

Chesapeake Bay Program Watershed Model Issues

*Presentation to
Water Resources Technical Committee*

March 10, 2011



CBP Watershed Model Development Status

- November 2009 – Phase 5.2 output used for preliminary allocations
- March - May 2010 – Phase 5.3 output available; major problems identified
 - Few corrections made (e.g. urban E3 scenario definition), but others deferred to new version (5.3.2)
- June – July 2010 – Phase 5.3 output used for final allocations, Phase I WIPs despite known flaws
 - Work begins on revising land use, ag nutrient management; collecting state data for new version
- **February 2011 CBP releases 5.3.2 land use**
- **March 2011 calibration of 5.3.2 begins**
- **June 2011 ? – new load data available**

Why Do We Care?

- CBP, states will update TMDL allocations and base WIP Phase II plans on 5.3.2 data
- Use of local land use data not an option in Version 5.3.2
- MD had considered using MDP land use rather than CBP WSM data; need to check this

Variation in Developed Lands in Phase 5.x models

Model Version	Impervious Surface (acres)	Pervious Surface (acres)
Phase 5.2 (2002)	799,989	3,591,799
Phase 5.3 (2002)	675,917	1,885,935
Phase 5.3.1 (2001)	1,587,575	5,896,707
Phase 5.3.1 (2001) Excl wooded residential	1,569,377	3,442,346
Phase 5.3.2 (2001) (Mean rural lot size = 2.24 acres)	1,212,520	2,980,906*

* 2005 Turf Grass Estimate (Turf Industry Data apportioned to watershed) = 3,790,000 acres
 2006 P532 estimate of turf grass = 3,387,741 acres

U.S. Department of the Interior
 U.S. Geological Survey

Phase 5.3.0

- Based on satellite derived land cover data (1984, 1992, 2001, 2006) and state mining information

Pros:

- Satellite data are comparable and consistent across space and time.
- Clear methodology.
- Impervious surfaces that may be most relevant to water quality are captured.

Cons:

- Low density residential development is not well represented.
- Roads are inconsistently represented.

U.S. Department of the Interior
U.S. Geological Survey

Phase 5.3.2

- Based on a combination of land cover, roads, housing, impervious and road width coefficients, and state mining datasets.

Pros:

- Captures 94% (vs. 74%) of impervious surfaces in Montgomery County, MD.
- Pervious developed lands, representing mostly lawns, approximate the extent of turf grass estimated from Turf Grass Industry data (3.79 million acres).
- Estimates the number of septic systems within 1% of Maryland Dept. of Planning data (+ ~15% in Phase 5.3.0)

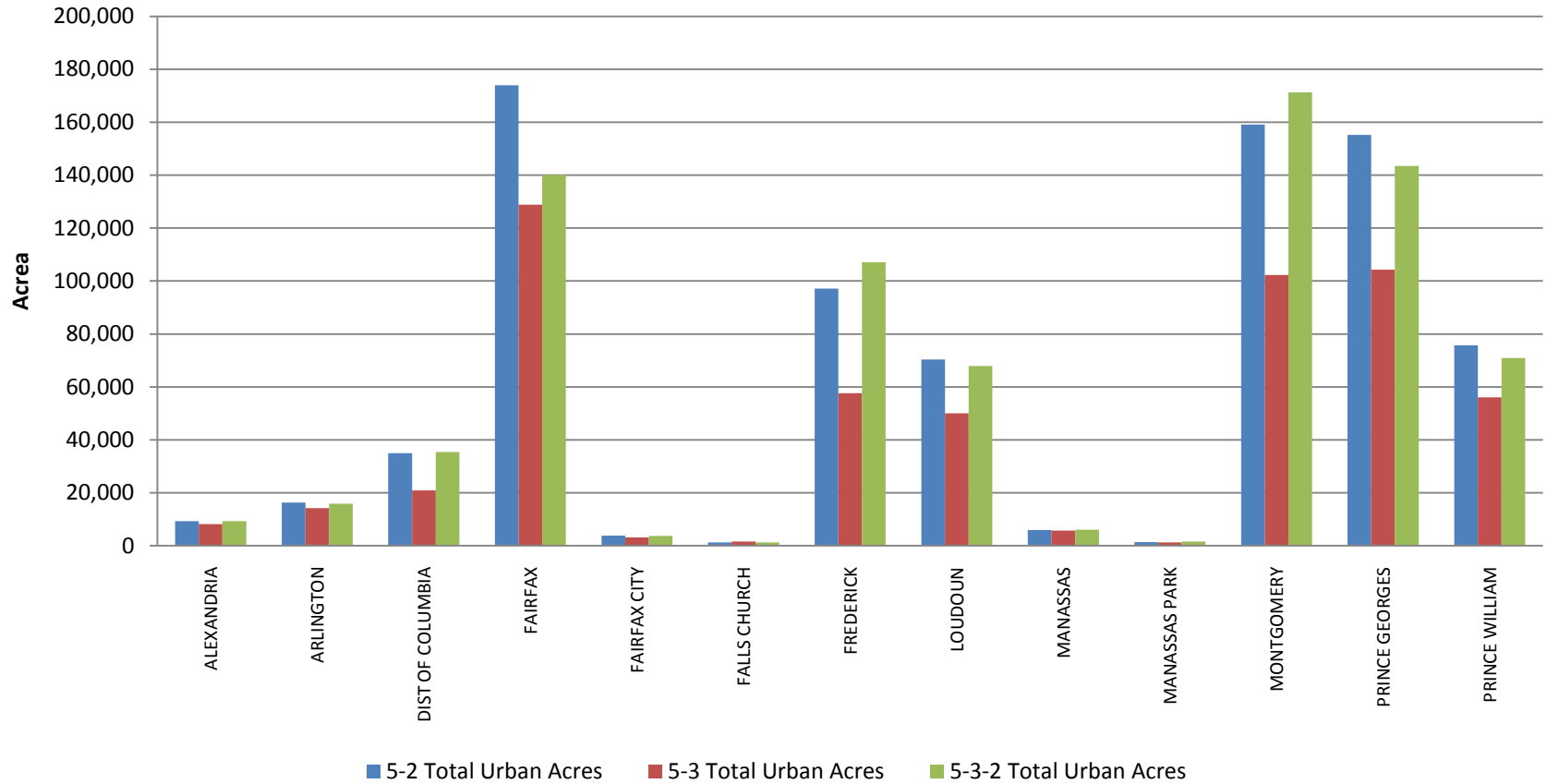
Cons:

- Very complex methodology involving a large number of assumptions.
- Impervious surface associated with farm buildings and rural warehouses are excluded.

Urban Acres Comparison

Total Urban

COG Members Total Urban Acreage: 5.2 vs. 5.3 vs. 5.3.2



Urban Acres Comparison

Total Urban

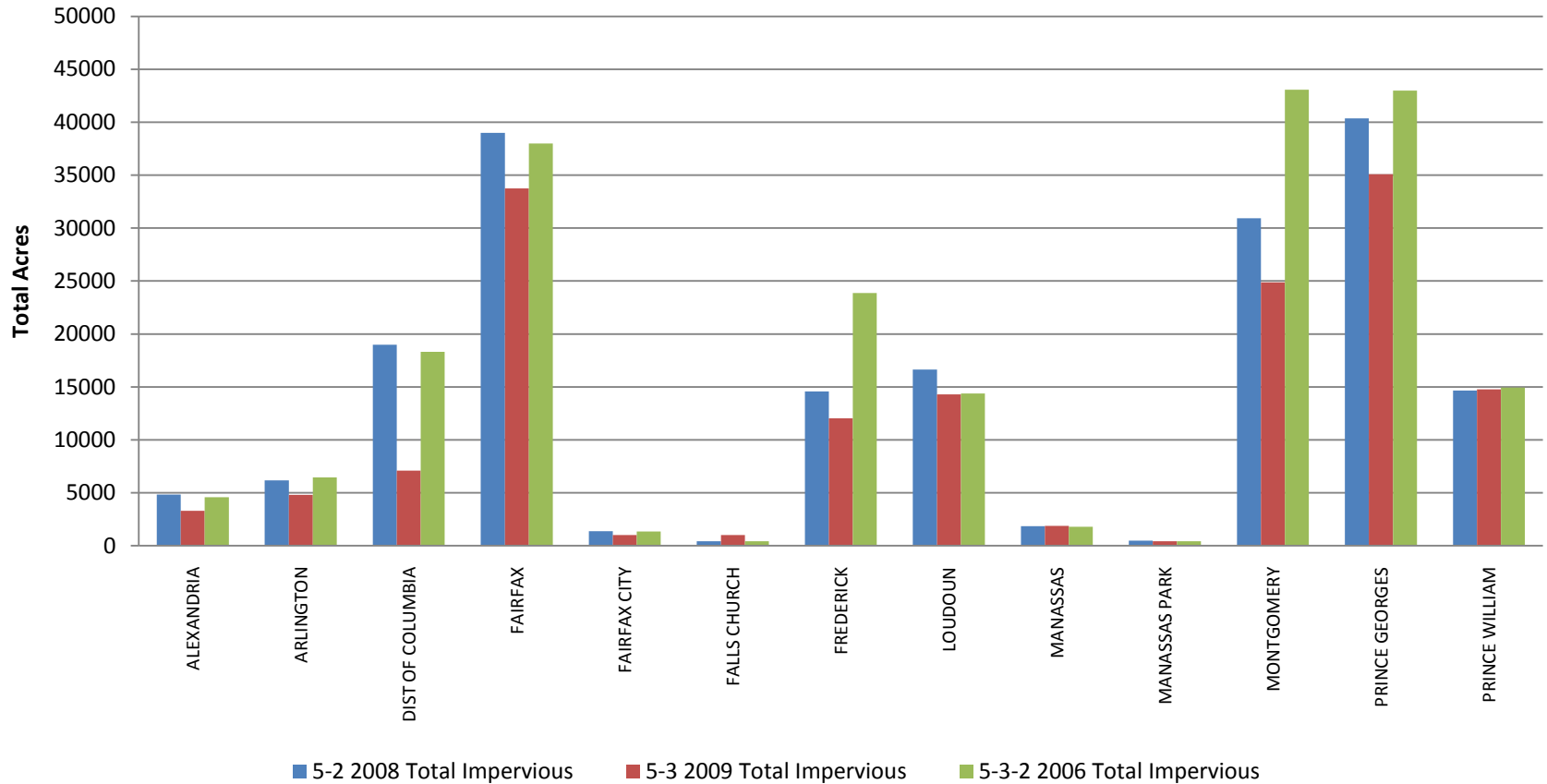
COG Jurisdiction	5-2 Total Urban Acres	5-3 Total Urban Acres	5-3-2 Total Urban Acres
ALEXANDRIA	9,322	8,180	9,247
ARLINGTON	16,335	14,179	15,933
DIST OF COLUMBIA	34,937	20,904	35,426
FAIRFAX	173,988	128,885	140,082
FAIRFAX CITY	3,777	3,197	3,771
FALLS CHURCH	1,248	1,647	1,219
FREDERICK	97,113	57,670	107,045
LOUDOUN	70,318	50,052	67,878
MANASSAS	5,922	5,735	6,072
MANASSAS PARK	1,391	1,312	1,580
MONTGOMERY	159,077	102,330	171,267
PRINCE GEORGES	155,180	104,274	143,482
PRINCE WILLIAM	75,741	56,035	70,917

MD municipal data included in county data

Urban Acres Comparison

Total Impervious

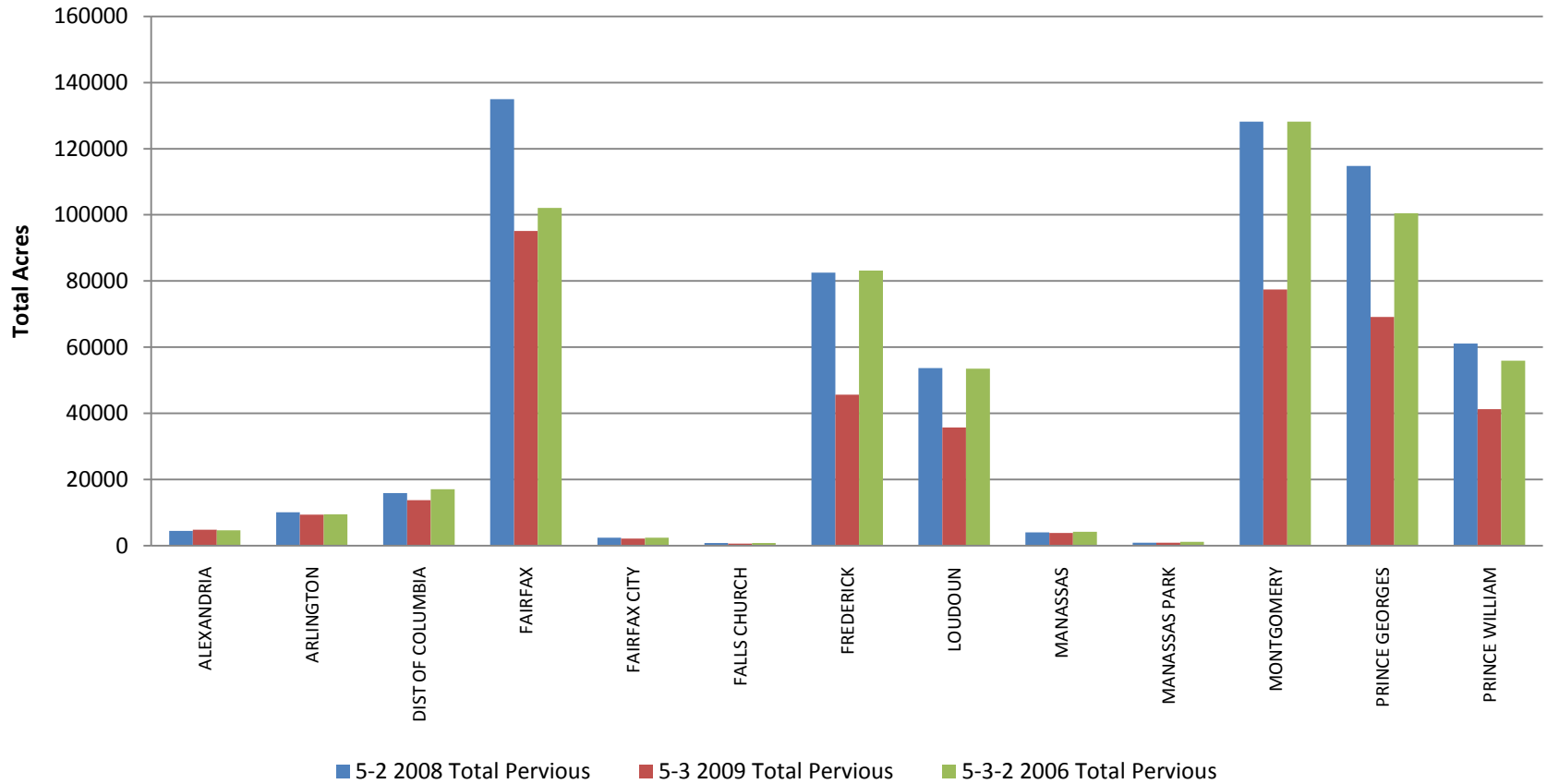
COG Members Impervious Urban Acreage: 5.2 vs. 5.3 vs. 5.3.2



Urban Acres Comparison

Total Pervious

COG Members Pervious Urban Acreage: 5.2 vs. 5.3 vs. 5.3.2



Urban Acres Comparison

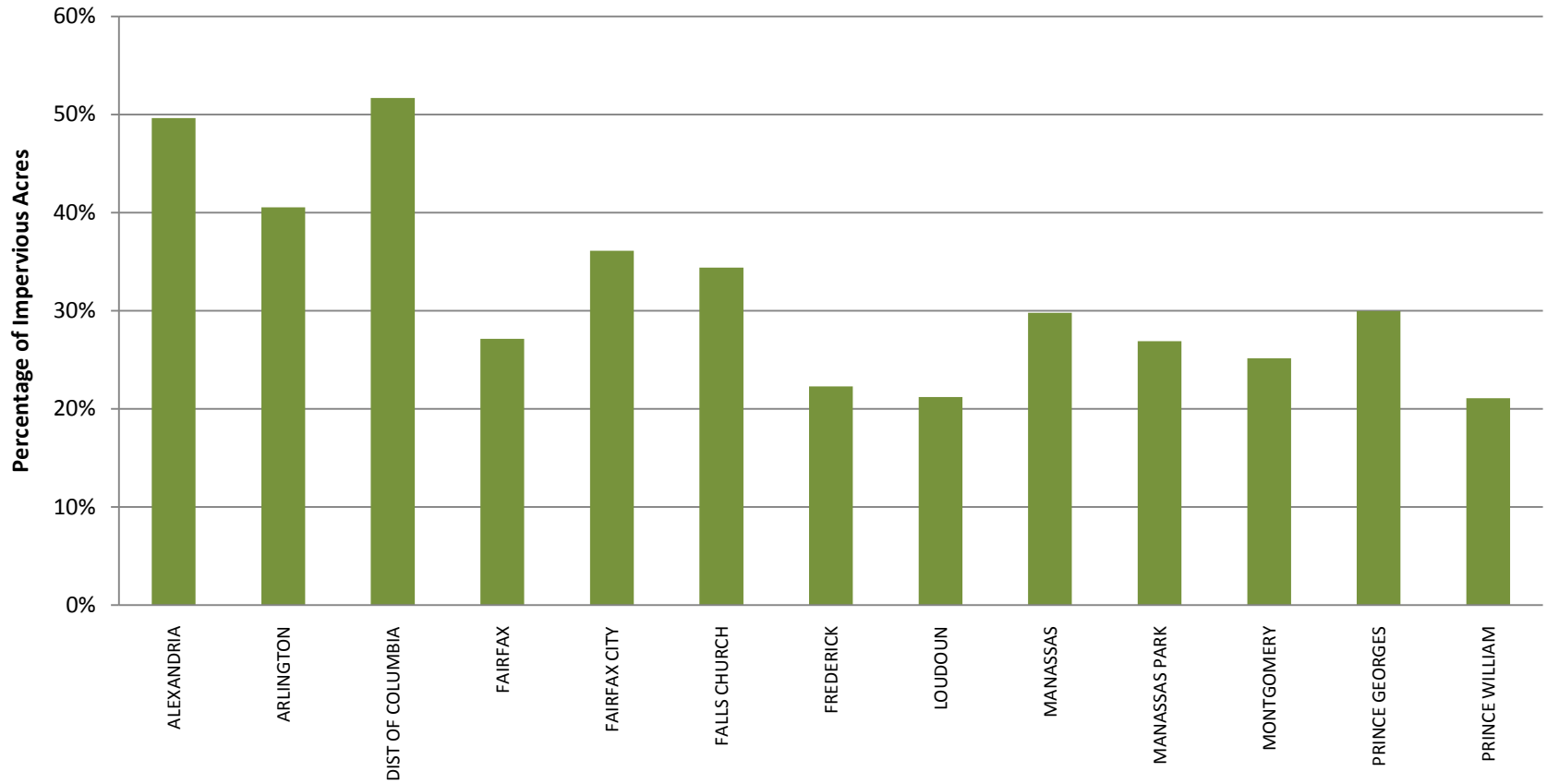
Pervious and Impervious

Watershed model version	Version 5.2		Version 5.3		Version 5.3.2	
	2008 Total Impervious	2008 Total Pervious	2009 Total Impervious	2009 Total Pervious	2006 Total Impervious	2006 Total Pervious
ALEXANDRIA	4,850	4,472	3,299	4,881	4,588	4,659
ARLINGTON	6,188	10,147	4,810	9,369	6,460	9,473
DIST OF COLUMBIA	18,989	15,948	7,094	13,809	18,305	17,122
FAIRFAX	38,985	135,003	33,753	95,132	37,994	102,088
FAIRFAX CITY	1,364	2,413	1,006	2,191	1,362	2,409
FALLS CHURCH	428	820	1,023	624	419	799
FREDERICK	14,585	82,529	12,035	45,635	23,856	83,190
LOUDOUN	16,649	53,669	14,303	35,748	14,389	53,489
MANASSAS	1,863	4,059	1,888	3,846	1,808	4,264
MANASSAS PARK	495	896	423	888	425	1,155
MONTGOMERY	30,940	128,137	24,861	77,469	43,075	128,192
PRINCE GEORGES	40,363	114,817	35,089	69,185	42,972	100,511
PRINCE WILLIAM	14,651	61,090	14,762	41,272	14,942	55,974

MD municipal data included in county data

5.3.2: Percent Impervious

COG Members: % of Total Urban Acres That Are Impervious

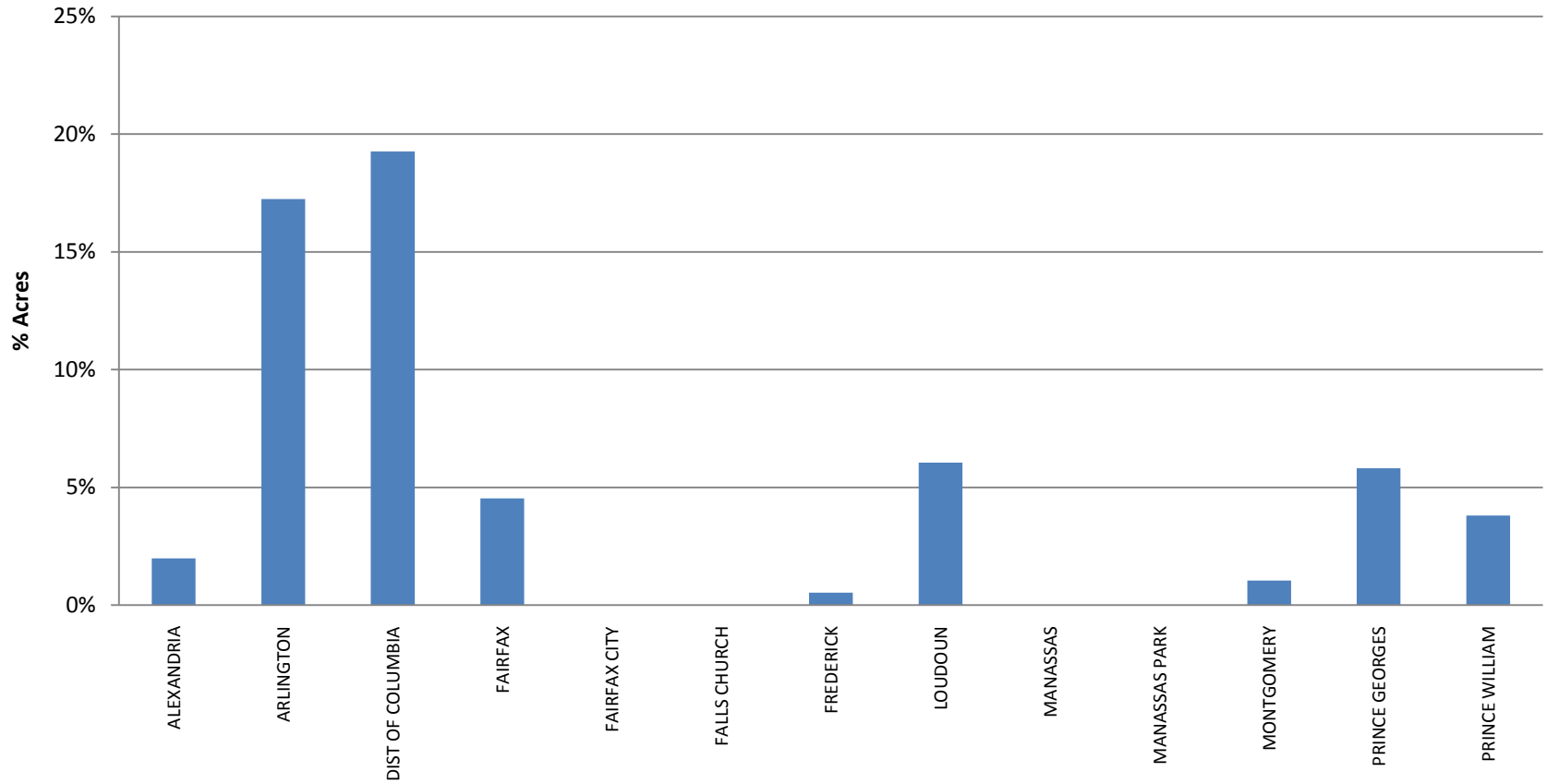


5.3.2: Percent Impervious

COG Jurisdiction	5-3-2 Total Urban Acres	% Impervious
ALEXANDRIA	9,247	50%
ARLINGTON	15,933	41%
DIST OF COLUMBIA	35,426	52%
FAIRFAX	140,082	27%
FAIRFAX CITY	3,771	36%
FALLS CHURCH	1,219	34%
FREDERICK	107,045	22%
LOUDOUN	67,878	21%
MANASSAS	6,072	30%
MANASSAS PARK	1,580	27%
MONTGOMERY	171,267	25%
PRINCE GEORGES	143,482	30%
PRINCE WILLIAM	70,917	21%

5.3.2: Percent Federal Land Use

COG Members: Percent of Total Urban Acres That Are Federal Land Use



5.3.2: Percent Federal Land Use

Percent of Total Urban Acres That Are Federal

COG jurisdiction	Total Urban Acres	Federal Urban Acres	% Federal
ALEXANDRIA	9,247	183	2%
ARLINGTON	15,933	2,747	17%
DIST OF COLUMBIA	35,426	6,823	19%
FAIRFAX	140,082	6,351	5%
FAIRFAX CITY	3,771	0	0%
FALLS CHURCH	1,219	0	0%
FREDERICK	107,045	568	1%
LOUDOUN	67,878	4,107	6%
MANASSAS	6,072	0	0%
MANASSAS PARK	1,580	0	0%
MONTGOMERY	171,267	1,785	1%
PRINCE GEORGES	143,482	8,335	6%
PRINCE WILLIAM	70,917	2,698	4%

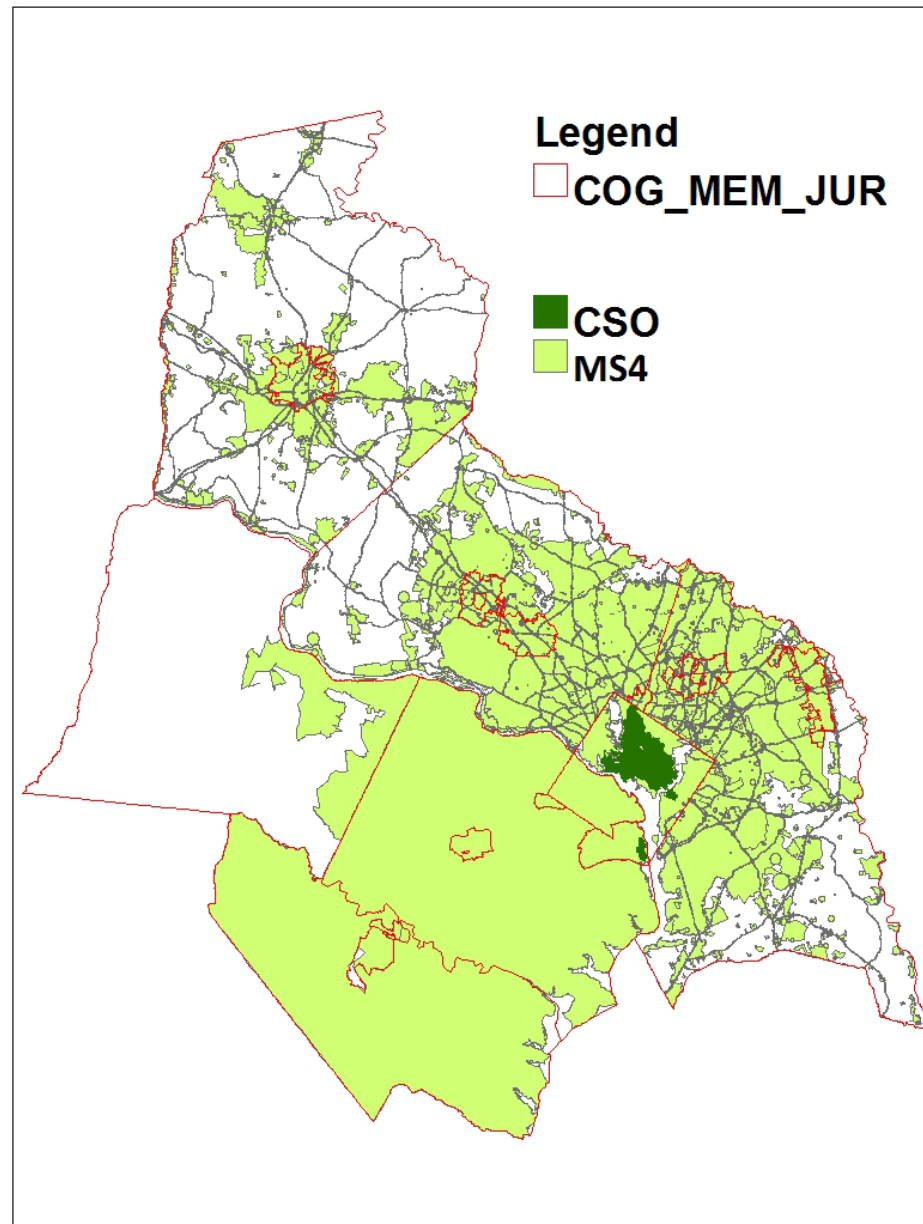
MD municipal data included in county data

MS4 and CSO Land Coverage in COG Region

CBP GIS data layers
available for:

- federal lands
- CSOs
- MS4 coverage
 - Currently does not distinguish between Phase Is and Phase IIs

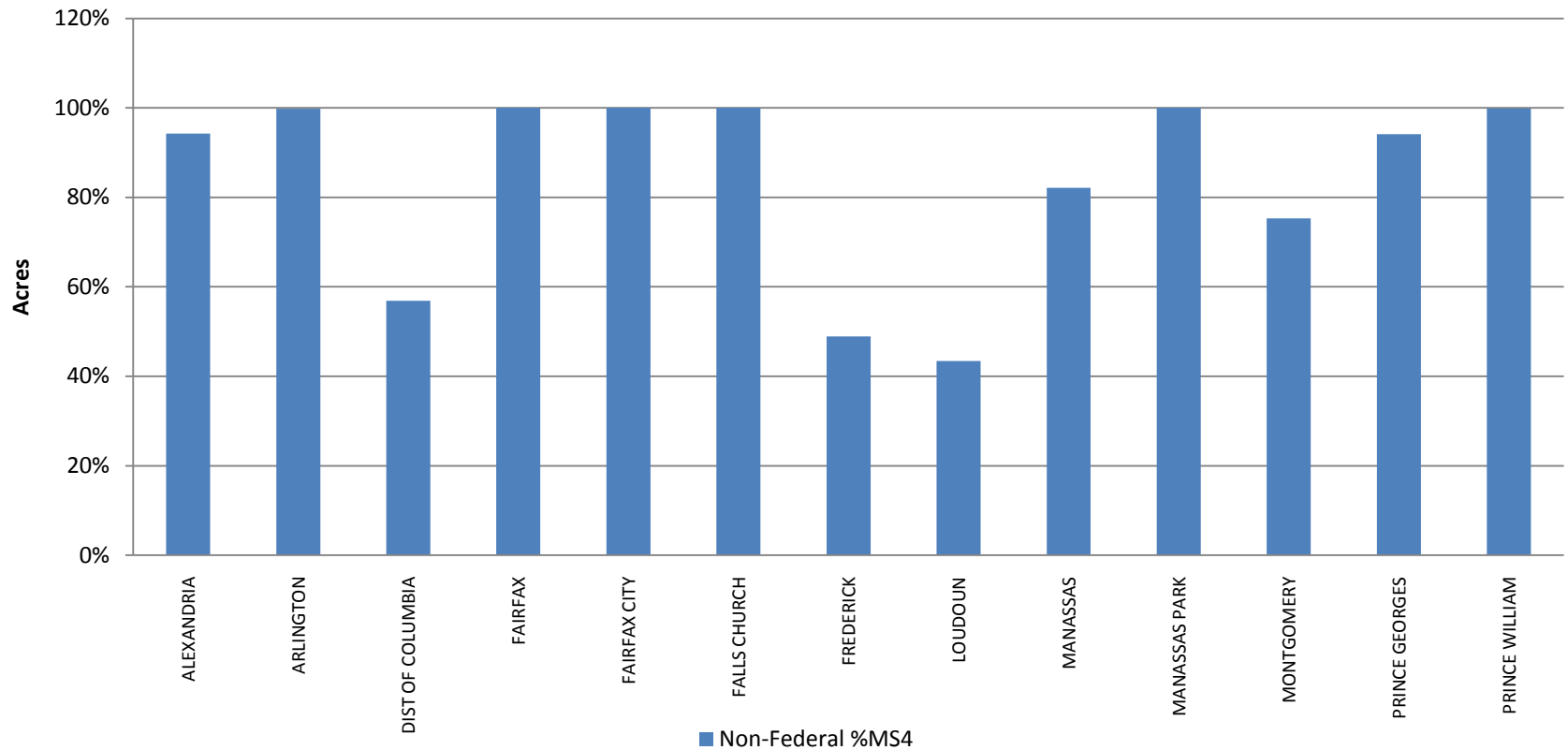
Based on CBP GIS analysis for
Version 5.3.2 of the watershed
model



5.3.2: Percent MS4 Coverage

Percent of Total Urban Acres under MS4 Coverage

COG Members Percent of Total Urban Acres under MS4 Permit Coverage



5.3.2: Percent MS4 Coverage

COG Jurisdiction	Total Urban Acres (minus federal)	Total MS4 Acres	MS4 % of Total
ALEXANDRIA	9,064	8,545	94%
ARLINGTON	13,186	13,163	100%
DIST OF COLUMBIA	28,603	16,273	57%
FAIRFAX	133,731	133,727	100%
FAIRFAX CITY	3,771	3,771	100%
FALLS CHURCH	1,219	1,219	100%
FREDERICK	106,478	52,108	49%
LOUDOUN	63,771	27,690	43%
MANASSAS	6,072	4,988	82%
MANASSAS PARK	1,580	1,580	100%
MONTGOMERY	169,482	127,606	75%
PRINCE GEORGES	135,147	127,164	94%
PRINCE WILLIAM	68,218	68,124	100%

MD municipal data included in county data

Conclusions

- Overall 5.3.2 load estimates will change
 - Loads will change with changes in urban impervious acreage (impervious[^] - Load [^])
 - Increasing urban load should result in decreased forest load
 - Loads should not change with changes in urban pervious acreage
- In MD, municipal data not separated from counties (has to be done for WIP Phase IIs)
- In VA, not sure why there is no distinction between county and MS4 land coverage

What's Next - ?

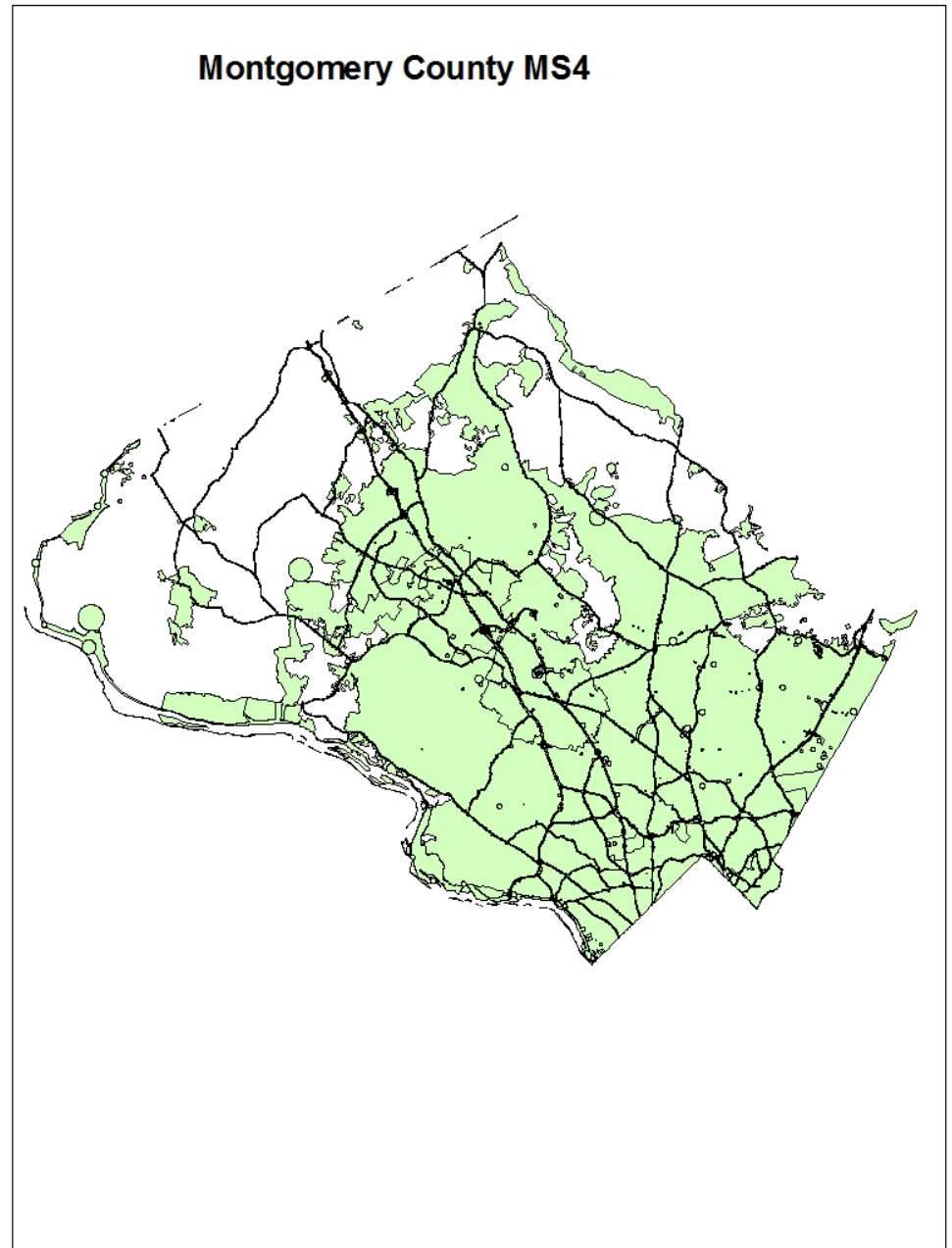
- COG staff could provide (or you can access) land use data at land-river segment level
<ftp://ftp.chesapeakebay.net/Modeling/phase5/>
- Version 5.3.2 is locked into this land use data for now, but may be worthwhile for local jurisdictions to compare against local land use data
- Further analysis - ???

WIP Phase II development in Montgomery County

- “Coordinated Implementation Strategy” draft released in February
- Designed to meet MS4 permit requirement for watershed implementation plans by major sub-watershed (8-digit HUCs)
- Addresses how to attain compliance with:
 - Additional 20 % impervious surface treatment
 - All applicable WLAs for existing TMDLs (both Bay and local)
- Accounting based on local, state land use and CWP watershed treatment model

Extent of MS4 Land Area in Montgomery County

according to
CBP GIS
analysis



Extent of MS4 Land Area in Montgomery County

according to
Montgomery
County GIS
analysis

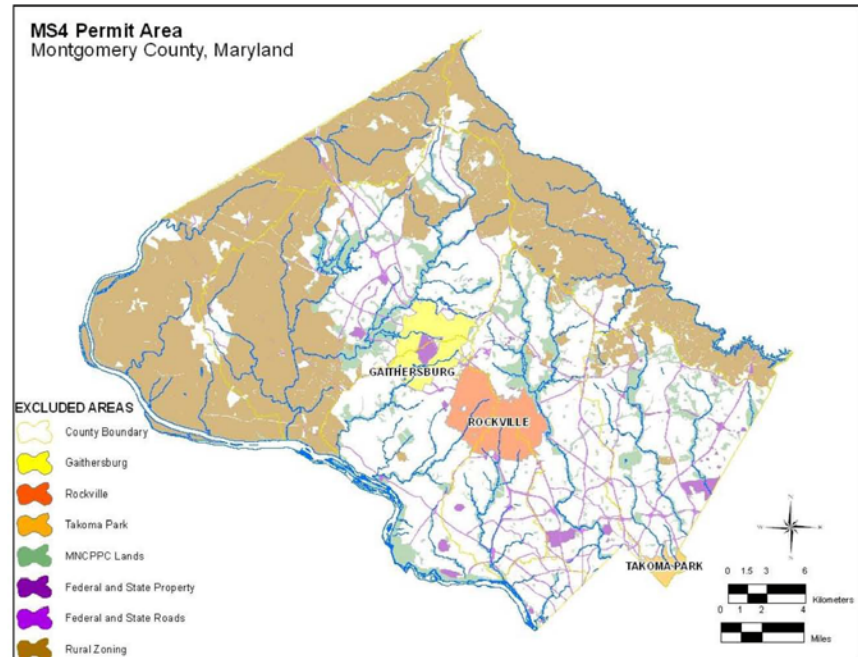


Figure 2.2: Areas outside the Montgomery County MS4 Permit Area

Impervious Surfaces

As previously mentioned, the County's MS4 Permit requires treatment of an additional 20% of impervious cover not currently receiving treatment to the MEP. Table 2.1 presents a summary of the countywide impervious cover totals along with breakdowns by major land cover type. These land covers will be the focus of much of the County's targeted effort to treat the 20% target.