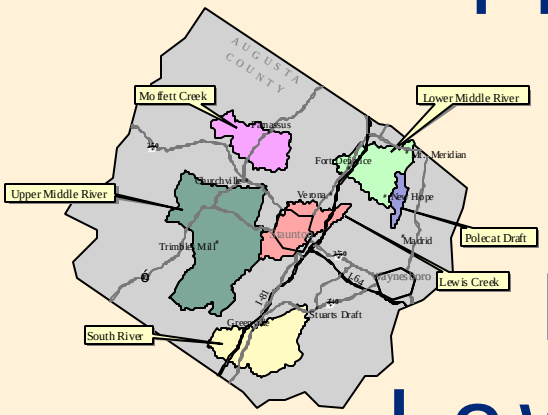
Fecal Bacteria TMDLs

for



Upper Middle River
Moffett Creek
Lewis Creek
Polecat Draft
Lower Middle River
South River

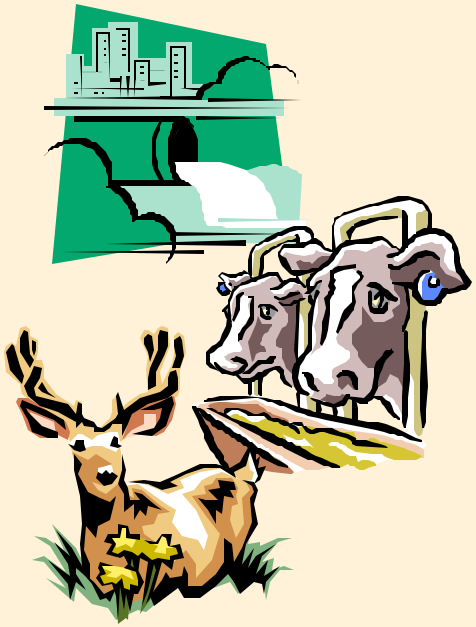
10/7/2003

Acknowledgements

- Department of Conservation and Recreation
- Department of Environmental Quality
- James Madison University

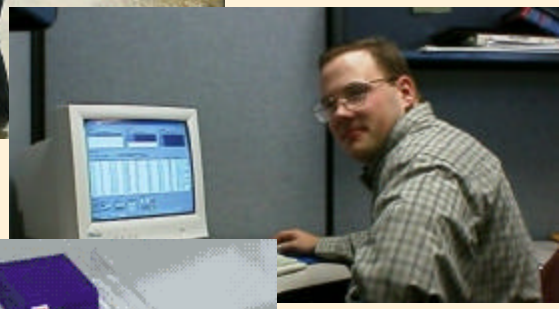
Basics of a TMDL

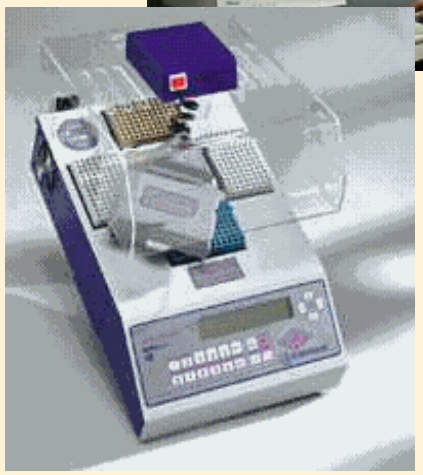
- Watershed-based
- Pollutant-specific
- Address All Sources
- MOS



TMDL Process

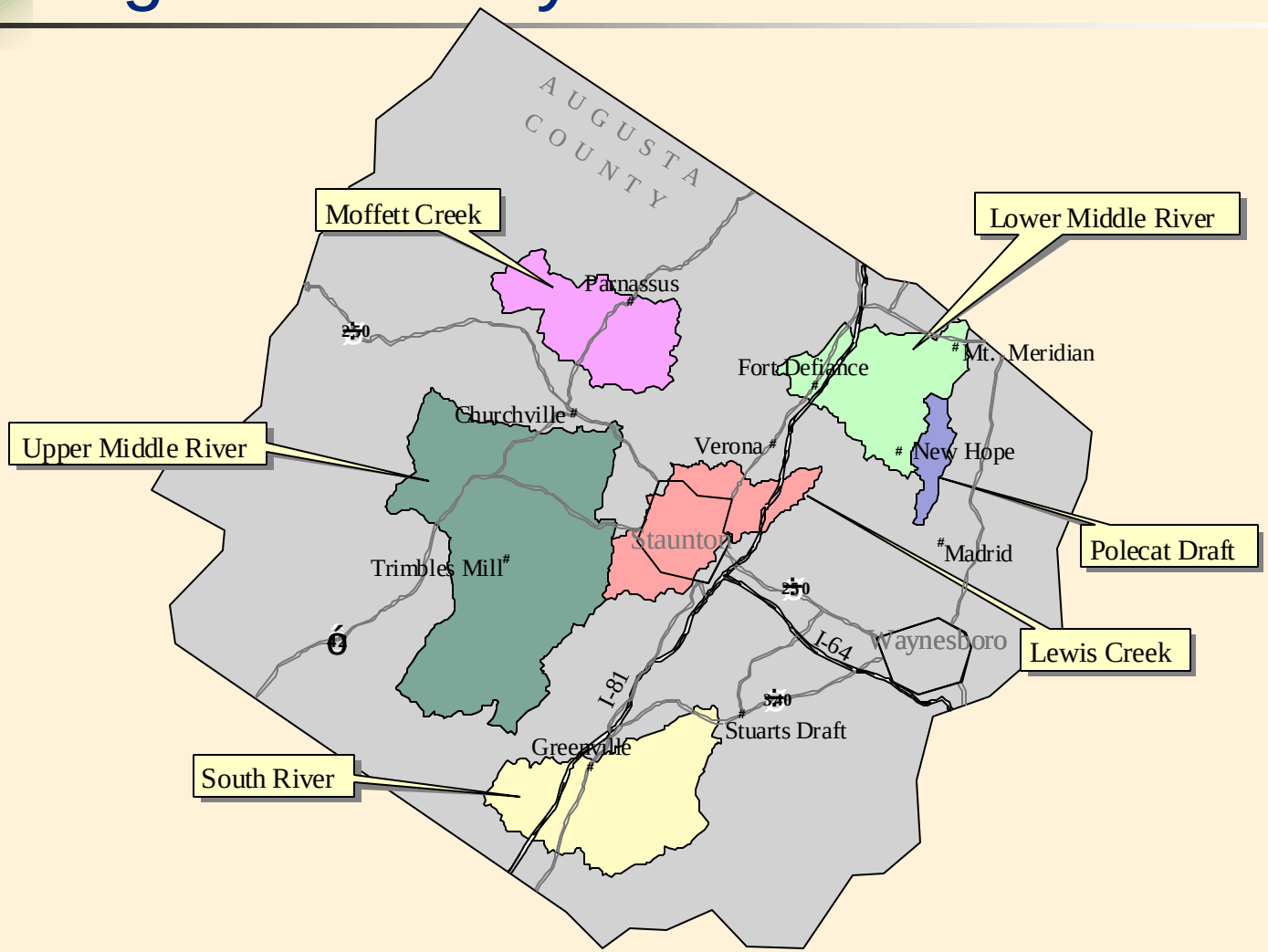
- Water Quality Assessment
  - Monitoring
  - Standards Evaluation
  - Bacteria Source Tracking
- **TMDL Development**
  - **Modeling**
    - **Hydrology**
    - **Water Quality**
  - **Load Allocation**
- Implementation Plan Development
- Implementation



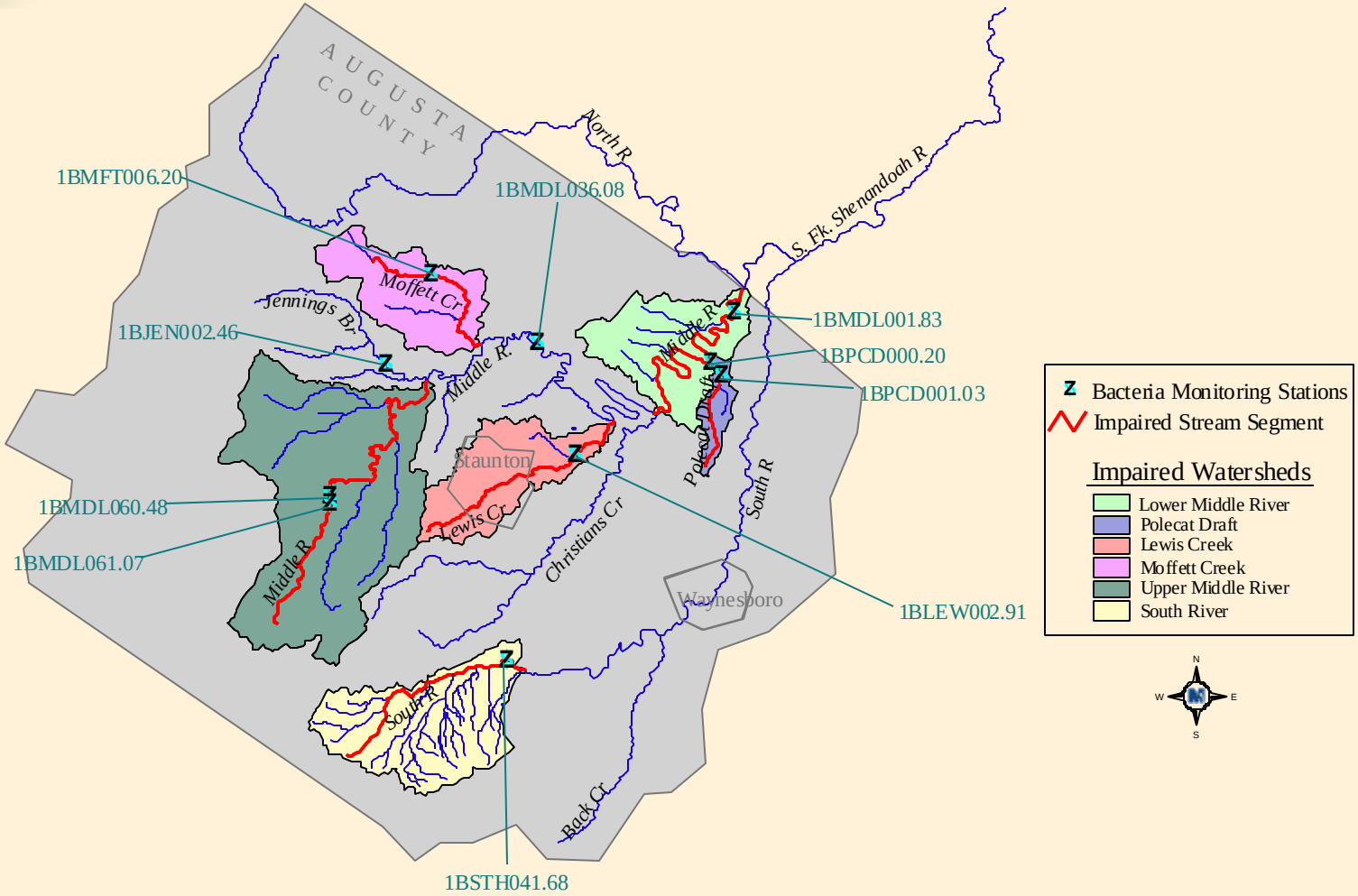


Middle River TMDL

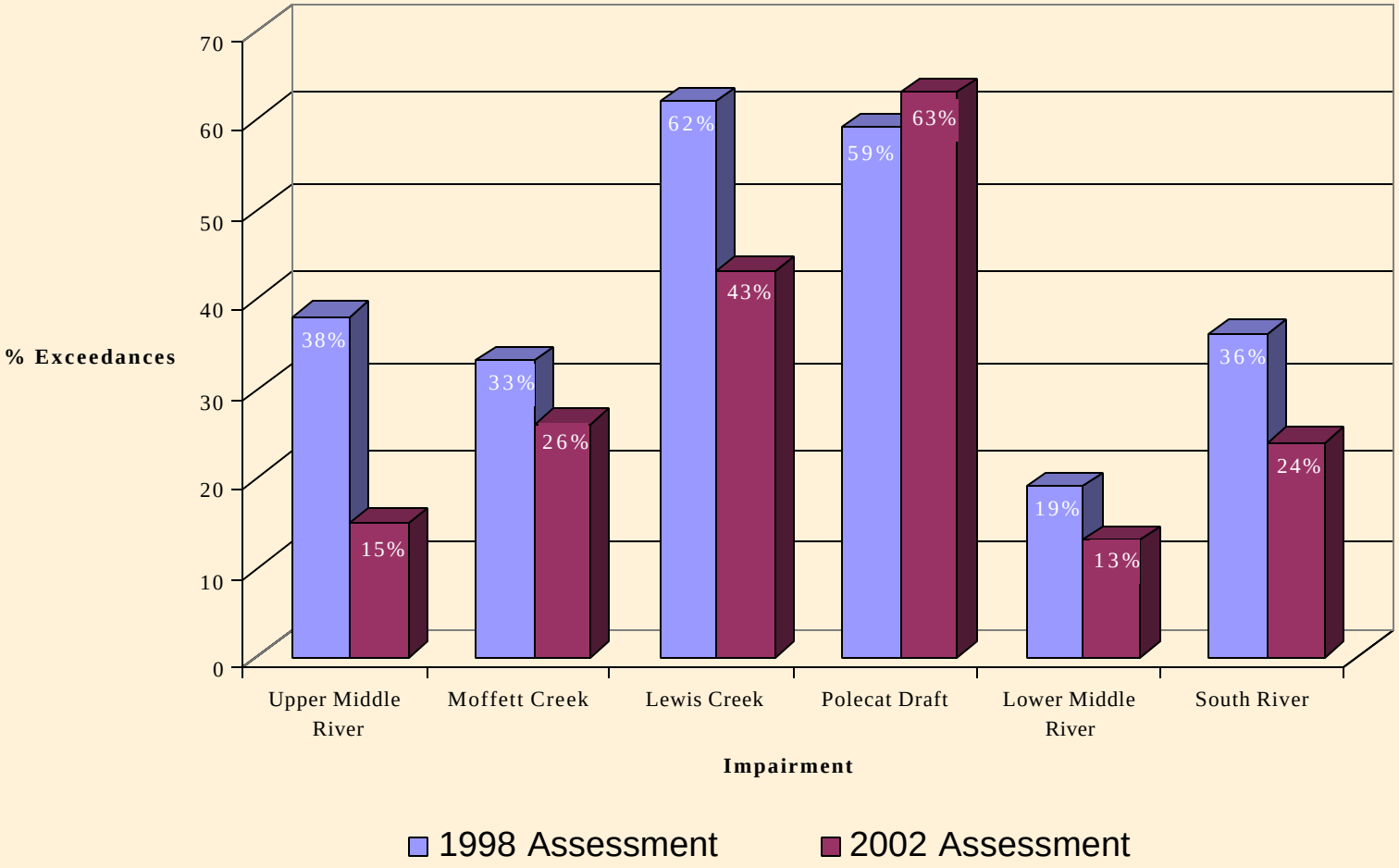
Augusta County



DEQ Bacteria Monitoring Network

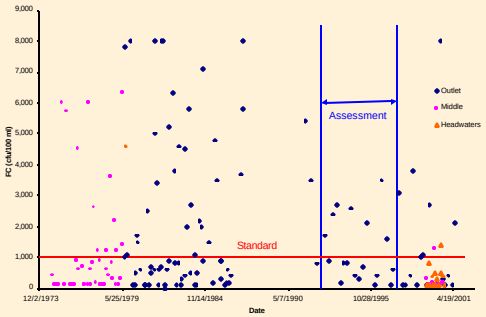


Fecal Coliform Standard Violations



TMDL Development

- Source Assessment
- Modeling
  - Hydrology
  - Water Quality
- Load Allocation



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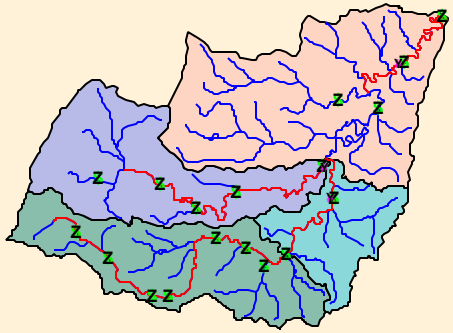

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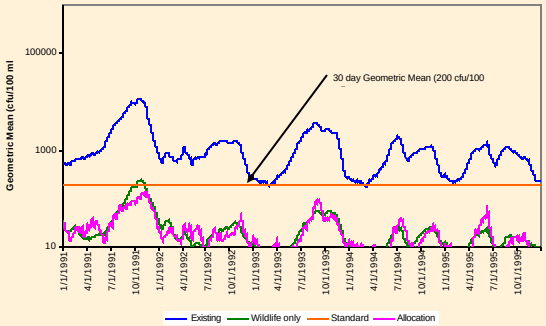

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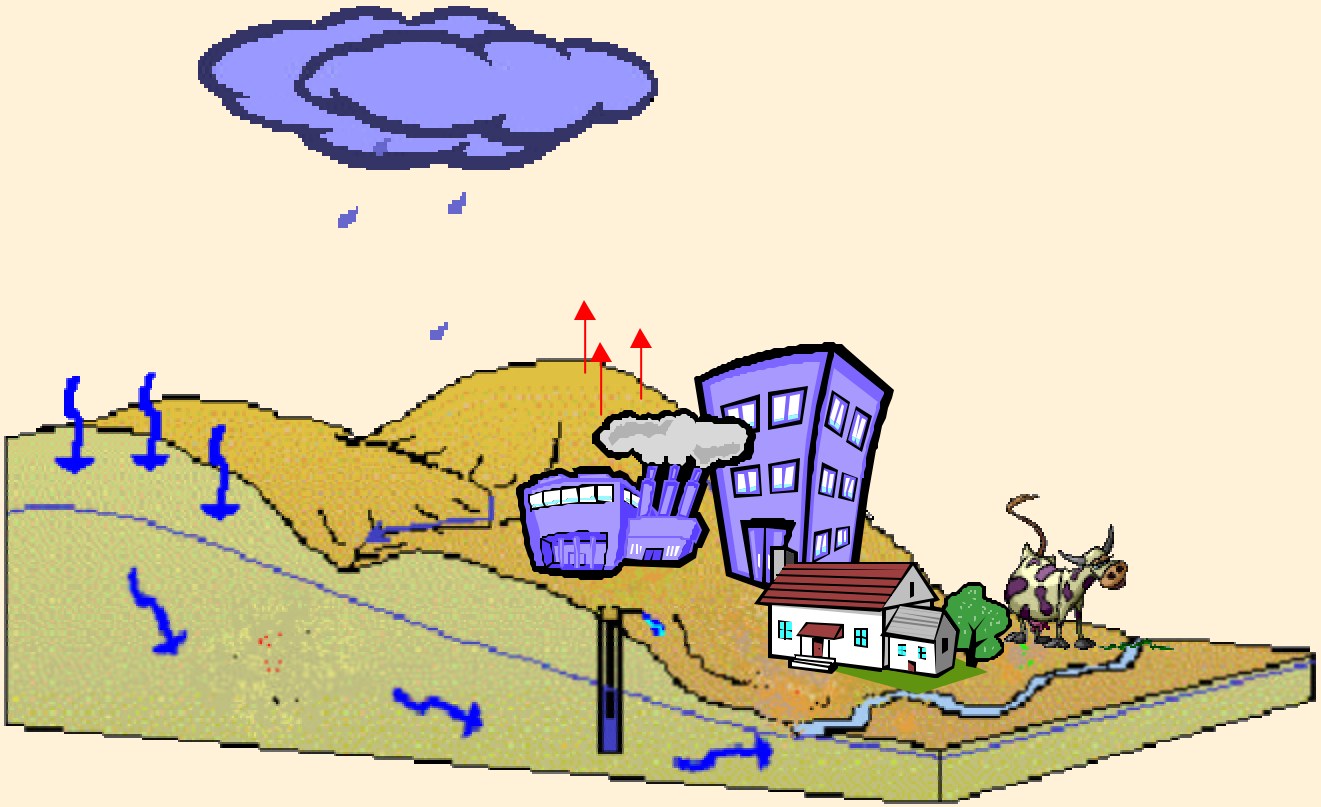
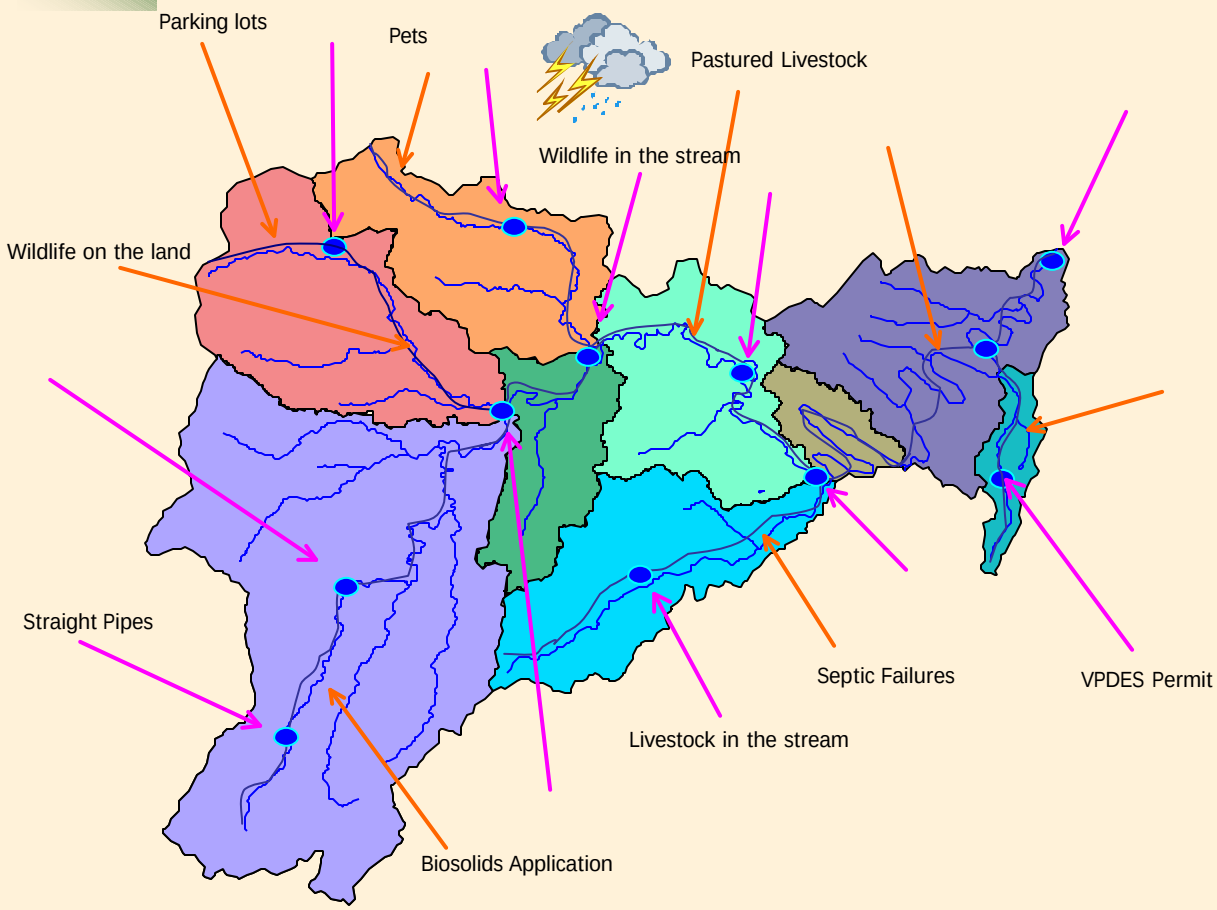
Modeling



HSPF

- Hydrologic Simulation Program - Fortran
- Watershed-based
- Continuous time interval
- Land-applied, direct loads

Conceptual Model

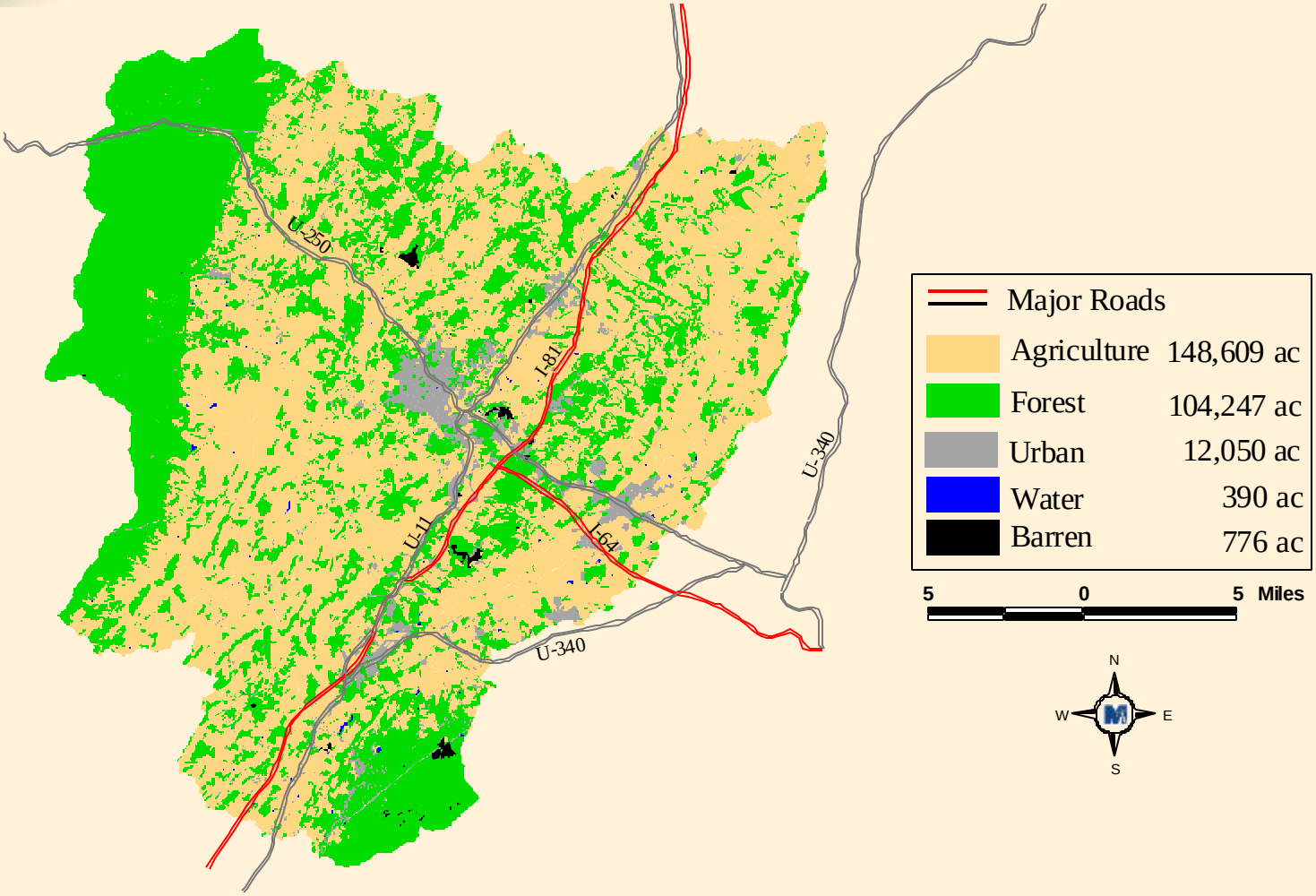


- Mathematical representation
- Overland
- Direct discharges
- Withdrawal

Hydrologic Modeling Components

- Climatic Data
- Soils
- Topography
- Landuse
- Stream channel characteristics
- Point source discharge/withdrawal
- Flow Data

Land use

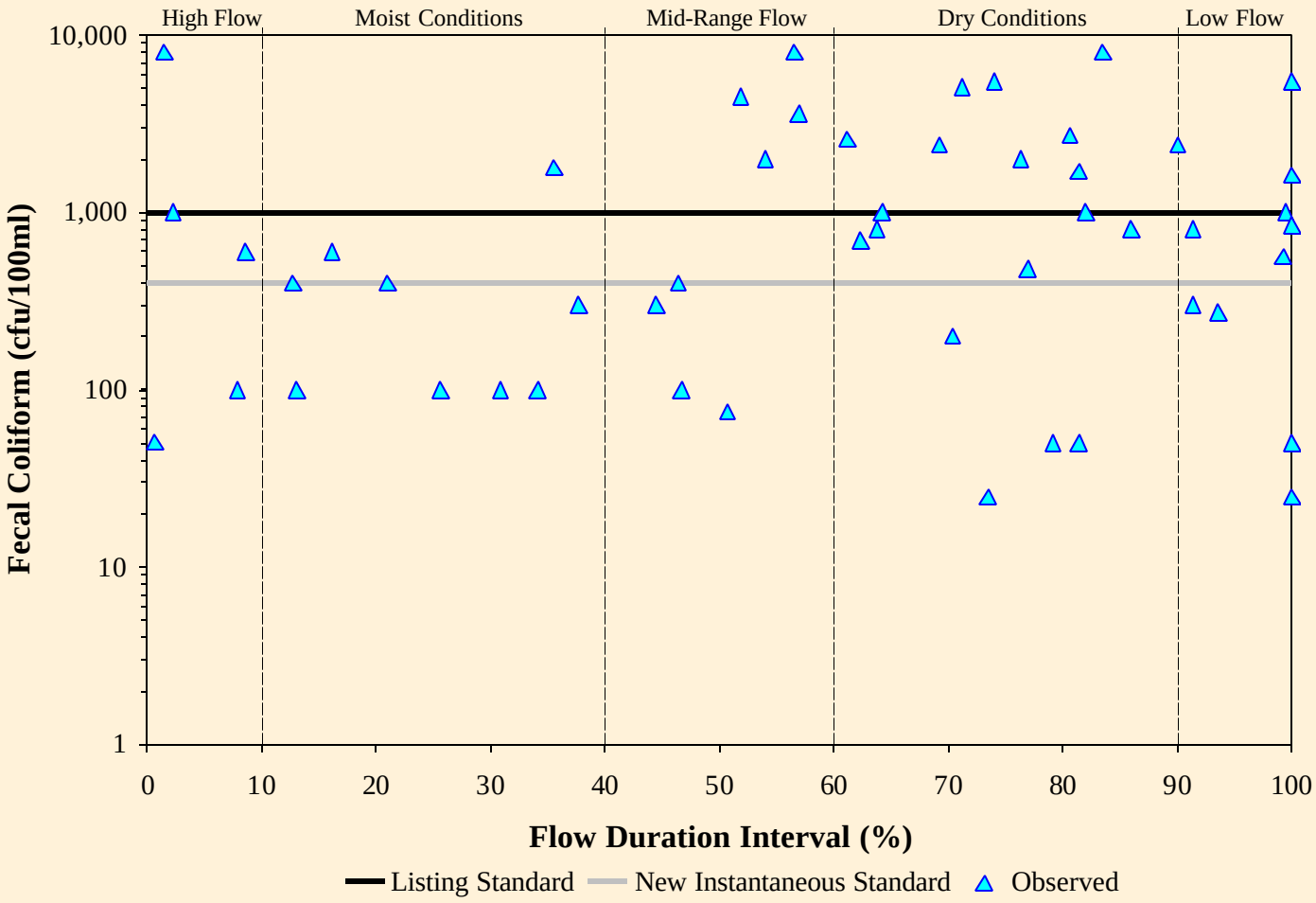

U-250
I-81
U-11
I-64
U-340
U-340
Major Roads
Agriculture 148,609 ac
Forest 104,247 ac
Urban 12,050 ac
Water 390 ac
Barren 776 ac
5 0 5 Miles
N
W
E
S

Hydrologic Calibration

- Calibration
  - A process of characterizing the watershed in terms of the model parameters
    - Compare measured to modeled flow values
    - Adjust model parameters as required
- Defining Calibration Period
  - Identifying critical condition
  - Availability of measured data
  - Representing historical data

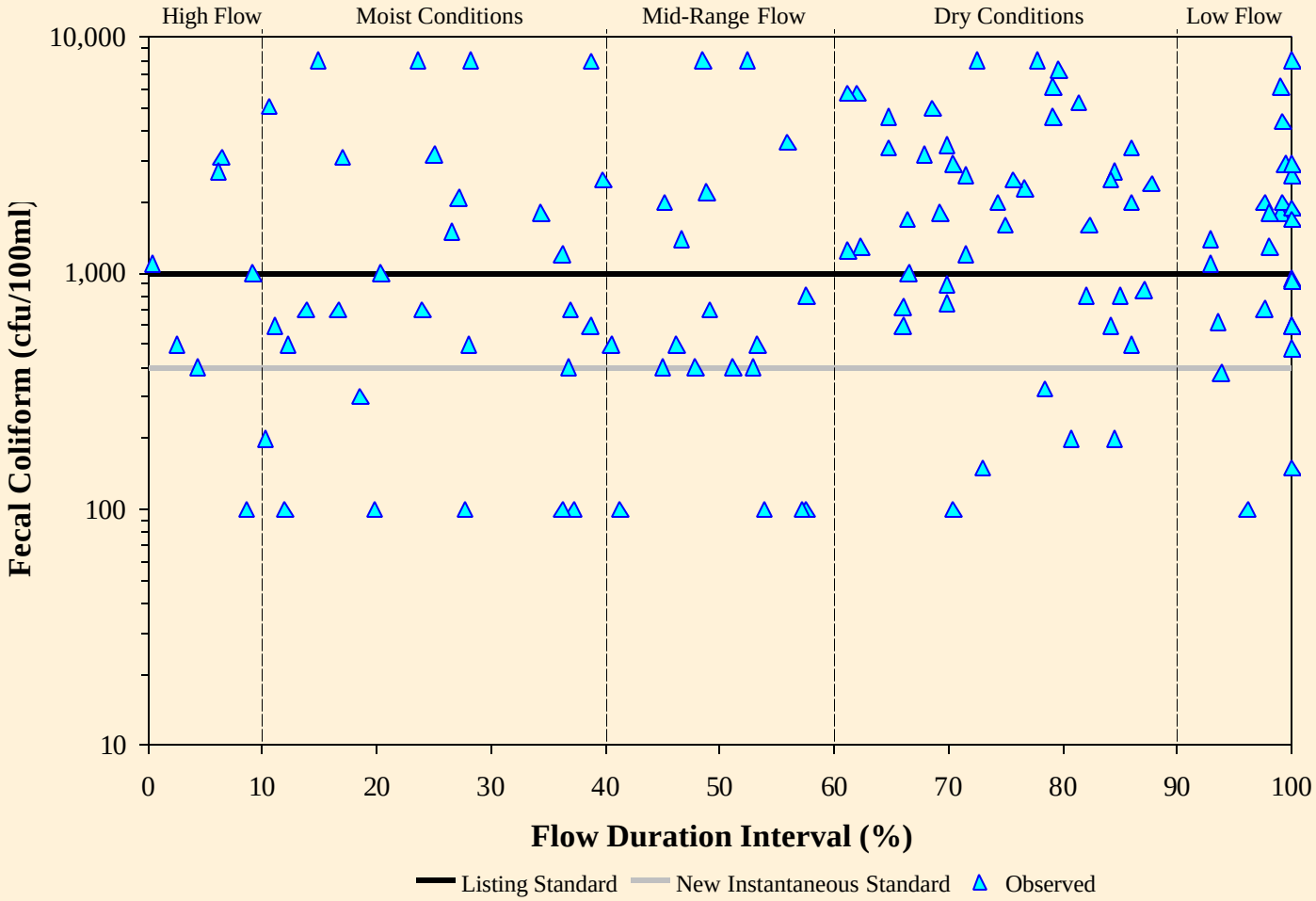
Analysis of Historical Data

Upper Middle River



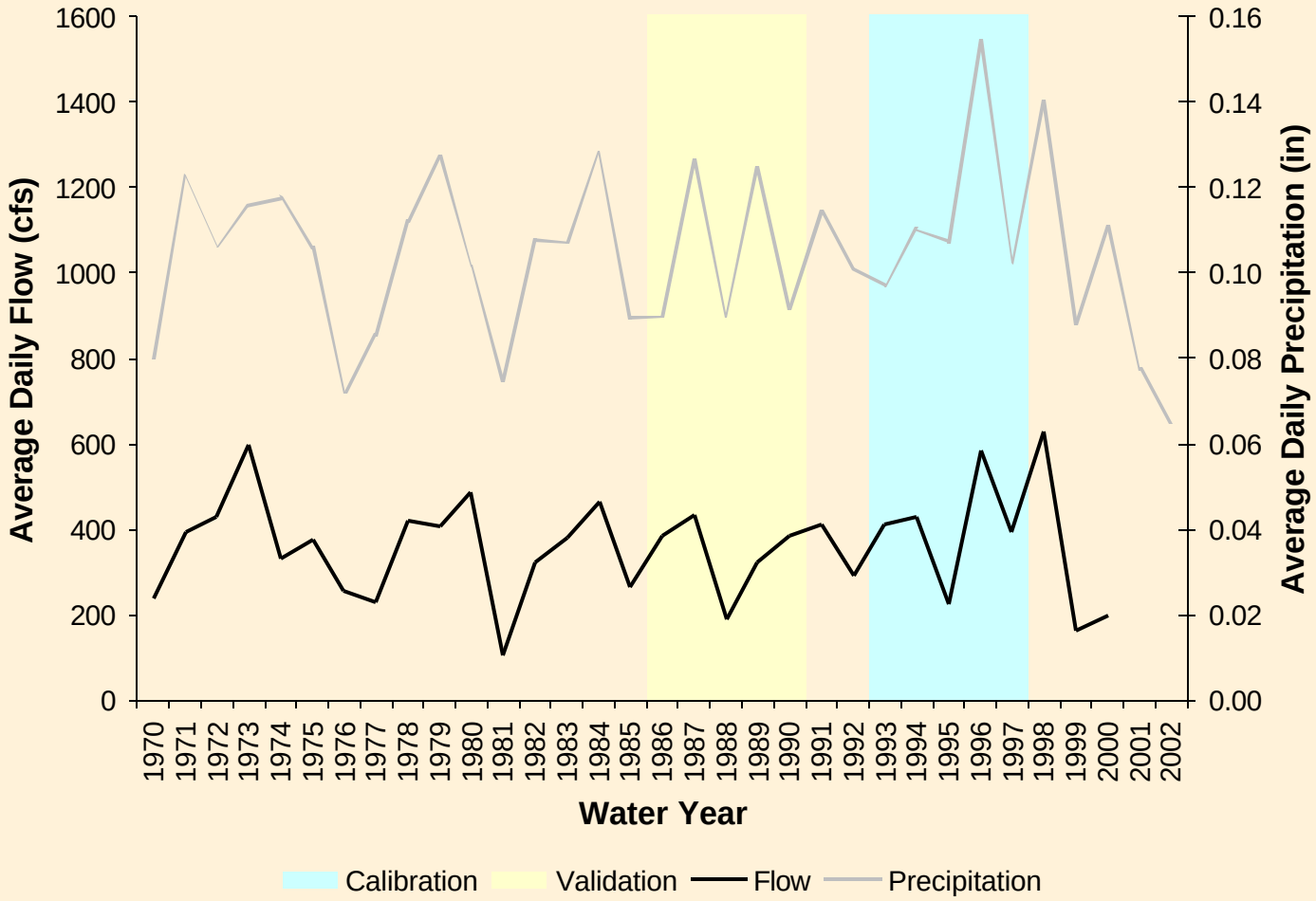
Analysis of Historical Data

Lewis Creek



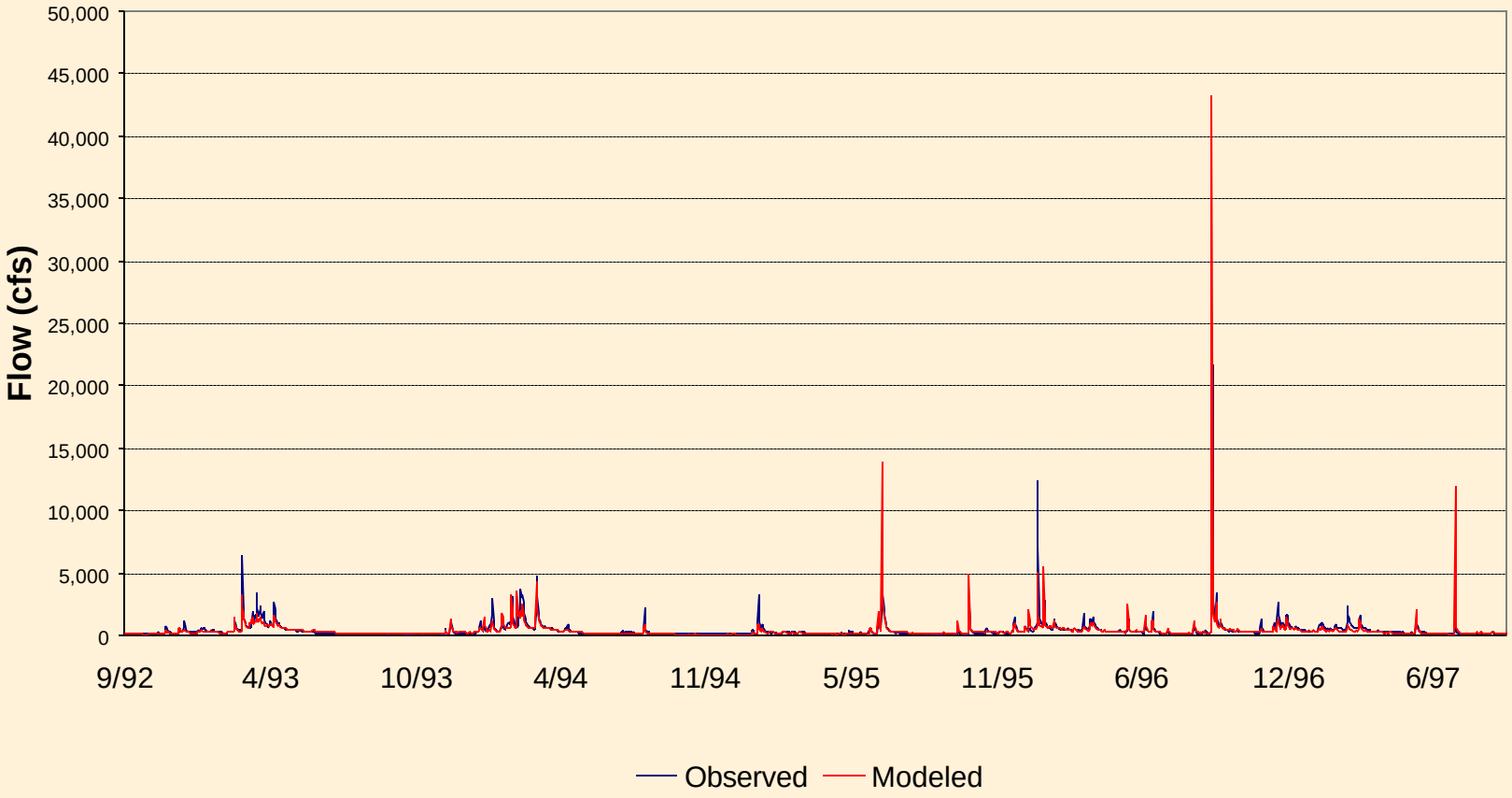
Analysis of Historical Data

Calibration and Validation



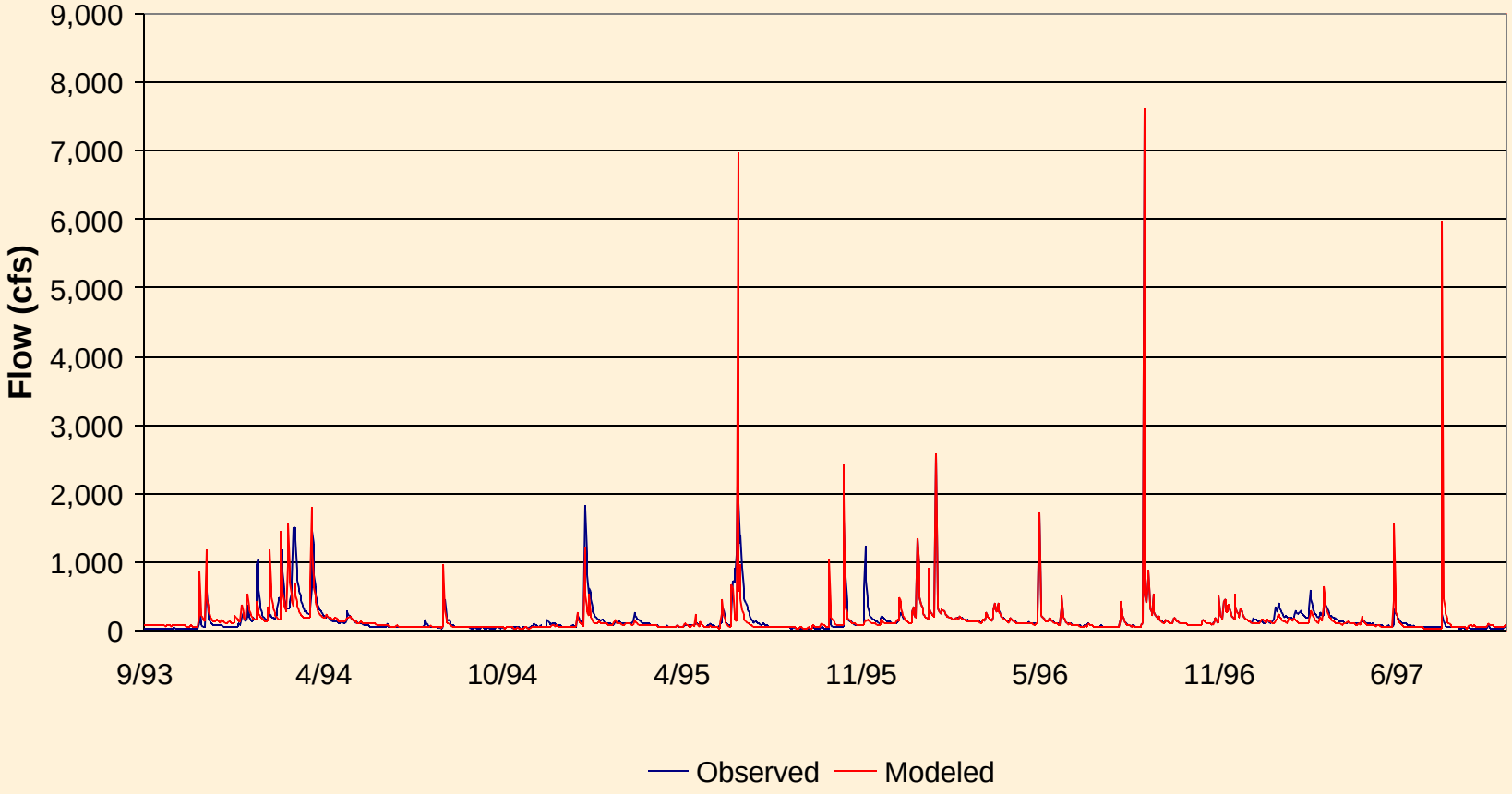
Hydrology Calibration

Middle River (10/93-9/97)



Hydrology Calibration

South River (10/93-9/97)



Hydrology Calibration

Criterion	Observed	Simulated	% Error
Total runoff, in.	71.75	69.67	-2.90
Total of Highest 10% of flows, in	30.57	30.01	-1.83
Total of lowest 50% of flows, in.	12.60	13.60	7.91
Summer flow vol., in.	12.50	14.16	13.28
Winter flow vol., in.	29.53	24.80	-16.02

TMDL Development

- TMDL Development
  - Modeling
    - Hydrology
    - Water Quality
      - Source identification
      - Load distribution
  - Load Allocation

Middle/South River TMDLs
Modeling Components, Water Quality

- Sources
  - Fecal Production
  - FC densities
  - FC distribution
  - Waste management
- Delivery Mechanisms

Pollutant Sources

- Livestock
- Wildlife
- Human
  - Biosolids
  - Septic systems
- Pets
- Permitted discharges
  - Wastewater treatment facilities

Livestock & Poultry Sources

- Population
  - Virginia Ag. Statistics
  - Consultation with Headwaters SWCD, Livestock Producers, VADCR, NRCS, Pilgrim's Pride, Dairyman's Assc. Equine Vet.
  - Watershed visits
- Distribution of waste
  - Pastured
  - Confined and waste collected
  - Direct deposition to the stream
- Seasonal varying applications

Old (3/4/03) Livestock Population Estimates

Impairment	Beef	Dairy	Horse	Poultry	Turkey*	Sheep	Other+
Upper Middle	9,109	420	8	0	149,775	710	80
Moffett Creek	811	1,090	12	0	180,600	105	0
Lewis Creek	220	756	24	0	22,800	0	0
Polecat Draft	420	72	0	84,000	36,500	0	0
Lower Middle	2,412	3,860	0	231,500	88,500	100	0
South River	3,291	415	63	0	82,108	439	30

*Turkey includes 1 growing cycle of Breeder, Finished Hen, Finished Tom and Brood to Move

+Minor sources such as Swine and Goats

Current Livestock Estimates

Impairment	Beef	Dairy	Horse	Swine	Sheep	Goat
Upper Middle	9,591	1,700	606	80	1,000	0
Jennings Branch*	1,090	0	152	0	172	0
Moffett Creek	1,016	1,090	172	0	253	0
Middle Middle*	3,305	967	448	0	620	22
Lewis Creek	220	756	201	0	629	0
Polecat Draft	716	188	40	0	73	0
Lower Middle	4,160	1,096	255	0	426	0
TOTAL Middle	20,098	5,797	1,875	80	3,172	22
South River	3,291	415	218	0	351	30

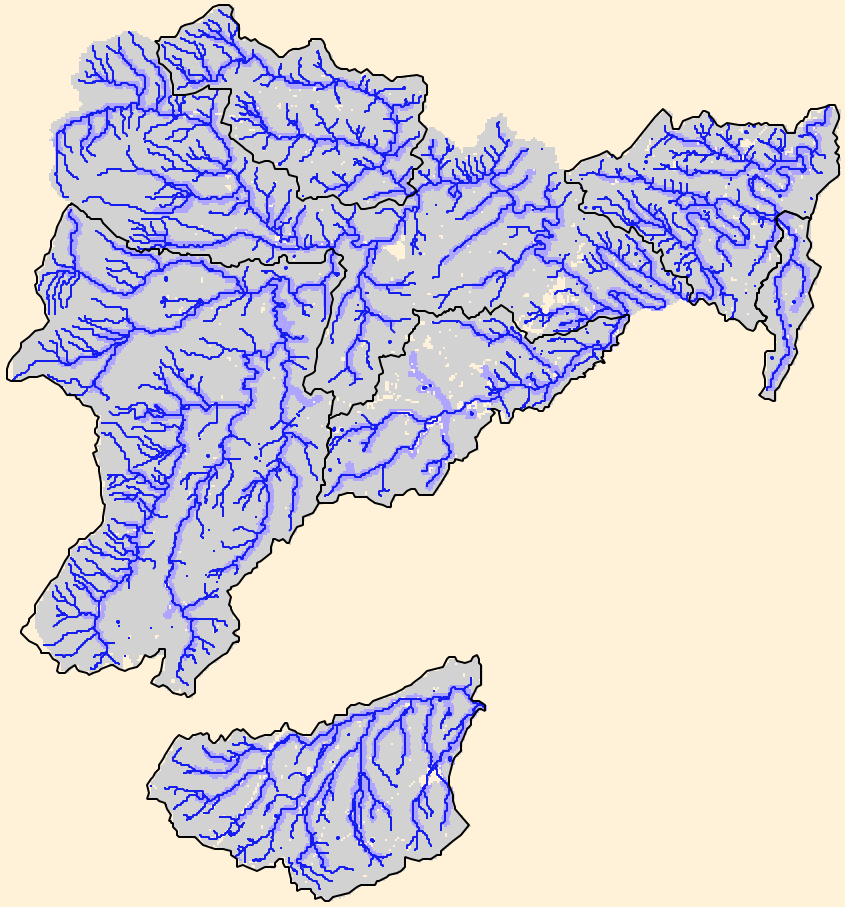
*** Non-impaired areas.**

Poultry (Total Birds per Year)

Impairment	Broilers	Pullets	Breeders	Hens	Toms	2-Stage Toms
Upper Middle	0	0	15,000	522,800	19,500	0
Jennings Branch*	672,000	0	0	160,000	0	672,000
Moffett Creek	336,000	0	31,700	225,600	222,000	336,000
Middle Middle*	312,000	224,000	0	108,800	0	312,000
Lewis Creek	0	0	0	91,200	0	0
Polecat Draft	504,000	0	0	0	25,500	504,000
Lower Middle	1,389,000	0	0	624,000	225,000	1,389,000
TOTAL Middle	3,213,000	224,000	46,700	1,732,400	492,000	3,213,000
South River	0	0	20,000	291,200	0	0

*** Non-impaired areas.**

Wildlife



- Wildlife population densities
- Habitat evaluation
- Load assessment
- Load distribution

Current Wildlife Population Estimates

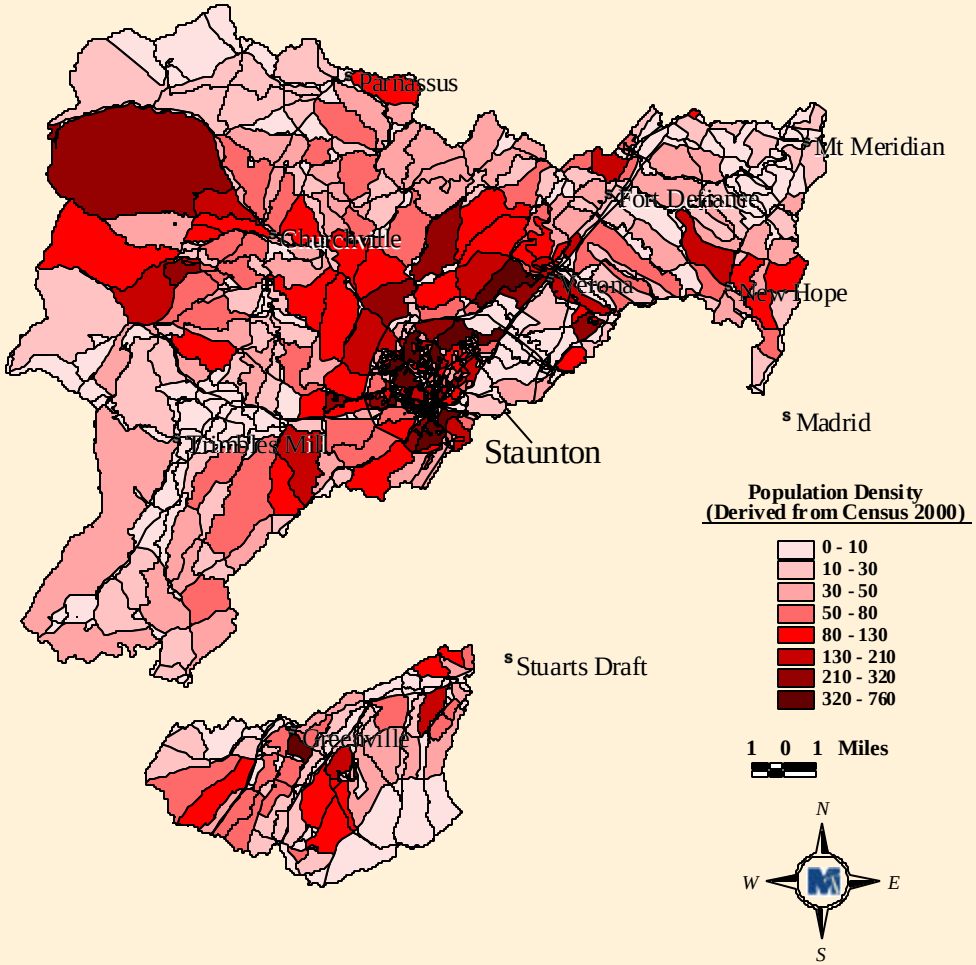
Impairment	Deer	Turkey	Goose	Duck	Muskrat	Raccoon	Beaver
Upper Middle	1,913	213	176	1,027	4,005	856	299
Jennings Branch*	740	136	60	131	1,700	379	116
Moffett Creek	555	69	51	296	1,207	258	79
Middle Middle*	984	82	94	203	2,612	560	142
Lewis Creek	465	35	53	116	1,272	286	58
Polecat Draft	115	8	11	23	376	87	0
Lower Middle	620	26	58	125	1,832	401	111
TOTAL Middle	5,392	569	503	1,921	13,004	2,827	805
South River	835	112	244	492	2,473	511	230

*** Non-impaired areas.**

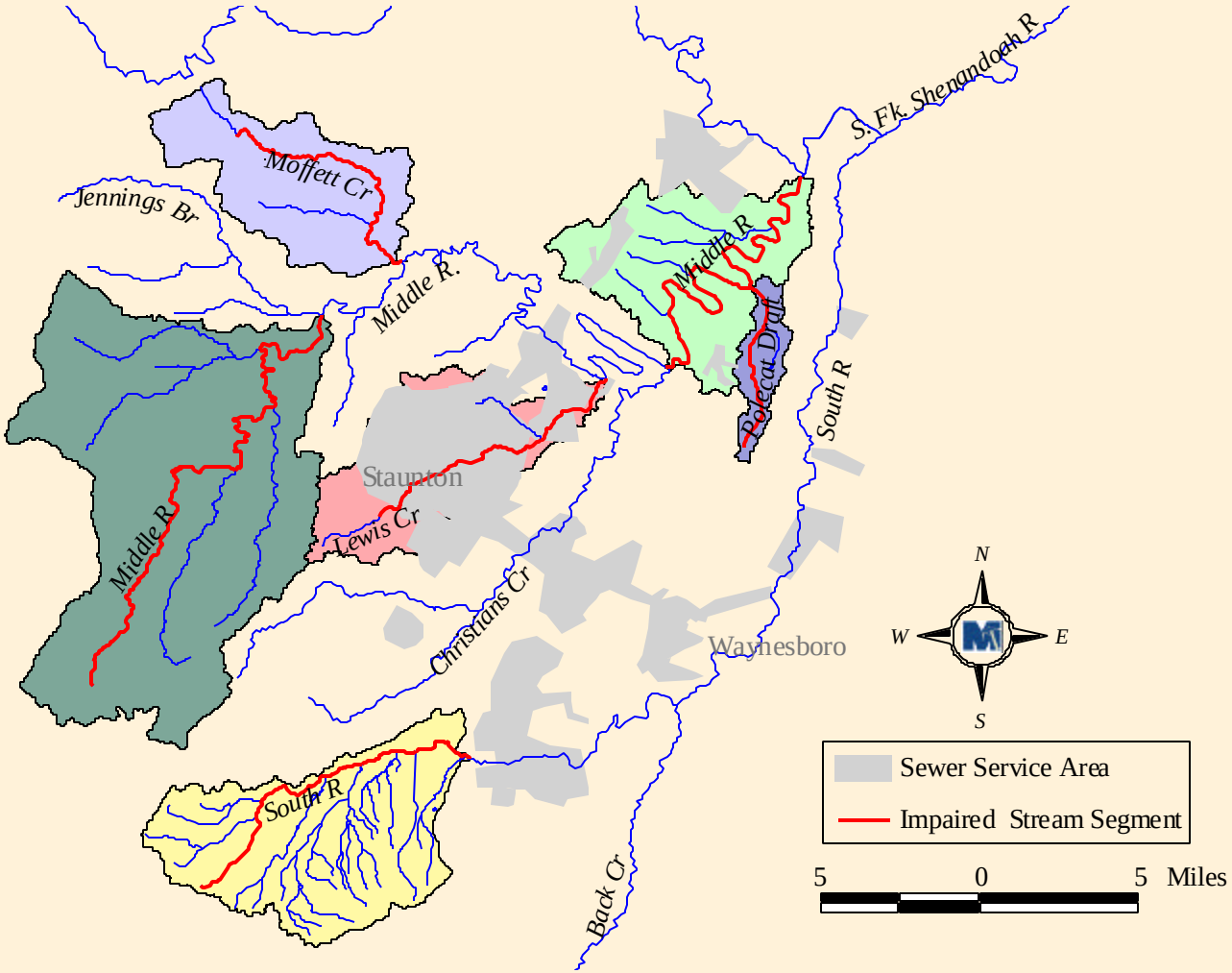
Human Source

- Population projected based on 1990 and 2000 census
- Septic
  - Failure rate based on age of home
  - VDH
- Straight Pipes
  - Estimate 1.61% of households not sewer or septic
- VPDES Permits
- Sewer system exfiltration and overflows
- Biosolids

Population Distribution



Sewer Service Area



Old (3/4/03)
Human Population Estimates

Impairment	Population	Housing Units	Housing Units with sewer	Housing units with septic	Housing units with other
Upper Middle	3,716	1,522	21	1,393	107
Moffett Creek	2,644	1,103	8	1,029	66
Lewis Creek	24,694	10,978	10,245	659	74
Polecat Draft	484	183	16	159	7
Lower Middle	2,285	916	361	533	22
South River	3,877	1,460	145	1,259	56
Totals	37,699	16,161	10,795	5,033	333

Current Human Population Estimates

Impairment	Population	Households	Sewer (Homes)	Septic (Homes)	Other (Homes)
Upper Middle	3,817	1,577	0	1,486	91
Jennings Branch*	1,695	730	0	695	35
Moffett Creek	1,055	427	0	408	19
Middle Middle*	6,753	2,871	1,369	1,442	60
Lewis Creek	24,822	11,075	10,326	680	69
Polecat Draft	517	193	0	187	6
Lower Middle	2,372	949	375	556	18
TOTAL Middle	41,030	17,822	12,070	5,454	297
South River	4,528	1,593	161	1,389	43

*** Non-impaired areas.**

VPDES Permits (Fecal Bacteria)

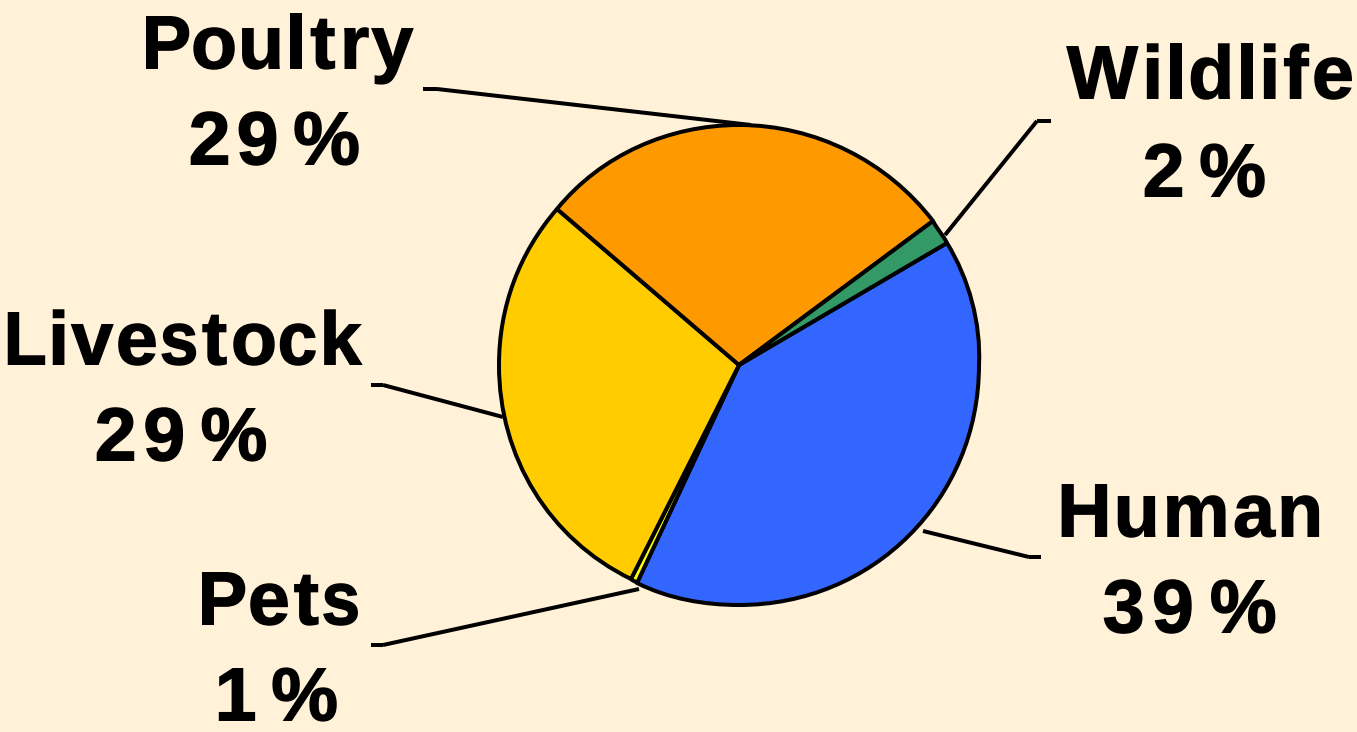
Facility	VAPDES #	Impairment
ACSA; Mt. Sidney, Ft. Defiance STP	VA0022322	Middle River
Cold Spring Correctional Unit 10	VA0023400	South River
Camp Shenandoah STP	VA0060917	Middle River
ACSA-New Hope STP	VA0062481	Middle River
Permit Expired ~~Verona STP~~	~~VA0064637~~	~~Lewis & Middle~~
Middle River Regional STP	VA0064793	Middle River
ACSA-Chruchville WTP	VA0084212	Jennings Branch
Greenville STP	VA0089362	South River
White Way Lunch	VA0089419	Jennings Branch

Biosolids (2000-2002)

Impairment	Permitted Acreage	Application Acreage	Load Applied (Dry Tons)
Upper Middle	0	0	0
Moffett Creek	0	0	0
Lewis Creek	0	0	0
Polecat Draft	0	0	0
Lower Middle	528	26	415
South River	193	89	725

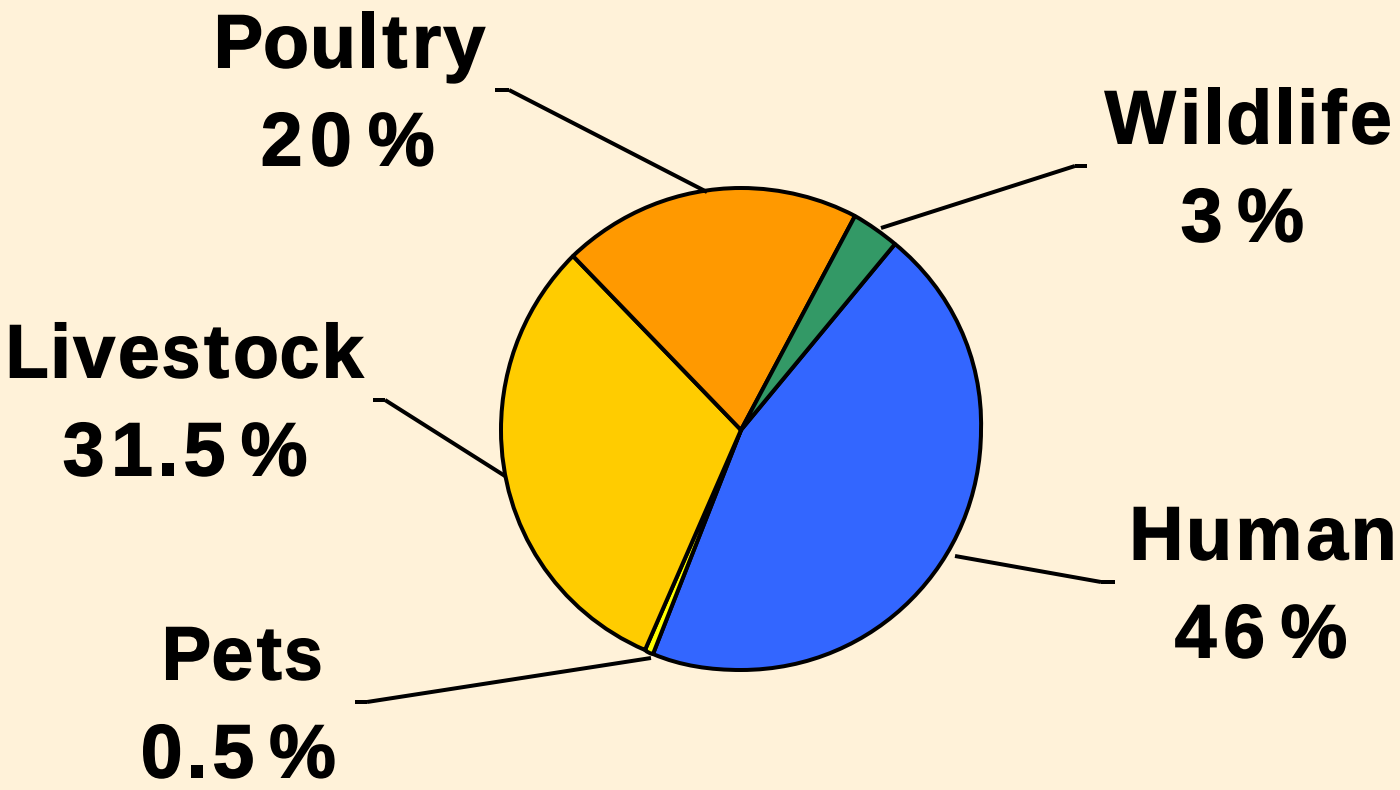
Middle River FC Production

Calculated as (FC/day)

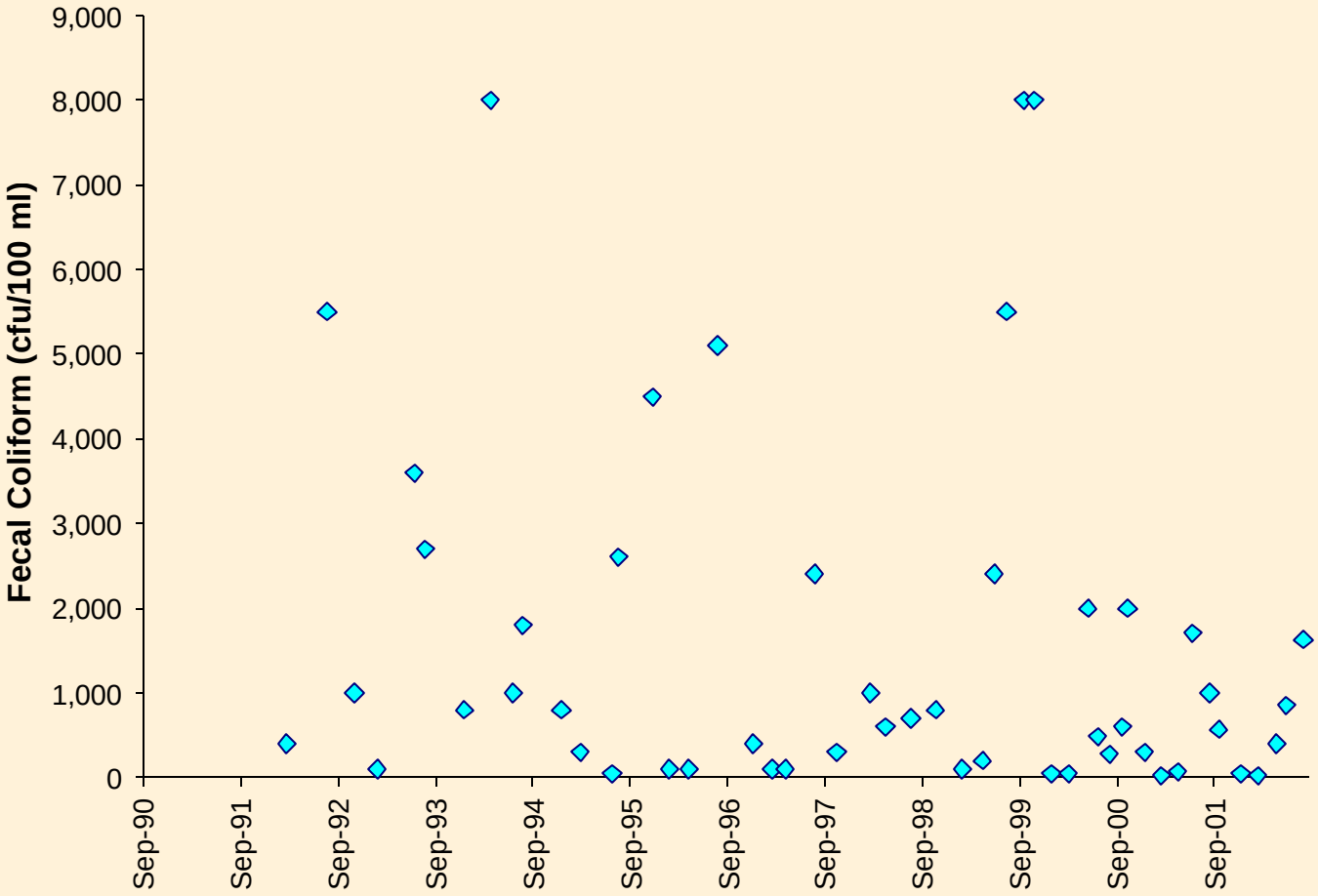


South River FC Production

Calculated as (FC/day)



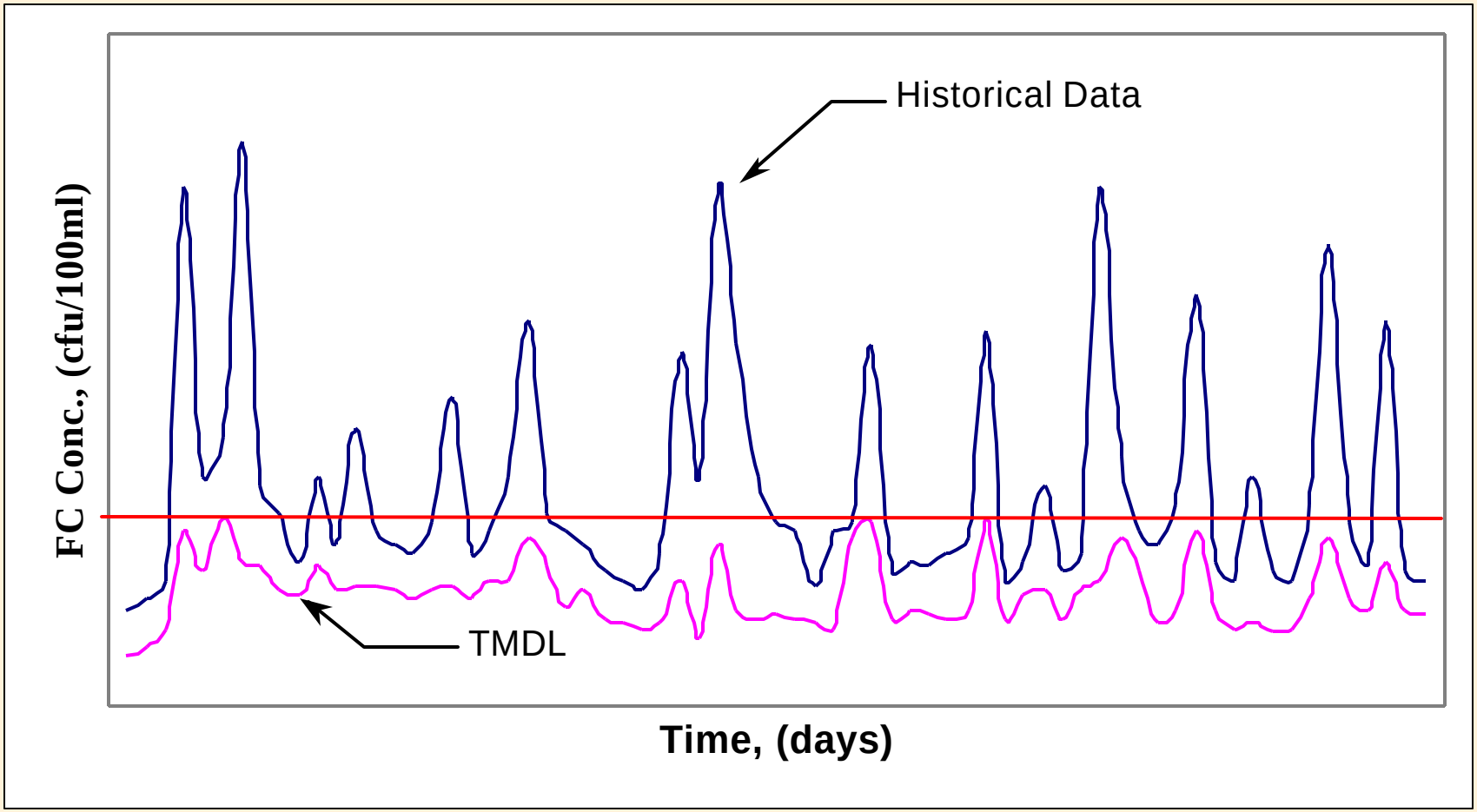
Water Quality Modeling



Next Step?

- Develop load reduction scenarios
- Model scenarios
- Select scenario(s)

Next Step?



Where from here?

- Public Meeting 3 (Date?)
- Public Review (30 days)
- Submit to EPA (30 days)
- State Approval
- Implementation Plan Development
- Implementation

Middle/South River TMDLs
Augusta County

- Department of Conservation and Recreation, Division of Soil & Water Conservation
  - William Keeling, TMDL Project Manager, 804-371-7485
  - Tamara Keeler, Watershed Manager, 540-332-8955
- Department of Environmental Quality
  - Robert Brent, Regional TMDL Coordinator, 540-574-7848
- MapTech, Inc
  - Jim Kern, Contractor, 540-961-7864
  - Email jkern@maptech-inc.com