

GIS Modeling of Cryptosporidium Loadings in the Potomac River Watershed

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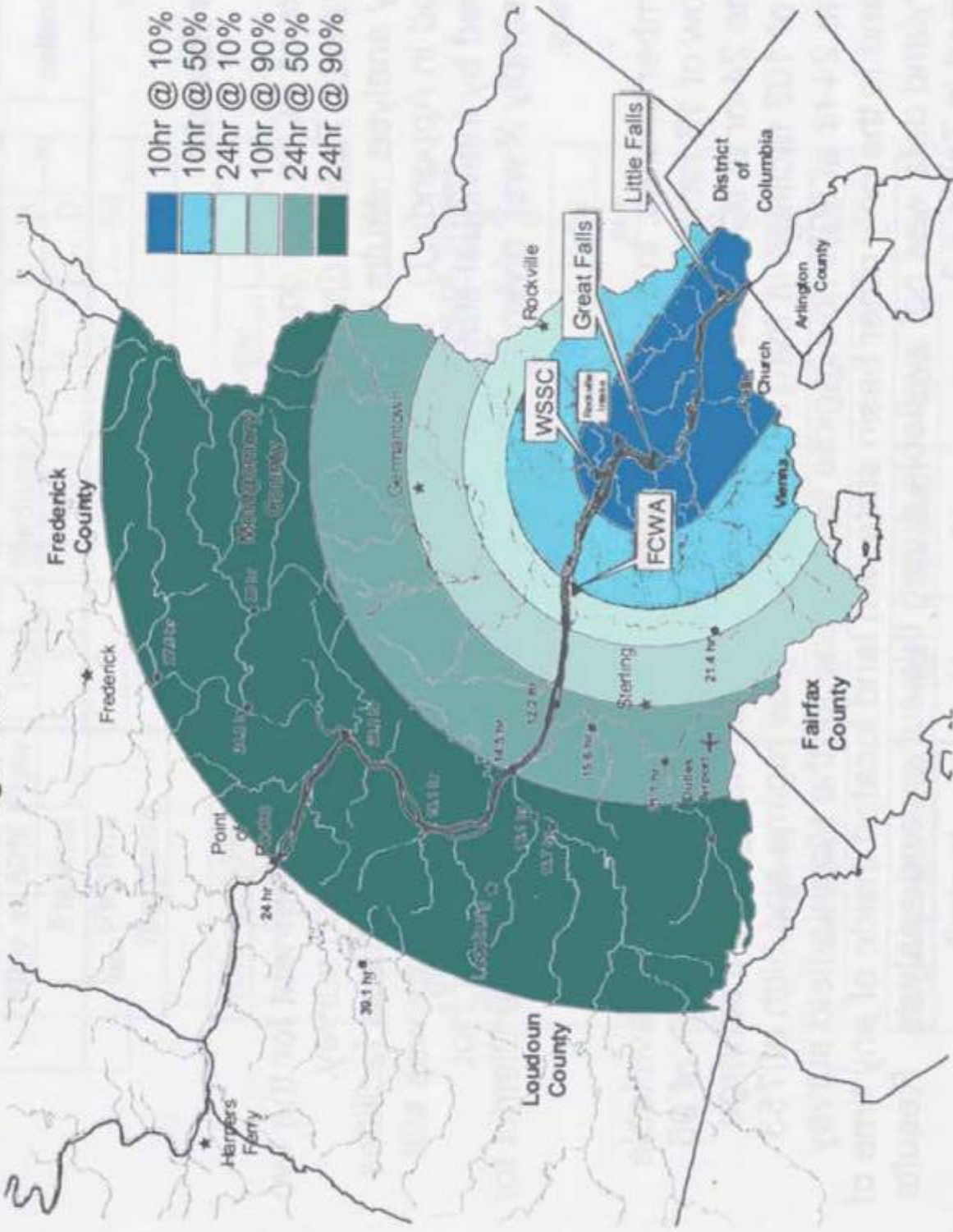
Existing Studies to Use as Basis for Model

- MDE Potomac Cryptosporidium Study
- ICPRB D.C Source Water Assessment (CBP Fecal Coliform Model)
- CWP Watershed Treatment Model for the WSSC Intake (Fecal Coliform Model)

Fecal Coliform Modeling Process

- **Quantify Watershed Sources Based on Land Use**
- **Calculate Coliform Based on Loading Coefficient**
- **Calibrate to Water Quality Data**
- **Model Total Loadings**
- **Eval. Sources Based on Distance to Intake**

Figure 4.1. Time of travel segments



Crypto vs. Bacteria – Differences in Modeling Approach

- **Crypto Survives Longer – Travel Time Less of An Issue**
- **Crypto Loading Coefficients Not Well Known for Watershed Sources In Particular**
- **Limited Sampling Data Available to Calibrate Models**

GIS Modeling Approach

- **Develop Focused Subwatershed Models to Quantify Crypto Sources**
 - Agriculture
 - Urban
 - Residential
- **Apply Model for Subwatersheds Throughout the Potomac Basin**

Land Use in the Potomac Basin

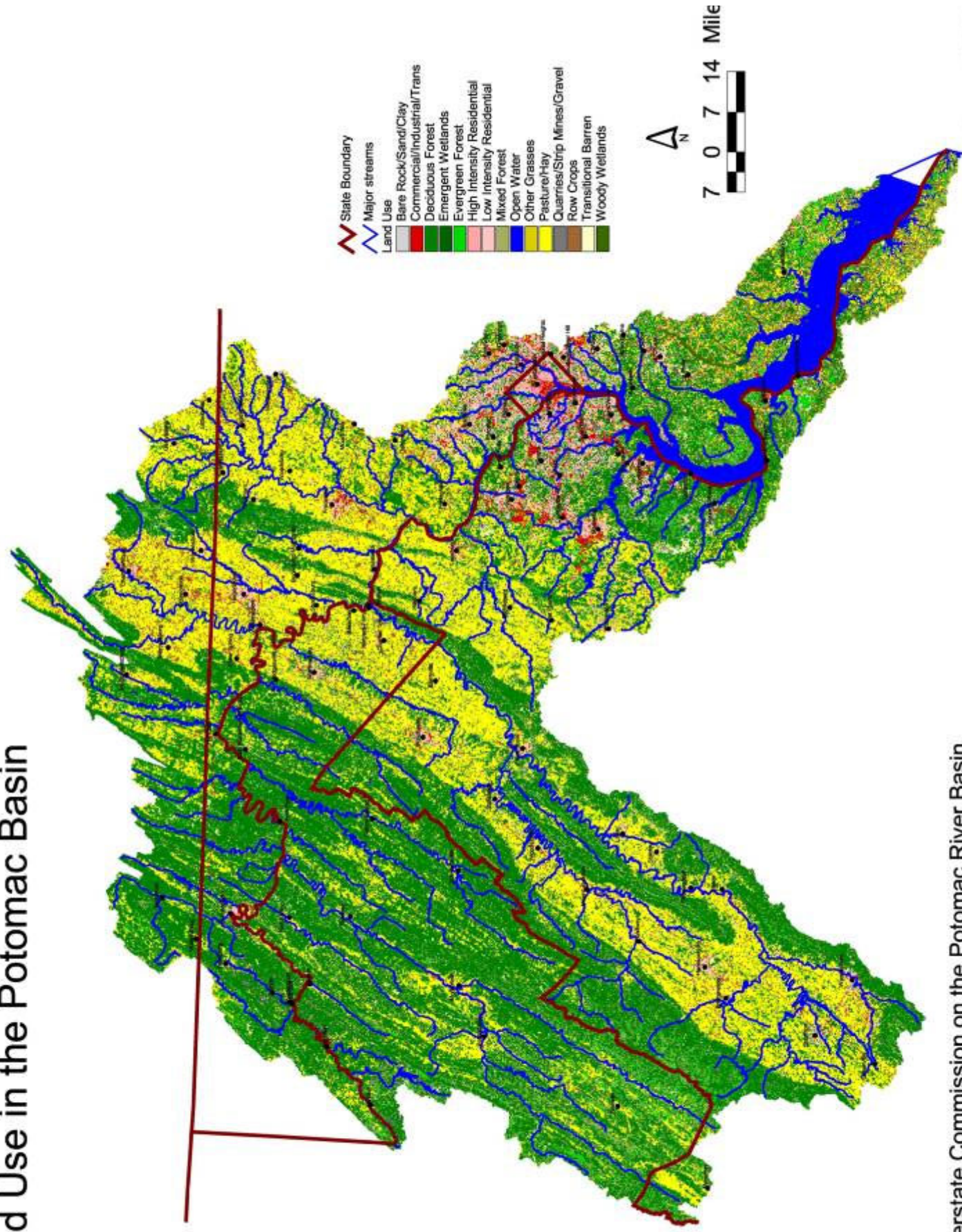
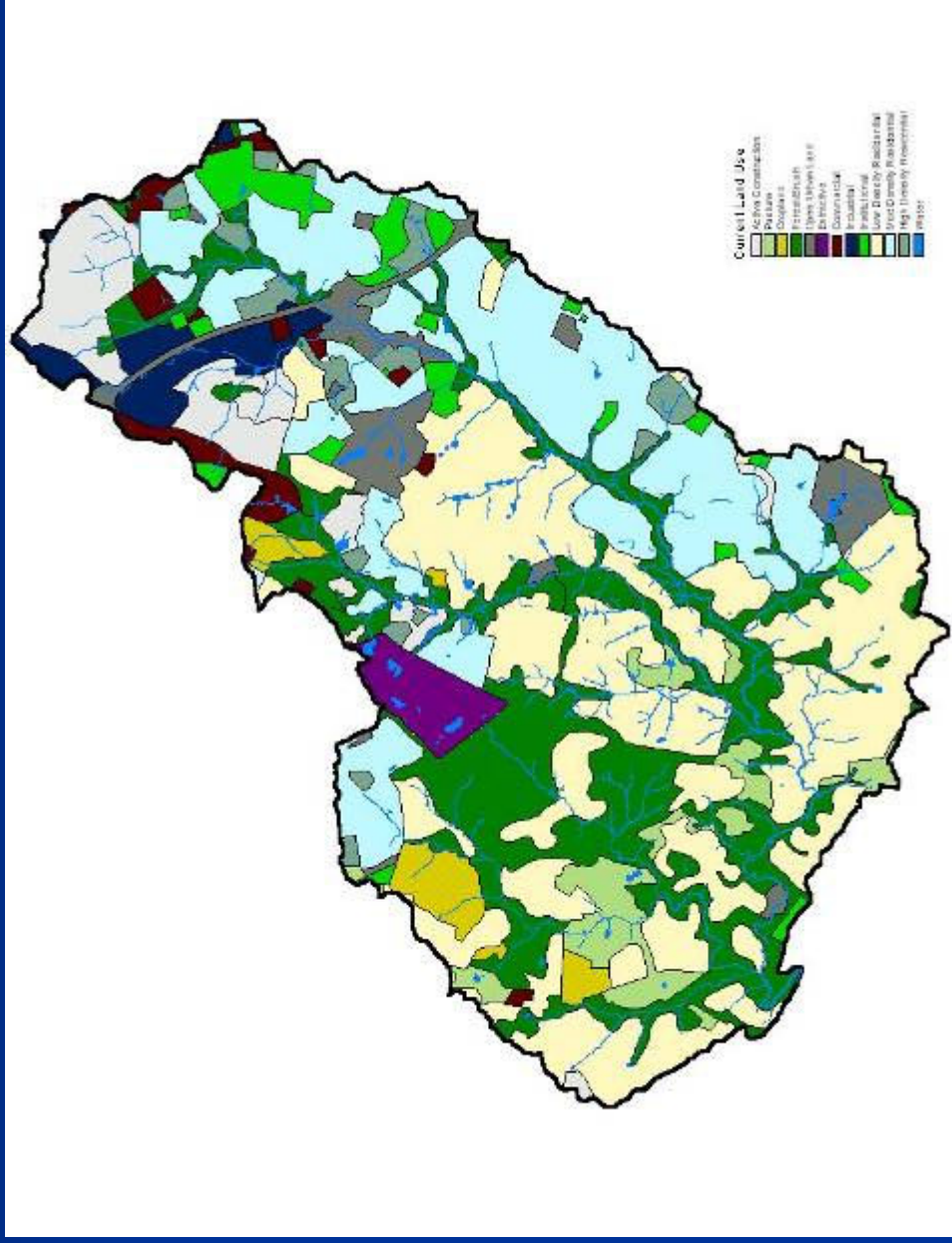


Figure 2. Land Use in Watts Branch



Current and Future Land Use in Watts Branch

Land Use Category	Impervious Cover	Area in 1997 (acres)	Area in 2020 (acres)	Change (acres)
Low Density Residential	11%	4,183	6,291	2,108
Medium Density Residential	23%	3,338	3,339	1
High Density Residential	40%	380	1,109	729
Commercial	72%	300	301	1
Roadway	80%	651	651	0
Industrial	53%	389	437	48
Forest	0%	3,015	1,906	(1,110)
Rural	0%	1,162	0	(1,162)
Open Water	0%	10	10	(9)
Active Construction	0%	818	201	(617)
Vacant Land	0%	0	0	0
Resulting Impervious Cover (%)		16.3%	20.4%	

Modeling Steps

- **Select 3-6 Subwatersheds for Detailed Analysis (Maryland)**
- **Map Sources with GIS Data**
- **Confirm with Ortho Photos and Targeted Field Surveys**
- **Develop Subwatershed Sampling Plans to Quantify Crypto Loading Coefficients**

Modeling Steps (Cont.)

- Calibrate Loading Coefficients to Sampling Data
- Relate Detailed MD GIS Data to More Generalized GIS Data for Remaining Watershed Areas
- Apply Model Throughout Basin

Animals by Watershed Segment.

Segment	SWINE	DAIRY	LAYERS	BROILERS	TURKEYS
160	2,760	7,416	28,030	214,028	5,628
170	1,466	149	59,305	628,195	137,038
175	4,466	5,055	17,480	88,105	1,158
180	20,244	20,284	62,926	7,700	18,995
190	8,207	22,246	242,957	2,600,899	655,708
200	6,833	16,864	139,477	1,614,577	404,747
210	10,533	26,060	108,346	2,588	42,558
220	1,037	2,649	350	25	64
225	228	1,255	1,719	0	1,695
730	65,184	27,673	156,846	36,443	49,229
740	22,055	15,933	31,631	2,697	15,781
750	6,389	3,120	73,714	6,250	36,857
Total	149,400	148,702	922,781	5,201,507	1,369,459

What Can Be Done Now

- **Collect and Assemble GIS Data (as necessary)**
- **Select Subwatersheds**
- **Conduct Analysis of One – Identifying Data Gaps**
- **Develop Sampling Program**
- **Evaluate Potential BMPs to Reduce Crypto Loadings**