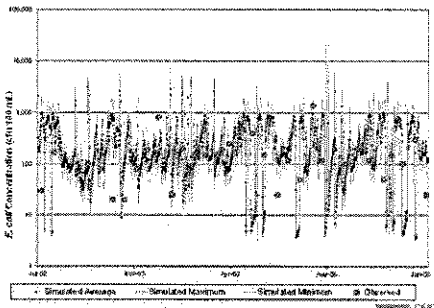
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Tarrara Creek – Calibration – FC



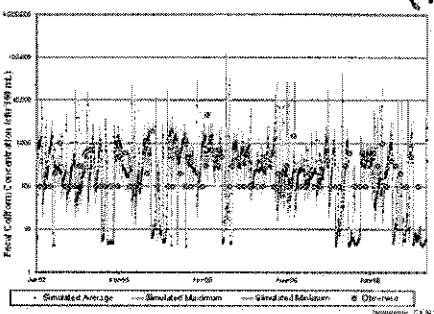
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Tarrara Creek – Calibration – EC



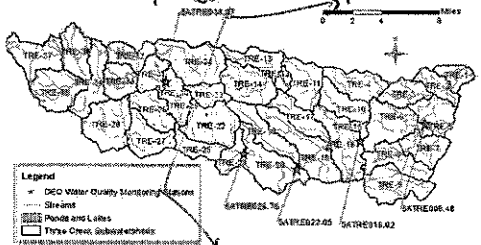
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Tarrara Creek – Validation – FC only



Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Monitoring Station Locations – TRE



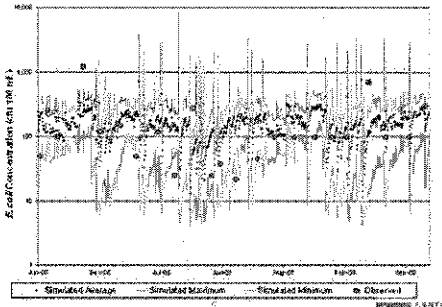
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Calibration Information – TRE

- TRE038.07
  - 4 years of *E. coli* data
  - Only station in Piedmont ecoregion
- TRE026.75
  - Long period of record – fecal coliform only
- TRE022.05
  - 6 years of *E. coli* data
- TRE016.02
  - Long period of record for fecal coliform
  - 8 years of *E. coli* data
- TRE008.48
  - Long period of record for fecal coliform
  - 8 years of *E. coli* data

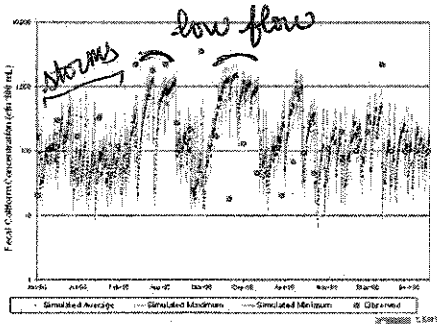
Biological Systems Engineering VirginiaTech Center for Watershed Studies at Virginia Tech

TRE038.07 – Calibration Only – EC



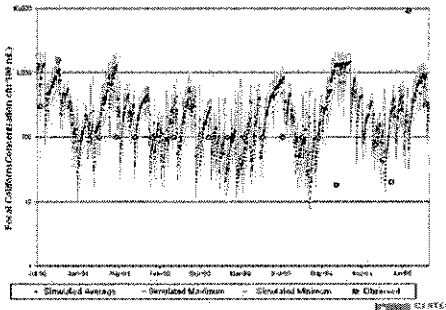
Biological Systems Engineering VirginiaTech Center for Watershed Studies at Virginia Tech

TRE026.75 – Calibration – FC



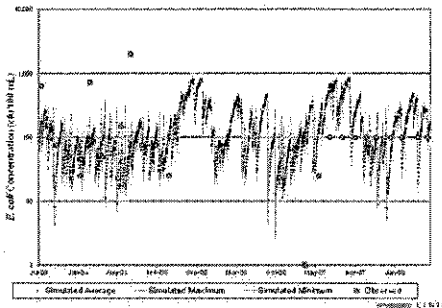
Biological Systems Engineering VirginiaTech Center for Watershed Studies at Virginia Tech

TRE026.75 – Validation – FC



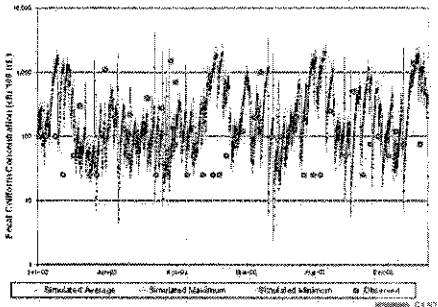
Biological Systems Engineering VirginiaTech Center for Watershed Studies at Virginia Tech

TRE022.05 – Calibration Only – EC



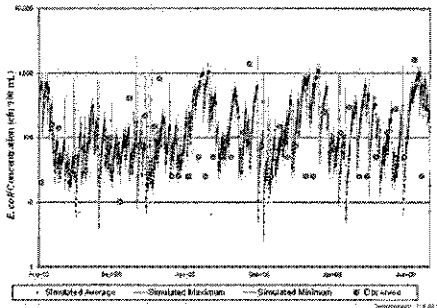
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

TRE016.02 – Calibration – FC



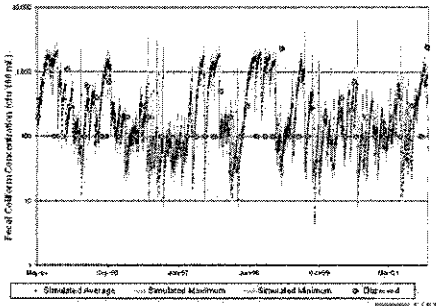
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

TRE016.02 – Calibration – EC



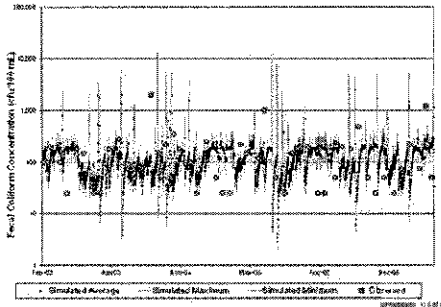
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

TRE016.02 – Validation – FC



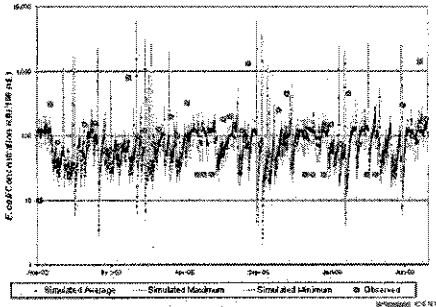
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

TRE008.48 – Calibration – FC



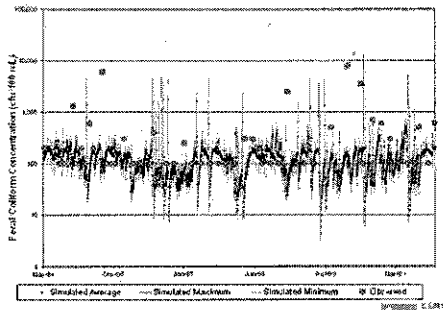
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

TRE008.48 – Calibration – EC



Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

TRE008.48 – Validation – FC



Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

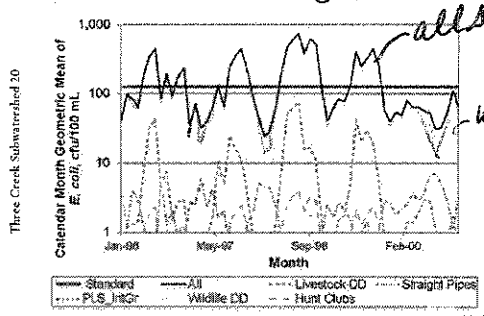
Allocation Scenarios

- Goal: 0 violations of the geometric mean component of the water quality standard (126 cfu *E. coli*/100 mL)
- Secondary Goal: Keep wildlife reductions to a minimum
- Tertiary Goal: Try to be equitable in allocations
- All permitted operations (point sources, CAFOs, and biosolids applications) are represented at their worst case permitted limits

Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

ave load

Wildlife Issues – Existing Conditions

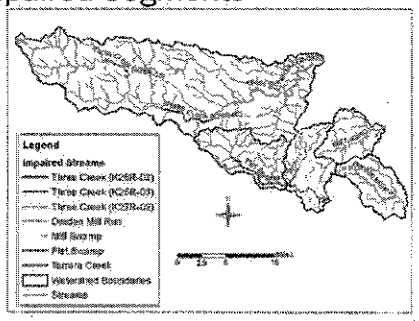


all sources

wildlife load dominates

Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Impaired Segments



Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

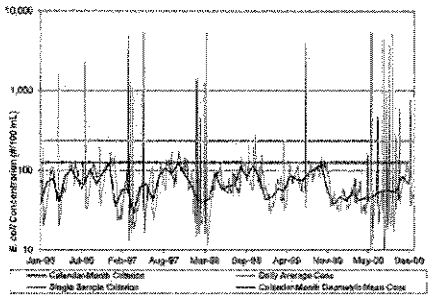
all others are below geometric mean

Allocation Scenarios – the Numbers

Impaired Segment	Reductions Required (%)							
	Wildlife DD	Livestock DD	Straight Pipes	Hunt Clubs	Hunt Clubs	Standard	Hunt Clubs	Livestock Dog
Darden Mill Run	65	95	100	95	0	0	0	0
Mill Swamp	0	0	100	0	0	0	0	0
Flat Swamp	85	0	100	0	35	35	35	0
Tarrara Creek	90	75	100	0	0	0	0	0
K26R-03	50	75	100	75	75	75	75	75
K26R-02	85	90	100	90	0	0	0	0
K27R-02	0	0	100	0	0	0	0	0

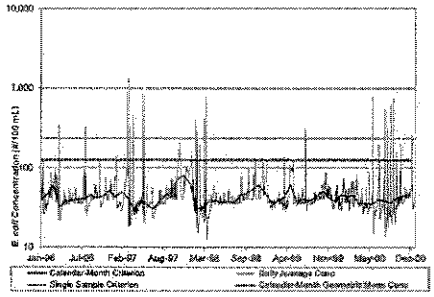
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Allocation – Darden Mill Run



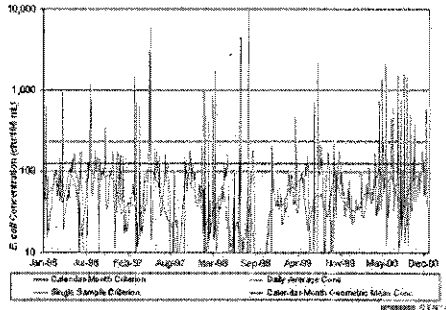
Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Allocation – Mill Swamp



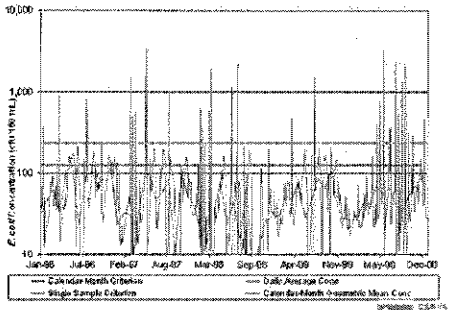
Biological Systems Engineering VirginiaTech CENTER for WATERSHED STUDIES at VIRGINIA TECH

Allocation – Flat Swamp



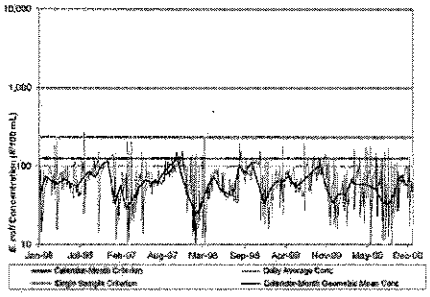
Biological Systems Engineering VirginiaTech CENTER for WATERSHED STUDIES at VIRGINIA TECH

Allocation – Tarrara Creek



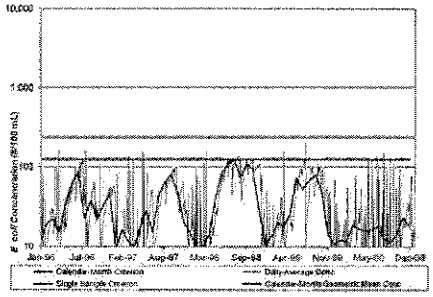
Biological Systems Engineering VirginiaTech CENTER for WATERSHED STUDIES at VIRGINIA TECH

Allocation – Three Creek K26R-03



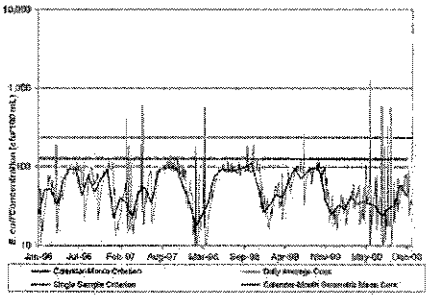
Biological Systems Engineering VirginiaTech CENTER for WATERSHED STUDIES at VIRGINIA TECH

Allocation – Three Creek K26R-02



Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Allocation – Three Creek K27R-02



Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Next Steps

- Calibration and preliminary allocation scenarios must be approved by the TAC and DEQ
- Finalize the report in preparation for the final public meeting
- Final public meeting with completed TMDL report:

February 15, 2012

- Implementation planning will begin shortly after the final public meeting

Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech

Questions?

- Contact Information:
  - Becky Zeckoski, project lead, VT: beckyz@vt.edu, 540-585-4686
  - Karen Kline, supervisor, VT: klinek@vt.edu, 540-231-0094
  - Jennifer Howell, TMDL Project Coordinator, DEQ: Jennifer.Howell@deq.virginia.gov, 757-518-2111

Biological Systems Engineering | VirginiaTech | Center for Watershed Studies at Virginia Tech