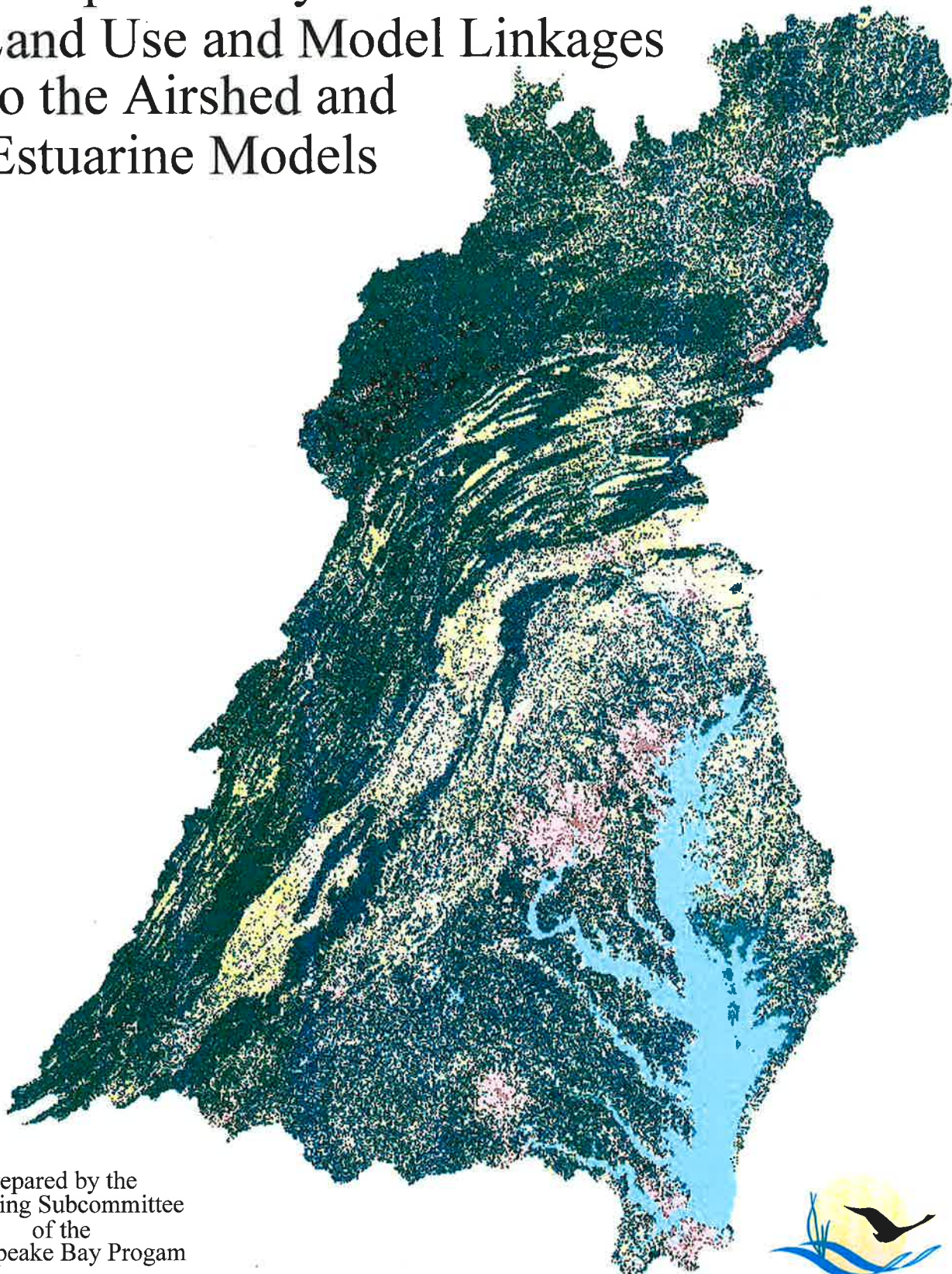


Chesapeake Bay Watershed Model Land Use and Model Linkages to the Airshed and Estuarine Models



Prepared by the
Modeling Subcommittee
of the
Chesapeake Bay Program

January 2000



Chesapeake Bay Program

CHESAPEAKE BAY WATERSHED MODEL LAND USES AND
LINKAGES TO THE AIRSHED AND ESTUARINE MODELS

A Report of the
Modeling Subcommittee
Chesapeake Bay Program Office
Annapolis, MD

January 2000

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Section 1. Phase 4.2 Watershed Model (WSM) Segmentation

The Chesapeake Bay watershed covers just over 41 million acres. The area stretches from southern New York, through Pennsylvania, Maryland, and Washington D.C., to southern Virginia. It includes portions of Delaware and West Virginia on its eastern and western borders, respectively (Figure 1). The Chesapeake Bay watershed is comprised of eight major basins or sub-watersheds. These smaller watersheds drain the Susquehanna, Patuxent, Potomac, Rappahannock, York, and James rivers as well as the Eastern and Western Bay shores, which are comprised of many smaller rivers and creeks (Figure 2).

The Chesapeake Bay watershed can be further divided into sub-watersheds based on state hydrologic units, known as HUCS. State, federal, and local government agencies use hydrologic units for hydrologic planning and management. Although hydrologic units are delineated roughly to follow watershed lines, they are intended for administrative use rather than to identify surface water drainage patterns. New York, Pennsylvania, Maryland, Delaware, Virginia, and West Virginia provide hydrologic unit data to the Chesapeake Bay Program. The boundaries provided by Delaware are not officially recognized hydrologic units but are watershed boundaries. Adjacent hydrologic units that terminated at state boundaries were aggregated by the Chesapeake Bay Program to approximate entire sub-watersheds. There are just over 500 hydrologic units at the 11-digit HUCS level (Figure 3).

Small but relatively homogenous hydrologic units are aggregated into larger watershed areas, or model segments, for ease of model calculation. Model segment size is dictated by terrain and soil properties, location of model calibration stations, model computation time, and availability of pertinent model input data. Model segments containing calibration stations are occasionally altered slightly from their original hydrologic boundaries so that their downstream edge coincides with the U.S. Geological Survey (USGS) water quality monitoring station. This process resulted in 89 watershed model segments for the Chesapeake Bay (Figure 4). The tidal shoreline of the model segments come from the National Oceanographic and Atmospheric Administration (NOAA) data and satellite imagery and was delineated at (1:10000 to 1:80000).

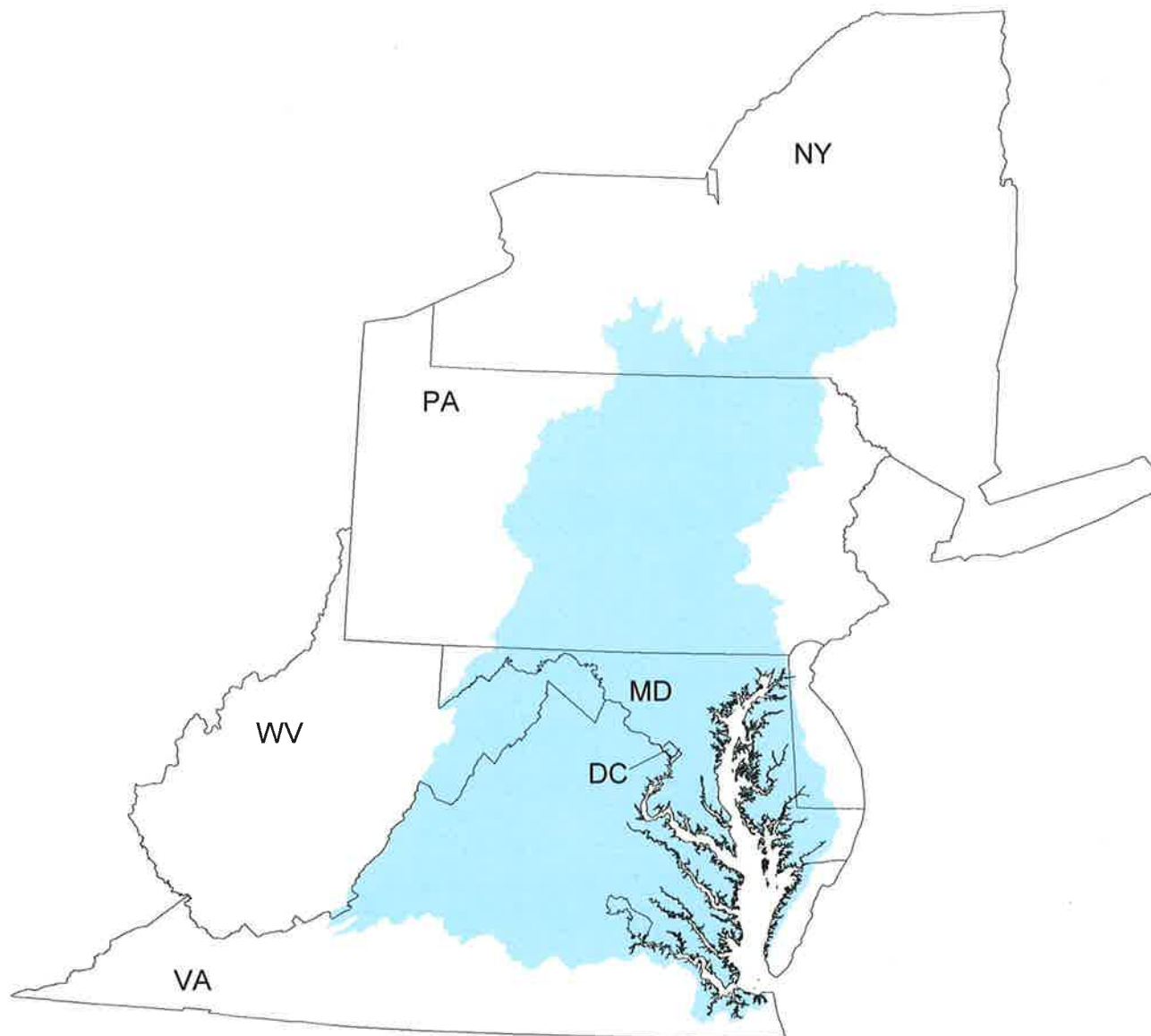
Model segments are subdivided into above and below fall line segments. Both above and below fall line segments simulate land processes associated with edge of stream nutrient and sediment loads. Above fall line segments have edge of stream loads which are delivered to the Bay's non-tidal rivers. These model segments also simulate riverine processes through which loads are delivered downstream to the Bay. There are 43 above fall line segments covering 32.5 million acres (Figure 5). Below fall line segments are adjacent to the Bay where free flowing rivers are too small to be simulated. Edge of stream loads in below fall line segments are delivered directly to the Bay. There are 46 below fall line segments that cover 8.5 million acres (Figure 6).

Geographic Information Systems (GIS) data are maintained spatially in a file called a cover or a shape file. Some data are not available in spatial GIS databases, but rather are in traditional tabular format such as the county-based Agricultural Census data from the

U.S. Department of Agriculture (USDA). The Watershed Model requires input data on a segment basis. In order to distribute county based data into segments, a new cover of county-segments (Cosegs) is created, formed by the union of a cover of county lines (from the USGS) and our cover of segment lines. The new cover contains county-segments (Coseg), which are the smallest units that can be formed both with county and segment boundaries (Figure 7). Each county-segment has a unique identifying number devised from the model segment number and the county FIPS code. One model segment, for example, might contain parts of four counties, and thus would be comprised of four cosegs, each with the same segment number but different FIPS codes. Likewise, a county might cross two segments and would be comprised of two cosegs with the same FIPS code but different segment numbers. Figures 8.1 – 8.8 show the segment and county lines by major Chesapeake Bay basin. Table 1 can be used to look up coseg numbers by segment number and county name.

Figure 1

Location of the Chesapeake Bay Watershed in the Mid-Atlantic States



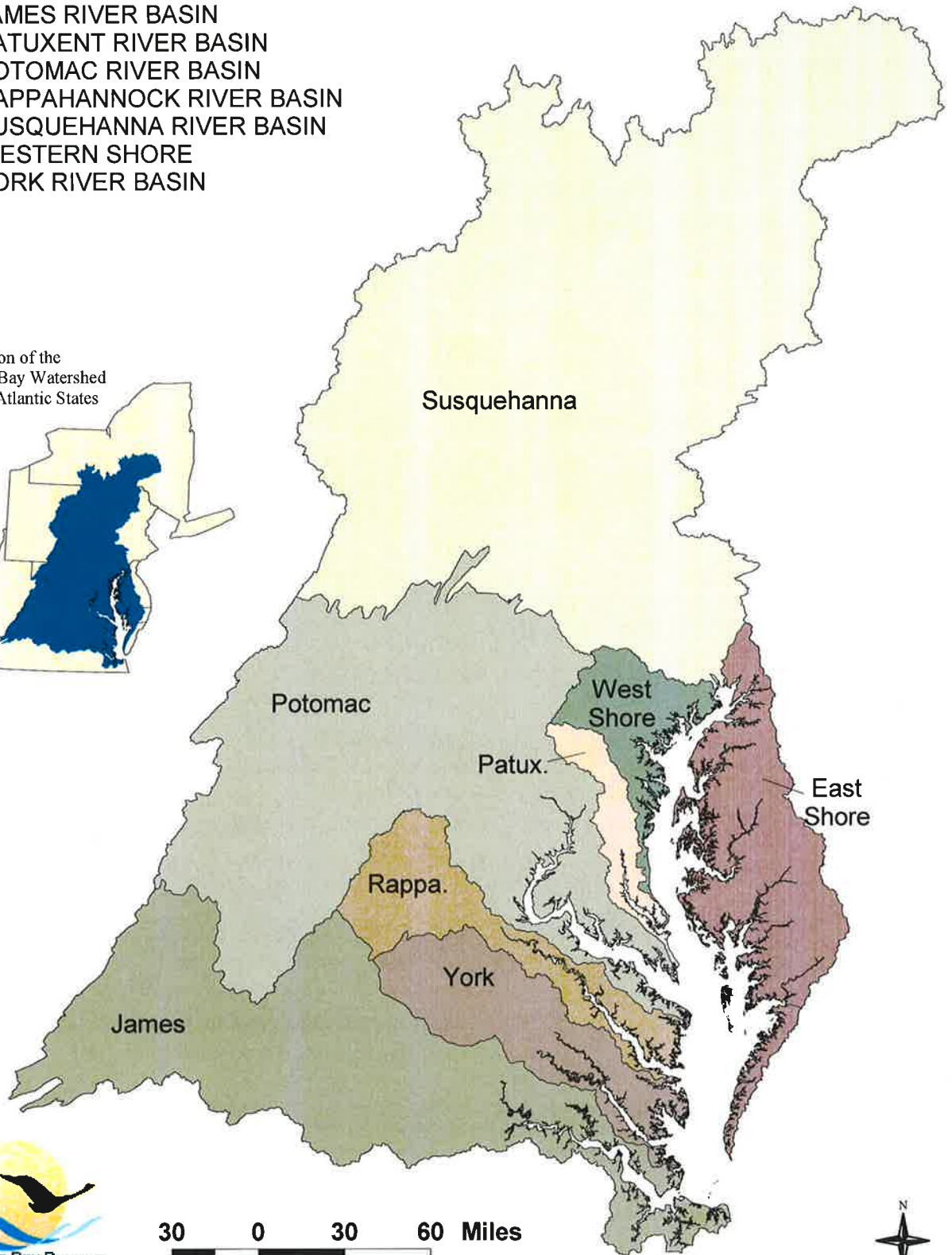
50 0 50 100 Miles



Major Basins of the Chesapeake Bay Watershed

- EASTERN SHORE
- JAMES RIVER BASIN
- PATUXENT RIVER BASIN
- POTOMAC RIVER BASIN
- RAPPAHANNOCK RIVER BASIN
- SUSQUEHANNA RIVER BASIN
- WESTERN SHORE
- YORK RIVER BASIN

Location of the Chesapeake Bay Watershed in the Mid-Atlantic States



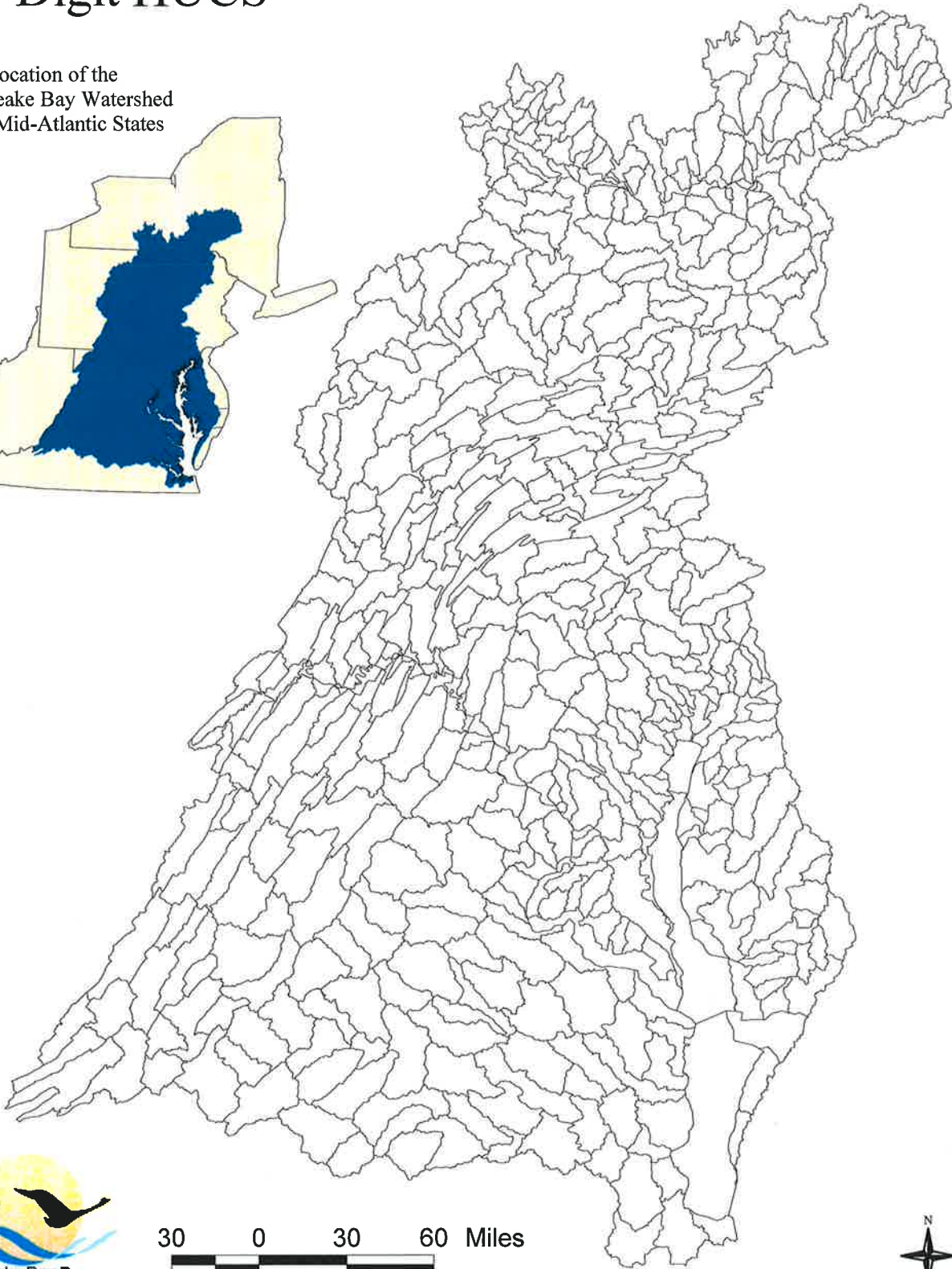
30 0 30 60 Miles



Chesapeake Bay Program

11 Digit HUCS

Location of the
Chesapeake Bay Watershed
in the Mid-Atlantic States



Chesapeake Bay Program

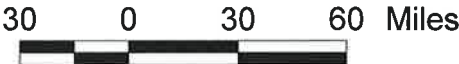
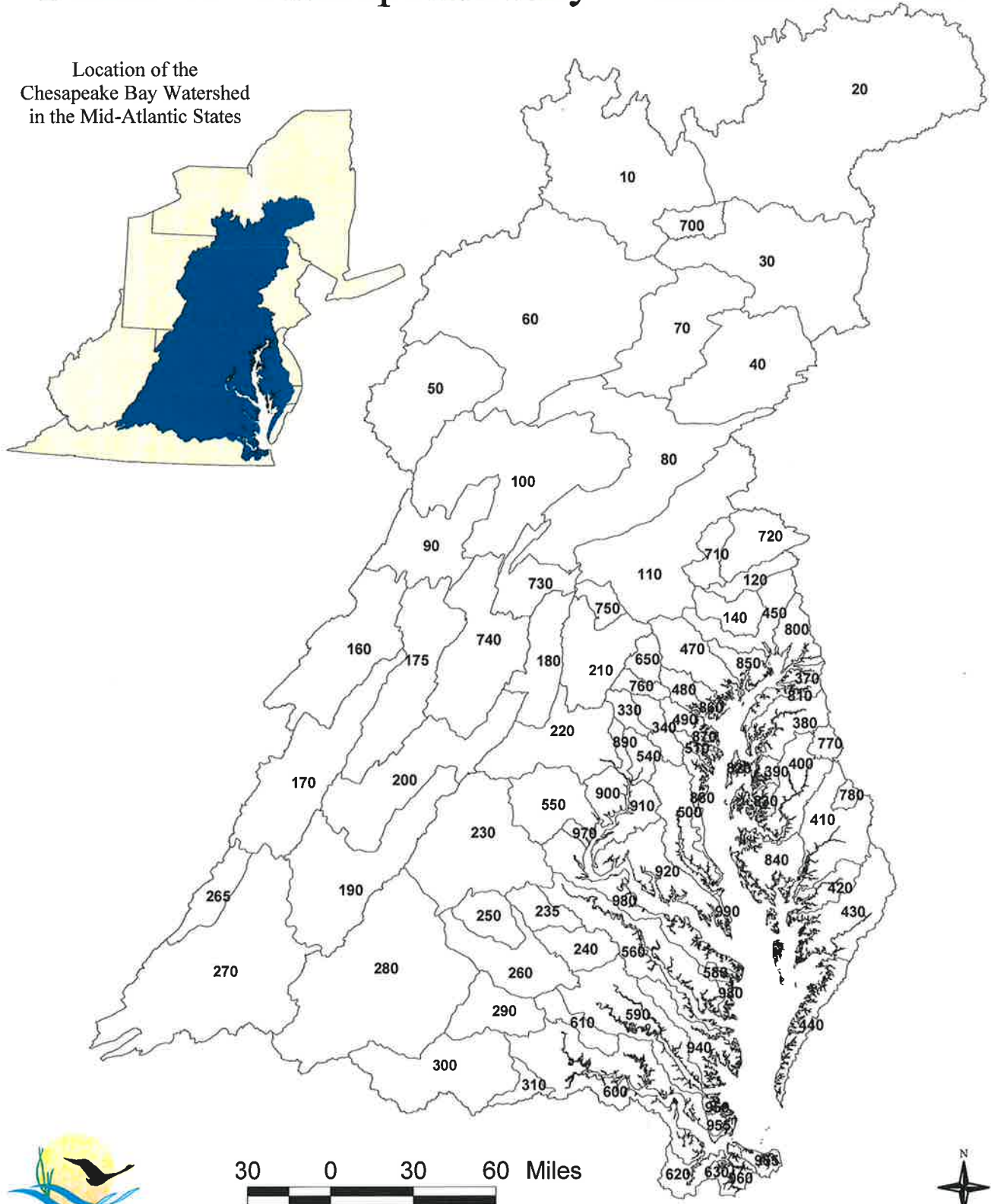


Figure 4

Above and Below Fall Line Segments in the Phase 4.2 Chesapeake Bay Watershed Model

Location of the Chesapeake Bay Watershed in the Mid-Atlantic States



30 0 30 60 Miles



Figure 5

Above Fall Line Segments in the Phase 4.2 Chesapeake Bay Watershed Model

Location of the Above Fall Line Segments in the Chesapeake Bay Watershed

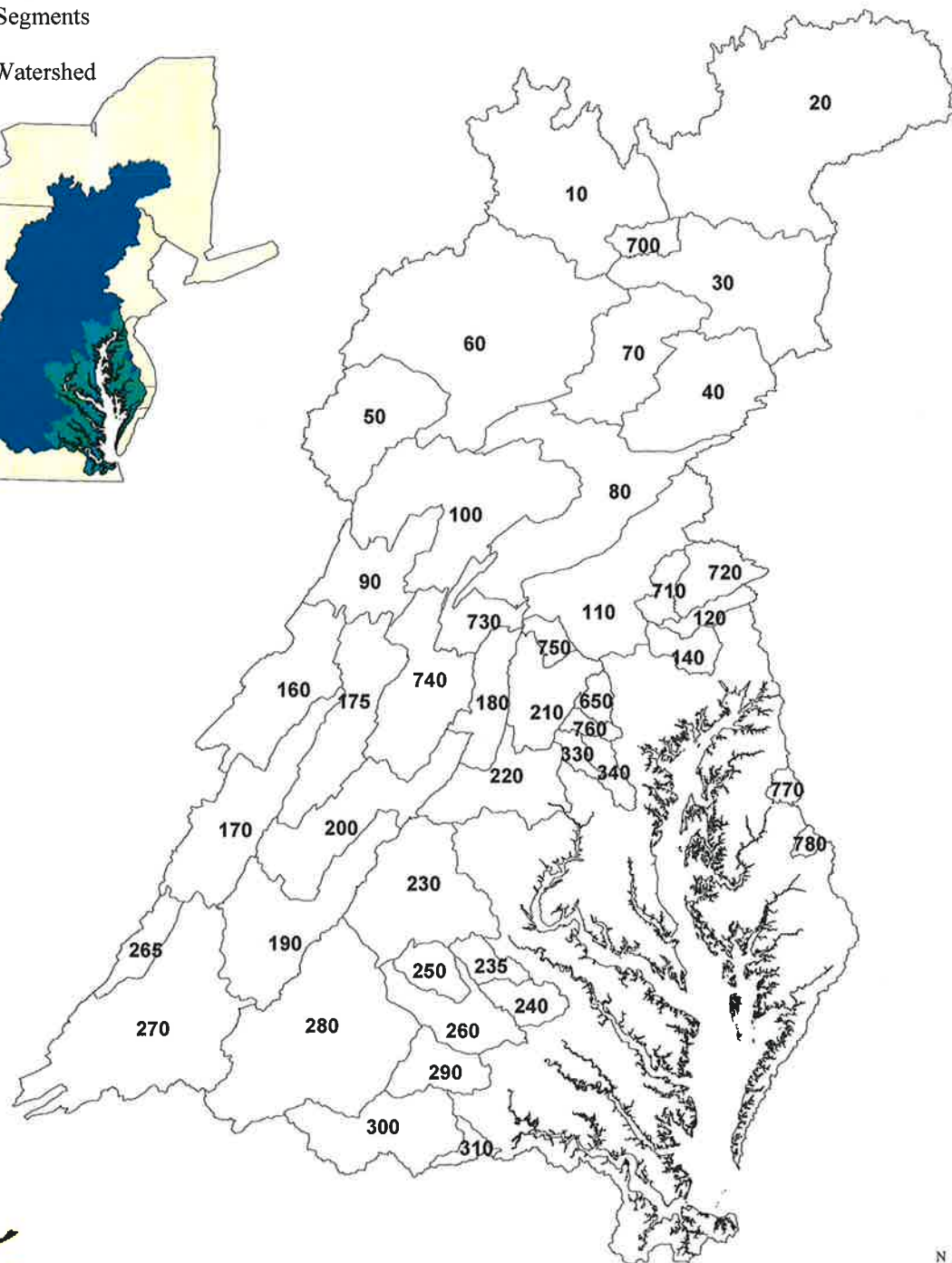
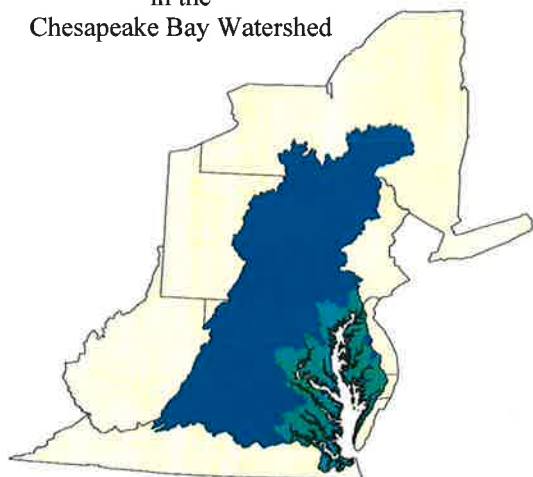
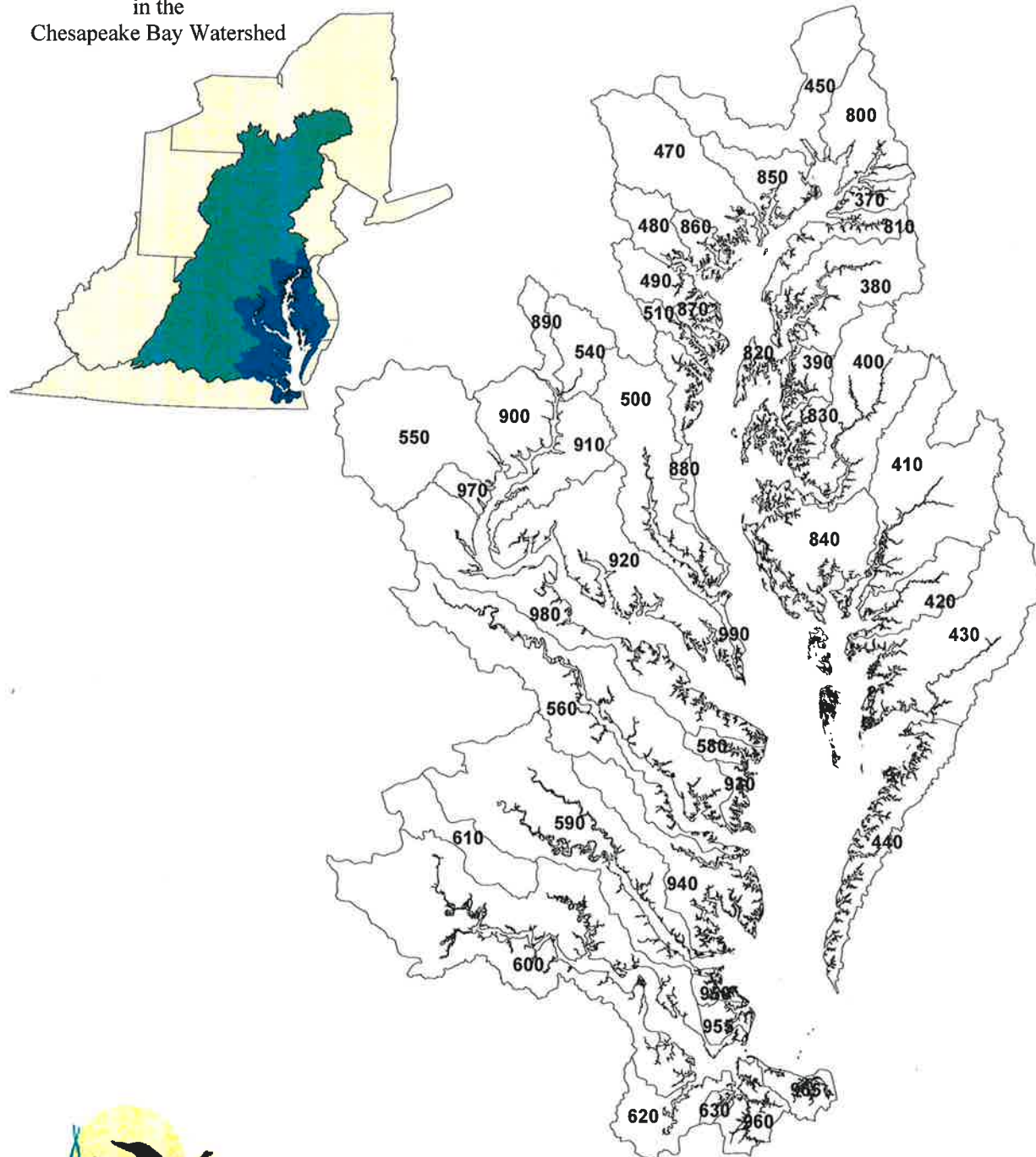


Figure 6

Below Fall Line Segments in the Phase 4.2 Chesapeake Bay Watershed Model

Location of the Below Fall Line Segments in the Chesapeake Bay Watershed



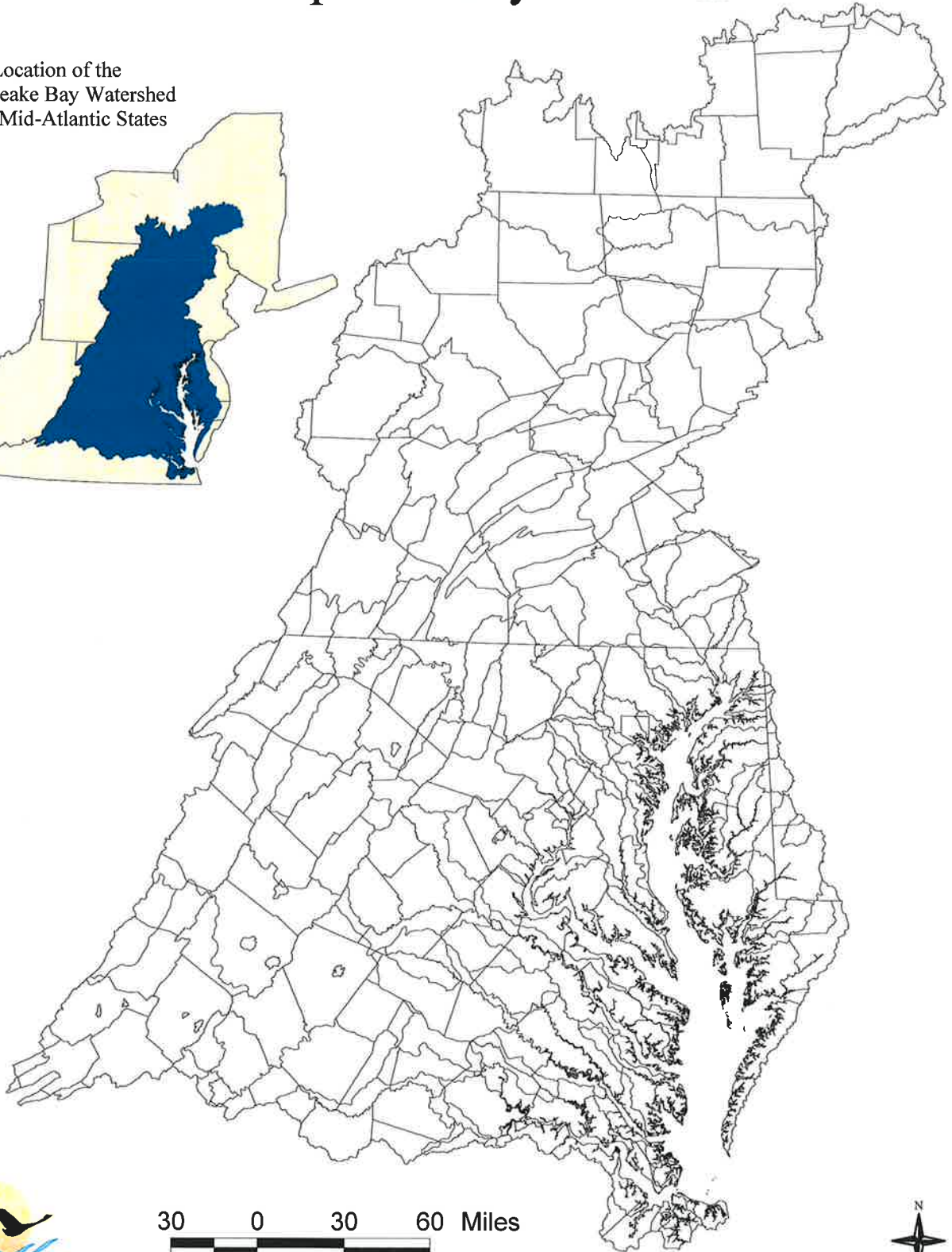
10 0 10 20 Miles



Figure 7

County-Segments in the Phase 4.2 Chesapeake Bay Watershed Model

Location of the
Chesapeake Bay Watershed
in the Mid-Atlantic States



30 0 30 60 Miles

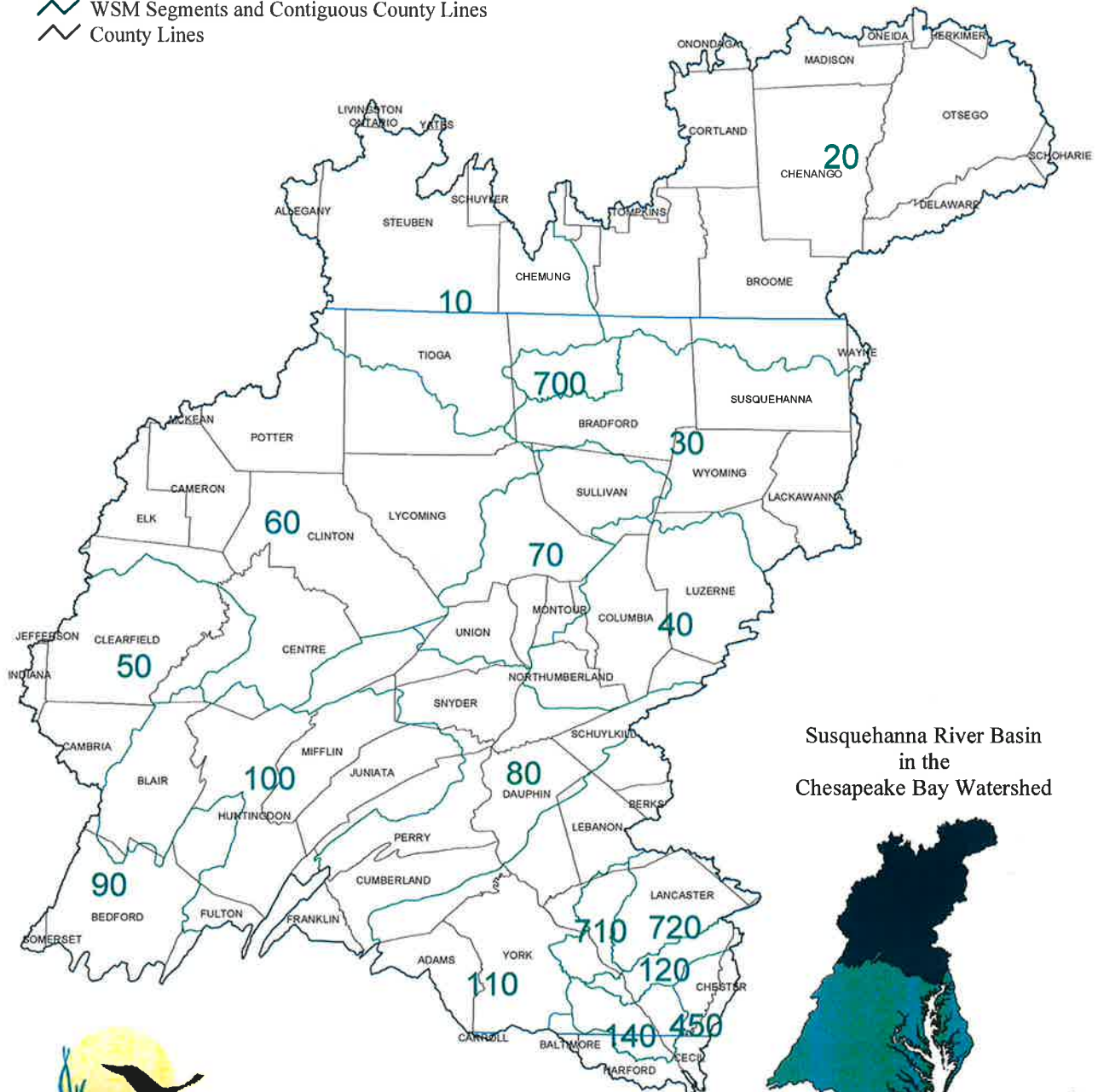


Figure 8.1

Susquehanna River Basin

Watershed Model Segments with State and County Boundaries

- ↗ State Boundary
- ↗ WSM Segments and Contiguous County Lines
- ↗ County Lines



Susquehanna River Basin
in the
Chesapeake Bay Watershed



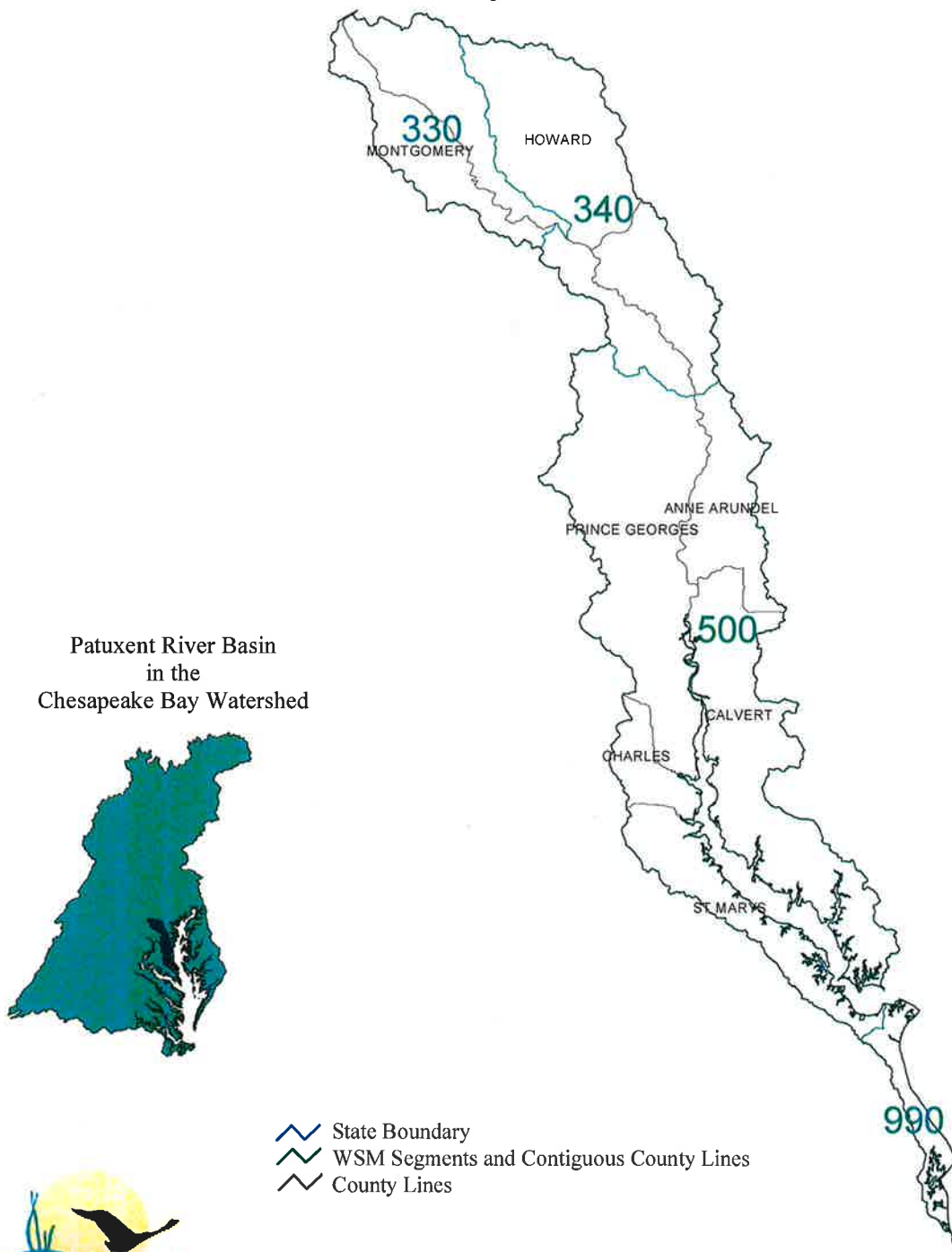
20 0 20 40 Miles



Figure 8.2

Patuxent River Basin

Watershed Model Segments with State and County Boundaries



Patuxent River Basin
in the
Chesapeake Bay Watershed



- State Boundary
- WSM Segments and Contiguous County Lines
- County Lines



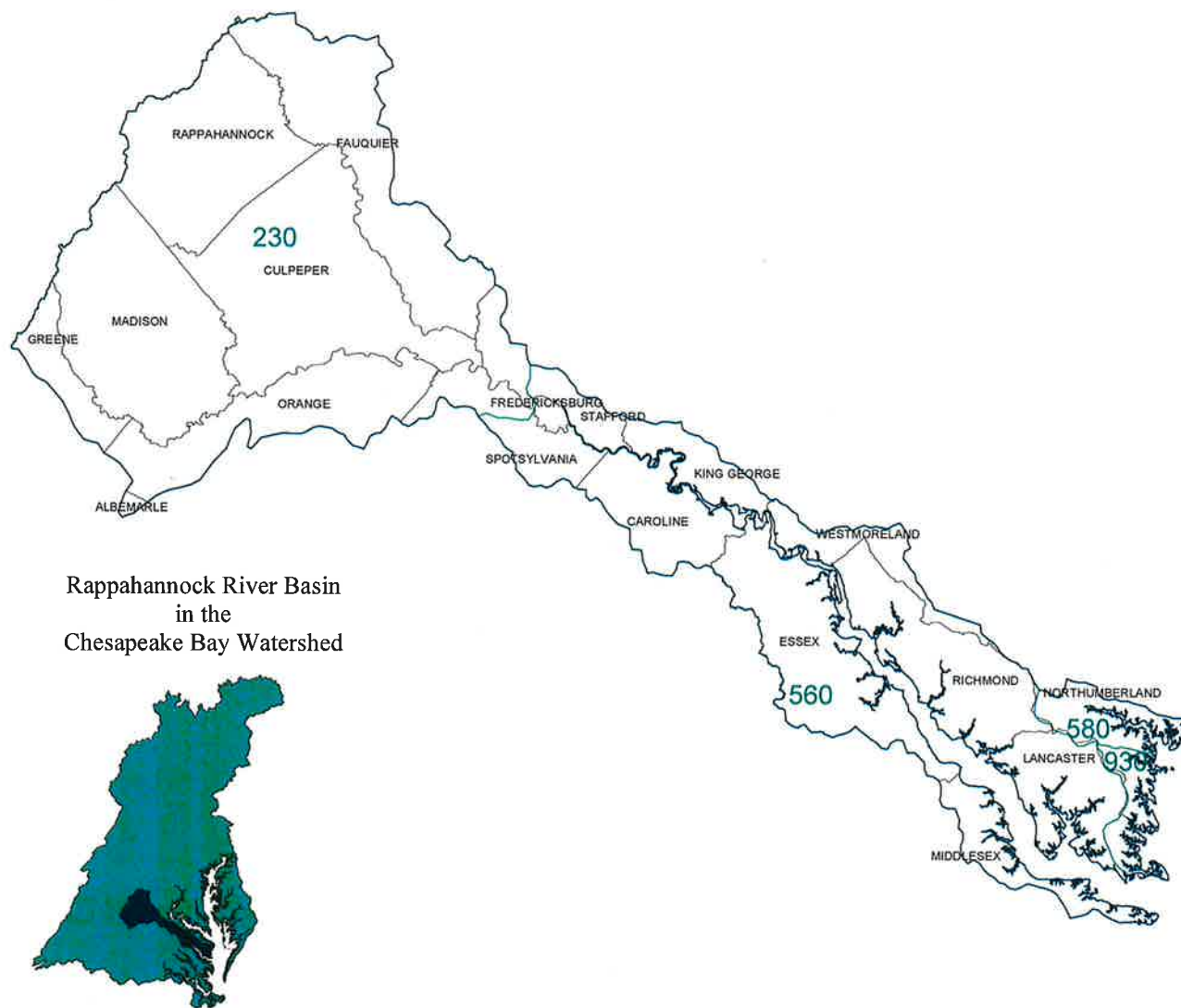
Chesapeake Bay Program



Figure 8.4

Rappahannock River Basin

Watershed Model Segments with State and County Boundaries



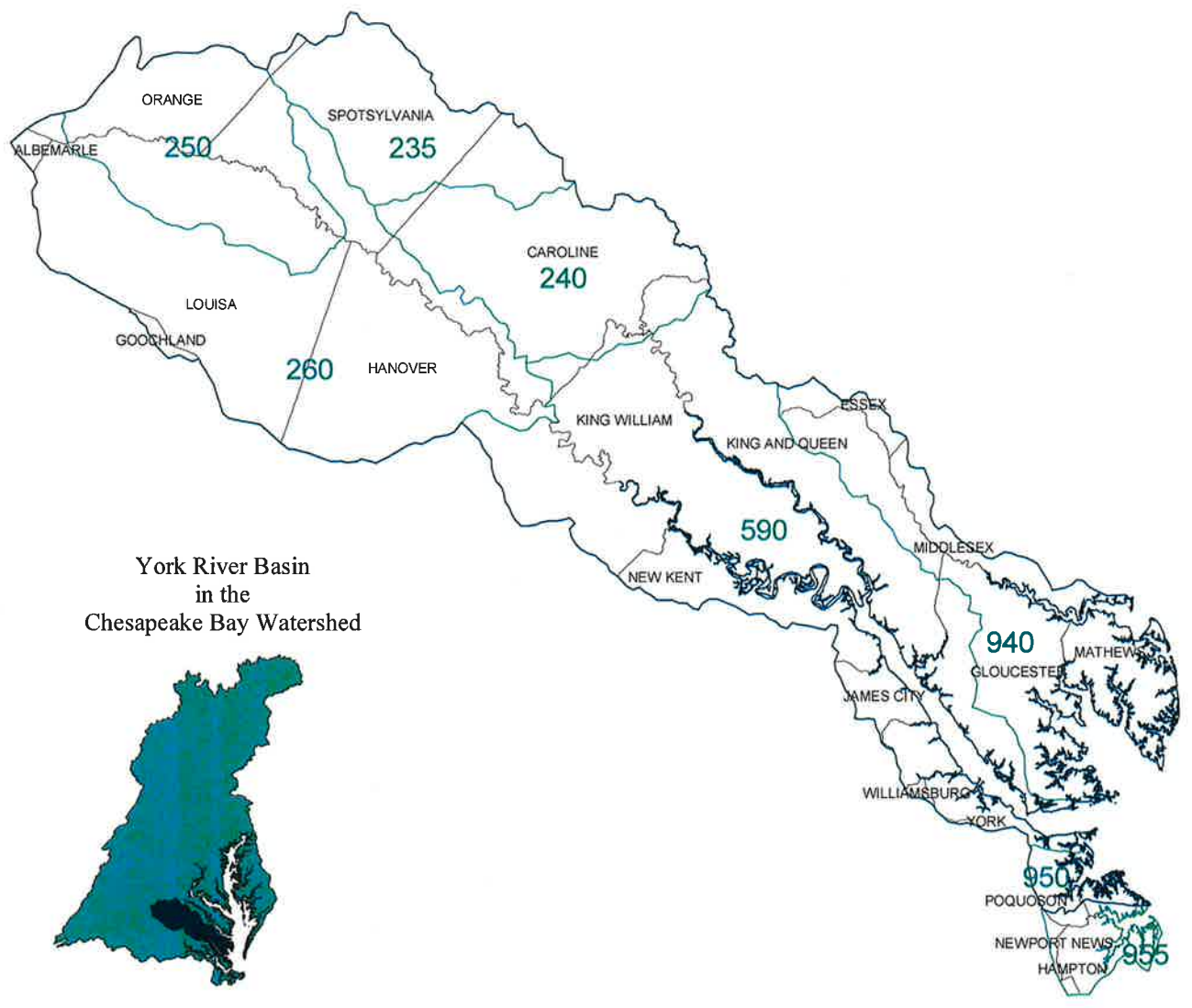
- State Boundary
- WSM Segments and Contiguous County Lines
- County Lines



Figure 8.5

York River Basin

Watershed Model Segments with State and County Boundaries



York River Basin
in the
Chesapeake Bay Watershed



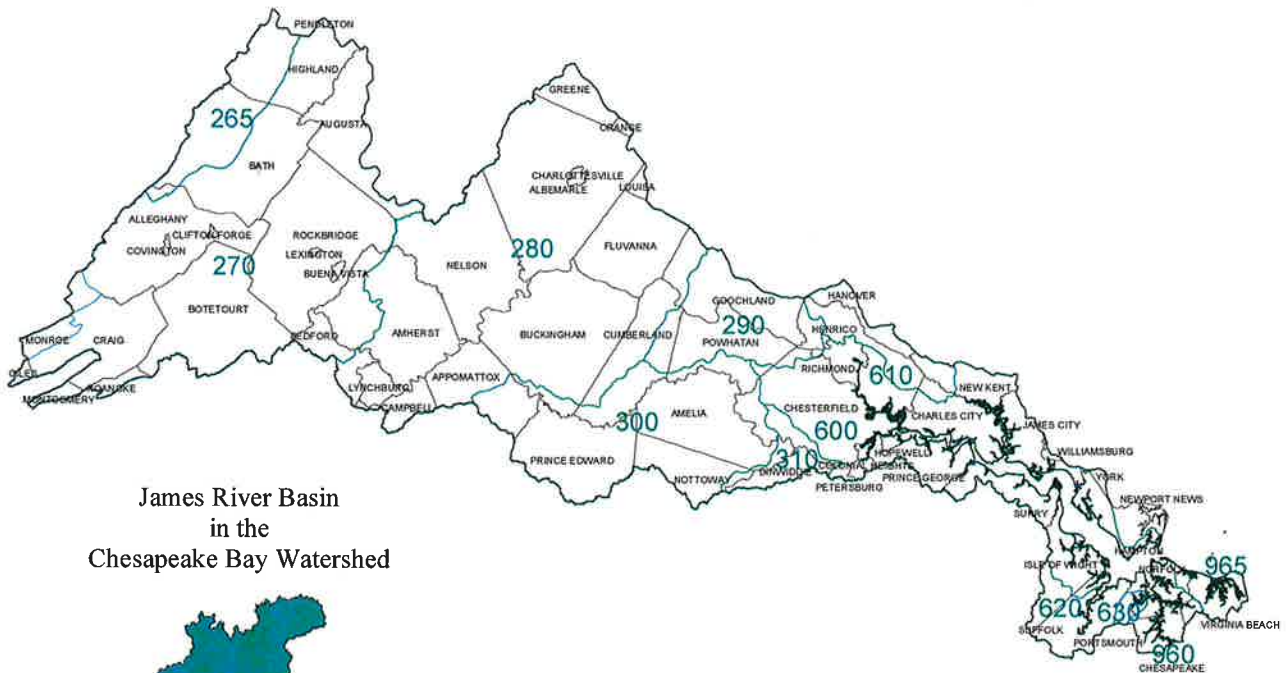
- State Boundary
- WSM Segments and Contiguous County Lines
- County Lines



Figure 8.6

James River Basin

Watershed Model Segments with State and County Boundaries



James River Basin
in the
Chesapeake Bay Watershed



- State Boundary
- WSM Segments and Contiguous County Lines
- County Lines



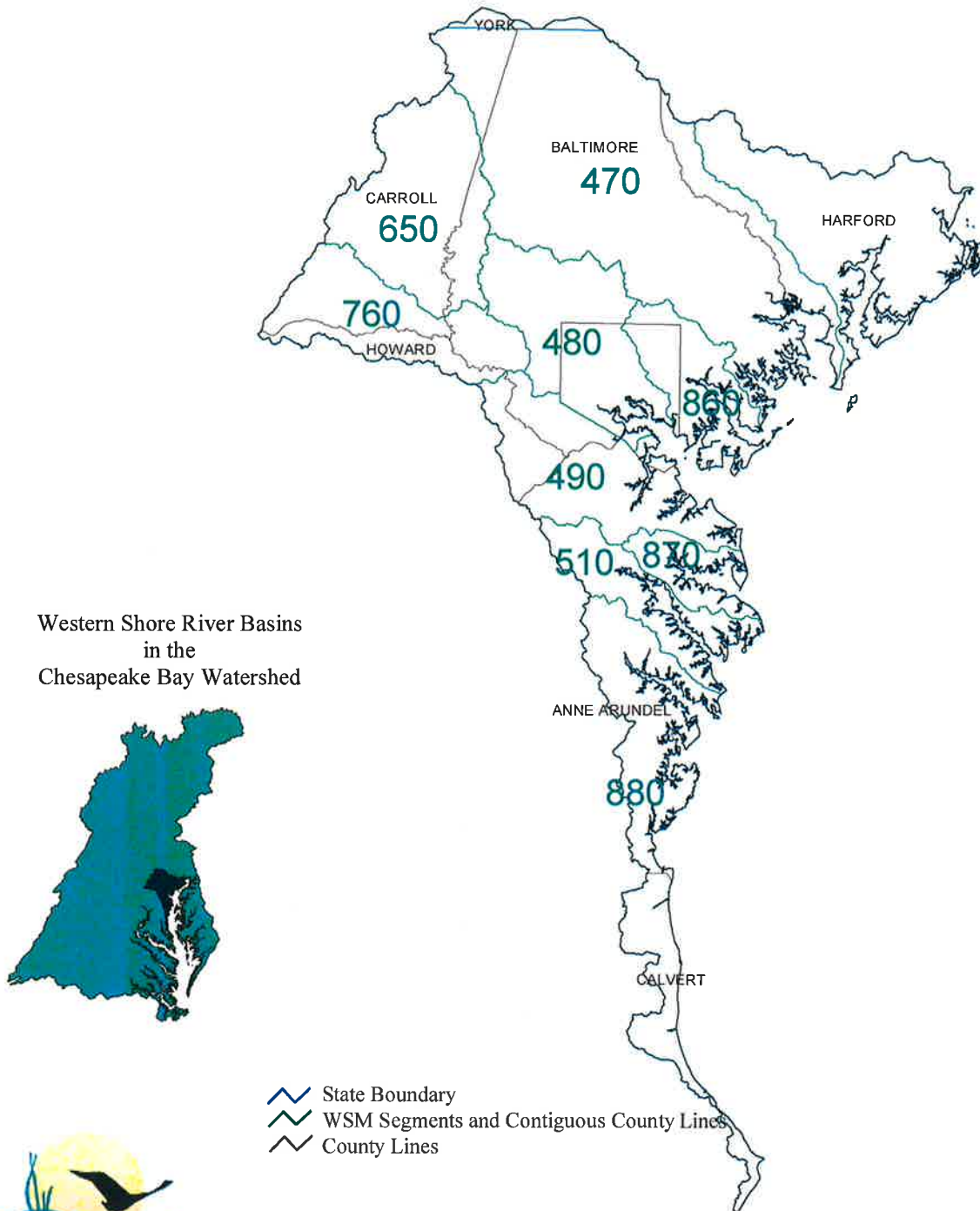
20 0 20 40 Miles



Figure 8.7

Western Shore River Basins

Watershed Model Segments with State and County Boundaries



Western Shore River Basins
in the
Chesapeake Bay Watershed



- State Boundary
- WSM Segments and Contiguous County Lines
- County Lines



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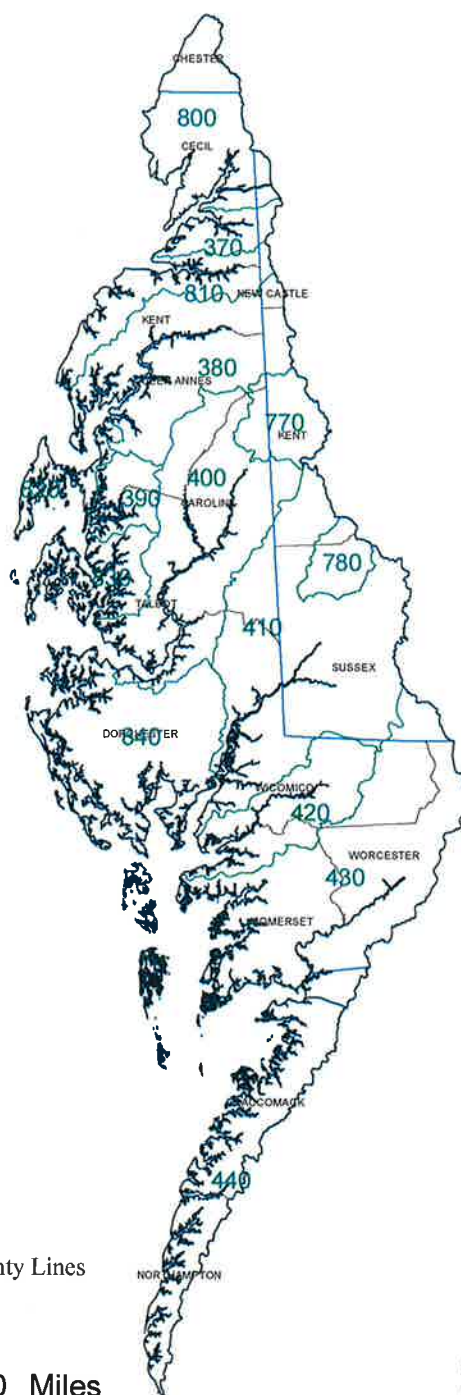


Figure 8.8

Eastern Shore River Basins

Watershed Model Segments with State and County Boundaries

Eastern Shore River Basins
in the
Chesapeake Bay Watershed



- State Boundary
- WSM Segments and Contiguous County Lines
- County Lines

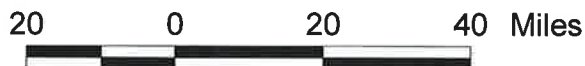


Table 1. County Segments by Basin, State, County, and Segment

Basin	State	County	SEG	COSEG	Basin	State	County	SEG	COSEG	Basin	State	County	SEG	COSEG
Susq	MD	BALTIMORE	450	450024005	Susq	PA	LEBANON	710	710042075	Potomac	MD	PRINCE GEORGES	920	920024033
Susq	MD	CARROLL	110	110024013	Susq	PA	LEBANON	720	720042075	Potomac	MD	ST MARYS	920	920024037
Susq	MD	CECIL	140	140024015	Susq	PA	LUZERNE	30	30042079	Potomac	MD	WASHINGTON	175	175024043
Susq	MD	CECIL	450	450024015	Susq	PA	LUZERNE	40	40042079	Potomac	MD	WASHINGTON	180	180024043
Susq	MD	HARFORD	140	140024025	Susq	PA	LYCOMING	30	30042081	Potomac	MD	WASHINGTON	730	730024043
Susq	MD	HARFORD	450	450024025	Susq	PA	LYCOMING	60	60042081	Potomac	MD	WASHINGTON	740	740024043
Susq	NY	ALLEGANY	10	10036003	Susq	PA	LYCOMING	70	70042081	Potomac	PA	ADAMS	180	180042001
Susq	NY	BROOME	20	20036007	Susq	PA	MCKEAN	60	60042083	Potomac	PA	ADAMS	210	210042001
Susq	NY	CHEMUNG	10	10036015	Susq	PA	MIFFLIN	80	80042087	Potomac	PA	ADAMS	730	730042001
Susq	NY	CHEMUNG	20	20036015	Susq	PA	MIFFLIN	100	100042087	Potomac	PA	ADAMS	750	750042001
Susq	NY	CHENANGO	20	20036017	Susq	PA	MONTGOMERY	40	40042093	Potomac	PA	BEDFORD	160	160042009
Susq	NY	CORTLAND	20	20036023	Susq	PA	MONTGOMERY	70	70042093	Potomac	PA	BEDFORD	175	175042009
Susq	NY	DELAWARE	20	20036025	Susq	PA	NORTHUMBERLAND	40	40042097	Potomac	PA	FRANKLIN	180	180042055
Susq	NY	HERKIMER	20	20036043	Susq	PA	NORTHUMBERLAND	70	70042097	Potomac	PA	FRANKLIN	730	730042055
Susq	NY	LIVINGSTON	10	10036051	Susq	PA	NORTHUMBERLAND	80	80042097	Potomac	PA	FRANKLIN	740	740042055
Susq	NY	MADISON	20	20036053	Susq	PA	PERRY	80	80042099	Potomac	PA	FULTON	175	175042057
Susq	NY	ONEIDA	20	20036065	Susq	PA	PERRY	100	100042099	Potomac	PA	FULTON	740	740042057
Susq	NY	ONONDAGA	20	20036067	Susq	PA	POTTER	10	10042105	Potomac	PA	SOMERSET	160	160042111
Susq	NY	ONTARIO	10	10036069	Susq	PA	POTTER	60	60042105	Potomac	VA	ALEXANDRIA CITY	900	900051510
Susq	NY	OTSEGO	20	20036077	Susq	PA	SCHUYLKILL	40	40042107	Potomac	VA	ARLINGTON CITY	220	220051013
Susq	NY	SCHOHARIE	20	20036095	Susq	PA	SCHUYLKILL	80	80042107	Potomac	VA	ARLINGTON CITY	900	900051013
Susq	NY	SCHUYLER	10	10036097	Susq	PA	SCHUYLKILL	110	110042107	Potomac	VA	AUGUSTA	190	190051015
Susq	NY	SCHUYLER	20	20036097	Susq	PA	SNYDER	80	80042109	Potomac	VA	CLARKE	200	200051043
Susq	NY	STEUBEN	10	10036101	Susq	PA	SNYDER	100	100042109	Potomac	VA	CLARKE	740	740051043
Susq	NY	TIOGA	20	20036107	Susq	PA	SOMERSET	90	90042111	Potomac	VA	FAIRFAX	220	220051059
Susq	NY	TOMPKINS	20	20036109	Susq	PA	SULLIVAN	30	30042113	Potomac	VA	FAIRFAX	550	550051059
Susq	NY	YATES	10	10036123	Susq	PA	SULLIVAN	40	40042113	Potomac	VA	FAIRFAX	900	900051059
Susq	PA	ADAMS	110	110042001	Susq	PA	SULLIVAN	60	60042113	Potomac	VA	FAIRFAX CITY	900	900051600
Susq	PA	BEDFORD	90	90042009	Susq	PA	SULLIVAN	70	70042113	Potomac	VA	FALLS CHURCH CITY	900	900051610
Susq	PA	BEDFORD	100	100042009	Susq	PA	SUSQUEHANNA	20	20042115	Potomac	VA	FAUQUIER	220	220051061
Susq	PA	BERKS	110	110042011	Susq	PA	SUSQUEHANNA	30	30042115	Potomac	VA	FAUQUIER	550	550051061
Susq	PA	BERKS	720	720042011	Susq	PA	TIOGA	10	10042117	Potomac	VA	FAUQUIER	980	980051061
Susq	PA	BLAIR	90	90042013	Susq	PA	TIOGA	30	30042117	Potomac	VA	FREDERICK	200	200051069
Susq	PA	BLAIR	100	100042013	Susq	PA	TIOGA	60	60042117	Potomac	VA	FREDERICK	740	740051069
Susq	PA	BRADFORD	10	10042015	Susq	PA	TIOGA	700	700042117	Potomac	VA	HARRISONBURG CITY	190	190051660
Susq	PA	BRADFORD	20	20042015	Susq	PA	UNION	70	70042119	Potomac	VA	HARRISONBURG CITY	200	200051660
Susq	PA	BRADFORD	30	30042015	Susq	PA	UNION	80	80042119	Potomac	VA	HIGHLAND	170	170051091
Susq	PA	BRADFORD	70	70042015	Susq	PA	WAYNE	20	20042127	Potomac	VA	KING GEORGE	980	980051099
Susq	PA	BRADFORD	700	700042015	Susq	PA	WAYNE	30	30042127	Potomac	VA	LOUDOUN	180	180051107
Susq	PA	CAMBRIA	50	50042021	Susq	PA	WYOMING	30	30042131	Potomac	VA	LOUDOUN	220	220051107
Susq	PA	CAMBRIA	90	90042021	Susq	PA	WYOMING	70	70042131	Potomac	VA	LOUDOUN	550	550051107
Susq	PA	CAMERON	60	60042023	Susq	PA	YORK	110	110042133	Potomac	VA	MANASSAS CITY	550	550051683
Susq	PA	CENTRE	50	50042027	Susq	PA	YORK	120	120042133	Potomac	VA	MANASSAS PARK CITY	550	550051685
Susq	PA	CENTRE	60	60042027	Susq	PA	YORK	140	140042133	Potomac	VA	NORTHUMBERLAND	980	980051133
Susq	PA	CENTRE	70	70042027	Susq	PA	YORK	450	450042133	Potomac	VA	PAGE	190	190051139
Susq	PA	CENTRE	80	80042027	Susq	PA	YORK	710	710042133	Potomac	VA	PAGE	200	200051139
Susq	PA	CENTRE	100	100042027	Patuxent	MD	ANNE ARUNDEL	340	340024003	Potomac	VA	PRINCE WILLIAM	550	550051153
Susq	PA	CHESTER	120	120042029	Patuxent	MD	ANNE ARUNDEL	500	500024003	Potomac	VA	PRINCE WILLIAM	970	970051153
Susq	PA	CHESTER	450	450042029	Patuxent	MD	CALVERT	500	500024009	Potomac	VA	PRINCE WILLIAM	980	980051153
Susq	PA	CHESTER	720	720042029	Patuxent	MD	CHARLES	500	500024017	Potomac	VA	ROCKINGHAM	980	980051159
Susq	PA	CLEARFIELD	50	50042033	Patuxent	MD	HOWARD	330	330024027	Potomac	VA	RICHMOND	190	190051165
Susq	PA	CLEARFIELD	60	60042033	Patuxent	MD	HOWARD	340	340024027	Potomac	VA	ROCKINGHAM	200	200051165
Susq	PA	CLINTON	60	60042035	Patuxent	MD	MONTGOMERY	330	330024031	Potomac	VA	SHENANDOAH	200	200051171
Susq	PA	COLUMBIA	40	40042037	Patuxent	MD	PRINCE GEORGES	340	340024033	Potomac	VA	STAFFORD	980	980051179
Susq	PA	COLUMBIA	70	70042037	Patuxent	MD	PRINCE GEORGES	500	500024033	Potomac	VA	STAUNTON CITY	190	190051790
Susq	PA	CUMBERLAND	80	80042041	Patuxent	MD	ST MARYS	500	500024037	Potomac	VA	WARREN	190	190051187
Susq	PA	CUMBERLAND	110	110042041	Patuxent	MD	ST MARYS	990	990024037	Potomac	VA	WARREN	200	200051187
Susq	PA	DAUPHIN	80	80042043	Potomac	DC	DISTRICT OF COLUMBIA	220	220011001	Potomac	VA	WAYNESBORO CITY	190	190051820
Susq	PA	DAUPHIN	110	110042043	Potomac	DC	DISTRICT OF COLUMBIA	540	540011001	Potomac	VA	WESTMORELAND	980	980051193
Susq	PA	ELK	60	60042047	Potomac	DC	DISTRICT OF COLUMBIA	890	890011001	Potomac	VA	WINCHESTER CITY	740	740051840
Susq	PA	FRANKLIN	80	80042055	Potomac	DC	DISTRICT OF COLUMBIA	900	900011001	Potomac	WV	BERKELEY	740	740054003
Susq	PA	FRANKLIN	100	100042055	Potomac	DC	DISTRICT OF COLUMBIA	910	910011001	Potomac	WV	GRANT	160	160054023
Susq	PA	FULTON	90	90042057	Potomac	MD	ALLEGANY	160	160024001	Potomac	WV	GRANT	170	170054023
Susq	PA	FULTON	100	100042057	Potomac	MD	ALLEGANY	175	175024001	Potomac	WV	HAMPSHIRE	160	160054027
Susq	PA	HUNTINGDON	90	90042061	Potomac	MD	CARROLL	210	210024013	Potomac	WV	HAMPSHIRE	170	170054027
Susq	PA	HUNTINGDON	100	100042061	Potomac	MD	CARROLL	750	750024013	Potomac	WV	HAMPSHIRE	175	175054027
Susq	PA	INDIANA	50	50042063	Potomac	MD	CHARLES	910	910024017	Potomac	WV	HARDY	170	170054031
Susq	PA	JEFFERSON	50	50042065	Potomac	MD	CHARLES	920	920024017	Potomac	WV	HARDY	175	175054031
Susq	PA	JUNIATA	80	80042067	Potomac	MD	FREDERICK	180	180024021	Potomac	WV	HARDY	200	200054031
Susq	PA	JUNIATA	100	100042067	Potomac	MD	FREDERICK	210	210024021	Potomac	WV	JEFFERSON	180	180054037
Susq	PA	LACKAWANNA	30	30042069	Potomac	MD	FREDERICK	220	220024021	Potomac	WV	JEFFERSON	200	200054037
Susq	PA	LANCASTER	110	110042071	Potomac	MD	FREDERICK	750	750024021	Potomac	WV	JEFFERSON	740	740054037
Susq	PA	LANCASTER	120	120042071	Potomac	MD	GARRETT	160	160024023	Potomac	WV	MINERAL	160	160054057
Susq	PA	LANCASTER	140	140042071	Potomac	MD	MONTGOMERY	210	210024031	Potomac	WV	MORGAN	175	175054065
Susq	PA	LANCASTER	450	450042071	Potomac	MD	MONTGOMERY	220	220024031	Potomac	WV	MORGAN	740	740054065
Susq	PA	LANCASTER	710	710042071	Potomac	MD	MONTGOMERY	540	540024031	Potomac	WV	PENDELTON	170	170054071
Susq	PA	LANCASTER	720	720042071	Potomac	MD	MONTGOMERY	890	890024031	Potomac	WV	PRESTON	160	160054077
Susq	PA	LEBANON	80	80042075	Potomac	MD	PRINCE GEORGES	540	540024033	Potomac	WV	TUCKER	160	160054093
Susq	PA	LEBANON	110	110042075	Potomac	MD	PRINCE GEORGES	910	910024033					

Table 1. County Segments by Basin, State, County, and Segment

Basin	State	County	SEG	COSEG	Basin	State	County	SEG	COSEG	Basin	State	County	SEG	COSEG
Rapp. VA	ALBEMARLE	230	230051003	James VA	CHARLES CITY	610	610051036	West Shore MD	BALTIMORE	480	480024005			
Rapp. VA	CAROLINE	560	560051033	James VA	CHARLOTTESVILLE CITY	280	280051540	West Shore MD	BALTIMORE	490	490024005			
Rapp. VA	CULPEPPER	230	230051047	James VA	CHESAPEAKE CITY	630	630051550	West Shore MD	BALTIMORE	650	650024005			
Rapp. VA	ESSEX	560	560051057	James VA	CHESAPEAKE CITY	960	960051550	West Shore MD	BALTIMORE	760	760024005			
Rapp. VA	FAUQUIER	230	230051061	James VA	CHESTERFIELD	290	290051041	West Shore MD	BALTIMORE	860	860024005			
Rapp. VA	FREDERICKSBURG CITY	230	230051630	James VA	CHESTERFIELD	300	300051041	West Shore MD	BALTIMORE CITY	480	480024510			
Rapp. VA	FREDERICKSBURG CITY	560	560051630	James VA	CHESTERFIELD	310	310051041	West Shore MD	BALTIMORE CITY	490	490024510			
Rapp. VA	GREENE	230	230051079	James VA	CHESTERFIELD	600	600051041	West Shore MD	BALTIMORE CITY	860	860024510			
Rapp. VA	KING GEORGE	560	560051099	James VA	CLIFTON FORGE CITY	270	270051560	West Shore MD	CALVERT	880	880024009			
Rapp. VA	LANCASTER	560	560051103	James VA	COLONIAL HEIGHTS CITY	600	600051570	West Shore MD	CARROLL	470	470024013			
Rapp. VA	LANCASTER	580	580051103	James VA	COVINGTON CITY	270	270051580	West Shore MD	CARROLL	650	650024013			
Rapp. VA	LANCASTER	930	930051103	James VA	CRAIG	270	270051043	West Shore MD	CARROLL	760	760024013			
Rapp. VA	MADISON	230	230051113	James VA	CUMBERLAND	280	280051049	West Shore MD	HARFORD	470	470024025			
Rapp. VA	MIDDLESEX	560	560051119	James VA	CUMBERLAND	290	290051049	West Shore MD	HARFORD	850	850024025			
Rapp. VA	NORTHUMBERLAND	560	560051133	James VA	CUMBERLAND	300	300051049	West Shore MD	HOWARD	490	490024027			
Rapp. VA	NORTHUMBERLAND	580	580051133	James VA	DINWIDDIE	310	310051053	West Shore MD	HOWARD	760	760024027			
Rapp. VA	NORTHUMBERLAND	930	930051133	James VA	DINWIDDIE	600	600051053	West Shore PA	YORK	470	470042133			
Rapp. VA	ORANGE	230	230051137	James VA	FLUVANNA	280	280051063	East Shore DE	KENT	380	380010001			
Rapp. VA	RAPPAHANNOCK	230	230051157	James VA	GILES	270	270051071	East Shore DE	KENT	400	400010001			
Rapp. VA	RICHMOND	560	560051159	James VA	GOOCHLAND	280	280051075	East Shore DE	KENT	410	410010001			
Rapp. VA	RICHMOND	580	580051159	James VA	GOOCHLAND	290	290051075	East Shore DE	KENT	770	770010001			
Rapp. VA	SPOTSYLVANIA	230	230051177	James VA	GREENE	280	280051079	East Shore DE	KENT	780	780010001			
Rapp. VA	SPOTSYLVANIA	560	560051177	James VA	HAMPTON CITY	600	600051650	East Shore DE	NEW CASTLE	370	370010003			
Rapp. VA	STAFFORD	230	230051179	James VA	HAMPTON CITY	955	955051650	East Shore DE	NEW CASTLE	380	380010003			
Rapp. VA	STAFFORD	560	560051179	James VA	HAMPTON CITY	960	960051650	East Shore DE	NEW CASTLE	800	800010003			
Rapp. VA	WESTMORELAND	560	560051193	James VA	HANOVER	610	610051085	East Shore DE	NEW CASTLE	810	810010003			
York VA	ALBEMARLE	260	260051003	James VA	HENRICO	290	290051087	East Shore DE	SUSSEX	410	410010005			
York VA	CAROLINE	235	235051033	James VA	HENRICO	600	600051087	East Shore DE	SUSSEX	420	420010005			
York VA	CAROLINE	240	240051033	James VA	HENRICO	610	610051087	East Shore DE	SUSSEX	430	430010005			
York VA	CAROLINE	260	260051033	James VA	HIGHLAND	265	265051091	East Shore DE	SUSSEX	780	780010005			
York VA	CAROLINE	590	590051033	James VA	HIGHLAND	270	270051091	East Shore MD	CAROLINE	380	380024011			
York VA	ESSEX	940	940051057	James VA	HOPEWELL CITY	600	600051670	East Shore MD	CAROLINE	400	400024011			
York VA	GLOUCESTER	590	590051073	James VA	ISLE OF WIGHT	600	600051093	East Shore MD	CAROLINE	410	410024011			
York VA	GLOUCESTER	940	940051073	James VA	ISLE OF WIGHT	620	620051093	East Shore MD	CAROLINE	770	770024011			
York VA	GOOCHLAND	260	260051075	James VA	JAMES CITY	600	600051095	East Shore MD	Cecil	370	370024015			
York VA	HANOVER	260	260051085	James VA	LEXINGTON CITY	270	270051678	East Shore MD	Cecil	800	800024015			
York VA	HANOVER	590	590051085	James VA	LOUISA	280	280051109	East Shore MD	Cecil	810	810024015			
York VA	JAMES CITY	590	590051095	James VA	LYNCHBURG CITY	280	280051680	East Shore MD	DORCHESTER	400	400024019			
York VA	KING AND QUEEN	240	240051097	James VA	MONTGOMERY	270	270051121	East Shore MD	DORCHESTER	410	410024019			
York VA	KING AND QUEEN	590	590051097	James VA	NELSON	280	280051125	East Shore MD	DORCHESTER	840	840024019			
York VA	KING AND QUEEN	940	940051097	James VA	NEW KENT	600	600051127	East Shore MD	KENT	380	380024029			
York VA	KING WILLIAM	240	240051101	James VA	NEW KENT	610	610051127	East Shore MD	KENT	810	810024029			
York VA	KING WILLIAM	590	590051101	James VA	NEWPORT NEWS CITY	600	600051700	East Shore MD	QUEEN ANNES	380	380024035			
York VA	LOUISA	250	250051109	James VA	NEWPORT NEWS CITY	955	955051700	East Shore MD	QUEEN ANNES	390	390024035			
York VA	LOUISA	260	260051109	James VA	NORFOLK CITY	960	960051710	East Shore MD	QUEEN ANNES	400	400024035			
York VA	MATHEWS	940	940051115	James VA	NORFOLK CITY	965	965051710	East Shore MD	QUEEN ANNES	770	770024035			
York VA	MIDDLESEX	940	940051119	James VA	NORTHAMPTON	960	960051131	East Shore MD	QUEEN ANNES	820	820024035			
York VA	NEW KENT	590	590051127	James VA	NOTTOWAY	300	300051135	East Shore MD	SOMERSET	420	420024039			
York VA	ORANGE	235	235051137	James VA	NOTTOWAY	310	310051135	East Shore MD	SOMERSET	430	430024039			
York VA	ORANGE	250	250051137	James VA	ORANGE	280	280051137	East Shore MD	SOMERSET	840	840024039			
York VA	ORANGE	260	260051137	James VA	PETERSBURG CITY	600	600051730	East Shore MD	TALBOT	390	390024041			
York VA	POQUOSON CITY	950	950051735	James VA	POQUOSON CITY	955	955051735	East Shore MD	TALBOT	400	400024041			
York VA	SPOTSYLVANIA	235	235051177	James VA	PORTSMOUTH CITY	620	620051740	East Shore MD	TALBOT	830	830024041			
York VA	SPOTSYLVANIA	240	240051177	James VA	PORTSMOUTH CITY	630	630051740	East Shore MD	WICOMICO	410	410024045			
York VA	SPOTSYLVANIA	250	250051177	James VA	PORTSMOUTH CITY	960	960051740	East Shore MD	WICOMICO	420	420024045			
York VA	SPOTSYLVANIA	260	260051177	James VA	POWHATAN	290	290051145	East Shore MD	WICOMICO	430	430024045			
York VA	WILLIAMSBURG CITY	590	590051830	James VA	POWHATAN	300	300051145	East Shore MD	WORCESTER	420	420024047			
York VA	YORK	590	590051199	James VA	POWHATAN	600	600051145	East Shore MD	WORCESTER	430	430024047			
York VA	YORK	950	950051199	James VA	PRINCE EDWARD	300	300051147	East Shore PA	CHESTER	800	800042029			
James VA	ALBEMARLE	280	280051003	James VA	PRINCE GEORGE	600	600051149	East Shore VA	ACCOMACK	430	430051001			
James VA	ALLEGHANY	265	265051005	James VA	RICHMOND CITY	290	290051760	East Shore VA	ACCOMACK	440	440051001			
James VA	ALLEGHANY	270	270051005	James VA	RICHMOND CITY	600	600051760	East Shore VA	NORTHAMPTON	440	440051131			
James VA	AMELIA	300	300051007	James VA	ROANOKE	270	270051161							
James VA	AMELIA	310	310051007	James VA	ROCKBRIDGE	270	270051163							
James VA	AMHERST	270	270051009	James VA	SUFFOLK	600	600051800							
James VA	AMHERST	280	280051009	James VA	SUFFOLK	620	620051800							
James VA	APPOMATTOX	280	280051011	James VA	SURRY	600	600051181							
James VA	APPOMATTOX	300	300051011	James VA	VIRGINIA BEACH	960	960051810							
James VA	AUGUSTA	270	270051015	James VA	VIRGINIA BEACH	965	965051810							
James VA	BATH	265	265051017	James VA	WILLIAMSBURG CITY	600	600051830							
James VA	BATH	270	270051017	James VA	YORK	600	600051199							
James VA	BEDFORD	270	270051019	James VA	YORK	955	955051199							
James VA	BEDFORD	280	280051019	James WV	MONROE	270	270054063							
James VA	BOTETOURT	270	270051023	James WV	PENDLETON	270	270054071							
James VA	BUCKINGHAM	280	280051029	West Shore MD	ANNE ARUNDEL	490	490024003							
James VA	BUCKINGHAM	300	300051029	West Shore MD	ANNE ARUNDEL	510	510024003							
James VA	BUENA VISTA CITY	270	270051530	West Shore MD	ANNE ARUNDEL	870	870024003							
James VA	CAMPBELL	280	280051031	West Shore MD	ANNE ARUNDEL	880	880024003							
James VA	CHARLES CITY	600	600051036	West Shore MD	BALTIMORE	470	470024005							

Section 2. Chesapeake Bay Program Land Use

The Chesapeake Bay Program Land Use (CBPLU) database is a combination of the EPA Environmental Monitoring and Assessment Program (EMAP)¹, NOAA Coastal Change Assessment Program (C-CAP)², and USGS Geographic Information Retrieval and Analysis System (GIRAS)³ land use databases. The 1990 EMAP database is the primary source of land use data. EMAP Level 2 data is delivered in raster (grid) format with each raster (grid-cell) being approximately 660 square meters (0.165 acres). EMAP employs two levels of detail in classification of land use and the more detailed level was chosen for the CBPLU.

The documentation for the EMAP Chesapeake Bay watershed study showed that using the aggregation scheme detailed below, overall thematic accuracy for the data set was eighty percent and non-transition site (pixels not located on a land use border) accuracy was ninety percent.

<i>Original EMAP Land Use Level 2 Classification Scheme</i>		<i>Final Database Category</i>	
11	High Intensity Developed	11	High Intensity Developed
12	Low Intensity Developed	12	Low Intensity Developed
21	Woody Cultivated	30	Woody
22	Herbaceous Cultivated	20	Herbaceous
31	Herbaceous	20	Herbaceous
41	Deciduous Forest	30	Woody
42	Evergreen Forest	30	Woody
43	Mixed Forest	40	Woody
52	Exposed Sand	40	Exposed
53	Exposed Rock	40	Exposed
71	Deciduous Wetland	30	Woody
72	Evergreen Wetland	30	Woody
73	Mixed Forest Wetland	30	Woody
81	Herbaceous Wetland	20	Herbaceous
91	Non-vegetated Wetland	40	Exposed
100	Water	60	Water

The original EMAP cover has data gaps within the Chesapeake Bay and at the watershed boundary. GIRAS data is used, where possible, to fill these small data gaps around the basin edge and within the watershed. The GIRAS data are reclassified to EMAP land use categories, converted to grid data, and merged with the EMAP data. In some places,

¹ Chesapeake Bay Watershed Pilot Project, EMAP Center, Research Triangle Park, NC 27711 Publication Code: EPA/620/R-94/XXX, March 1994

² Documentation for C-CAP is available from Dr. Kent Hughes, NOAA/NESDID/NODC, 1825 Connecticut Ave., NW, Washington, D.C. 20235

³ Anderson, et. al. A Land Use and Land Cover Classification System for Use with Remote Sensor Data 1976

GIRAS data are unavailable. A GRID: NIBBLE edge expansion algorithm is performed on the EMAP-GIRAS data to fill these data gaps. The GRID: NIBBLE function incrementally fills in raster cells with missing data based upon the value of the nearest neighboring raster, with proximity determined by least Euclidean distance.

To ensure the accuracy of land use assignments between herbaceous agricultural cover and emergent coastal wetlands NOAA Coastal Change Assessment Program (C-CAP) data are used. C-CAP herbaceous emergent wetland types are selected out of the 1989-1990 grid and then merged with the EMAP/GIRAS. The CBPLU grid is classified as wetland wherever the C-CAP data indicates wetland land.

To further enhance the accuracy of the final CBPLU, urban land use categories in GIRAS are selected out, converted to a grid, and merged with the EMAP/GIRAS/C-CAP grid. Herbaceous and woody areas in EMAP that are classified as urban categories in GIRAS were selected out and classified as Herbaceous Urban and Woody Urban, respectively. This enhancement was performed to capture rural residential areas where natural covers dominated the landscape, resulting in them often being misclassified as an undeveloped land cover when they are more accurately classified as pervious urban. To avoid double counting, GIRAS class 14, which is transportation and communication utilities, was not used because EMAP captures transportation networks in its Low Intensity Urban category.

The combination of EMAP, C-CAP, and GIRAS data resulted in the following CBPLU classification scheme:

EMAP High Intensity Urban	⇒	CBPLU High Intensity Urban
EMAP Low Intensity Urban	⇒	CBPLU Low Intensity Urban
GIRAS Urban + EMAP Herbaceous	⇒	CBPLU Herbaceous Urban
GIRAS Urban + EMAP Woody	⇒	CBPLU Woody Urban
EMAP Herbaceous	⇒	CBPLU Herbaceous
EMAP Woody	⇒	CBPLU Woody
EMAP Exposed	⇒	CBPLU Exposed
EMAP Water	⇒	CBPLU Water
C-CAP Emergent Herb. Wetlands	⇒	CBPLU Herbaceous Wetlands

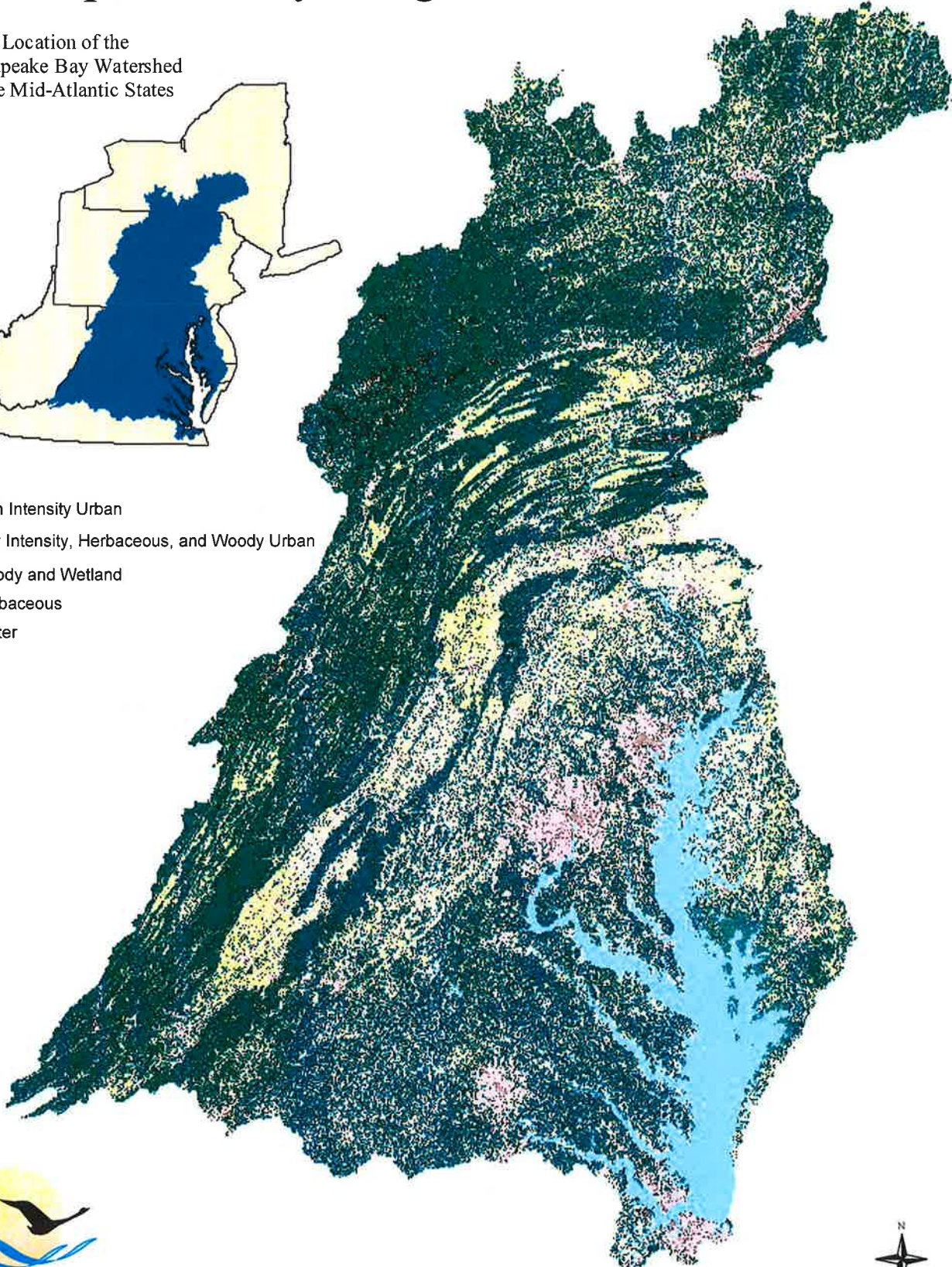
In Phase 4.2 of the Chesapeake Bay Watershed Model, refinements were made to the model segments and watershed boundary covers. Improved data from the states, USGS, and NOAA resulted in high-resolution shoreline and watershed covers. These refinements greatly improved the accuracy of watershed and sub-watershed delineation; however, they resulted in data gaps in the land use cover. Another GRID: NIBBLE edge expansion algorithm is performed on the CBPLU data to fill data gaps where the CBPLU basin boundary does not agree with the CBP watershed model basin boundary. Figure 9 shows the final Chesapeake Bay Program Land Use (CBPLU) cover. Table 2 represents the percent of total land use area by county-segment, from the original EMAP cover to the current high-resolution basin boundary, that contained unassigned land use data. Table 3 lists the final Chesapeake Bay Program Land Use data by county-segment.

Chesapeake Bay Program Land Use

Location of the Chesapeake Bay Watershed in the Mid-Atlantic States



- High Intensity Urban
- Low Intensity, Herbaceous, and Woody Urban
- Woody and Wetland
- Herbaceous
- Water



Chesapeake Bay Program



Table 2. Percent Area with Unassigned EMAP Data by County-Segment

<i>Coseg</i>	County Name	SEG	Basin	State	Nibbled Acres	Total Coseg Acres	Percent Nibbled
720042029	CHESTER	720	Susq.	PA	1313.04	1313.04	100.00%
90042021	CAMBRIA	90	Susq.	PA	68.42	68.42	100.00%
50042065	JEFFERSON	50	Susq.	PA	860.72	867.63	99.20%
120042029	CHESTER	120	Susq.	PA	4726.98	5019.59	94.17%
160054077	PRESTON	160	Potomac	WV	576.01	1033.43	55.74%
720042011	BERKS	720	Susq.	PA	10074.87	18661.53	53.99%
10036123	YATES	10	Susq.	NY	3274.46	6505.50	50.33%
10036069	ONTARIO	10	Susq.	NY	338.17	716.14	47.22%
600051053	DINWIDDIE	600	James	VA	3158.01	7096.15	44.50%
20036067	ONONDAGA	20	Susq.	NY	15173.41	35569.87	42.66%
280051019	BEDFORD	280	James	VA	12567.56	29843.02	42.11%
160054093	TUCKER	160	Potomac	WV	219.09	562.03	38.98%
270051071	GILES	270	James	VA	2855.20	7568.53	37.72%
60042083	MCKEAN	60	Susq.	PA	5060.87	15587.90	32.47%
270051019	BEDFORD	270	James	VA	12339.59	38677.06	31.90%
90042013	BLAIR	90	Susq.	PA	2465.71	7836.14	31.47%
10036051	LIVINGSTON	10	Susq.	NY	3165.41	10103.66	31.33%
270054063	MONROE	270	James	WV	14489.34	49765.13	29.12%
160024023	GARRETT	160	Potomac	MD	42909.78	153100.28	28.03%
600051730	PETERSBURG CITY	600	James	VA	2577.23	9724.04	26.50%
50042063	INDIANA	50	Susq.	PA	9863.19	40325.15	24.46%
960051550	CHESAPEAKE CITY	960	James	VA	10561.73	44681.22	23.64%
270051161	ROANOKE	270	James	VA	3882.21	16755.05	23.17%
600051149	PRINCE GEORGE	600	James	VA	17770.71	77795.58	22.84%
20036097	SCHUYLER	20	Susq.	NY	5603.99	25539.25	21.94%
160042111	SOMERSET	160	Potomac	PA	16353.72	77359.22	21.14%
620051800	SUFFOLK	620	James	VA	19343.79	95686.53	20.22%
20036095	SCHOHARIE	20	Susq.	NY	5283.42	26243.88	20.13%
30042127	WAYNE	30	Susq.	PA	3572.00	18025.65	19.82%
280051031	CAMPBELL	280	James	VA	8819.23	44530.89	19.80%
265051005	ALLEGHANY	265	James	VA	1456.80	7649.13	19.05%
450042029	CHESTER	450	Susq.	PA	7672.98	44461.97	17.26%
270051121	MONTGOMERY	270	James	VA	2480.85	14434.57	17.19%
600051181	SURRY	600	James	VA	11931.85	70418.83	16.94%
630051550	CHESAPEAKE CITY	630	James	VA	1945.79	11919.84	16.32%
20036065	ONEIDA	20	Susq.	NY	4570.89	30713.28	14.88%
20036043	HERKIMER	20	Susq.	NY	7171.97	50771.91	14.13%
20042127	WAYNE	20	Susq.	PA	2708.49	20212.90	13.40%
265051091	HIGHLAND	265	James	VA	12201.10	94003.08	12.98%
265051017	BATH	265	James	VA	17009.33	133226.54	12.77%
10036003	ALLEGANY	10	Susq.	NY	6447.77	53041.72	12.16%
965051810	VIRGINIA BEACH	965	James	VA	4760.37	47815.38	9.96%
170051091	HIGHLAND	170	Potomac	VA	5595.76	63312.33	8.84%
20036109	TOMPKINS	20	Susq.	NY	5093.28	59932.76	8.50%
300051135	NOTTOWAY	300	James	VA	8378.92	99660.52	8.41%
800042029	CHESTER	800	E.Shore MD	PA	3247.98	40485.51	8.02%
280051680	LYNCHBURG CITY	280	James	VA	2389.89	31893.10	7.49%
310051053	DINWIDDIE	310	James	VA	3192.55	43500.92	7.34%
10036097	SCHUYLER	10	Susq.	NY	3792.08	52264.23	7.26%
430024047	WORCESTER	430	E.Shore MD	MD	13239.62	183681.66	7.21%
300051147	PRINCE EDWARD	300	James	VA	14789.68	216862.96	6.82%
20036053	MADISON	20	Susq.	NY	13765.63	205656.14	6.69%
80042107	SCHUYLKILL	80	Susq.	PA	7712.29	115388.56	6.68%
40042107	SCHUYLKILL	40	Susq.	PA	3442.89	53333.02	6.46%
60042105	POTTER	60	Susq.	PA	24827.71	404388.17	6.14%
620051093	ISLE OF WIGHT	620	James	VA	2043.82	34624.77	5.90%
770010001	KENT	770	E.Shore MD	DE	2419.17	50422.88	4.80%
270051005	ALLEGHANY	270	James	VA	12809.35	279420.65	4.58%
110042011	BERKS	110	Susq.	PA	1626.70	38190.36	4.26%
310051135	NOTTOWAY	310	James	VA	297.71	7006.17	4.25%
170054071	PENDLETON	170	Potomac	WV	17599.32	446458.78	3.94%

Table 2. Percent Area with Unassigned EMAP Data by County-Segment

<i>Coseg</i>	<i>County Name</i>	<i>SEG</i>	<i>Basin</i>	<i>State</i>	Nibbled Acres	Total Coseg Acres	Percent Nibbled
10036015	CHEMUNG	10	Susq.	NY	7978.09	205293.46	3.89%
720042075	LEBANON	720	Susq.	PA	532.59	14024.52	3.80%
160054023	GRANT	160	Potomac	WV	5341.31	155385.40	3.44%
20036025	DELAWARE	20	Susq.	NY	5954.00	187071.75	3.18%
270051023	BOTETOURT	270	James	VA	9639.66	306378.21	3.15%
170054023	GRANT	170	Potomac	WV	4278.12	152719.35	2.80%
30042079	LUZERNE	30	Susq.	PA	2482.82	99467.58	2.50%
40042079	LUZERNE	40	Susq.	PA	8759.36	395579.79	2.21%
30042069	LACKAWANNA	30	Susq.	PA	5498.55	252004.69	2.18%
50042021	CAMBRIA	50	Susq.	PA	3475.29	186631.10	1.86%
60042047	ELK	60	Susq.	PA	2867.21	173669.62	1.65%
10036101	STEUBEN	10	Susq.	NY	11185.93	784017.55	1.43%
90042009	BEDFORD	90	Susq.	PA	6265.85	446139.85	1.40%
410010005	SUSSEX	410	E.Shore	MD DE	3233.34	232177.82	1.39%
380010003	NEW CASTLE	380	E.Shore	MD DE	103.95	7509.98	1.38%
20036023	CORTLAND	20	Susq.	NY	3768.72	280808.20	1.34%
110042075	LEBANON	110	Susq.	PA	2146.95	168309.88	1.28%
430051001	ACCOMACK	430	E.Shore	MD VA	223.03	19186.71	1.16%
50042033	CLEARFIELD	50	Susq.	PA	5762.38	552028.72	1.04%
720042071	LANCASTER	720	Susq.	PA	2815.73	270210.12	1.04%
370010003	NEW CASTLE	370	E.Shore	MD DE	66.78	7023.77	0.95%
90042111	SOMERSET	90	Susq.	PA	163.99	17362.31	0.94%
120042071	LANCASTER	120	Susq.	PA	911.22	104912.19	0.87%
160024001	ALLEGANY	160	Potomac	MD	1235.08	168921.09	0.73%
300051011	APPOMATTOX	300	James	VA	422.22	61320.81	0.69%
Total Area of the Chesapeake Bay Watershed					561002.56	9119868.61	1.39%

Table 3. 1990 Chesapeake Bay Program Land Use in Acres by Phase 4.2 Watershed Model County Segments

COSEG	SEG	FIPS	State	County	High Intensity Developed	Low Intensity Developed	Herbaceous Urban	Woody Urban	Herbaceous	Woody	Exposed	Water	Herbaceous Wetland	Total Acreage
10036003	10	36003	NY	ALLEGANY	1	2672	291	298	12596	37090	12	5	0	52964
10036015	10	36015	NY	CHEMUNG	1463	14292	7343	1007	75404	104028	128	1587	0	205251
10036051	10	36051	NY	LIVINGSTON	0	0	0	0	5477	4603	0	0	0	10080
10036069	10	36069	NY	ONTARIO	0	0	0	0	276	440	0	0	0	716
10036097	10	36097	NY	SCHUYLER	0	1748	188	173	11618	36542	0	1976	0	52246
10036101	10	36101	NY	STEUBEN	804	35969	4114	3120	244707	491685	87	3381	0	783867
10036123	10	36123	NY	YATES	0	13	39	1	3365	3038	0	28	0	6484
10042015	10	42015	PA	BRADFORD	83	2040	928	121	52113	55289	101	931	0	111605
10042105	10	42105	PA	POTTER	0	273	39	33	11598	18259	0	103	0	30304
10042117	10	42117	PA	TIOGA	84	10135	1744	714	131960	267995	302	3120	0	416054
20036007	20	36007	NY	BROOME	3635	36392	9692	4554	145556	199742	338	5802	0	405711
20036015	20	36015	NY	CHEMUNG	4	562	103	38	11521	22633	0	23	0	34883
20036017	20	36017	NY	CHENANGO	136	10399	4525	1249	184138	369580	51	3433	0	573511
20036023	20	36023	NY	CORTLAND	7	4610	4098	997	100324	169057	12	1608	0	280712
20036025	20	36025	NY	DELAWARE	135	4042	697	309	61177	119842	0	864	0	187066
20036043	20	36043	NY	HERKIMER	21	1543	310	187	28146	22843	0	254	0	53303
20036053	20	36053	NY	MADISON	0	803	1860	483	71496	129261	0	1672	0	205575
20036065	20	36065	NY	ONEIDA	35	271	118	20	10565	19716	0	116	0	30841
20036067	20	36067	NY	ONONDAGA	0	86	515	223	13107	21140	0	423	0	35494
20036077	20	36077	NY	OTSEGO	27	10775	4601	2041	235309	369748	0	8823	0	631324
20036095	20	36095	NY	SCHOHARIE	0	184	53	7	7980	17877	18	125	0	26244
20036097	20	36097	NY	SCHUYLER	33	475	102	10	6002	18517	6	360	0	25504
20036107	20	36107	NY	TIOGA	400	12230	6230	1236	143175	167122	355	2781	0	333528
20036109	20	36109	NY	TOMPKINS	3	566	207	61	12704	46192	5	122	0	59859
20042015	20	42015	PA	BRADFORD	147	2284	123	46	29386	30608	0	618	0	63212
20042115	20	42115	PA	SUSQUEHANNA	61	5511	401	396	53985	127950	65	3150	0	191519
20042127	20	42127	PA	WAYNE	0	45	1	25	5484	14318	0	338	0	20211
30042015	30	42015	PA	BRADFORD	56	5126	734	260	170719	224041	257	5328	0	406521
30042069	30	42069	PA	LACKAWANNA	8355	24232	6298	20625	41868	142687	4366	3561	0	251991
30042079	30	42079	PA	LUZERNE	6040	12036	1901	3763	9215	63076	1617	1823	0	99470
30042081	30	42081	PA	LYCOMING	0	0	0	0	149	973	0	0	0	1123
30042113	30	42113	PA	SULLIVAN	17	152	28	8	4352	13711	4	101	0	18373
30042115	30	42115	PA	SUSQUEHANNA	0	3113	862	685	146417	185108	160	4517	0	340862
30042117	30	42117	PA	TIOGA	0	70	0	0	2001	3168	0	0	0	5239
30042127	30	42127	PA	WAYNE	0	214	76	61	2502	14698	89	373	0	18014
30042131	30	42131	PA	WYOMING	18	4417	8156	10571	61130	166107	230	4990	0	255620
40042037	40	42037	PA	COLUMBIA	791	8020	2435	1727	126050	157576	1257	2304	0	300162
40042079	40	42079	PA	LUZERNE	6688	20320	3683	6852	75742	266977	9590	5737	0	395587
40042093	40	42093	PA	MONTOUR	106	1868	974	2970	14492	9751	8	546	0	30714
40042097	40	42097	PA	NORTHUMBERLAND	897	7251	1658	1314	50405	69157	5861	3171	0	139715
40042107	40	42107	PA	SCHUYLKILL	9	1124	399	1058	9787	39091	1631	237	0	53336
40042113	40	42113	PA	SULLIVAN	0	22	0	0	1265	28015	0	150	0	29453
50042021	50	42021	PA	CAMBRIA	3	3941	944	1415	32123	143093	3108	1962	0	186589
50042027	50	42027	PA	CENTRE	20	1527	87	636	3580	105802	3142	570	0	115364
50042033	50	42033	PA	CLEARFIELD	428	9489	1124	3189	37771	463653	32474	3859	0	551987
50042063	50	42063	PA	INDIANA	0	171	91	146	8366	28188	3260	26	0	40250
50042065	50	42065	PA	JEFFERSON	0	0	0	0	0	8	854	0	0	862
60042023	60	42023	PA	CAMERON	30	1409	493	611	12629	237385	276	1682	0	254514
60042027	60	42027	PA	CENTRE	100	11735	3438	1616	86170	282827	3678	3061	0	392625
60042033	60	42033	PA	CLEARFIELD	0	535	49	170	4443	110356	2063	271	0	117886
60042035	60	42035	PA	CLINTON	351	8006	1226	1100	68322	485993	3929	6239	0	575166
60042047	60	42047	PA	ELK	0	793	263	231	13258	156915	1510	587	0	173557
60042081	60	42081	PA	LYCOMING	395	8386	1490	817	78302	391053	306	4633	0	485382
60042083	60	42083	PA	MCKEAN	0	48	0	7	352	15131	0	4	0	15542
60042105	60	42105	PA	POTTER	9	959	433	574	30848	371012	14	443	0	404291
60042113	60	42113	PA	SULLIVAN	0	11	0	0	744	2808	0	48	0	3611
60042117	60	42117	PA	TIOGA	46	3067	117	353	63550	235195	610	944	0	303883
70042015	70	42015	PA	BRADFORD	0	20	0	0	2592	6088	0	90	0	8790
70042027	70	42027	PA	CENTRE	0	47	0	0	199	9036	0	0	0	9282
70042037	70	42037	PA	COLUMBIA	0	96	22	0	7583	5394	0	0	0	13095
70042081	70	42081	PA	LYCOMING	274	7936	2705	844	91570	203041	42	3377	0	309789
70042093	70	42093	PA	MONTOUR	122	927	171	14	39636	12612	188	259	0	53929
70042097	70	42097	PA	NORTHUMBERLAND	291	4341	981	262	43777	17102	19	2607	0	69380
70042113	70	42113	PA	SULLIVAN	18	1772	253	356	43289	190626	323	1398	0	238036
70042119	70	42119	PA	UNION	34	4297	973	472	58071	83512	25	434	0	147817
70042131	70	42131	PA	WYOMING	0	0	0	0	414	3114	0	11	0	3539
80042027	80	42027	PA	CENTRE	4	677	651	65	51831	92596	0	205	0	146028
80042041	80	42041	PA	CUMBERLAND	2718	19392	2997	981	134521	76805	203	1938	0	239556
80042043	80	42043	PA	DAUPHIN	1698	9795	2747	1234	71421	132380	205	14074	0	233555
80042055	80	42055	PA	FRANKLIN	281	2592	1046	2872	38211	41866	0	138	0	87006
80042067	80	42067	PA	JUNIATA	0	57	26	0	9488	10253	0	4	0	19828
80042075	80	42075	PA	LEBANON	0	0	0	0	17	9595	0	0	0	9612
80042087	80	42087	PA	MIFFLIN	0	0	0	0	97	10180	0	26	0	10302
80042097	80	42097	PA	NORTHUMBERLAND	1	455	180	61	47096	42110	69	6376	0	96349
80042099	80	42099	PA	PERRY	32	3360	1099	505	79565	157893	205	1708	0	244368
80042107	80	42107	PA	SCHUYLKILL	375	3738	909	824	31882	67763	9738	157	0	115386

Table 3. 1990 Chesapeake Bay Program Land Use in Acres by Phase 4.2 Watershed Model County Segments

COSEG	SEG	FIPS	State	County	Developed	Developed	Urban	Urban	Herbaceous	Woody	Exposed	Water	Wetland	Acreege
10036003	10	36003	NY	ALLEGANY	1	2672	291	298	12596	37090	12	5	0	52964
10036015	10	36015	NY	CHEMUNG	1463	14292	7343	1007	75404	104028	128	1587	0	205251
10036051	10	36051	NY	LIVINGSTON	0	0	0	0	5477	4603	0	0	0	10080
10036069	10	36069	NY	ONTARIO	0	0	0	0	276	440	0	0	0	716
10036097	10	36097	NY	SCHUYLER	0	1748	188	173	11618	36542	0	1976	0	52246
10036101	10	36101	NY	STEUBEN	804	35969	4114	3120	244707	491685	87	3381	0	783867
10036123	10	36123	NY	YATES	0	13	39	1	3365	3038	0	28	0	6484
10042015	10	42015	PA	BRADFORD	83	2040	928	121	52113	55289	101	931	0	111605
10042105	10	42105	PA	POTTER	0	273	39	33	11598	18259	0	103	0	30304
80042109	80	42109	PA	SNYDER	125	2562	1970	275	101838	96836	0	1572	0	205178
80042119	80	42119	PA	UNION	0	28	320	37	19045	35527	0	498	0	55455
90042009	90	42009	PA	BEDFORD	56	4887	3140	1247	138565	295035	842	2317	0	446088
90042013	90	42013	PA	BLAIR	0	18	45	0	4311	3449	0	0	0	7823
90042021	90	42021	PA	CAMBRIA	0	0	0	0	66	0	0	0	0	66
90042057	90	42057	PA	FULTON	0	240	0	0	4021	18659	0	0	0	22920
90042061	90	42061	PA	HUNTINGDON	0	209	183	121	17259	86493	90	8506	0	112860
90042111	90	42111	PA	SOMERSET	0	277	18	24	1971	15030	6	0	0	17327
1E+08	100	42009	PA	BEDFORD	0	100	171	177	5584	8948	0	5	0	14986
1E+08	100	42013	PA	BLAIR	132	16684	4976	4261	73446	229943	848	1026	0	331316
1E+08	100	42027	PA	CENTRE	0	64	74	51	14934	32833	0	11	0	47967
1E+08	100	42055	PA	FRANKLIN	0	99	11	7	5714	11166	0	0	0	16997
1E+08	100	42057	PA	FULTON	0	629	201	164	12457	57156	161	133	0	70899
1E+08	100	42061	PA	HUNTINGDON	27	3374	1186	871	100836	349044	420	1621	0	457378
1E+08	100	42067	PA	JUNIATA	3	1182	941	118	84965	142947	69	1680	0	231905
1E+08	100	42087	PA	MIFFLIN	204	3544	3595	1386	91585	151634	201	2288	0	254437
1E+08	100	42099	PA	PERRY	0	394	389	49	37086	72787	5	618	0	111327
1E+08	100	42109	PA	SNYDER	0	5	13	0	1609	5956	0	0	0	7583
1.1E+08	110	24013	MD	CARROLL	0	8	15	0	2125	1327	0	0	0	3476
1.1E+08	110	42001	PA	ADAMS	124	3170	1664	177	111284	55512	183	1023	0	173138
1.1E+08	110	42011	PA	BERKS	40	908	293	8	24137	12798	0	5	0	38188
1.1E+08	110	42041	PA	CUMBERLAND	1107	9164	1559	474	41030	59344	249	309	0	113236
1.1E+08	110	42043	PA	DAUPHIN	3166	19947	5133	1569	57711	28906	89	6712	0	123232
1.1E+08	110	42071	PA	LANCASTER	380	3165	533	285	19076	8368	84	3726	0	35618
1.1E+08	110	42075	PA	LEBANON	1357	13118	4922	555	99166	47364	802	1027	0	168311
1.1E+08	110	42107	PA	SCHUYLKILL	30	2382	801	604	24782	57002	1758	164	0	87524
1.1E+08	110	42133	PA	YORK	2409	27651	8261	2543	211104	128596	412	4707	0	385683
1.2E+08	120	42029	PA	CHESTER	0	0	0	0	2183	2833	0	0	0	5016
1.2E+08	120	42071	PA	LANCASTER	338	4367	797	324	66565	29672	62	2787	0	104911
1.2E+08	120	42133	PA	YORK	0	66	79	5	10241	10778	0	78	0	21247
1.4E+08	140	24015	MD	CECIL	0	31	0	0	1232	3260	0	1426	299	6249
1.4E+08	140	24025	MD	HARFORD	2	345	156	199	16587	15532	9	1704	167	34700
1.4E+08	140	42071	PA	LANCASTER	65	513	129	52	32235	13381	88	6694	42	53199
1.4E+08	140	42133	PA	YORK	55	637	221	108	58550	36208	12	480	0	96271
1.6E+08	160	24001	MD	ALLEGANY	163	14088	2749	3511	23183	122246	2066	920	0	168927
1.6E+08	160	24023	MD	GARRETT	52	1394	24	216	22522	125468	2375	896	0	152948
1.6E+08	160	42009	PA	BEDFORD	0	679	148	60	15131	69503	0	415	0	85935
1.6E+08	160	42111	PA	SOMERSET	0	395	41	58	14786	62012	0	5	0	77297
1.6E+08	160	54023	WV	GRANT	0	1696	101	179	43334	105182	3484	1371	0	155346
1.6E+08	160	54027	WV	HAMPSHIRE	88	256	28	10	3634	7841	35	30	0	11922
1.6E+08	160	54057	WV	MINERAL	66	6391	998	749	37708	163107	956	1107	0	211082
1.6E+08	160	54077	WV	PRESTON	0	0	0	0	108	716	203	0	0	1027
1.6E+08	160	54093	WV	TUCKER	0	0	0	0	24	490	43	0	0	557
1.7E+08	170	51091	VA	HIGHLAND	0	290	124	25	23145	39692	0	0	0	63276
1.7E+08	170	54023	WV	GRANT	0	3147	632	239	46116	102057	13	487	0	152691
1.7E+08	170	54027	WV	HAMPSHIRE	0	1870	180	129	23864	88765	300	1755	0	116863
1.7E+08	170	54031	WV	HARDY	17	2511	250	98	48436	115183	52	142	0	166689
1.7E+08	170	54071	WV	PENDLETON	56	3564	1052	221	109228	331487	190	568	0	446365
1.75E+08	175	24001	MD	ALLEGANY	0	918	18	20	14324	90159	20	1040	0	106500
1.75E+08	175	24043	MD	WASHINGTON	0	632	201	193	3406	22893	0	557	0	27881
1.75E+08	175	42009	PA	BEDFORD	0	0	0	0	18625	85183	0	0	0	103808
1.75E+08	175	42057	PA	FULTON	0	37	0	0	3351	12454	0	0	0	15842
1.75E+08	175	54027	WV	HAMPSHIRE	0	2848	382	272	61936	217522	32	1458	0	284449
1.75E+08	175	54031	WV	HARDY	6	1526	312	367	39351	157254	23	144	0	198983
1.75E+08	175	54065	WV	MORGAN	0	2108	434	317	6667	56232	140	1019	0	66917
1.8E+08	180	24021	MD	FREDERICK	128	2726	424	129	52435	34182	38	1133	12	91207
1.8E+08	180	24043	MD	WASHINGTON	1057	12296	1290	395	71497	48183	537	1453	40	136748
1.8E+08	180	42001	PA	ADAMS	0	21	0	0	172	4548	0	32	0	4773
1.8E+08	180	42055	PA	FRANKLIN	263	4959	861	280	34606	22460	9	12	1	63450
1.8E+08	180	51107	VA	LOUDOUN	0	258	409	81	48151	31942	0	146	7	80994
1.8E+08	180	54037	WV	JEFFERSON	5	513	682	138	22103	6179	0	113	5	29738
1.9E+08	190	51015	VA	AUGUSTA	481	10701	15126	3566	221898	205759	22	472	0	458025
1.9E+08	190	51139	VA	PAGE	78	2065	12313	2318	61293	115344	144	1720	0	195275
1.9E+08	190	51165	VA	ROCKINGHAM	484	8991	15960	1959	119515	159890	115	1845	0	308760
1.9E+08	190	51187	VA	WARREN	9	330	2307	819	13425	35951	13	708	0	53561
1.9E+08	190	51660	VA	HARRISONBURG CITY	1370	2934	1194	131	3133	807	0	5	0	9574
1.9E+08	190	51790	VA	STAUNTON CITY	277	3473	1942	817	4536	1627	0	4	0	12676
1.9E+08	190	51820	VA	WAYNESBORO CITY	499	3616	1016	255	2487	1111	16	18	0	9018
2E+08	200	51043	VA	CLARKE	9	1157	492	41	51692	36917	8	926	2	91244

Table 3. 1990 Chesapeake Bay Program Land Use in Acres by Phase 4.2 Watershed Model County Segments

COSEG	SEG	FIPS	State	County	Developed	Developed	Urban	Urban	Herbaceous	Woody	Exposed	Water	Wetland	Acreege
10036003	10	36003	NY	ALLEGANY	1	2672	291	298	12596	37090	12	5	0	52964
10036015	10	36015	NY	CHEMUNG	1463	14292	7343	1007	75404	104028	128	1587	0	205251
10036051	10	36051	NY	LIVINGSTON	0	0	0	0	5477	4603	0	0	0	10080
10036069	10	36069	NY	ONTARIO	0	0	0	0	276	440	0	0	0	716
10036097	10	36097	NY	SCHUYLER	0	1748	188	173	11618	36542	0	1976	0	52246
10036101	10	36101	NY	STEUBEN	804	35969	4114	3120	244707	491685	87	3381	0	783867
10036123	10	36123	NY	YATES	0	13	39	1	3365	3038	0	28	0	6484
10042015	10	42015	PA	BRADFORD	83	2040	928	121	52113	55289	101	931	0	111605
10042105	10	42105	PA	POTTER	0	273	39	33	11598	18259	0	103	0	30304
2E+08	200	51069	VA	FREDERICK	30	947	404	35	35970	40378	166	173	0	78103
2E+08	200	51139	VA	PAGE	0	0	0	0	17	6010	0	0	0	6028
2E+08	200	51165	VA	ROCKINGHAM	193	5032	7102	868	90337	134654	66	229	0	238481
2E+08	200	51171	VA	SHENANDOAH	235	6972	12079	3280	118750	184812	263	2144	0	328535
2E+08	200	51187	VA	WARREN	280	3082	5588	3990	30543	40492	4	1061	0	85040
2E+08	200	51660	VA	HARRISONBURG CITY	235	717	221	10	517	11	0	0	0	1711
2E+08	200	54031	WV	HARDY	0	43	0	0	1398	7699	0	0	0	9141
2E+08	200	54037	WV	JEFFERSON	61	1545	1880	2769	36234	18650	361	1383	9	62893
2.1E+08	210	24013	MD	CARROLL	191	2381	929	293	94378	32552	242	190	12	131169
2.1E+08	210	24021	MD	FREDERICK	687	18226	3237	908	165233	118454	1002	1602	75	309422
2.1E+08	210	24031	MD	MONTGOMERY	31	609	239	109	9792	9411	0	5	1	20197
2.1E+08	210	42001	PA	ADAMS	35	1630	207	154	14130	24786	135	72	4	41153
2.2E+08	220	11001	DC	DISTRICT OF COLUMBIA	121	898	43	203	0	79	6	25	0	1376
2.2E+08	220	24021	MD	FREDERICK	164	873	175	20	12104	5401	8	742	1	19488
2.2E+08	220	24031	MD	MONTGOMERY	4687	29212	6222	7743	72194	60460	41	5351	51	185959
2.2E+08	220	51013	VA	ARLINGTON CITY	0	9	0	33	0	34	0	0	0	76
2.2E+08	220	51059	VA	FAIRFAX	4605	22711	5121	9416	8637	23209	3	252	78	74033
2.2E+08	220	51061	VA	FAUQUIER	0	1053	4148	902	50685	40600	39	102	16	97546
2.2E+08	220	51107	VA	LOUDOUN	1910	11952	4619	1541	122460	92601	282	1042	77	236484
2.3E+08	230	51003	VA	ALBEMARLE	0	0	0	0	710	2148	0	3	0	2860
2.3E+08	230	51047	VA	CULPEPER	79	3169	8794	2891	132182	96416	286	909	145	244873
2.3E+08	230	51061	VA	FAUQUIER	38	1730	6136	1488	86549	85517	109	422	103	182090
2.3E+08	230	51079	VA	GREENE	0	126	1102	318	14573	23449	32	39	0	39638
2.3E+08	230	51113	VA	MADISON	0	475	7021	2538	86134	109813	63	160	0	206204
2.3E+08	230	51137	VA	ORANGE	44	2106	3239	1844	60776	59292	102	674	45	128123
2.3E+08	230	51157	VA	RAPPAHANNOCK	0	665	4092	1134	63553	101361	49	122	0	170975
2.3E+08	230	51177	VA	SPOTSYLVANIA	9	453	249	135	6232	19517	22	364	17	26997
2.3E+08	230	51179	VA	STAFFORD	0	278	482	294	5462	18059	0	410	15	25001
2.3E+08	230	51630	VA	FREDERICKSBURG CITY	0	0	0	0	156	216	4	21	0	398
2.35E+08	235	51033	VA	CAROLINE	0	328	422	300	9492	25219	0	94	4	35859
2.35E+08	235	51137	VA	ORANGE	0	2	0	0	1004	1701	0	0	2	2708
2.35E+08	235	51177	VA	SPOTSYLVANIA	3	971	1207	720	31527	90392	105	882	65	125871
2.4E+08	240	51033	VA	CAROLINE	0	2758	2021	1295	56162	127231	0	987	130	190583
2.4E+08	240	51097	VA	KING AND QUEEN	0	3	13	105	4427	9627	0	13	0	14189
2.4E+08	240	51101	VA	KING WILLIAM	0	8	0	0	1253	2952	0	21	0	4234
2.4E+08	240	51177	VA	SPOTSYLVANIA	0	7	87	22	2031	4880	0	12	3	7041
2.5E+08	250	51109	VA	LOUISA	42	1305	850	1056	26280	56716	181	8481	13	94923
2.5E+08	250	51137	VA	ORANGE	0	171	1674	556	37712	38693	83	373	10	79274
2.5E+08	250	51177	VA	SPOTSYLVANIA	0	119	30	0	13345	20525	366	5291	4	39681
2.6E+08	260	51003	VA	ALBEMARLE	0	26	0	0	3111	2167	6	10	0	5320
2.6E+08	260	51033	VA	CAROLINE	0	565	366	172	8309	23273	0	151	12	32848
2.6E+08	260	51075	VA	GOOCHLAND	0	336	2	0	1177	3304	0	7	0	4827
2.6E+08	260	51085	VA	HANOVER	0	1637	3075	2068	62228	102192	298	728	69	172296
2.6E+08	260	51109	VA	LOUISA	22	2471	2666	1649	76140	137698	0	945	43	221633
2.6E+08	260	51137	VA	ORANGE	0	176	379	25	2253	964	0	18	0	3815
2.6E+08	260	51177	VA	SPOTSYLVANIA	0	44	199	48	7468	21077	0	7	1	28845
2.65E+08	265	51005	VA	ALLEGHANY	0	0	0	0	2	7141	0	502	0	7644
2.65E+08	265	51017	VA	BATH	0	553	206	154	12172	116989	814	2114	0	133002
2.65E+08	265	51091	VA	HIGHLAND	10	380	426	25	32394	60750	99	0	0	94083
2.7E+08	270	51005	VA	ALLEGHANY	191	4804	2008	2105	25850	243249	0	1136	0	279343
2.7E+08	270	51009	VA	AMHERST	0	829	9	55	11049	77512	79	826	0	90359
2.7E+08	270	51015	VA	AUGUSTA	42	1901	961	416	30326	132011	0	63	0	165722
2.7E+08	270	51017	VA	BATH	42	1437	1238	1633	28318	176926	8	506	0	210108
2.7E+08	270	51019	VA	BEDFORD	34	788	231	238	5196	31728	0	448	0	38665
2.7E+08	270	51023	VA	BOTETOURT	32	8350	5068	2286	68083	220596	17	1927	0	306361
2.7E+08	270	51045	VA	CRAIG	0	452	364	85	22363	160053	50	19	0	183386
2.7E+08	270	51071	VA	GILES	0	0	0	0	18	7520	0	0	0	7538
2.7E+08	270	51091	VA	HIGHLAND	3	322	203	19	27996	81140	0	0	0	109682
2.7E+08	270	51121	VA	MONTGOMERY	0	15	0	0	466	13923	0	0	0	14404
2.7E+08	270	51161	VA	ROANOKE	0	61	62	46	4990	11581	0	0	0	16740
2.7E+08	270	51163	VA	ROCKBRIDGE	327	13169	5689	2880	105114	256488	73	2042	0	385784
2.7E+08	270	51530	VA	BUENA VISTA CITY	355	1142	178	141	661	1808	0	102	0	4386
2.7E+08	270	51560	VA	CLIFTON FORGE CITY	288	661	39	242	24	687	0	48	0	1989
2.7E+08	270	51580	VA	COVINGTON CITY	288	1173	153	181	265	618	0	170	0	2848
2.7E+08	270	51678	VA	LEXINGTON CITY	203	856	281	104	72	75	0	8	0	1599
2.7E+08	270	54063	WV	MONROE	0	42	69	0	7088	42489	0	0	0	49688
2.7E+08	270	54071	WV	PENDLETON	0	0	0	0	595	1124	0	0	0	1719
2.8E+08	280	51003	VA	ALBEMARLE	634	9282	10466	9395	141257	283608	37	2660	0	457339
2.8E+08	280	51009	VA	AMHERST	254	8531	3545	4923	50584	147114	51	1874	0	216876

Table 3. 1990 Chesapeake Bay Program Land Use in Acres by Phase 4.2 Watershed Model County Segments

COSEG	SEG	FIPS	State	County	Developed	Developed	Urban	Urban	Herbaceous	Woody	Exposed	Water	Wetland	Acreege
10036003	10 36003	NY	ALLEGANY		1	2672	291	298	12596	37090	12	5	0	52964
10036015	10 36015	NY	CHEMUNG		1463	14292	7343	1007	75404	104028	128	1587	0	205251
10036051	10 36051	NY	LIVINGSTON		0	0	0	0	5477	4603	0	0	0	10080
10036069	10 36069	NY	ONTARIO		0	0	0	0	276	440	0	0	0	716
10036097	10 36097	NY	SCHUYLER		0	1748	188	173	11618	36542	0	1976	0	52246
10036101	10 36101	NY	STEUBEN		804	35969	4114	3120	244707	491685	87	3381	0	783867
10036123	10 36123	NY	YATES		0	13	39	1	3365	3038	0	28	0	6484
10042015	10 42015	PA	BRADFORD		83	2040	928	121	52113	55289	101	931	0	111605
10042105	10 42105	PA	POTTER		0	273	39	33	11598	18259	0	103	0	30304
2.8E+08	280 51011	VA	APPOMATTOX		26	1337	808	883	29395	57314	6	590	0	90360
2.8E+08	280 51019	VA	BEDFORD		39	7362	140	413	4241	17223	40	352	0	29809
2.8E+08	280 51029	VA	BUCKINGHAM		9	2604	2359	2356	99899	242283	297	2690	0	352497
2.8E+08	280 51031	VA	CAMPBELL		195	6624	614	1309	7549	27905	0	318	0	44515
2.8E+08	280 51049	VA	CUMBERLAND		40	816	924	460	31178	60028	0	469	0	93915
2.8E+08	280 51065	VA	FLUVANNA		24	3313	3497	2285	62713	111423	0	2717	0	185972
2.8E+08	280 51075	VA	GOOCHLAND		0	363	184	212	16329	22332	0	689	0	40108
2.8E+08	280 51079	VA	GREENE		0	327	3193	584	20798	35877	24	168	0	60971
2.8E+08	280 51109	VA	LOUISA		0	170	368	265	3074	6729	0	39	0	10644
2.8E+08	280 51125	VA	NELSON		128	1715	4349	3759	66080	226549	47	1565	0	304192
2.8E+08	280 51137	VA	ORANGE		0	4	348	152	2267	3296	0	3	0	6071
2.8E+08	280 51540	VA	CHARLOTTESVILLE CITY		770	3408	1478	478	282	151	0	11	0	6578
2.8E+08	280 51680	VA	LYNCHBURG CITY		1069	14361	196	1270	1782	12992	0	224	0	31895
2.9E+08	290 51041	VA	CHESTERFIELD		14	1516	319	602	1470	5765	0	64	1	9751
2.9E+08	290 51049	VA	CUMBERLAND		0	379	176	160	12532	19560	0	65	0	32872
2.9E+08	290 51075	VA	GOOCHLAND		64	2940	1920	1599	53513	77187	0	3526	74	140822
2.9E+08	290 51087	VA	HENRICO		601	8971	1031	1338	3266	5990	0	630	11	21839
2.9E+08	290 51145	VA	POWHATAN		4	2160	939	1182	40249	76569	0	1200	113	122416
2.9E+08	290 51760	VA	RICHMOND CITY		1	563	58	517	123	680	0	60	0	2002
3E+08	300 51007	VA	AMELIA		49	1918	856	478	86507	125304	0	950	69	216132
3E+08	300 51011	VA	APPOMATTOX		26	1248	602	762	15116	43313	0	118	0	61185
3E+08	300 51029	VA	BUCKINGHAM		0	111	3	33	6072	15406	0	82	0	21706
3E+08	300 51041	VA	CHESTERFIELD		0	376	14	1	5758	25987	0	298	4	32437
3E+08	300 51049	VA	CUMBERLAND		11	525	851	254	27959	35269	0	419	0	65288
3E+08	300 51135	VA	NOTTOWAY		156	1929	986	579	35663	59724	124	466	13	99640
3E+08	300 51145	VA	POWHATAN		12	192	160	81	15409	24532	0	244	15	40646
3E+08	300 51147	VA	PRINCE EDWARD		258	4371	3162	1657	71478	134093	114	1688	0	216822
3.1E+08	310 51007	VA	AMELIA		0	29	0	0	3322	9653	0	540	10	13555
3.1E+08	310 51041	VA	CHESTERFIELD		6	460	226	140	4701	23778	0	1611	2	30924
3.1E+08	310 51053	VA	DINWIDDIE		21	392	61	36	12194	29423	0	1344	19	43491
3.1E+08	310 51135	VA	NOTTOWAY		0	44	0	0	2332	4603	0	27	0	7006
3.3E+08	330 24027	MD	HOWARD		10	857	562	376	22889	19450	0	820	18	44983
3.3E+08	330 24031	MD	MONTGOMERY		112	1693	897	670	17857	17387	0	634	13	39264
3.4E+08	340 24003	MD	ANNE ARUNDEL		1269	8462	2541	1360	5016	19413	13	26	97	38198
3.4E+08	340 24027	MD	HOWARD		2253	17591	3304	2944	26018	24387	13	188	33	76733
3.4E+08	340 24033	MD	PRINCE GEORGES		1277	9075	1619	1840	2325	9470	3	90	49	25749
3.7E+08	370 10003	DE	NEW CASTLE		0	28	21	0	6119	768	0	16	70	7023
3.7E+08	370 24015	MD	CECIL		5	433	326	83	25485	9628	0	596	1790	38344
3.8E+08	380 10001	DE	KENT		0	20	302	96	10384	8477	0	0	21	19299
3.8E+08	380 10003	DE	NEW CASTLE		0	0	0	0	3071	4437	0	0	0	7508
3.8E+08	380 24011	MD	CAROLINE		0	0	0	0	15	6	0	0	0	21
3.8E+08	380 24029	MD	KENT		3	1242	986	421	75758	20967	8	1317	3146	103848
3.8E+08	380 24035	MD	QUEEN ANNES		13	1431	1404	552	85480	32968	0	724	1909	124481
3.9E+08	390 24035	MD	QUEEN ANNES		0	579	1039	152	20233	6696	0	475	473	29648
3.9E+08	390 24041	MD	TALBOT		0	74	460	98	14995	4578	0	410	341	20954
4E+08	400 10001	DE	KENT		0	0	117	11	9190	5140	0	0	0	14459
4E+08	400 24011	MD	CAROLINE		14	1803	3135	1044	95654	39885	6	563	3390	145494
4E+08	400 24019	MD	DORCHESTER		346	1665	1383	335	20636	5146	0	474	1080	31064
4E+08	400 24035	MD	QUEEN ANNES		0	70	216	81	33747	11898	0	9	86	46107
4E+08	400 24041	MD	TALBOT		22	634	1648	392	51840	17880	0	724	3146	76286
4.1E+08	410 10001	DE	KENT		0	51	172	31	23484	14007	0	0	12	37757
4.1E+08	410 10005	DE	SUSSEX		846	4188	4842	2129	126836	90551	46	1146	1594	232177
4.1E+08	410 24011	MD	CAROLINE		99	980	508	380	23687	14410	0	48	248	40361
4.1E+08	410 24019	MD	DORCHESTER		82	556	630	152	36910	23557	0	748	2956	65590
4.1E+08	410 24045	MD	WICOMICO		78	954	1495	517	32612	32120	0	601	7410	75786
4.2E+08	420 10005	DE	SUSSEX		56	248	80	29	874	263	0	0	0	1550
4.2E+08	420 24039	MD	SOMERSET		31	1111	1264	510	12417	15038	0	666	7148	37186
4.2E+08	420 24045	MD	WICOMICO		1740	7914	4575	1803	42757	34310	0	641	6612	100352
4.2E+08	420 24047	MD	WORCESTER		0	0	0	0	45	25	0	0	0	69
4.3E+08	430 10005	DE	SUSSEX		0	0	102	0	11201	11151	0	0	0	22454
4.3E+08	430 24039	MD	SOMERSET		16	1718	3107	1923	55464	63961	250	3015	41811	171266
4.3E+08	430 24045	MD	WICOMICO		14	414	1506	224	33400	29348	0	17	41	64963
4.3E+08	430 24047	MD	WORCESTER		75	1721	1375	629	68868	108863	0	507	1650	183687
4.3E+08	430 51001	VA	ACCOMACK		0	64	325	232	7749	8777	0	38	2004	19189
4.4E+08	440 51001	VA	ACCOMACK		0	936	2919	1762	48478	48056	228	2205	21058	125640
4.4E+08	440 51131	VA	NORTHAMPTON		227	1656	1702	444	40400	15897	662	1792	1186	63965
4.5E+08	450 24005	MD	BALTIMORE		0	29	18	17	4317	2822	0	0	0	7203
4.5E+08	450 24015	MD	CECIL		278	1950	485	854	15300	14760	4	1134	586	35351
4.5E+08	450 24025	MD	HARFORD		214	1350	754	664	47635	42406	82	892	345	94341

Table 3. 1990 Chesapeake Bay Program Land Use in Acres by Phase 4.2 Watershed Model County Segments

COSEG	SEG	FIPS	State	County	Developed	Developed	Urban	Urban	Herbaceous	Woody	Exposed	Water	Wetland	Acreege
10036003	10 36003	NY	ALLGANY		1	2672	291	298	12596	37090	12	5	0	52964
10036015	10 36015	NY	CHEMUNG		1463	14292	7343	1007	75404	104028	128	1587	0	205251
10036051	10 36051	NY	LIVINGSTON		0	0	0	0	5477	4603	0	0	0	10080
10036069	10 36069	NY	ONTARIO		0	0	0	0	276	440	0	0	0	716
10036097	10 36097	NY	SCHUYLER		0	1748	188	173	11618	36542	0	1976	0	52246
10036101	10 36101	NY	STEUBEN		804	35969	4114	3120	244707	491685	87	3381	0	783867
10036123	10 36123	NY	YATES		0	13	39	1	3365	3038	0	28	0	6484
10042015	10 42015	PA	BRADFORD		83	2040	928	121	52113	55289	101	931	0	111605
10042105	10 42105	PA	POTTER		0	273	39	33	11598	18259	0	103	0	30304
4.5E+08	450 42029	PA	CHESTER		119	868	319	244	22964	19457	0	331	157	44458
4.5E+08	450 42071	PA	LANCASTER		25	906	350	133	52377	15417	29	437	60	69733
4.5E+08	450 42133	PA	YORK		3	843	265	23	12490	4107	37	20	0	17788
4.7E+08	470 24005	MD	BALTIMORE		3807	20715	5340	4672	87077	112410	1525	4468	810	240824
4.7E+08	470 24013	MD	CARROLL		22	397	307	99	13782	6895	32	0	0	21533
4.7E+08	470 24025	MD	HARFORD		458	3226	2038	1075	10629	10364	33	359	836	29018
4.7E+08	470 42133	PA	YORK		0	92	53	23	4504	1178	0	0	0	5850
4.8E+08	480 24005	MD	BALTIMORE		2794	19009	4280	5831	7972	13304	147	69	51	53458
4.8E+08	480 24510	MD	BALTIMORE CITY		17352	12740	2505	1568	310	1396	15	217	33	36137
4.9E+08	490 24003	MD	ANNE ARUNDEL		4999	21970	2655	2131	4379	13853	243	827	236	51294
4.9E+08	490 24005	MD	BALTIMORE		1511	8082	1307	1421	680	4106	95	172	209	17583
4.9E+08	490 24027	MD	HOWARD		612	4518	794	1010	3302	8823	4	27	19	19109
4.9E+08	490 24510	MD	BALTIMORE CITY		1539	861	17	6	95	35	0	60	14	2626
5E+08	500 24003	MD	ANNE ARUNDEL		56	1309	3868	1089	18398	16067	310	660	550	42308
5E+08	500 24009	MD	CALVERT		200	2768	12400	6395	25246	50455	86	1569	1713	100832
5E+08	500 24017	MD	CHARLES		5	625	1445	952	3577	11325	5	36	126	18096
5E+08	500 24033	MD	PRINCE GEORGES		2114	14384	12467	6453	40844	54310	172	583	2322	133649
5E+08	500 24037	MD	ST MARYS		423	2120	3617	4099	7911	23678	26	482	742	43098
5.1E+08	510 24003	MD	ANNE ARUNDEL		1834	13376	1850	4252	4426	16401	141	953	138	43370
5.4E+08	540 11001	DC	DISTRICT OF COLUMBIA		7408	7018	1988	728	435	345	0	299	0	18221
5.4E+08	540 24031	MD	MONTGOMERY		1550	16907	2984	4305	4278	8131	176	5	15	38352
5.4E+08	540 24033	MD	PRINCE GEORGES		6758	25762	5692	3294	3216	8561	963	63	29	54337
5.5E+08	550 51059	VA	FAIRFAX		1996	11722	6799	5135	12892	29258	54	734	75	68665
5.5E+08	550 51061	VA	FAUQUIER		265	6211	10558	3888	61303	52213	117	580	81	135216
5.5E+08	550 51107	VA	LOUDOUN		105	1435	671	249	6870	6771	50	16	23	16190
5.5E+08	550 51153	VA	PRINCE WILLIAM		1946	22157	14722	9344	52900	69911	209	1765	302	173256
5.5E+08	550 51683	VA	MANASSAS CITY		707	2788	971	26	1714	208	0	0	5	6420
5.5E+08	550 51685	VA	MANASSAS PARK CITY		89	436	176	3	211	255	0	0	1	1171
5.6E+08	560 51033	VA	CAROLINE		0	1287	1428	654	15685	56193	0	398	437	76082
5.6E+08	560 51057	VA	ESSEX		0	1303	1073	387	53093	87884	0	967	4366	149072
5.6E+08	560 51099	VA	KING GEORGE		60	328	452	301	17064	21981	78	302	489	41056
5.6E+08	560 51103	VA	LANCASTER		0	410	1447	1140	20850	46344	13	1414	1497	73116
5.6E+08	560 51119	VA	MIDDLESEX		0	222	1491	773	16698	26737	97	988	1167	48173
5.6E+08	560 51133	VA	NORTHUMBERLAND		0	34	21	25	946	655	0	0	5	1686
5.6E+08	560 51159	VA	RICHMOND		0	581	2640	842	40982	72284	3	992	4095	122419
5.6E+08	560 51177	VA	SPOTSYLVANIA		317	4817	1389	416	10597	17619	50	254	37	35497
5.6E+08	560 51179	VA	STAFFORD		240	3588	1881	880	8642	9899	47	207	27	25410
5.6E+08	560 51193	VA	WESTMORELAND		0	86	1198	366	15809	22613	0	234	684	40990
5.6E+08	560 51630	VA	FREDERICKSBURG CITY		303	2540	540	363	901	1620	5	83	9	6362
5.8E+08	580 51103	VA	LANCASTER		0	0	21	6	313	226	0	0	3	570
5.8E+08	580 51133	VA	NORTHUMBERLAND		0	126	1277	790	9534	26352	20	734	801	39634
5.8E+08	580 51159	VA	RICHMOND		0	0	0	0	78	79	0	0	0	157
5.9E+08	590 51033	VA	CAROLINE		0	32	229	124	2027	5220	0	0	4	7635
5.9E+08	590 51073	VA	GLOUCESTER		88	4084	66	94	15930	23993	25	807	2702	47789
5.9E+08	590 51085	VA	HANOVER		36	4132	4181	2803	26545	47988	0	1044	28	86759
5.9E+08	590 51095	VA	JAMES CITY		90	1513	56	31	4927	13906	0	81	872	21476
5.9E+08	590 51097	VA	KING AND QUEEN		25	569	805	291	46085	89874	0	1045	4005	142700
5.9E+08	590 51101	VA	KING WILLIAM		20	1024	694	434	56132	106770	0	2426	4793	172292
5.9E+08	590 51127	VA	NEW KENT		3	580	148	53	14358	42214	2	1242	4796	63399
5.9E+08	590 51199	VA	YORK		519	6854	1633	1445	5418	21797	78	1124	2209	41076
5.9E+08	590 51830	VA	WILLIAMSBURG CITY		22	921	63	75	42	326	0	1	53	1504
6E+08	600 51036	VA	CHARLES CITY		14	571	275	264	28296	71421	103	1800	3200	105943
6E+08	600 51041	VA	CHESTERFIELD		2895	36958	6106	7564	33267	111927	118	4278	749	203861
6E+08	600 51053	VA	DINWIDDIE		1391	1055	860	277	1840	1518	61	86	2	7091
6E+08	600 51087	VA	HENRICO		838	7405	3585	2302	19315	22379	181	1364	280	57650
6E+08	600 51093	VA	ISLE OF WIGHT		565	4125	2606	947	26798	25536	957	956	5142	67632
6E+08	600 51095	VA	JAMES CITY		382	9650	640	1042	13661	37419	108	2397	6476	71775
6E+08	600 51127	VA	NEW KENT		21	1644	118	102	8338	36699	0	1827	295	49045
6E+08	600 51145	VA	POWHATAN		0	69	117	85	1559	3178	0	9	1	5018
6E+08	600 51149	VA	PRINCE GEORGE		625	2774	1072	383	32185	38522	0	1267	949	77778
6E+08	600 51181	VA	SURRY		171	403	1225	1901	24733	38419	185	1026	2318	70380
6E+08	600 51199	VA	YORK		62	1076	409	244	651	5085	2	22	70	7621
6E+08	600 51570	VA	COLONIAL HEIGHTS CITY		324	2305	283	116	687	909	0	201	71	4896
6E+08	600 51650	VA	HAMPTON CITY		612	5233	602	91	98	16	0	162	102	6915
6E+08	600 51670	VA	HOPEWELL CITY		796	3456	606	255	375	1028	0	90	32	6638
6E+08	600 51700	VA	NEWPORT NEWS CITY		4469	17258	1535	1453	2456	8843	77	1270	2588	39948
6E+08	600 51730	VA	PETERSBURG CITY		1169	3412	1152	534	1202	2056	37	152	8	9723
6E+08	600 51760	VA	RICHMOND CITY		5696	19139	4230	3858	1221	2041	16	1169	36	37406
6E+08	600 51800	VA	SUFFOLK		127	876	856	339	3262	1995	51	362	787	8656

Table 3. 1990 Chesapeake Bay Program Land Use in Acres by Phase 4.2 Watershed Model County Segments

COSEG	SEG	FIPS	State	County	Developed	Developed	Urban	Urban	Herbaceous	Woody	Exposed	Water	Wetland	Acreeage
10036003	10 36003	NY	ALLEGANY		1	2672	291	298	12596	37090	12	5	0	52964
10036015	10 36015	NY	CHEMUNG		1463	14292	7343	1007	75404	104028	128	1587	0	205251
10036051	10 36051	NY	LIVINGSTON		0	0	0	0	5477	4603	0	0	0	10080
10036069	10 36069	NY	ONTARIO		0	0	0	0	276	440	0	0	0	716
10036097	10 36097	NY	SCHUYLER		0	1748	188	173	11618	36542	0	1976	0	52246
10036101	10 36101	NY	STEUBEN		804	35969	4114	3120	244707	491685	87	3381	0	783867
10036123	10 36123	NY	YATES		0	13	39	1	3365	3038	0	28	0	6484
10042015	10 42015	PA	BRADFORD		83	2040	928	121	52113	55289	101	931	0	111605
10042105	10 42105	PA	POTTER		0	273	39	33	11598	18259	0	103	0	30304
6E+08	600 51830	VA	WILLIAMSBURG CITY		43	1299	163	179	156	2133	1	57	24	4055
6.1E+08	610 51036	VA	CHARLES CITY		20	140	0	0	3208	8271	0	57	10	11707
6.1E+08	610 51085	VA	HANOVER		313	4867	4058	2138	11673	20911	0	238	14	44211
6.1E+08	610 51087	VA	HENRICO		2381	22438	5651	4136	11666	27445	12	389	65	74183
6.1E+08	610 51127	VA	NEW KENT		0	1442	157	247	4872	16271	0	364	25	23378
6.2E+08	620 51093	VA	ISLE OF WIGHT		99	650	792	202	17404	14478	93	824	17	34559
6.2E+08	620 51740	VA	PORTSMOUTH CITY		461	1989	305	240	658	371	1582	664	314	6583
6.2E+08	620 51800	VA	SUFFOLK		1712	10291	5109	1979	33766	33882	53	4717	4163	95671
6.3E+08	630 51550	VA	CHESAPEAKE CITY		359	4900	724	553	1609	3084	0	169	523	11920
6.3E+08	630 51740	VA	PORTSMOUTH CITY		723	3972	582	431	171	45	0	314	230	6470
6.5E+08	650 24005	MD	BALTIMORE		14	608	244	185	5695	9553	196	1144	19	17659
6.5E+08	650 24013	MD	CARROLL		594	3295	1852	746	47573	31588	2	1441	38	87128
7E+08	700 42015	PA	BRADFORD		92	4264	415	146	59260	86437	0	1815	0	152429
7E+08	700 42117	PA	TIOGA		0	54	0	0	1273	1293	0	35	0	2655
7.1E+08	710 42071	PA	LANCASTER		825	5441	1317	339	65072	12721	43	7924	0	93682
7.1E+08	710 42075	PA	LEBANON		0	148	9	24	504	5067	0	0	0	5751
7.1E+08	710 42133	PA	YORK		355	3257	1306	335	30455	19721	30	139	0	55599
7.2E+08	720 42011	PA	BERKS		274	579	229	67	5380	12044	0	61	0	18633
7.2E+08	720 42029	PA	CHESTER		22	74	2	0	255	962	0	0	0	1315
7.2E+08	720 42071	PA	LANCASTER		5528	34103	7053	2286	167625	51071	733	1822	0	270221
7.2E+08	720 42075	PA	LEBANON		0	247	111	17	6530	7080	0	25	0	14009
7.3E+08	730 24043	MD	WASHINGTON		0	18	0	0	1500	318	0	103	0	1940
7.3E+08	730 42001	PA	ADAMS		3	167	1	2	506	14178	27	251	0	15135
7.3E+08	730 42055	PA	FRANKLIN		1333	12104	3212	2140	166137	118378	298	757	3	304362
7.4E+08	740 24043	MD	WASHINGTON		582	9274	1028	318	64668	52720	134	4055	45	132825
7.4E+08	740 42055	PA	FRANKLIN		0	27	0	0	4499	18421	0	0	0	22947
7.4E+08	740 42057	PA	FULTON		0	1081	471	75	41849	127249	0	214	0	170939
7.4E+08	740 51043	VA	CLARKE		0	107	22	0	18500	4249	0	19	0	22897
7.4E+08	740 51069	VA	FREDERICK		160	6777	2227	532	89599	88128	275	521	0	188218
7.4E+08	740 51840	VA	WINCHESTER CITY		182	3179	925	121	1278	291	3	0	0	5978
7.4E+08	740 54003	WV	BERKELEY		374	7720	3641	737	97044	95850	0	625	4	205996
7.4E+08	740 54037	WV	JEFFERSON		3	264	939	142	31503	9999	0	58	1	42909
7.4E+08	740 54065	WV	MORGAN		0	855	122	158	24202	54793	16	87	0	80233
7.5E+08	750 24013	MD	CARROLL		0	21	33	1	5346	1392	0	178	5	6976
7.5E+08	750 24021	MD	FREDERICK		0	29	5	3	4982	2023	0	69	3	7114
7.5E+08	750 42001	PA	ADAMS		247	5208	773	151	57582	35028	142	476	9	99616
7.6E+08	760 24005	MD	BALTIMORE		183	1463	481	456	5312	8691	210	34	24	16853
7.6E+08	760 24013	MD	CARROLL		89	2015	1060	281	21152	14323	0	299	13	39233
7.6E+08	760 24027	MD	HOWARD		7	1048	248	166	9501	10369	0	49	45	21432
7.7E+08	770 10001	DE	KENT		0	4	1019	194	26874	22178	0	42	111	50422
7.7E+08	770 24011	MD	CAROLINE		0	6	548	112	11300	7258	0	14	47	19284
7.7E+08	770 24035	MD	QUEEN ANNES		0	0	39	0	1067	835	0	0	1	1942
7.8E+08	780 10001	DE	KENT		0	35	180	27	4367	3242	0	0	0	7851
7.8E+08	780 10005	DE	SUSSEX		42	458	1132	128	22735	13322	0	0	24	37841
8E+08	800 10003	DE	NEW CASTLE		4	104	263	80	6123	2975	8	107	69	9733
8E+08	800 24015	MD	CECIL		428	6994	3857	3747	47330	57312	469	861	2224	123223
8E+08	800 42029	PA	CHESTER		53	994	651	208	25120	12984	55	406	27	40497
8.1E+08	810 10003	DE	NEW CASTLE		0	19	28	0	3405	1271	0	0	5	4727
8.1E+08	810 24015	MD	CECIL		0	192	87	16	11897	4072	0	257	753	17274
8.1E+08	810 24029	MD	KENT		0	1078	507	332	50579	18821	0	1522	3011	75848
8.2E+08	820 24035	MD	QUEEN ANNES		0	4265	1728	1009	17892	7694	27	1865	1621	36101
8.3E+08	830 24041	MD	TALBOT		364	4958	4464	1860	39904	19102	0	3009	1643	75306
8.4E+08	840 24019	MD	DORCHESTER		523	797	3887	991	90624	78965	282	12650	80111	268829
8.4E+08	840 24039	MD	SOMERSET		0	0	1	0	8	2	0	12	0	25
8.5E+08	850 24025	MD	HARFORD		1517	16480	6988	3361	39902	50246	590	772	5783	125638
8.6E+08	860 24005	MD	BALTIMORE		8386	15887	2663	1027	2203	3373	0	743	211	34493
8.6E+08	860 24510	MD	BALTIMORE CITY		3614	7352	1664	396	124	40	0	67	4	13261
8.7E+08	870 24003	MD	ANNE ARUNDEL		481	9926	892	2387	1955	6393	21	587	67	22710
8.8E+08	880 24003	MD	ANNE ARUNDEL		989	11839	3726	3041	15190	31760	35	1292	483	68354
8.8E+08	880 24009	MD	CALVERT		155	1828	2703	2797	4199	24273	32	163	933	37083
8.9E+08	890 11001	DC	DISTRICT OF COLUMBIA		5077	6487	1068	1367	87	2029	11	220	4	16349
8.9E+08	890 24031	MD	MONTGOMERY		2987	16771	2006	3576	6644	7192	0	140	9	39324
9E+08	900 11001	DC	DISTRICT OF COLUMBIA		34	36	24	0	63	0	0	50	0	207
9E+08	900 51013	VA	ARLINGTON CITY		3125	10027	1614	1009	376	385	0	68	1	16606
9E+08	900 51059	VA	FAIRFAX		6092	48084	13883	17852	7248	16802	109	847	344	111262
9E+08	900 51510	VA	ALEXANDRIA CITY		3065	4994	731	472	199	197	0	25	2	9684
9E+08	900 51600	VA	FAIRFAX CITY		641	2214	571	332	45	190	0	0	3	3996
9E+08	900 51610	VA	FALLS CHURCH CITY		233	897	46	92	3	0	0	0	0	1271
9.1E+08	910 11001	DC	DISTRICT OF COLUMBIA		641	1959	549	120	56	97	0	36	0	3458

Table 3. 1990 Chesapeake Bay Program Land Use in Acres by Phase 4.2 Watershed Model County Segments

COSEG	SEG	FIPS	State	County	Developed	Developed	Urban	Urban	Herbaceous	Woody	Exposed	Water	Wetland	Acreage
10036003	10	36003	NY	ALLEGANY	1	2672	291	298	12596	37090	12	5	0	52964
10036015	10	36015	NY	CHEMUNG	1463	14292	7343	1007	75404	104028	128	1587	0	205251
10036051	10	36051	NY	LIVINGSTON	0	0	0	0	5477	4603	0	0	0	10080
10036069	10	36069	NY	ONTARIO	0	0	0	0	276	440	0	0	0	716
10036097	10	36097	NY	SCHUYLER	0	1748	188	173	11618	36542	0	1976	0	52246
10036101	10	36101	NY	STEUBEN	804	35969	4114	3120	244707	491685	87	3381	0	783867
10036123	10	36123	NY	YATES	0	13	39	1	3365	3038	0	28	0	6484
10042015	10	42015	PA	BRADFORD	83	2040	928	121	52113	55289	101	931	0	111605
10042105	10	42105	PA	POTTER	0	273	39	33	11598	18259	0	103	0	30304
9.1E+08	910	24017	MD	CHARLES	485	7291	3921	5769	7202	40059	47	665	468	65906
9.1E+08	910	24033	MD	PRINCE GEORGES	3459	19871	13380	8369	14526	33338	63	248	51	93304
9.2E+08	920	24017	MD	CHARLES	539	9024	11677	8704	52188	123919	101	1551	2951	210655
9.2E+08	920	24033	MD	PRINCE GEORGES	5	122	396	218	1081	2815	12	0	6	4655
9.2E+08	920	24037	MD	ST MARYS	453	4683	11957	6190	53633	89767	264	2760	1673	171381
9.3E+08	930	51103	VA	LANCASTER	0	74	495	295	4079	6102	85	561	419	12110
9.3E+08	930	51133	VA	NORTHUMBERLAND	0	64	337	121	6567	9940	38	522	565	18155
9.4E+08	940	51057	VA	ESSEX	0	93	6	1	6549	9824	0	50	2	16525
9.4E+08	940	51073	VA	GLOUCESTER	58	4343	1074	908	24187	56651	28	1364	4049	92663
9.4E+08	940	51097	VA	KING AND QUEEN	0	84	0	0	11557	34077	0	24	20	45761
9.4E+08	940	51115	VA	MATHEWS	38	1598	1056	476	17426	29111	417	1836	2941	54898
9.4E+08	940	51119	VA	MIDDLESEX	0	147	275	277	10004	24247	9	265	518	35741
9.5E+08	950	51199	VA	YORK	537	5713	273	463	2010	6407	0	554	497	16453
9.5E+08	950	51735	VA	POQUOSON CITY	43	1511	157	49	1152	631	0	395	2402	6340
9.55E+08	955	51199	VA	YORK	171	1413	48	26	263	1409	6	95	154	3584
9.55E+08	955	51650	VA	HAMPTON CITY	2731	12652	2315	365	2160	4060	5	596	1395	26280
9.55E+08	955	51700	VA	NEWPORT NEWS CITY	410	3103	215	57	123	331	0	66	8	4313
9.55E+08	955	51735	VA	POQUOSON CITY	43	896	40	40	449	776	0	54	1379	3677
9.6E+08	960	51131	VA	NORTHAMPTON	9	1	0	0	0	0	0	5	0	15
9.6E+08	960	51550	VA	CHESAPEAKE CITY	3940	16699	3072	1479	7906	9954	29	999	584	44663
9.6E+08	960	51650	VA	HAMPTON CITY	11	8	6	0	0	0	0	3	0	27
9.6E+08	960	51710	VA	NORFOLK CITY	7022	13977	2399	1057	415	183	8	749	444	26254
9.6E+08	960	51740	VA	PORTSMOUTH CITY	1632	5489	916	87	137	12	0	141	114	8527
9.6E+08	960	51810	VA	VIRGINIA BEACH	1184	5613	452	361	231	394	8	397	334	8974
9.65E+08	965	51710	VA	NORFOLK CITY	1199	5141	493	277	347	205	79	538	201	8480
9.65E+08	965	51810	VA	VIRGINIA BEACH	5172	23148	2654	4159	2674	5594	947	2223	1235	47805
9.7E+08	970	51153	VA	PRINCE WILLIAM	357	4071	917	1407	2720	26611	101	239	163	36587
9.8E+08	980	51061	VA	FAUQUIER	0	41	52	117	389	1986	0	0	0	2586
9.8E+08	980	51099	VA	KING GEORGE	100	1551	2869	2461	14110	51470	26	755	650	73992
9.8E+08	980	51133	VA	NORTHUMBERLAND	0	219	1316	490	27777	31636	148	1478	1205	64269
9.8E+08	980	51153	VA	PRINCE WILLIAM	13	556	136	221	547	7379	0	288	10	9150
9.8E+08	980	51159	VA	RICHMOND	0	5	32	0	147	26	0	0	0	210
9.8E+08	980	51179	VA	STAFFORD	238	7631	4494	7000	19718	82426	89	1285	795	123677
9.8E+08	980	51193	VA	WESTMORELAND	87	1820	3370	2418	37366	58530	55	1835	1264	106745
9.9E+08	990	24037	MD	ST MARYS	735	817	1612	1678	3663	7171	45	635	354	16711
					247696	1762463	731338	466449	13415169	23626639	132425	423311	306906	41112397

Section 3. Phase 4.2 Watershed Model Land Use Classification

Agricultural Land Use Classification

The Phase 4.2 Chesapeake Bay Watershed Model employs the U.S. Agricultural Census data¹ to determine agricultural land use. Various categories from several different tables in the U.S. Agricultural Census are used in the calculation of conventionally tilled cropland (*High Till*), conservation tilled cropland (*Low Till*), *Pasture*, and *Hayland*². Conservation tillage is defined as all tillage practices that have 30% plant residue cover at the time of planting. This section will review the data and methodology used in the calculation of each land use.

Table 4 summarizes the county-based land use data contained in the U.S. Agricultural Census and the table in which the data are found. Data for census years 1982, 1987, 1992 and 1997 have been collected with the 1990 Base Land Use being determined by linear interpolation between the 1987 and 1992 data.

Table 4. Agricultural Land Use Data in U.S. Agricultural Census

<i>U.S. Agricultural Census Data Category</i>	<i>U.S. Agricultural Census Table</i>
<i>Total cropland</i>	<i>Table 6; Farms, Land in Farms</i>
<i>Hay-alfalfa, other tame, small grain, wild, grass silage, green chop, etc.</i>	<i>Table 13; Selected Crops</i>
<i>Other cropland, cropland in cover crops, legumes, and soil-improvement grasses</i>	<i>Table 6; Farms, Land in Farms</i>
<i>Other cropland, cropland idle</i>	<i>Table 6; Farms, Land in Farms</i>
<i>Total cropland, cropland used only for pasture and grazing</i>	<i>Table 6; Farms, Land in Farms</i>
<i>Other land, pastureland, and rangeland other than cropland and woodland pasture</i>	<i>Table 6; Farms, Land in Farms</i>
<i>Total woodland, woodland pastured</i>	<i>Table 6; Farms, Land in Farms</i>
<i>Grass silage, haylage, and green chop hay³</i>	<i>Table 28; Seed, hay, forage, and silage</i>
<i>Land in orchards</i>	<i>Table 30; Land in Orchards</i>

¹ Census of Agriculture, Volume 1, Geographic Area Series, published by the U.S. Department of Commerce, Washington, D.C., 1982, 1987, 1992, and 1997.

² Italics are used to differentiate Phase 4.2 WSM land uses from CBPLU or Ag. Census land use categories.

³ David Knopf, Deputy State Statistician, Maryland Agricultural Statistics Service, recommended through communication with the Tributary Strategy Workgroup that this category be subtracted from 'Hay-alfalfa, other tame, small grain, wild, grass silage, green chop, etc. (acres)' to avoid double-counting in *Hayland* acres.

High/Low Till, Pasture and Hayland are calculated as follows:

Total Hayland =

(Hay-alfalfa, other tame, small grain, wild, grass silage, green chop, etc.) –
(Grass silage, haylage and green chop hay) + (Land in orchards)

High/Low Till =

(Total *Cropland*) – (Total Hayland (as calculated above)) –
(Total *Cropland*, *Cropland* used only for pasture and grazing)

Pasture =

(Total cropland, cropland used only for pasture and grazing) +
(Total woodland, woodland pasture) + (Other land, pastureland and
rangeland other than cropland and woodland pasture)

Assigning County Based Agricultural Census Data

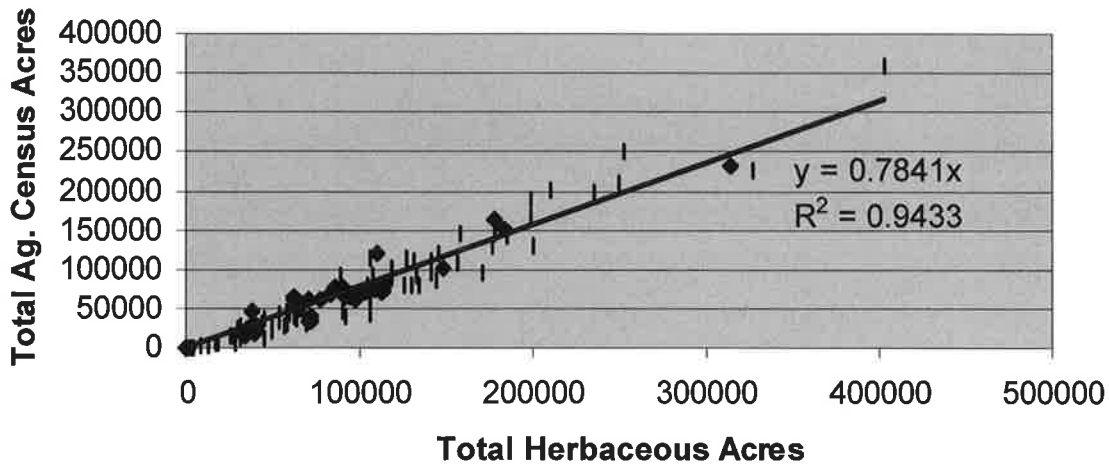
As previously discussed, county-based land use data available in the U.S. Agricultural Census was used to calculate the area of *High/Low Till Cropland, Hayland, and Pasture* for each county. The following method for disaggregating the data to the county-segment level was then developed. For counties fully contained in the watershed, the fraction of the total Agricultural Census county data assigned to a particular county-segment is determined by the ratio of CBPLU Herbaceous Acres found in a county-segment to the total CBPLU Herbaceous Acres in the county. The following equation illustrates the method for distributing Agricultural Census data to County-Segment 1 located in County X:

Fraction of Agricultural Land of County X in County-segment 1 =
$$\frac{(\text{CBPLU Herbaceous Acres in County-Segment 1})}{(\text{CBPLU Herbaceous Acres in County X})}$$

This method distributes county based Agricultural Census data into county-segments based on the spatial distribution of herbaceous land in the CBPLU data set.

In counties not fully within the watershed, the total county herbaceous acres are not known due to the unavailability of CBPLU data beyond the watershed boundary. Therefore, a method for the estimation of total herbaceous acres in counties not fully within the watershed is needed. The relationship between Total CBPLU Herbaceous acres and Total Agricultural Land from the U.S. Agricultural Census by county (Figure 10) is examined for the 134 counties fully contained in the watershed. This relationship (Total County Herbaceous Acres = Total Agricultural Census County Agricultural Land / 0.7841) was then applied to the 63 counties not fully contained in the Chesapeake Bay Watershed to estimate Total County Herbaceous acres. The method described previously for disaggregating the Agricultural Census county data to the county-segment level was then applied to these counties.

Figure 10. CBPLU Herbaceous Acres by County vs. U.S. Agricultural Census Agricultural Land by County



The final step in the calculation of the agricultural land use for 1990 is the split of the *High /Low Till* cropland category into its separate components. This is accomplished using information from the Conservation Technology Information Center (CTIC)¹ regarding the fraction of cropland under conservation and conventional tillage on a county basis.

Non-Agricultural Land Use Classification

After the disaggregation of the county-based U.S. Agricultural Census data to the county-segment level is complete, the full land use data set is developed for the remaining land uses at the county-segment level. *Impervious Urban*, *Pervious Urban*, and *Water* are determined based on CBPLU data at the county-segment level in the following manner:

Impervious Urban =

$$\begin{aligned} & (0.85 * \text{CBPLU High Intensity Urban}) + \\ & (0.4 * \text{CBPLU Low Intensity Urban}) + \\ & (0.1 * \text{CBPLU Herbaceous Urban}) + \\ & (0.1 * \text{CBPLU Woody Urban}) + \\ & (0.4 * \text{CBPLU Exposed}) \end{aligned}$$

Pervious Urban =

$$\begin{aligned} & (0.15 * \text{CBPLU High Intensity Urban}) + \\ & (0.6 * \text{CBPLU Low Intensity Urban}) + \\ & (0.9 * \text{CBPLU Herbaceous Urban}) + \\ & (0.9 * \text{CBPLU Woody Urban}) + \\ & (0.6 * \text{CBPLU Exposed}) \end{aligned}$$

¹ Conservation Technology Information Center, West Lafayette, IL

Water = CBPLU Water

Forest acres in the previous version of the WSM may have been over estimated by the inclusion of wooded pastureland that appears to be forest in the image processing procedure performed on the EMAP satellite data, but has a land use and a stocking rate more like *Pasture*. The US Agricultural Census data includes a category for wooded pasture, which can now be distinguished from *Forest*. The 'Woodland Pasture' acres, from the U.S. Agricultural Census data, are removed from CBPLU Woody and added to CBPLU Herbaceous. The final *Forest* land use for Phase 4.2 will be:

Forest =
(CBPLU Woody + CBPLU Herbaceous Wetlands) –
(Agricultural Census Woodland Pasture)

And the new Herbaceous becomes:

Herbaceous =
(CBPLU Herbaceous) + (Agricultural Census Woodland Pasture)

The use, in Phase 4.2, of Agricultural Census data leaves residual acres, representing the difference between Herbaceous and Total Agricultural Census Agricultural Land. A new land use category called *Non-Agricultural Herbaceous* is created in Phase 4.2 to account for these residual herbaceous acres not in agricultural production. *Non-Agricultural Herbaceous* land will have an application rate set at 25% of the *Pervious Urban* application rate.

Animal Numbers and Manure Acres

The final land use category in the Phase 4.2 Chesapeake Bay Watershed Model is *Manure Acres*. The *Manure Acres* land use category simulates the high nutrient content runoff from animal operations in unconfined (pasture) or confined areas where a portion of the manure nutrient content is assumed to be lost in runoff prior to collection. A more detailed description of the calculation of Manure acres, and manure handling in the Chesapeake Bay Watershed Model, can be found in the report, *Tracking Best Management Practice Nutrient Reductions in the Chesapeake Bay Program (1999.)*

Manure Acres are based upon the population of different animal types present within each model segment. Animal populations were gathered from the U.S. Agricultural Census for 1982, 1987, 1992, and 1997 for use in the estimation of *Manure Acres* as well as application of manure to cropland and pasture. The Watershed Model calculation includes manure generated by beef cattle, dairy cows, swine, layers (2), broilers, and turkeys. Table 5 shows the animal numbers used to estimate the population of each species by county.

Table 5. U.S. Agricultural Census Animal Population Data

<i>Animal Type</i>	<i>Agricultural Census Table Number</i>	<i>Agricultural Census Table Name</i>	<i>Data heading</i>
<i>Beef Cattle</i>	<i>14</i>	<i>Cattle and calves – inventory & sales</i>	<i>(Cattle and calves inventory) – (Cows and heifers that had calved, milk cows)</i>
<i>Dairy</i>	<i>14</i>	<i>Cattle and calves – inventory & sales</i>	<i>Cows and heifers that had calved, milk cows</i>
<i>Swine</i>	<i>15</i>	<i>Hogs and pigs – inventory, litters & sales</i>	<i>Hogs and pigs</i>
<i>Layers > 3 lbs.</i>	<i>16</i>	<i>Poultry – inventory & sales</i>	<i>Any poultry, layers and pullets 13 weeks old and older</i>
<i>Layers < 3 lbs.</i>	<i>16</i>	<i>Poultry – inventory & sales</i>	<i>Any poultry, pullet chicks and pullets less than 13 weeks old</i>
<i>Broilers</i>	<i>16</i>	<i>Poultry – inventory & sales</i>	<i>Any poultry, broilers and other meat-type chickens</i>
<i>Turkeys</i>	<i>16</i>	<i>Poultry – inventory & sales</i>	<i>Any poultry, turkeys</i>

County based animal populations for 1990 are estimated using an interpolation between the 1987 and 1992 U.S. Agricultural Census values; whereas, the 1985 populations use the 1982 and 1987 Census years. However, as was the case with the land use data taken from the Census, these data must be disaggregated to the county-segment level for use in the Phase 4.2 Watershed Model. The disaggregation is accomplished in a manner similar to that used in determining county-segment land use. The fraction of the county animal population in a given county-segment is equal to the ratio of total agricultural land (*High Till, Low Till, Pasture, and Hayland*) in the county-segment to the total agricultural land in the county as determined from the Agricultural Census. The animal population in the county is multiplied by this ratio to estimate the animal population in the county-segment. Table 6 shows the final Phase 4.2 Watershed Model 1990 base land use data set by major tributary basin.

Table 6. 1990 Phase 4.2 Watershed Model Land Use Sorted by Major Tributary Basin

Basin	State	COSEG	County	SEG	Forest	Hi Till	Lo Till	Pasture	PervUrban	Hay	Non-Ag. Herb.	Imperv. Urb	Manure	Water	
E.Shore MD	DE	370010003	NEW CASTLE	370	807	2039	2293	232	35	234	1353	13	1	16	
E.Shore MD	DE	380010001	KENT	380	8391	2159	5306	447	370	228	2348	48	3	0	
E.Shore MD	DE	380010003	NEW CASTLE	380	4421	1023	1151	118	0	117	679	0	0	0	
E.Shore MD	DE	400010001	KENT	400	5047	1910	4896	395	115	202	2078	13	2	0	
E.Shore MD	DE	410010001	KENT	410	13779	4882	12000	1010	214	516	5310	41	6	0	
E.Shore MD	DE	410010005	SUSSEX	410	91337	31980	63410	2511	6941	1489	28191	3110	61	1146	
E.Shore MD	DE	420010005	SUSSEX	420	258	220	437	17	255	10	194	158	0	0	
E.Shore MD	DE	430010005	SUSSEX	430	11080	2824	5600	222	92	132	2489	10	5	0	
E.Shore MD	DE	770010001	KENT	770	22014	5586	13733	1156	1095	590	6077	123	7	42	
E.Shore MD	DE	780010001	KENT	780	3197	908	2231	188	208	96	987	35	1	0	
E.Shore MD	DE	780010005	SUSSEX	780	13201	5732	11386	450	1415	287	5053	345	11	0	
E.Shore MD	DE	800010003	NEW CASTLE	800	3012	2040	2294	232	377	234	1354	82	1	107	
E.Shore MD	DE	810010003	NEW CASTLE	810	1257	1134	1276	129	37	130	753	11	0	0	
E.Shore MD	MD	370024015	CECIL	370	11130	3972	7496	3413	628	2135	8746	218	10	586	
E.Shore MD	MD	380024011	CAROLINE	380	6	4	8	0	0	0	2	0	0	0	
E.Shore MD	MD	380024029	KENT	380	23624	36805	28540	2927	2017	2265	7881	643	29	1317	
E.Shore MD	MD	380024035	QUEEN ANNES	380	33819	23693	49850	3596	2621	1493	6089	779	16	724	
E.Shore MD	MD	390024035	QUEEN ANNES	390	6872	5608	11799	851	1420	353	1915	351	4	475	
E.Shore MD	MD	390024041	TALBOT	390	4852	4239	8444	371	546	201	1806	85	2	410	
E.Shore MD	MD	400024011	CAROLINE	400	42242	23831	51897	3175	4848	2053	15701	1154	30	563	
E.Shore MD	MD	400024019	DORCHESTER	400	6041	6637	7009	416	2597	129	6625	1132	5	474	
E.Shore MD	MD	400024035	QUEEN ANNES	400	11488	9354	19861	1420	309	589	3194	58	6	9	
E.Shore MD	MD	400024041	TALBOT	400	20796	14653	29192	1281	2219	694	6242	476	7	724	
E.Shore MD	MD	410024011	CAROLINE	410	14403	5901	12851	786	1402	508	3888	565	7	48	
E.Shore MD	MD	410024019	DORCHESTER	410	26181	11871	12537	743	1050	231	11850	378	9	748	
E.Shore MD	MD	410024045	WICOMICO	410	38998	15869	4531	1188	2395	346	11194	649	15	601	
E.Shore MD	MD	420024039	SOMERSET	420	22086	1242	8075	335	1668	224	2495	69	6	666	
E.Shore MD	MD	420024045	WICOMICO	420	40224	20806	5941	1558	10749	453	14677	5282	20	641	
E.Shore MD	MD	420024047	WORCESTER	420	24	30	2	3	0	0	11	0	0	0	
E.Shore MD	MD	430024039	SOMERSET	430	105326	5548	27137	1494	5710	1001	20703	1304	28	3015	
E.Shore MD	MD	430024045	WICOMICO	430	28844	16253	4641	1217	1807	354	11465	350	16	17	
E.Shore MD	MD	430024047	WORCESTER	430	109014	45811	3486	4085	2847	577	16367	952	41	507	
E.Shore MD	MD	770024011	CAROLINE	770	7182	2815	6131	375	597	243	1855	68	4	14	
E.Shore MD	MD	770024035	QUEEN ANNES	770	820	296	622	45	35	19	101	4	0	0	
E.Shore MD	MD	800024015	CECIL	800	59002	7377	13921	6339	11388	3965	16243	4110	19	861	
E.Shore MD	MD	810024015	CECIL	810	4691	1854	3499	1593	208	997	4083	87	5	257	
E.Shore MD	MD	810024029	KENT	810	21505	24439	17719	1954	1401	1512	5262	515	19	1522	
E.Shore MD	MD	820024035	QUEEN ANNES	820	9052	4959	10434	753	5038	312	1693	1990	3	1865	
E.Shore MD	MD	830024041	TALBOT	830	20589	11280	22470	986	8721	534	4805	2925	6	3009	
E.Shore MD	MD	840024019	DORCHESTER	840	158264	29146	30782	1825	5116	586	29094	1364	23	12650	
E.Shore MD	MD	840024039	SOMERSET	840	2	1	4	0	1	0	3	0	0	12	
E.Shore MD	PA	800042029	CHESTER	800	12740	0	10489	4215	1410	4988	5695	550	25	406	
E.Shore MD	PA	430051001	ACCOMACK	430	10744	5826	23	185	540	31	1710	81	1	38	
BASIN SUBTOTAL					1028140	402357	531005	54246	92442	30999	28240	30301	456	33479	
E.Shore VA	VA	440051001	ACCOMACK	440	68882	36444	142	1222	4911	197	10697	933	6	2205	
E.Shore VA	VA	440051131	NORTHAMPTON	440	16829	26390	3989	1169	3356	129	8977	1335	0	1792	
BASIN SUBTOTAL					85711	62834	4131	2391	8267	326	19674	2288	6	3996	
James VA	VA	265051005	ALLEGHANY	265	7140	0	0	1	0	0	1	0	0	502	
James VA	VA	265051017	BATH	265	116233	211	235	5326	1144	1827	5330	583	0	2114	
James VA	VA	265051091	HIGHLAND	265	55657	47	399	23023	695	3448	10569	245	1	0	
James VA	VA	270051005	ALLEGHANY	270	239485	533	335	11369	6613	3107	14267	2495	1	1136	
James VA	VA	270051009	AMHERST	270	74597	105	437	9129	602	2031	4281	369	0	826	
James VA	VA	270051015	AUGUSTA	270	129540	1263	3209	20393	2387	5499	2418	934	14	63	
James VA	VA	270051017	BATH	270	175166	490	547	12390	3457	4250	12401	901	0	506	
James VA	VA	270051019	BEDFORD	270	30996	213	127	2736	900	998	1854	391	1	448	
James VA	VA	270051023	BOTETOURT	270	213202	1110	3157	38136	11644	10968	22094	4110	13	1927	
James VA	VA	270051045	CRAIG	270	157775	476	476	12523	705	4059	7106	246	1	19	
James VA	VA	270051071	GILES	270	7517	0	1	12	0	2	7	0	0	0	
James VA	VA	270051091	HIGHLAND	270	78739	40	345	19897	393	2980	9134	153	1	0	
James VA	VA	270051121	MONTGOMERY	270	13868	5	27	262	9	71	155	6	0	0	
James VA	VA	270051161	ROANOKE	270	10972	176	179	2546	134	1009	1687	35	1	0	
James VA	VA	270051163	ROCKBRIDGE	270	240121	0	6689	88080	15707	22036	6702	6432	13	2042	
James VA	VA	270051530	BUENA VISTA CITY	270	1809	0	0	0	1028	0	661	780	0	102	
James VA	VA	270051560	CLIFTON FORGE CITY	270	687	0	0	0	693	0	24	537	0	48	
James VA	VA	270051580	COVINGTON CITY	270	618	0	0	0	1048	0	265	747	0	170	
James VA	VA	270051878	LEXINGTON CITY	270	75	0	0	0	890	0	72	553	0	8	
James VA	VA	280051003	ALBEMARLE	280	269974	4895	3437	76337	23561	33476	36736	6252	10	2660	
James VA	VA	280051009	AMHERST	280	133772	481	2000	41795	12809	9298	10350	4496	2	1874	
James VA	VA	280051011	APPOMATTOX	280	53524	2212	1197	14256	2332	5378	10136	728	4	590	
James VA	VA	280051019	BEDFORD	280	16626	174	104	2233	4945	814	1513	3049	1	352	
James VA	VA	280051029	BUCKINGHAM	280	235484	0	6030	23942	5985	11517	65201	1640	8	2690	
James VA	VA	280051031	CAMPBELL	280	26919	898	312	3466	5735	1242	2615	3008	1	318	
James VA	VA	280051049	CUMBERLAND	280	57663	420	2446	10301	1741	3820	16545	499	9	469	
James VA	VA	280051065	FLUVANNA	280	106975	785	2719	22618	7195	9704	31333	1924	1	2717	
James VA	VA	280051075	GOOCHLAND	280	21595	1687	882	3605	574	1817	9073	1825	1	689	
James VA	VA	280051079	GREENE	280	33853	712	1133	9441	3610	3897	7635	518	4	168	
James VA	VA	280051109	LOUISA	280	6542	66	255	842	672	433	1674	131	0	39	
James VA	VA	280051125	NELSON	280	217475	352	2729	35194	8373	12208	24670	1625	2	1565	
James VA	VA	280051137	ORANGE	280	3163	241	84	947	453	469	657	52	0	3	
James VA	VA	280051540	CHARLOTTESVILLE CITY	280	151	0	0	0	3921	0	282	2213	0	11	
James VA	VA	280051680	LYNCHBURG CITY	280	12992	0	0	0	10096	0	1782	6800	0	224	
James VA	VA	290051041	CHESTERFIELD	290	5719	122	47	138	1741	59	1151	710	0	64	
James VA	VA	290051049	CUMBERLAND	290	18609	169	983	4141	530	1536	6651	185	4	65	
James VA	VA	290051075	GOOCHLAND	290	74845	5528	2891	11815	4941	5955	29735	1583	4	3526	
James VA	VA	290051087	HENRICO	290	5307	401	1226	414	7605	178	1741	4337	0	630	
James VA	VA	290051145	POWHATAN	290	74724	2329	3084	10213	3205	5623	20947	1079	11	1200	
James VA	VA	290051760	RICHMOND CITY	290	680	0	0	0	856	0	123	284	0	60	
James VA	VA	300051007	AMELIA	300	120276	10333	7639	17704	2359	7884	48223	942	22	950	
James VA	VA	300051011	APPOMATTOX	300	41384	1137	816	7332	1980	2765	5212	658	2	118	
James VA	VA	300051029	BUCKINGHAM	300	14993	0	366	1455	99	700	3963	48	0	82	
James VA	VA	300051041	CHESTERFIELD	300	25807	476	184	542	238	230	4510	152	0	298	
James VA	VA	300051049	CUMBERLAND	300	33149	377	2194	9238	1311	3426	14838	330	8	419	
James VA	VA	300051135	NOTTOWAY	300	5578										

Table 6. 1990 Phase 4.2 Watershed Model Land Use Sorted by Major Tributary Basin

Basin	State	COSEG	County	SEG	Forest	Hi Till	Lo Till	Pasture	PervUrban	Hay	Non-Ag. Herb.	Imperv. Urb	Manure	Water
James	VA	310051041	CHESTERFIELD	310	23630	369	150	443	607	188	3682	225	0	1611
James	VA	310051053	DINWIDDIE	310	28584	4978	798	3017	326	765	3490	184	4	1344
James	VA	310051135	NOTTOWAY	310	4344	208	211	1003	27	406	762	18	1	27
James	VA	600051036	CHARLES CITY	600	74330	7049	7049	1372	891	882	12232	335	1	1600
James	VA	600051041	CHESTERFIELD	600	111615	2750	1062	3132	34983	1330	26054	18658	1	4278
James	VA	600051053	DINWIDDIE	600	1391	751	120	455	1902	115	527	1743	1	86
James	VA	600051087	HENRICO	600	18551	2369	7250	2449	9975	1053	10303	4336	0	1364
James	VA	600051093	ISLE OF WIGHT	600	29905	10373	8081	2261	6332	272	6560	2868	24	956
James	VA	600051095	JAMES CITY	600	43679	1262	2019	943	7426	640	9112	4396	1	2397
James	VA	600051127	NEW KENT	600	38810	1712	1956	478	1188	183	4192	698	0	1827
James	VA	600051145	POWHATAN	600	3103	90	119	396	223	218	812	48	0	9
James	VA	600051149	PRINCE GEORGE	600	38134	13108	6680	4191	3068	1255	8286	1787	4	1267
James	VA	600051181	SURRY	600	40187	9052	7180	2875	3192	259	5890	693	26	1028
James	VA	600051199	YORK	600	5155	46	23	38	1244	17	528	549	0	22
James	VA	600051570	COLONIAL HEIGHTS CITY	600	981	0	0	0	1790	0	687	1237	0	201
James	VA	600051650	HAMPTON CITY	600	118	0	0	0	3855	0	98	2683	0	162
James	VA	600051670	HOPEWELL CITY	600	1059	0	0	0	2968	0	375	2145	0	90
James	VA	600051700	NEWPORT NEWS CITY	600	11430	0	0	0	13780	0	2456	11031	0	1270
James	VA	600051730	PETERSBURG CITY	600	2063	0	0	0	3763	0	1202	2542	0	152
James	VA	600051760	RICHMOND CITY	600	2076	0	0	0	19626	0	1221	13312	0	1169
James	VA	600051800	SUFFOLK	600	2727	1061	1257	201	1651	38	760	598	1	362
James	VA	600051830	WILLIAMSBURG CITY	600	2157	0	0	0	1094	0	158	591	0	57
James	VA	610051036	CHARLES CITY	610	8248	799	799	158	87	100	1387	73	0	57
James	VA	610051085	HANOVER	610	20427	2934	1535	2295	6543	1371	4033	2832	2	238
James	VA	610051087	HENRICO	610	25032	1431	4379	1480	22636	636	6217	11983	0	389
James	VA	610051127	NEW KENT	610	16188	1001	1143	279	1229	107	2449	617	0	364
James	VA	620051093	ISLE OF WIGHT	620	13992	6737	5249	1469	1355	177	4260	460	16	824
James	VA	620051740	PORTSMOUTH CITY	620	684	0	0	0	2702	0	658	1874	0	664
James	VA	620051800	SUFFOLK	620	37469	10978	13015	2078	12842	397	7866	6301	8	4717
James	VA	630051550	CHESAPEAKE CITY	630	3601	0	1192	41	4143	28	353	2383	0	169
James	VA	630051740	PORTSMOUTH CITY	630	276	0	0	0	3404	0	171	2305	0	314
James	VA	955051199	YORK	955	1563	18	9	15	943	7	213	720	0	95
James	VA	955051650	HAMPTON CITY	955	5456	0	0	0	10416	0	2160	7652	0	596
James	VA	955051700	NEWPORT NEWS CITY	955	340	0	0	0	2167	0	123	1617	0	66
James	VA	955051735	POQUOSON CITY	955	2155	0	0	0	617	0	449	403	0	54
James	VA	960051131	NORTHAMPTON	960	0	0	0	0	2	0	0	8	0	5
James	VA	960051550	CHESAPEAKE CITY	960	10510	0	5658	201	14724	139	1735	10496	1	999
James	VA	960051650	HAMPTON CITY	960	0	0	0	0	11	0	0	13	0	3
James	VA	960051710	NORFOLK CITY	960	627	0	0	0	12555	0	415	11909	0	749
James	VA	960051740	PORTSMOUTH CITY	960	126	0	0	0	4441	0	137	3683	0	141
James	VA	960051810	VIRGINIA BEACH	960	726	0	171	8	4282	2	52	3336	0	397
James	VA	965051710	NORFOLK CITY	965	406	0	0	0	4005	0	347	3184	0	538
James	VA	985051810	VIRGINIA BEACH	985	6805	0	1979	90	21364	27	601	14715	0	2223
James	WV	270054063	MONROE	270	41471	273	398	4070	87	816	2548	24	1	0
James	WV	270054071	PENDELTON	270	949	9	19	548	0	75	118	0	0	0
BASIN SUBTOTAL					4057173	132855	146036	630644	427440	215014	645512	223980	271	69710
Paluxent	MD	330024027	HOWARD	330	19109	1578	6932	4079	1361	2629	8024	445	6	820
Paluxent	MD	330024031	MONTGOMERY	330	17042	179	6796	3039	2443	2135	6062	930	4	634
Paluxent	MD	340024003	ANNE ARUNDEL	340	19343	1218	542	842	6786	504	8787	4859	0	26
Paluxent	MD	340024027	HOWARD	340	24012	1794	7880	4636	16524	2988	9121	9582	7	188
Paluxent	MD	340024033	PRINCE GEORGES	340	9376	742	163	398	8752	169	927	5063	0	90
Paluxent	MD	500024003	ANNE ARUNDEL	500	16001	4467	1990	3090	5441	1848	7619	1191	1	660
Paluxent	MD	500024009	CALVERT	500	50379	12343	2002	4858	18658	1869	5962	3191	1	1569
Paluxent	MD	500024017	CHARLES	500	11318	587	889	480	2536	214	1540	496	1	36
Paluxent	MD	500024033	PRINCE GEORGES	500	54127	13036	2855	6984	26079	2963	17508	9511	4	583
Paluxent	MD	500024037	ST MARYS	500	23977	2938	1527	1211	8295	516	2157	1989	3	482
Paluxent	MD	990024037	ST MARYS	990	7320	1360	707	561	3589	239	999	1299	2	635
BASIN SUBTOTAL					252004	40242	32283	30178	102464	16074	62066	38557	29	5724
Potomac	DC	220011001	DISTRICT OF COLUMBIA	220	79	0	0	0	782	0	0	489	0	25
Potomac	DC	540011001	DISTRICT OF COLUMBIA	540	345	0	0	0	7766	0	435	9376	0	299
Potomac	DC	890011001	DISTRICT OF COLUMBIA	890	2033	0	0	0	6852	0	87	7158	0	220
Potomac	DC	900011001	DISTRICT OF COLUMBIA	900	0	0	0	0	48	0	63	46	0	50
Potomac	DC	910011001	DISTRICT OF COLUMBIA	910	98	0	0	0	1874	0	56	1395	0	36
Potomac	MD	160024001	ALLEGANY	160	117958	2528	342	10089	15351	4319	9285	7227	7	920
Potomac	MD	160024023	GARRETT	160	123004	2752	1546	8436	2485	4908	7327	1578	17	866
Potomac	MD	175024001	ALLEGANY	175	87510	1562	211	6790	598	2668	5737	379	5	1040
Potomac	MD	175024043	WASHINGTON	175	22793	186	1142	795	733	591	768	292	5	557
Potomac	MD	180024021	FREDERICK	180	32902	1213	20309	12363	2176	10538	9238	1270	65	1133
Potomac	MD	180024043	WASHINGTON	180	46115	3901	23969	16709	9374	12404	16548	6200	77	1453
Potomac	MD	210024013	CARROLL	210	31362	20038	24475	14808	2703	12982	23226	1334	53	190
Potomac	MD	210024031	FREDERICK	210	114459	3823	63997	39959	15369	33208	29110	8990	206	1602
Potomac	MD	210024031	MONTGOMERY	210	9215	98	3727	1867	684	1171	3324	305	2	5
Potomac	MD	220024021	FREDERICK	220	5104	280	4688	2854	729	2433	2132	511	15	742
Potomac	MD	220024031	MONTGOMERY	220	59062	725	27475	12287	30823	8632	24507	17081	16	5351
Potomac	MD	540024031	MONTGOMERY	540	8060	43	1628	728	17043	511	1452	8880	1	5
Potomac	MD	540024033	PRINCE GEORGES	540	8393	1026	225	550	25136	233	1378	17333	0	63
Potomac	MD	730024043	WASHINGTON	730	274	82	503	351	11	260	347	7	2	103
Potomac	MD	740024043	WASHINGTON	740	50857	3528	21678	15113	6944	11219	14967	4393	69	4055
Potomac	MD	750024013	CARROLL	750	1328	1135	1386	839	44	735	1316	12	3	178
Potomac	MD	750024021	FREDERICK	750	1903	115	1930	1175	25	1001	878	12	6	69
Potomac	MD	890024031	MONTGOMERY	890	7067	67	2529	1131	15534	794	2255	9805	2	140
Potomac	MD	910024017	CHARLES	910	40259	1182	1789	967	13196	431	3100	4317	1	665
Potomac	MD	910024033	PRINCE GEORGES	910	32497	4636	1015	2484	32053	1054	6226	13088	2	248
Potomac	MD	920024017	CHARLES	920	124929	8563	12965	7009	23899	3122	22463	6146	7	1551
Potomac	MD	920024033	PRINCE GEORGES	920	2755	345	76	185	634	78	463	119	0	0
Potomac	MD	920024037	ST MARYS	920	88437	19920	10354	8213	19369	3501	14625	4179	23	2760
Potomac	PA	160042009	BEDFORD	160	68465	1724	2947	8008	594	3873	3698	292	17	415
Potomac	PA	160042111	SOMERSET	160	60682	2978	1672	3840	327	3089	4522	168	14	5
Potomac	PA	175042009	BEDFORD	175	83906	2123	3628	4810	0	4768	4552	0	21	0
Potomac	PA	175042057	FULTON	175	12313	493	799	908	22	1093	195	15	5	0
Potomac	PA	180042001	ADAMS	180	4545	33	33	25	13	49	33	9	0	32
Potomac	PA	180042055	FRANKLIN	180	21881	7049	8996	5111	4047	8244	5727	2324	59	12
Potomac	PA	210042001	ADAMS	210	24550	2744	2754	2091	1369	4035	2738	772	9	72
Potomac	PA	730042001	ADAMS											

Table 6. 1990 Phase 4.2 Watershed Model Land Use Sorted by Major Tributary Basin

Basin	State	COSEG	County	SEG	Forest	Hi Till	Lo Till	Pasture	PervUrban	Hay	Non-Ag. Herb.	Imperv. Urb	Manure	Water
Polomac	PA	740042057	FULTON	740	125483	8152	9979	11354	1140	13646	2435	487	49	214
Polomac	PA	750042001	ADAMS	750	34060	11184	11222	8520	4079	16441	11156	2443	36	476
Polomac	VA	170051091	HIGHLAND	170	36053	33	285	16445	308	2464	7551	131	5	0
Polomac	VA	180051107	LOUDOUN	180	29970	6544	7483	19910	596	10530	5658	152	5	146
Polomac	VA	190051015	AUGUSTA	190	187683	9244	23477	149215	23329	40237	17695	6567	104	472
Polomac	VA	190051139	PAGE	190	111254	1243	7089	33391	14505	12404	11232	2413	25	1720
Polomac	VA	190051165	ROCKINGHAM	190	152824	6785	18481	63850	21863	25932	11372	5846	161	1845
Polomac	VA	190051187	WARREN	190	35153	202	196	8327	3020	2832	4665	457	0	708
Polomac	VA	190051860	HARRISONBURG CITY	190	807	0	0	0	3158	0	3133	2470	0	5
Polomac	VA	190051790	STAUNTON CITY	190	1627	0	0	0	4609	0	4536	1900	0	4
Polomac	VA	190051820	WAYNESBORO CITY	190	1111	0	0	0	3397	0	2487	2004	0	18
Polomac	VA	200051043	CLARKE	200	35249	2453	4986	26524	1180	12803	6583	527	13	926
Polomac	VA	200051069	FREDERICK	200	38512	932	1694	12370	1068	8179	14659	515	2	173
Polomac	VA	200051139	PAGE	200	8009	0	2	9	0	3	3	0	0	0
Polomac	VA	200051165	ROCKINGHAM	200	129313	5129	13969	48262	10261	19601	8596	3000	122	229
Polomac	VA	200051107	LOUDOUN	200	178611	7308	11285	59038	18199	25541	21743	4829	37	2144
Polomac	VA	200051187	WARREN	200	38677	459	447	14394	10513	6442	10614	2430	1	1061
Polomac	VA	200051660	HARRISONBURG CITY	200	11	0	0	0	674	0	517	510	0	0
Polomac	VA	220051013	ARLINGTON CITY	220	34	0	0	0	35	0	0	7	0	0
Polomac	VA	220051059	FAIRFAX	220	23174	38	323	1438	27403	417	6533	14453	1	252
Polomac	VA	220051061	FAUQUIER	220	37288	2196	6454	28927	5201	10563	5860	942	13	102
Polomac	VA	220051107	LOUDOUN	220	87646	16643	19031	50636	13171	26781	14389	7133	12	1042
Polomac	VA	550051059	FAIRFAX	550	29165	57	482	2147	18105	623	9751	7801	1	734
Polomac	VA	550051061	FAUQUIER	550	48298	2656	7806	34987	16838	12777	7088	4201	16	580
Polomac	VA	550051107	LOUDOUN	550	8512	934	1088	2841	1735	1502	807	778	1	16
Polomac	VA	550051153	PRINCE WILLIAM	550	68788	1521	6170	11883	35371	7451	27291	13007	10	1765
Polomac	VA	550051683	MANASSAS CITY	550	213	0	0	0	2677	0	1714	1816	0	0
Polomac	VA	550051685	MANASSAS PARK CITY	550	256	0	0	0	437	0	211	268	0	0
Polomac	VA	740051043	CLARKE	740	3651	878	1785	9493	84	4582	2356	45	5	19
Polomac	VA	740051069	FREDERICK	740	83480	2322	4220	30812	6739	20373	36514	3232	6	521
Polomac	VA	740051840	WINCHESTER CITY	740	291	0	0	0	2877	0	0	1532	0	0
Polomac	VA	900051013	ARLINGTON CITY	900	386	0	0	0	8846	0	376	6930	0	68
Polomac	VA	900051059	FAIRFAX	900	17051	32	271	1207	58392	350	5482	27629	1	847
Polomac	VA	900051510	ALEXANDRIA CITY	900	199	0	0	0	4539	0	199	4723	0	25
Polomac	VA	900051800	FAIRFAX CITY	900	193	0	0	0	2237	0	45	1521	0	0
Polomac	VA	900051810	FALLS CHURCH CITY	900	0	0	0	0	698	0	3	571	0	0
Polomac	VA	970051153	PRINCE WILLIAM	970	26701	78	317	611	4648	383	1403	2205	1	239
Polomac	VA	980051061	FAUQUIER	980	1961	17	49	222	177	81	45	33	0	0
Polomac	VA	980051099	KING GEORGE	980	51274	4312	3088	3295	5758	1448	2814	1249	0	755
Polomac	VA	980051133	NORTHUMBERLAND	980	31901	18939	3394	1872	1846	224	6387	327	1	1478
Polomac	VA	980051153	PRINCE WILLIAM	980	7374	16	64	123	657	77	282	270	0	288
Polomac	VA	980051159	RICHMOND	980	24	66	26	5	31	4	49	5	0	0
Polomac	VA	980051179	STAFFORD	980	82107	1802	1097	4008	15012	2190	11733	4440	1	1285
Polomac	VA	980051193	WESTMORELAND	980	59060	20062	5630	2943	6347	1166	8297	1403	2	1835
Polomac	WW	160054023	GRANT	160	95136	1072	181	30965	3360	5600	15549	2100	12	1371
Polomac	WW	160054027	HAMPSHIRE	160	7217	158	150	2170	222	826	954	195	1	30
Polomac	WW	160054057	MINERAL	160	154296	1463	2271	31281	5990	10298	1192	3170	14	1107
Polomac	WW	160054077	PRESTON	160	701	4	4	52	122	24	38	81	0	0
Polomac	WW	160054093	TUCKER	160	488	0	0	14	26	5	9	17	0	0
Polomac	WW	170054023	GRANT	170	91388	1141	192	32954	2680	5960	16548	1351	13	467
Polomac	WW	170054027	HAMPSHIRE	170	84663	1036	983	14250	1580	5423	6267	899	7	1755
Polomac	WW	170054031	HARDY	170	103394	4768	1087	38956	1853	6555	8933	1075	28	142
Polomac	WW	170054071	PENDLETON	170	299499	1614	3514	100637	3406	13718	21887	1676	47	588
Polomac	WW	175054027	HAMPSHIRE	175	206876	2690	2552	36983	2316	14075	16265	1217	17	1458
Polomac	WW	175054031	HARDY	175	147676	3872	883	31588	1542	5326	7258	683	23	144
Polomac	WW	175054065	MORGAN	175	55948	256	322	1249	2025	840	4284	974	1	1019
Polomac	WW	180054037	JEFFERSON	180	5703	1103	5885	6369	1046	3771	5447	291	9	113
Polomac	WW	200054031	HARDY	200	7359	138	31	1122	26	189	258	17	0	0
Polomac	WW	200054037	JEFFERSON	200	17871	1808	9647	10441	5338	6181	8930	1279	15	1383
Polomac	WW	740054003	BERKELEY	740	92540	5724	7949	28185	8628	22308	36165	3844	28	625
Polomac	WW	740054037	JEFFERSON	740	9316	1572	8387	9078	1132	5374	7764	216	13	58
Polomac	WW	740054065	MORGAN	740	53760	929	1170	4535	775	3048	15552	3770	1	87
BASIN SUBTOTAL					4868465	287230	510326	1247132	674846	580306	721776	304192	1859	58237
Rapp.	VA	230051003	ALBEMARLE	230	2079	25	17	383	0	168	185	0	0	3
Rapp.	VA	230051047	CULPEPER	230	92397	5547	18502	44403	12802	24901	42966	2618	28	909
Rapp.	VA	230051061	FAUQUIER	230	79936	3750	11021	49395	7970	18038	10007	1530	22	422
Rapp.	VA	230051079	GREENE	230	22031	499	794	8615	1372	2731	5349	205	3	39
Rapp.	VA	230051113	MADISON	230	102944	5232	7914	46420	8928	18076	15333	1171	27	160
Rapp.	VA	230051137	ORANGE	230	55788	6473	2241	25403	5906	12572	17626	1429	12	674
Rapp.	VA	230051157	RAPPAHANNOCK	230	95895	719	2213	34813	5132	16602	14571	808	1	122
Rapp.	VA	230051177	SPOTSYLVANIA	230	19246	488	429	1399	632	779	3425	236	1	364
Rapp.	VA	230051179	STAFFORD	230	17765	499	304	1110	866	607	3250	189	0	410
Rapp.	VA	230051830	FREDERICKSBURG CITY	230	216	0	0	0	2	0	156	2	0	21
Rapp.	VA	560051033	CAROLINE	560	56289	3898	1153	1071	2647	539	9363	723	1	398
Rapp.	VA	560051057	ESSEX	560	91289	28819	7063	2040	2095	560	15568	667	4	967
Rapp.	VA	560051099	KING GEORGE	560	21446	5215	3735	3984	930	1751	3403	288	0	302
Rapp.	VA	560051103	LANCASTER	560	47656	8300	2787	1039	2583	79	8829	428	1	1414
Rapp.	VA	560051119	MIDDLESEX	560	27904	6406	1314	611	2229	728	7636	354	2	988
Rapp.	VA	560051133	NORTHUMBERLAND	560	628	574	116	64	62	8	218	18	0	0
Rapp.	VA	560051159	RICHMOND	560	75690	18381	7193	1500	3484	1098	13498	582	2	992
Rapp.	VA	560051177	SPOTSYLVANIA	560	17167	827	730	2380	4592	1325	5824	2397	2	254
Rapp.	VA	560051179	STAFFORD	560	9437	790	481	1757	4702	960	5142	1934	1	207
Rapp.	VA	560051193	WESTMORELAND	560	22987	8488	2382	1245	1459	493	3510	191	1	234
Rapp.	VA	560051830	FREDERICKSBURG CITY	560	1628	0	0	0	2384	0	901	1366	0	83
Rapp.	VA	580051103	LANCASTER	580	227	125	42	16	25	1	133	3	0	0
Rapp.	VA	580051133	NORTHUMBERLAND	580	28830	5780	1165	643	1948	77	2192	265	0	734
Rapp.	VA	580051159	RICHMOND	580	78	35	14	3	0	2	26	0	0	0
Rapp.	VA	930051103	LANCASTER	930	6485	1624	545	203	807	15	1727	143	0	561
Rapp.	VA	930051133	NORTHUMBERLAND	930	10283	3981	802	443	474	53	1510	87	0	522
BASIN SUBTOTAL					904421	116473	72956	228938	73828	102165	192348	17632	107	10781
Susq.	MD	110024013	CARROLL	110	1300	451	551	333	18	292	523	5	1	0
Susq.	MD	140024015	CECIL	140	3545	192	362	165	19	103	423	13	1	1426
Susq.	MD	140024025	HARFORD											

Table 6. 1990 Phase 4.2 Watershed Model Land Use Sorted by Major Tributary Basin

Basin	State	COSEG	County	SEG	Forest	Hi Till	Lo Till	Pasture	PervUrban	Hay	Non-Ag. Herb.	Imperv. Urb	Manure	Water
Susq	NY	10036003	ALLEGANY	10	36428	2820	155	3614	2140	3277	3384	1133	11	5
Susq	NY	10036015	CHEMUNG	10	94247	18635	716	11838	16388	12221	41717	7846	57	1587
Susq	NY	10036051	LIVINGSTON	10	4508	2621	265	689	0	716	1277	0	4	0
Susq	NY	10036069	ONTARIO	10	438	128	29	23	0	36	63	0	0	0
Susq	NY	10036097	SCHUYLER	10	36231	2292	906	2945	1374	2960	2820	735	7	1976
Susq	NY	10036101	STEBUBEN	10	480110	73831	1871	55678	28264	60320	64408	15829	175	3381
Susq	NY	10036123	YATES	10	2988	1194	314	384	44	744	777	9	2	28
Susq	NY	20036007	BROOME	20	182828	27522	2009	30696	35404	24435	77670	19206	139	5802
Susq	NY	20036015	CHEMUNG	20	21138	2847	109	1809	464	1867	6374	243	9	23
Susq	NY	20036017	CHEMUNGO	20	358644	37893	1297	57256	11487	48074	50326	4872	228	3433
Susq	NY	20036023	CORTLAND	20	162804	27563	2537	25478	7360	22943	28112	2364	143	1608
Susq	NY	20036025	DELAWARE	20	115009	7062	93	23781	3351	16965	18041	1832	68	864
Susq	NY	20036043	HERKIMER	20	21114	6017	654	8237	1376	7128	7806	685	34	254
Susq	NY	20036053	MADISON	20	126644	24797	1026	16396	2591	13746	18053	556	95	1672
Susq	NY	20036065	ONEIDA	20	19114	2614	277	2876	292	2507	2883	151	11	116
Susq	NY	20036067	ONONDAGA	20	20980	4558	1355	1742	715	2808	2990	108	13	423
Susq	NY	20036077	OTSEGO	20	356213	49057	1953	72141	12447	61094	64338	4997	281	8823
Susq	NY	20036095	SCHOHARIE	20	17574	1364	417	1970	176	2499	2025	87	7	125
Susq	NY	20036097	SCHUYLER	20	18356	1184	468	1521	394	1529	1457	231	4	380
Susq	NY	20036107	TIOGA	20	162106	27270	1937	29062	14330	27313	62496	6120	112	2781
Susq	NY	20036109	TOMPKINS	20	45952	5160	309	2018	584	2463	2982	258	12	122
Susq	PA	10042015	BRADFORD	10	53311	10850	767	12162	2241	14988	15284	1032	60	931
Susq	PA	10042105	POTTER	10	17568	3225	0	3284	228	2576	3195	116	10	103
Susq	PA	10042117	TIOGA	10	259558	15650	13388	41067	8487	39918	30249	4492	123	3120
Susq	PA	20042015	BRADFORD	20	29492	6118	432	6858	1544	6451	8607	1055	34	618
Susq	PA	20042115	SUSQUEHANNA	20	124333	4200	2166	15748	4072	12880	22563	2362	46	3150
Susq	PA	20042127	WAYNE	20	13719	275	269	2112	51	1639	1783	21	5	338
Susq	PA	30042015	BRADFORD	30	217559	35544	2512	39843	4133	49099	50005	2301	198	5328
Susq	PA	30042069	LACKAWANNA	30	139850	6985	3677	8606	42642	12035	13375	21233	26	3651
Susq	PA	30042079	LUZERNE	30	61239	3419	668	706	14195	1105	5149	11161	5	1823
Susq	PA	30042081	LYCOMING	30	970	12	34	16	0	23	67	0	0	0
Susq	PA	30042113	SULLIVAN	30	13586	425	49	607	129	728	2665	80	2	101
Susq	PA	30042115	SUSQUEHANNA	30	175298	11391	5873	42712	3357	34932	61195	1464	124	4517
Susq	PA	30042117	TIOGA	30	3040	237	203	623	42	605	459	28	2	0
Susq	PA	30042127	WAYNE	30	14425	125	123	964	306	748	813	135	2	373
Susq	PA	30042131	WYOMING	30	162758	9627	5205	15019	19646	15875	18703	3747	51	4990
Susq	PA	40042037	COLUMBIA	40	156085	29010	23090	9423	9432	15665	50301	4800	52	2304
Susq	PA	40042079	LUZERNE	40	251873	28104	5494	5803	28430	9086	42320	18702	40	5737
Susq	PA	40042093	MONTGOMERY	40	9547	4441	2081	1068	4691	1605	5492	1235	9	546
Susq	PA	40042097	NORTHUMBERLAND	40	68808	15121	12425	2947	10677	4097	16130	6305	34	3171
Susq	PA	40042107	SCHUYLKILL	40	38957	3017	1807	1245	2966	1598	2247	1256	6	237
Susq	PA	40042113	SULLIVAN	40	27979	124	14	177	13	212	775	9	1	150
Susq	PA	50042021	CAMBRIA	50	141592	9283	2910	5697	6353	7281	8436	3058	17	1962
Susq	PA	50042027	CENTRE	50	105757	803	530	487	3455	635	1167	1956	3	570
Susq	PA	50042033	CLEARFIELD	50	461950	8136	3602	7382	29124	10476	9858	17580	21	3859
Susq	PA	50042063	INDIANA	50	27943	1898	1167	1578	2273	1910	2052	1396	6	26
Susq	PA	50042065	JEFFERSON	50	8	0	0	0	512	0	0	342	0	0
Susq	PA	60042023	CAMERON	60	237301	211	0	645	2009	726	11130	810	1	1682
Susq	PA	60042027	CENTRE	60	281738	19315	12761	11724	13812	15290	28090	6756	81	3081
Susq	PA	60042033	CLEARFIELD	60	110155	957	424	868	1756	1232	1160	1061	2	271
Susq	PA	60042035	CLINTON	60	484972	11168	6954	5801	9307	7895	37481	5305	46	6239
Susq	PA	60042047	ELK	60	156069	3309	61	3489	1826	3530	3708	971	7	587
Susq	PA	60042081	LYCOMING	60	389504	6436	17745	8198	7351	12294	35142	4043	45	4633
Susq	PA	60042083	MCKEAN	60	15096	49	0	128	35	98	111	20	0	4
Susq	PA	60042105	POTTER	60	369173	8578	0	8734	1491	6851	8499	498	25	443
Susq	PA	60042113	SULLIVAN	60	2786	73	8	104	7	125	456	4	0	48
Susq	PA	60042117	TIOGA	60	231132	7537	6447	19777	2837	19224	14568	1558	59	944
Susq	PA	70042015	BRADFORD	70	5990	540	38	605	12	745	759	8	3	90
Susq	PA	70042027	CENTRE	70	9034	45	29	27	28	35	65	19	0	0
Susq	PA	70042037	COLUMBIA	70	5305	1745	1389	567	78	942	3026	41	3	0
Susq	PA	70042081	LYCOMING	70	201230	7527	20753	9575	8022	14377	41097	3779	52	3377
Susq	PA	70042093	MONTGOMERY	70	12056	12147	5690	2921	854	4390	15020	568	24	259
Susq	PA	70042097	NORTHUMBERLAND	70	16799	13133	10791	2559	3778	3559	14009	2115	30	2607
Susq	PA	70042113	SULLIVAN	70	189382	4231	486	6042	1808	7243	26510	914	22	1398
Susq	PA	70042119	UNION	70	80671	18154	10952	4545	3898	10472	16713	1902	76	434
Susq	PA	70042131	WYOMING	70	3091	65	35	102	0	106	127	0	0	11
Susq	PA	80042027	CENTRE	80	91939	11618	7676	7052	1051	9197	16896	345	48	205
Susq	PA	80042041	CUMBERLAND	80	75713	16704	41963	18630	15746	25296	34553	10546	168	1938
Susq	PA	80042043	DAUPHIN	80	132050	17717	11816	5374	9838	9333	27459	5842	53	14074
Susq	PA	80042055	FRANKLIN	80	41225	7783	9933	5633	5124	9103	6324	1667	76	138
Susq	PA	80042067	JUNIATA	80	10019	2255	1276	1132	58	1746	3303	25	10	4
Susq	PA	80042075	LEBANON	80	9595	6	3	2	0	2	4	0	0	0
Susq	PA	80042087	MIFFLIN	80	10177	17	16	16	0	19	32	0	0	26
Susq	PA	80042097	NORTHUMBERLAND	80	41784	14129	11609	2753	532	3928	15071	235	32	6376
Susq	PA	80042099	PERRY	80	157047	8494	22787	8661	3588	14250	26140	1614	70	1708
Susq	PA	80042107	SCHUYLKILL	80	67327	9829	5888	4056	9702	5207	7320	5882	21	157
Susq	PA	80042109	SNYDER	80	95156	20871	21535	8914	3576	17627	34440	1356	131	1572
Susq	PA	80042119	UNION	80	34595	5954	3592	1490	338	3434	5481	47	25	498
Susq	PA	90042009	BEDFORD	90	285537	15791	26991	35789	7394	35472	33867	2778	156	2317
Susq	PA	90042013	BLAIR	90	3334	1681	193	802	51	1032	910	12	7	0
Susq	PA	90042021	CAMBRIA	90	0	19	6	12	0	15	17	0	0	0
Susq	PA	90042057	FULTON	90	18489	591	959	1090	144	1311	234	96	6	0
Susq	PA	90042061	HUNTINGDON	90	85732	2887	2850	3668	453	3899	4697	150	19	8506
Susq	PA	90042111	SOMERSET	90	14853	397	223	512	208	412	603	118	2	0
Susq	PA	100042009	BEDFORD	100	8565	636	1088	1442	374	1430	1365	75	6	5
Susq	PA	100042013	BLAIR	100	228000	28643	3284	10260	18852	17578	15498	8049	125	1026
Susq	PA	100042027	CENTRE	100	32644	3347	2211	2032	151	2650	4868	38	14	11
Susq	PA	100042055	FRANKLIN	100	11070	1164	1485	842	75	1361	946	41	11	0
Susq	PA	100042057	FULTON	100	56830	1831	2970	3377	802	4062	725	352	18	133
Susq	PA	100042061	HUNTINGDON	100	344598	16885	16654	21432	4131	22780	27441	1746	111	1621
Susq	PA	100042067	JUNIATA	100	140655	20196	11422	10134	1704	15638	29578	609	90	1690
Susq	PA	100042087	MIFFLIN	100	151634	16115	14756	14087	6760	17769	27921	2169	137	2288
Susq	PA													

Table 6. 1990 Phase 4.2 Watershed Model Land Use Sorted by Major Tributary Basin

Basin	State	COSEG	County	SEG	Forest	Hi Till	Lo Till	Pasture	PervUrban	Hay	Non-Ag. Herb.	Imperv. Urb	Manure	Water
Susq.	PA	110042071	LANCASTER	110	8214	6327	4836	2553	2743	3214	2238	1705	61	3728
Susq.	PA	110042075	LEBANON	110	46716	33865	17683	11723	13485	14287	22058	7269	198	1027
Susq.	PA	110042107	SCHUYLKILL	110	58663	7640	4575	3158	3754	4048	5689	1822	13	164
Susq.	PA	110042133	YORK	110	126915	34867	87886	19401	26923	24571	65928	14353	132	4707
Susq.	PA	120042029	CHESTER	120	2810	0	911	366	0	432	495	0	2	0
Susq.	PA	120042071	LANCASTER	120	29134	22079	16874	8908	3717	11216	7810	2171	215	2787
Susq.	PA	120042133	YORK	120	10696	1691	3293	941	115	1192	3198	35	6	78
Susq.	PA	140042071	LANCASTER	140	13163	10692	8172	4314	533	5432	3782	314	104	6694
Susq.	PA	140042133	YORK	140	35742	9671	18828	5381	693	8815	18285	339	37	480
Susq.	PA	450042029	CHESTER	450	19365	0	9589	3853	1046	4541	5206	505	23	331
Susq.	PA	450042071	LANCASTER	450	15054	17373	13277	7009	999	8826	6146	443	169	437
Susq.	PA	450042133	YORK	450	4008	2063	4016	1148	788	1454	3901	384	8	20
Susq.	PA	700042015	BRADFORD	700	84167	12338	872	13830	3077	17043	17358	1840	69	1815
Susq.	PA	700042117	TIOGA	700	1211	151	129	396	32	385	292	22	1	35
Susq.	PA	710042071	LANCASTER	710	12195	21584	16495	8708	4905	10965	7635	3060	210	7924
Susq.	PA	710042075	LEBANON	710	5064	172	90	80	118	73	112	83	1	0
Susq.	PA	710042133	YORK	710	19479	5030	9794	2799	3503	3545	9511	1781	19	139
Susq.	PA	720042011	BERKS	720	12004	1321	1432	512	654	948	1202	494	6	61
Susq.	PA	720042029	CHESTER	720	959	0	106	43	50	50	58	49	0	0
Susq.	PA	720042071	LANCASTER	720	49717	55601	42492	22432	30136	28245	19688	19567	540	1822
Susq.	PA	720042075	LEBANON	720	7037	2230	1164	772	264	941	1452	112	13	25
BASIN SUBTOTAL					10682927	1178334	757831	996750	621608	1113238	1718466	324426	6149	197363
West.Shore	MD	470024005	BALTIMORE	470	111608	8518	22686	16371	22926	7863	33225	13133	25	4468
West.Shore	MD	470024013	CARRROLL	470	6719	2926	3574	2162	625	1896	3392	230	8	0
West.Shore	MD	470024025	HARFORD	470	10984	619	3710	1025	4826	1249	3239	2004	4	359
West.Shore	MD	480024005	BALTIMORE	480	13207	780	2077	2499	21013	720	3042	11049	2	69
West.Shore	MD	480024510	BALTIMORE CITY	480	1429	0	0	0	13922	0	310	20259	0	217
West.Shore	MD	490024003	ANNE ARUNDEL	490	13943	1063	474	735	18365	440	1813	13613	0	827
West.Shore	MD	490024005	BALTIMORE	490	4302	67	177	128	7586	61	259	4828	0	172
West.Shore	MD	490024027	HOWARD	490	8790	228	1000	588	4429	379	1158	2509	1	27
West.Shore	MD	490024510	BALTIMORE CITY	490	49	0	0	0	768	0	95	1855	0	60
West.Shore	MD	510024003	ANNE ARUNDEL	510	16391	1074	479	743	13877	444	1833	7576	0	953
West.Shore	MD	650024005	BALTIMORE	650	9467	557	1484	1071	871	514	2173	376	2	1144
West.Shore	MD	650024013	CARROLL	650	31020	10100	12337	7464	4405	6544	11707	2084	27	1441
West.Shore	MD	760024005	BALTIMORE	760	8616	520	1384	999	1874	480	2027	918	2	34
West.Shore	MD	760024013	CARROLL	760	14067	4491	5485	3319	2430	2910	5205	1016	12	299
West.Shore	MD	760024027	HOWARD	760	10265	655	2877	1693	1002	1091	3331	466	2	49
West.Shore	MD	850024025	HARFORD	850	55216	2325	13927	7803	19784	4667	12159	9152	15	772
West.Shore	MD	860024005	BALTIMORE	860	3543	215	574	414	14111	199	841	13852	1	743
West.Shore	MD	860024510	BALTIMORE CITY	860	44	0	0	0	6807	0	124	6218	0	67
West.Shore	MD	870024003	ANNE ARUNDEL	870	6395	475	211	328	8992	196	810	4715	0	587
West.Shore	MD	880024003	ANNE ARUNDEL	880	31734	3688	1643	2551	13363	1525	6290	6267	1	1292
West.Shore	MD	880024009	CALVERT	880	24909	2053	333	808	6089	311	992	1426	0	163
West.Shore	MD	470042133	YORK	470	1142	744	1448	414	124	524	1407	44	3	0
BASIN SUBTOTAL					393840	41097	75880	50916	188211	32034	95430	123391	105	13741
York	VA	235051033	CAROLINE	235	25018	2359	698	648	847	326	5666	203	1	94
York	VA	235051137	ORANGE	235	1644	107	37	420	1	208	291	1	0	0
York	VA	235051177	SPOTSYLVANIA	235	89000	2460	2171	7080	2380	3943	17325	625	5	882
York	VA	240051033	CAROLINE	240	126144	13958	4127	2834	4639	1930	33526	1435	3	987
York	VA	240051097	KING AND QUEEN	240	9506	2095	404	364	108	81	1732	13	1	13
York	VA	240051101	KING WILLIAM	240	2921	501	326	164	5	32	261	3	0	21
York	VA	240051177	SPOTSYLVANIA	240	4789	158	140	456	102	254	1116	14	0	12
York	VA	250051109	LOUISA	250	55133	560	2183	7113	2613	3705	14312	821	2	8481
York	VA	250051137	ORANGE	250	36500	4016	1390	15763	2160	7801	10937	325	8	373
York	VA	250051177	SPOTSYLVANIA	250	19913	1041	919	2997	318	1669	7334	197	2	5291
York	VA	260051003	ALBEMARLE	260	1867	108	76	1681	19	737	809	13	0	10
York	VA	260051033	CAROLINE	260	23104	2065	611	567	823	286	4960	260	0	151
York	VA	260051075	GOOCHLAND	260	3251	122	64	260	204	131	654	135	0	7
York	VA	260051085	HANOVER	260	99607	15644	8186	12232	5790	7309	21502	1288	10	728
York	VA	260051109	LOUISA	260	133119	1623	6325	20609	5369	10736	41465	1438	6	945
York	VA	260051137	ORANGE	260	833	240	83	942	469	466	653	111	0	18
York	VA	260051177	SPOTSYLVANIA	260	20733	583	514	1677	249	934	4104	42	1	7
York	VA	590051033	CAROLINE	590	5180	504	149	138	337	70	1210	48	0	0
York	VA	590051073	GLOUCESTER	590	26370	4929	1585	724	2623	365	8671	1735	1	807
York	VA	590051085	HANOVER	590	48884	8673	3492	5218	8771	3118	9172	2382	4	1044
York	VA	590051095	JAMES CITY	590	14700	455	728	304	1000	231	3286	891	1	81
York	VA	590051097	KING AND QUEEN	590	92618	21811	4201	2461	1332	844	18026	359	6	1045
York	VA	590051101	KING WILLIAM	590	110152	22446	14619	7346	1633	1449	11673	539	9	2426
York	VA	590051127	NEW KENT	590	46693	2949	3369	823	531	316	7219	256	0	1242
York	VA	590051199	YORK	590	24006	380	191	316	7007	139	4391	3522	0	1124
York	VA	590051830	WILLIAMSBURG CITY	590	379	0	0	0	680	0	42	401	0	1
York	VA	940051057	ESSEX	940	9708	3555	871	252	82	69	1920	38	0	50
York	VA	940051073	GLOUCESTER	940	60206	7484	2376	1099	4416	555	13166	1996	1	1364
York	VA	940051097	KING AND QUEEN	940	33780	5469	1054	617	50	212	4520	34	1	24
York	VA	940051115	MATHEWS	940	31898	4345	162	825	2593	341	11905	992	0	1836
York	VA	940051119	MIDDLESEX	940	24765	3838	787	366	590	436	4575	117	1	265
York	VA	950051199	YORK	950	6904	141	71	117	4170	51	1629	2815	0	554
York	VA	950051735	POQUOSON CITY	950	3033	0	0	0	1099	0	1152	661	0	395
BASIN SUBTOTAL					1190354	132619	61887	97286	62989	48745	269206	23529	63	30280

Section 4. Land Use Hindcasting and Forecasting

Agricultural land uses for 1998 and 2000 are estimated by extending the trends of the 1992-1997 Agricultural Census data for *High/Low Till*, *Pasture*, and *Hayland* on a county-segment basis. Change in agricultural land acres between 1992 and 1997 is assumed to occur in equal annual increments. The rate of annual change is then applied at the county-segment level to forecast the 1998 and 2000 agricultural land use categories.

Impervious Urban and *Pervious Urban* are projected to increase by the percent increase in population predicted for each county-segment. Population projections were acquired from the U.S. Census Bureau web site for 1985 through 1998. The year 2000 population is estimated by extending the population trend for 1996-1998 through 2000.

The net change in agricultural and urban land from the base 1990 land use is applied to *Non-Agricultural Herbaceous* and *Forest* land uses while maintaining the 1990 ratio between these land uses. It was decided that the *Forest* in any given county-segment should never be less than 2% of the county-segment area. In some areas however, there are not enough base *Forest* acres to accommodate the increase in urban acres. This occurs in urban areas, such as Baltimore City and incorporated towns in Virginia, where there are no losses in agricultural land to offset the urban increases. If the increase in urban land results in a violation of the 2% forest threshold, *Forest* is held to 2% of the total county-segment area. The remaining change in acres is applied to the *Pervious Urban* and *Non-Agricultural Herbaceous* land use categories while maintaining the 1990 ratio between these land uses. Tables 7, 8, and 9 show the hindcasted and forecasted Phase 4.2 Chesapeake Bay Watershed Model land use data sets for 1985, 1998, and 2000 respectively.

Animal Projections

Animal populations are projected for the scenarios employing 1998 and 2000 land use. Industry trends are collected from representatives for each jurisdiction. Each source is asked for an estimated industry trend for the year 2000. This trend is assumed to occur in equal annual increments, thus providing a method for the estimation of 1998 animal numbers. Table 10 shows the data collected from each state. Unless otherwise noted, the figures shown in Table 11 are the percent increase in animal population by the over the three year period from 1997-2000.

Table 10. Expected annual state trends by animal species used to project 1998 and 2000 populations (%)

State	Beef	Dairy	Swine	Layers > 3 lbs.	Layers < 3 lbs.	Broilers	Turkeys
PA ¹	-0.83	+0.54	+2.75	-1.93	-9.77	+5.18	+13.97
MD ²	nc	nc	nc	nc	nc	+1.5/year	nc
VA	nc ³	-3 ³	nc ⁴	nc ⁵	nc ⁵	nc ⁵	nc ⁵
NY ⁶	nc	-4	-20	-2.5/year	-2.5/year	-2.5/year	-2.5/year
WV	nc ⁷	nc ⁷	nc ⁷	nc ⁸	nc ⁸	nc ⁸	nc ⁸
DE ⁹	nc	+10	nc	+7.5	+7.5	+7.5	+7.5

1. Data unavailable – 1992-1997 trend continued through 2000
2. Dr. Thomas W. Simpson, University of Maryland, Department of Agriculture and Natural Resources
3. Dr. Charles Stallings, Extension Dairy Project Leader, Dairy Scientist, VPISU (aka VA Tech)
4. Dr. Allen Harper, Extension Swine Specialist, Tidewater AREC
5. Mr. Phil Clauer, Animal & Poultry Science Dept., VPISU (aka VA Tech)
6. Keith Severson, Otsego County Cooperative Extension
7. Wayne Wagner, Extension Dairy Specialist, West Virginia University
8. Casey Ritz, Extension Poultry Specialist, West Virginia University
9. Tom Feurer, State Agricultural Statistician, Delaware Agricultural Statistics Service

Table 7. Hindcasted 1985 Phase 4.2 Chesapeake Bay Watershed Model Land Use in Acres by County Segment

State	County	COSEG	SEG	FIPS	Forest	HI Till	Lo Till	Pasture	Pervious			Non-Ag.		Impervious	Urban	Manure Acres	Water	
									Urban	Hay	Herb.	Urban						
MD	ST MARYS	920024037	920	24037	88203	17223	15024	8960	17319	3546	14586	3737	22	2760				
VA	LANCASTER	930051103	930	51103	6360	1874	489	197	778	20	1694	138	0	561				
VA	NORTHUMBERLAND	930051133	930	51133	10313	3655	1326	229	458	52	1514	84	0	522				
VA	ESSEX	940051057	940	51057	9091	3181	1874	332	63	97	1798	38	1	50				
VA	GLOUCESTER	940051073	940	51073	60272	7990	2623	1323	3681	563	13181	1664	2	1364				
VA	KING AND QUEEN	940051097	940	51097	34033	3861	2579	481	49	147	4554	33	2	24				
VA	MATHEWS	940051115	940	51115	31049	4885	504	1196	2539	329	11589	971	1	1836				
VA	MIDDLESEX	940051119	940	51119	24380	4706	376	499	558	340	4504	111	2	265				
VA	YORK	950051199	950	51199	7286	198	72	122	3828	89	1720	2584	0	554				
VA	POQUOSON CITY	950051735	950	51735	3033	0	0	0	1099	0	1152	661	0	395				
VA	YORK	955051199	955	51199	1671	26	10	16	866	12	228	661	0	95				
VA	HAMPTON CITY	955051650	955	51650	5996	0	0	0	9981	0	2374	7332	0	596				
VA	NEWPORT NEWS CITY	955051700	955	51700	340	0	0	0	2167	0	123	1617	0	66				
VA	POQUOSON CITY	955051735	955	51735	2155	0	0	0	617	0	449	403	0	54				
VA	NORTHAMPTON	960051131	960	51131	0	0	0	0	2	0	0	8	0	5				
VA	CHESAPEAKE CITY	960051550	960	51550	13222	2832	2977	198	12908	142	2183	9201	1	999				
VA	HAMPTON CITY	960051650	960	51650	1	0	0	0	11	0	0	13	0	3				
VA	NORFOLK CITY	960051710	960	51710	525	0	0	0	12634	0	306	12040	0	749				
VA	PORTSMOUTH CITY	960051740	960	51740	171	0	0	0	4399	0	121	3695	0	141				
VA	VIRGINIA BEACH	960051810	960	51810	1910	0	171	8	3569	2	137	2781	0	397				
VA	NORFOLK CITY	965051710	965	51710	364	0	0	0	4049	0	310	3219	0	538				
VA	VIRGINIA BEACH	965051810	965	51810	12332	0	1974	91	17807	23	1088	12266	0	2223				
VA	PRINCE WILLIAM	970051153	970	51153	27439	63	540	714	3883	424	1442	1842	1	239				
VA	FAUQUIER	980051061	980	51061	1988	14	60	216	154	79	46	29	0	0				
VA	KING GEORGE	980051099	980	51099	51830	3282	3981	3798	5123	1268	2844	1111	0	755				
VA	NORTHUMBERLAND	980051133	980	51133	32016	15489	5583	969	1785	222	6410	316	2	1478				
VA	PRINCE WILLIAM	980051153	980	51153	7453	14	107	144	549	85	285	225	0	288				
VA	RICHMOND	980051159	980	51159	23	87	9	5	31	3	47	5	0	0				
VA	STAFFORD	980051179	980	51179	83522	1355	2863	4435	12467	2127	11935	3687	1	1285				
VA	WESTMORELAND	980051193	980	51193	58223	21964	5630	2552	6052	970	8179	1337	3	1835				
MD	ST MARYS	990024037	990	24037	7609	1177	1025	612	3209	242	1038	1162	2	635				
					=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
					22965595	2445596	2411226	3598986	2122906	2173009	3929173	1033253	9344	423311				

Table 8. Forecasted 1998 Phase 4.2 Chesapeake Bay Watershed Model Land Use in Acres by County Segment

State	County	COSEG	SEG	FIPS	Forest	Hi Till	Lo Till	Pasture	Pervious			Non-Ag. Impervious		Manure Acres	Water	
									Urban	Hay	Herb.	Urban	Acres			
DC	DISTRICT OF COLUMBIA	910011001	910	11001	98	0	0	0	1874	0	56	1395	0	36		
MD	CHARLES	910024017	910	24017	37940	840	1901	694	15389	521	2922	5034	0	665		
MD	PRINCE GEORGES	910024033	910	24033	31777	3566	590	1810	34187	1078	6088	13960	1	248		
MD	CHARLES	920024017	920	24017	123234	6086	13778	5032	27871	3776	22158	7167	2	1551		
MD	PRINCE GEORGES	920024033	920	24033	2848	265	44	135	677	80	479	127	0	0		
MD	ST MARYS	920024037	920	24037	88811	19579	8624	5770	22350	3964	14687	4822	12	2760		
VA	LANCASTER	930051103	930	51103	6559	1657	461	102	842	32	1747	149	0	561		
VA	NORTHUMBERLAND	930051133	930	51133	10804	2748	1583	207	518	92	1586	95	0	522		
VA	ESSEX	940051057	940	51057	9425	1413	3002	520	66	146	1864	40	0	50		
VA	GLOUCESTER	940051073	940	51073	59779	6516	3032	984	5141	448	13073	2324	0	1364		
VA	KING AND QUEEN	940051097	940	51097	34557	2116	3781	413	52	157	4624	35	1	24		
VA	MATHEWS	940051115	940	51115	30362	3821	1283	1475	2819	892	11332	1078	0	1836		
VA	MIDDLESEX	940051119	940	51119	24181	3010	2369	417	656	246	4467	131	0	265		
VA	YORK	950051199	950	51199	4896	73	12	63	5779	19	1156	3901	0	554		
VA	POQUOSON CITY	950051735	950	51735	3033	0	0	0	1099	0	1152	661	0	395		
VA	YORK	955051199	955	51199	1023	10	2	8	1307	3	139	998	0	95		
VA	HAMPTON CITY	955051650	955	51650	5149	0	0	0	10663	0	2039	7834	0	596		
VA	NEWPORT NEWS CITY	955051700	955	51700	340	0	0	0	2167	0	123	1617	0	66		
VA	POQUOSON CITY	955051735	955	51735	2155	0	0	0	617	0	449	403	0	54		
VA	NORTHAMPTON	960051131	960	51131	0	0	0	0	2	0	0	8	0	5		
VA	CHESAPEAKE CITY	960051550	960	51550	3132	5779	476	396	19334	245	517	13782	2	999		
VA	HAMPTON CITY	960051650	960	51650	1	0	0	0	11	0	0	13	0	3		
VA	NORFOLK CITY	960051710	960	51710	627	0	0	0	12555	0	415	11909	0	749		
VA	PORTSMOUTH CITY	960051740	960	51740	171	0	0	0	4397	0	135	3683	0	141		
VA	VIRGINIA BEACH	960051810	960	51810	179	86	15	8	4611	4	6	3670	0	397		
VA	NORFOLK CITY	965051710	965	51710	406	0	0	0	4005	0	347	3184	0	538		
VA	VIRGINIA BEACH	965051810	965	51810	4225	991	173	90	23500	44	373	16187	0	2223		
VA	PRINCE WILLIAM	970051153	970	51153	25257	107	364	543	5600	493	1327	2656	0	239		
VA	FAUQUIER	980051061	980	51061	1950	35	38	207	197	77	45	37	0	0		
VA	KING GEORGE	980051099	980	51099	51701	3283	2414	2088	7337	1986	2837	1591	0	755		
VA	NORTHUMBERLAND	980051133	980	51133	34019	11625	6694	876	2019	388	6812	358	0	1478		
VA	PRINCE WILLIAM	980051153	980	51153	7169	21	73	109	792	99	274	325	0	288		
VA	RICHMOND	980051159	980	51159	26	62	21	7	31	3	54	5	0	0		
VA	STAFFORD	980051179	980	51179	76616	757	999	2629	21342	2787	10948	6311	1	1285		
VA	WESTMORELAND	980051193	980	51193	55192	20947	6982	4935	6676	948	7754	1475	1	1835		
MD	ST MARYS	990024037	990	24037	6902	1337	589	394	4142	271	942	1499	1	635		
					=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
					23289300	2533611	1863072	3026894	2485667	2177544	4116366	1188028	8606	423311		

Table 9. Forecasted 2000 Phase 4.2 Chesapeake Bay Watershed Model Land Use in Acres by County Segment

State	County	COSEG	SEG	FIPS	Forest	Hi Till	Lo Till	Pasture	Pervious		Non-Ag.		Impervious	Manure Acres	Water
									Urban	Hay	Herb.	Urban			
VA	NEW KENT	600051127	600	51127	36975	1649	1290	377	1608	162	4211	945	0	1827	
VA	POWHATAN	600051145	600	51145	3064	60	113	358	354	182	801	76	0	9	
VA	PRINCE GEORGE	600051149	600	51149	44520	11643	2229	1590	3581	1187	9674	2086	2	1267	
VA	SURRY	600051181	600	51181	41728	10423	5642	645	3396	627	6116	737	40	1026	
VA	YORK	600051199	600	51199	4447	16	3	17	1842	5	455	814	0	22	
VA	COLONIAL HEIGHTS CITY	600051570	600	51570	904	0	0	0	1868	0	633	1291	0	201	
VA	HAMPTON CITY	600051650	600	51650	138	0	0	0	3838	0	66	2711	0	162	
VA	HOPEWELL CITY	600051670	600	51670	1059	0	0	0	2968	0	375	2145	0	90	
VA	NEWPORT NEWS CITY	600051700	600	51700	11430	0	0	0	13760	0	2456	11031	0	1270	
VA	PETERSBURG CITY	600051730	600	51730	2063	0	0	0	3763	0	1202	2542	0	152	
VA	RICHMOND CITY	600051760	600	51760	2076	0	0	0	19626	0	1221	13312	0	1169	
VA	SUFFOLK	600051800	600	51800	2540	1598	340	219	2114	9	708	766	0	362	
VA	WILLIAMSBURG CITY	600051830	600	51830	2157	0	0	0	1094	0	156	591	0	57	
VA	CHARLES CITY	610051036	610	51036	8475	783	644	99	101	36	1425	85	1	57	
VA	HANOVER	610051085	610	51085	16608	3750	767	2423	11811	1420	3279	3915	1	238	
VA	HENRICO	610051087	610	51087	21034	2903	977	1029	27016	1015	5518	14302	0	389	
VA	NEW KENT	610051127	610	51127	16053	963	754	220	1664	95	2429	836	0	364	
VA	ISLE OF WIGHT	620051093	620	51093	13433	10865	2037	843	1630	239	4090	578	20	824	
VA	PORTSMOUTH CITY	620051740	620	51740	684	0	0	0	2702	0	658	1874	0	664	
VA	SUFFOLK	620051800	620	51800	36391	16540	3515	2264	16440	94	7639	8067	4	4717	
VA	CHESAPEAKE CITY	630051550	630	51550	1275	1191	98	98	5645	59	125	3260	0	169	
VA	PORTSMOUTH CITY	630051740	630	51740	276	0	0	0	3404	0	171	2305	0	314	
MD	BALTIMORE	650024005	650	24005	9991	411	1373	730	913	408	2293	395	1	1144	
MD	CARROLL	650024013	650	24013	30748	7217	14765	6864	5570	6260	11604	2635	24	1441	
PA	BRADFORD	700042015	700	42015	86632	12486	198	10330	3158	17998	17862	1888	61	1815	
PA	TIOGA	700042117	700	42117	1309	199	16	271	33	453	315	22	1	35	
PA	LANCASTER	710042071	710	42071	12062	32273	6014	8803	5360	10136	7552	3344	213	7924	
PA	LEBANON	710042075	710	42075	5038	189	106	56	122	63	111	65	1	0	
PA	YORK	710042133	710	42133	18486	10107	5578	2729	3902	3635	9026	1984	14	139	
PA	BERKS	720042011	720	42011	12155	1256	1294	490	699	926	1217	528	6	61	
PA	CHESTER	720042029	720	42029	948	36	70	39	58	51	57	56	0	0	
PA	LANCASTER	720042071	720	42071	47376	83135	15492	22677	32933	26111	18742	21383	549	1822	
PA	LEBANON	720042075	720	42075	6813	2452	1372	725	273	813	1406	116	16	25	
MD	WASHINGTON	730024043	730	24043	270	202	472	331	12	199	342	8	2	103	
PA	ADAMS	730042001	730	42001	14145	121	67	59	135	168	98	91	0	251	
PA	FRANKLIN	730042055	730	42055	119789	27754	52044	21245	13270	33600	28492	7061	350	757	
MD	WASHINGTON	740024043	740	24043	50132	8714	20332	14275	7289	8597	14754	4611	67	4055	
PA	FRANKLIN	740042055	740	42055	18512	752	1409	575	17	910	751	12	9	0	
PA	FULTON	740042057	740	42057	127372	10797	2111	10077	1200	16152	2471	513	31	214	
VA	CLARKE	740051043	740	51043	3552	1917	1290	8335	90	5351	2292	48	3	19	
VA	FREDERICK	740051069	740	51069	83151	4054	2833	28269	8569	20334	36370	4110	5	521	
VA	WINCHESTER CITY	740051840	740	51840	291	0	0	0	2877	0	1278	1532	0	0	
WV	BERKELEY	740054003	740	54003	92546	3964	7339	23171	10755	24618	38168	4792	18	625	
WV	JEFFERSON	740054037	740	54037	10387	1163	8848	7127	1348	5054	8656	258	10	58	
WV	MORGAN	740054065	740	54065	52103	1310	705	5213	879	4437	15072	427	0	87	
MD	CARROLL	750024013	750	24013	1397	811	1659	771	55	703	1383	15	3	178	
MD	FREDERICK	750024021	750	24021	2081	954	1189	902	32	905	960	16	5	69	
PA	ADAMS	750042001	750	42001	33496	13785	7614	6757	4596	19136	10972	2752	33	476	
MD	BALTIMORE	760024005	760	24005	9038	383	1280	681	1966	381	2126	963	1	34	
MD	CARROLL	760024013	760	24013	13836	3209	6565	3052	3072	2783	5120	1284	11	299	
MD	HOWARD	760024027	760	24027	11012	277	2495	1240	1332	833	3573	620	2	49	
DE	KENT	770010001	770	10001	22122	10206	8789	867	1243	898	6107	140	8	42	
MD	CAROLINE	770024011	770	24011	8593	4426	2965	174	658	156	2219	75	3	14	
MD	QUEEN ANNES	770024035	770	24035	795	251	722	12	43	17	98	5	0	0	
DE	KENT	780010001	780	10001	3210	1658	1428	141	236	146	991	39	1	0	
DE	SUSSEX	780010005	780	10005	13049	6389	10331	587	1780	266	4995	434	9	0	
DE	NEW CASTLE	800010003	800	10003	3530	2178	1362	213	422	241	1587	92	1	107	
MD	CECIL	800024015	800	24015	55264	7949	14529	7282	13674	3497	15214	4936	17	861	
PA	CHESTER	800042029	800	42029	12763	3520	6922	3841	1622	5064	5705	633	21	406	
DE	NEW CASTLE	810010003	810	10003	1534	1211	758	118	41	134	919	12	0	0	
MD	CECIL	810024015	810	24015	4437	1998	3652	1830	250	879	3862	105	4	257	
MD	KENT	810024029	810	24029	27997	20204	13148	2761	1489	1310	6850	547	20	1522	
MD	QUEEN ANNES	820024035	820	24035	7479	4200	12107	201	6142	280	1399	2426	2	1865	
MD	TALBOT	830024041	830	24041	19468	9737	23918	1467	9639	281	4548	3233	5	3009	
MD	DORCHESTER	840024019	840	24019	159326	21357	38409	1164	5116	145	29290	1364	8	12650	
MD	SOMERSET	840024039	840	24039	3	3	2	0	1	0	3	0	0	12	
MD	HARFORD	850024025	850	24025	51513	6946	10581	5682	23936	3777	11343	11073	15	772	
MD	BALTIMORE	860024005	860	24005	2660	159	531	282	14800	158	631	14528	1	743	
MD	BALTIMORE CITY	860024510	860	24510	265	0	0	0	6590	0	120	6218	0	67	
MD	ANNE ARUNDEL	870024003	870	24003	4999	381	203	169	10245	120	633	5373	0	587	
MD	ANNE ARUNDEL	880024003	880	24003	31643	2956	1580	1309	15226	935	6272	7140	1	1292	
MD	CALVERT	880024009	880	24009	22043	1298	464	666	9170	234	877	2148	0	163	
DC	DISTRICT OF COLUMBIA	890011001	890	11001	2033	0	0	0	6852	0	87	7158	0	220	
MD	MONTGOMERY	890024031	890	24031	4757	320	2192	757	17759	670	1518	11210	1	140	
DC	DISTRICT OF COLUMBIA	900011001	900	11001	4	0	0	0	46	0	61	46	0	50	
VA	ARLINGTON CITY	900051013	900	51013	332	0	0	0	8941	0	-2	7266	0	68	
VA	FAIRFAX	900051059	900	51059	6279	121	243	737	68250	473	2019	32293	0	847	
VA	ALEXANDRIA CITY	900051510	900	51510	194	0	0	0	4528	0	-119	5056	0	25	
VA	FAIRFAX CITY	900051600	900	51600	80	0	0	0	2318	0	16	1582	0	0	
VA	FALLS CHURCH CITY	900051610	900	51610	25	0	0	0	672	0	3	571	0	0	
DC	DISTRICT OF COLUMBIA	910011001	910	11001	98	0	0	0	1874	0	56	1395	0	36	
MD	CHARLES	910024017	910	24017	37264	830	1878	627	15986	558	2869	5229	0	665	
MD	PRINCE GEORGES	910024033	910	24033	31896	3162	524	1804	34364	1163	6111	14032	1	248	
MD	CHARLES	920024017	920	24017	122476	6011	13607	4543	28952	4046	22022	7445	2	1551	
MD	PRINCE GEORGES	920024033	920	24033	2870	235	39	134	680	87	483	128	0	0	

Table 9. Forecasted 2000 Phase 4.2 Chesapeake Bay Watershed Model Land Use in Acres by County Segment

State	County	COSEG	SEG	FIPS	Forest	HI Till	Lo Till	Pasture	Pervious		Non-Ag.		Manure Acres	Water
									Urban	Hay	Herb.	Urban		
MD	ST MARYS	920024037	920	24037	88335	19160	8439	5079	23706	4165	14608	5115	12	2760
VA	LANCASTER	930051103	930	51103	6574	1659	462	77	839	39	1751	148	0	581
VA	NORTHUMBERLAND	930051133	930	51133	10942	2675	1540	131	531	110	1607	97	0	522
VA	ESSEX	940051057	940	51057	9201	1445	3071	650	64	186	1820	39	0	50
VA	GLOUCESTER	940051073	940	51073	59684	6445	2999	923	5359	414	13052	2422	0	1364
VA	KING AND QUEEN	940051097	940	51097	34798	2055	3672	332	53	134	4657	36	1	24
VA	MATHEWS	940051115	940	51115	29620	4097	1376	1827	2852	1145	11055	1090	0	1836
VA	MIDDLESEX	940051119	940	51119	23985	3168	2494	408	673	184	4431	134	0	265
VA	YORK	950051199	950	51199	4393	49	8	51	6176	16	1037	4169	0	554
VA	POQUOSON CITY	950051735	950	51735	3033	0	0	0	1099	0	1152	661	0	395
VA	YORK	955051199	955	51199	888	6	1	7	1397	2	121	1066	0	95
VA	HAMPTON CITY	955051650	955	51650	5319	0	0	0	10526	0	2106	7732	0	596
VA	NEWPORT NEWS CITY	955051700	955	51700	340	0	0	0	2167	0	123	1617	0	66
VA	POQUOSON CITY	955051735	955	51735	2155	0	0	0	617	0	449	403	0	54
VA	NORTHAMPTON	960051131	960	51131	0	0	0	0	2	0	0	8	0	5
VA	CHESAPEAKE CITY	960051550	960	51550	1885	5854	482	479	20060	291	311	14299	2	999
VA	HAMPTON CITY	960051650	960	51650	1	0	0	0	11	0	0	13	0	3
VA	NORFOLK CITY	960051710	960	51710	627	0	0	0	12555	0	415	11909	0	749
VA	PORTSMOUTH CITY	960051740	960	51740	171	0	0	0	4397	0	135	3683	0	141
VA	VIRGINIA BEACH	960051810	960	51810	179	68	12	8	4616	4	4	3687	0	397
VA	NORFOLK CITY	965051710	965	51710	406	0	0	0	4005	0	347	3184	0	538
VA	VIRGINIA BEACH	965051810	965	51810	4279	782	136	89	23609	47	378	16262	0	2223
VA	PRINCE WILLIAM	970051153	970	51153	24844	118	401	529	5837	545	1306	2768	0	239
VA	FAUQUIER	980051061	980	51061	1943	36	39	202	206	75	45	39	0	0
VA	KING GEORGE	980051099	980	51099	51851	1384	3742	1843	7720	2177	2845	1674	0	755
VA	NORTHUMBERLAND	980051133	980	51133	34581	5348	12480	553	2071	467	6924	367	0	1478
VA	PRINCE WILLIAM	980051153	980	51153	7107	24	81	106	825	110	272	339	0	288
VA	RICHMOND	980051159	980	51159	28	60	20	8	31	3	56	5	0	0
VA	STAFFORD	980051179	980	51179	75496	687	908	2294	22524	3033	10788	6661	1	1285
VA	WESTMORELAND	980051193	980	51193	53838	8672	20234	5695	6568	887	7563	1452	1	1835
MD	ST MARYS	990024037	990	24037	6666	1309	576	347	4393	284	910	1590	1	635
					=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
					23228978	2506888	1881166	2967963	2543203	2215041	4125530	1211706	8613	423311

Section 5. Airshed, Watershed, and Estuarine Model Linkages

Regional Acid Deposition Model

A link between the Regional Acid Deposition Model (RADM) and the Phase 4.2 Watershed Model is forged to incorporate RADM output data into Watershed Model input decks for running scenarios. The RADM model is usually based on an 80x80-km grid. For purposes of simulating atmospheric deposition loads to the Chesapeake Bay Watershed Model, a refined 20x20-km grid is used (Figure 11). Using GIS, the Phase 4.2 Watershed Model segments are overlain with the refined 20x20-km grid to determine the percentage of each RADM grid cell falling within each Watershed Model segment (Figure 12).

Chesapeake Bay Water Quality Model

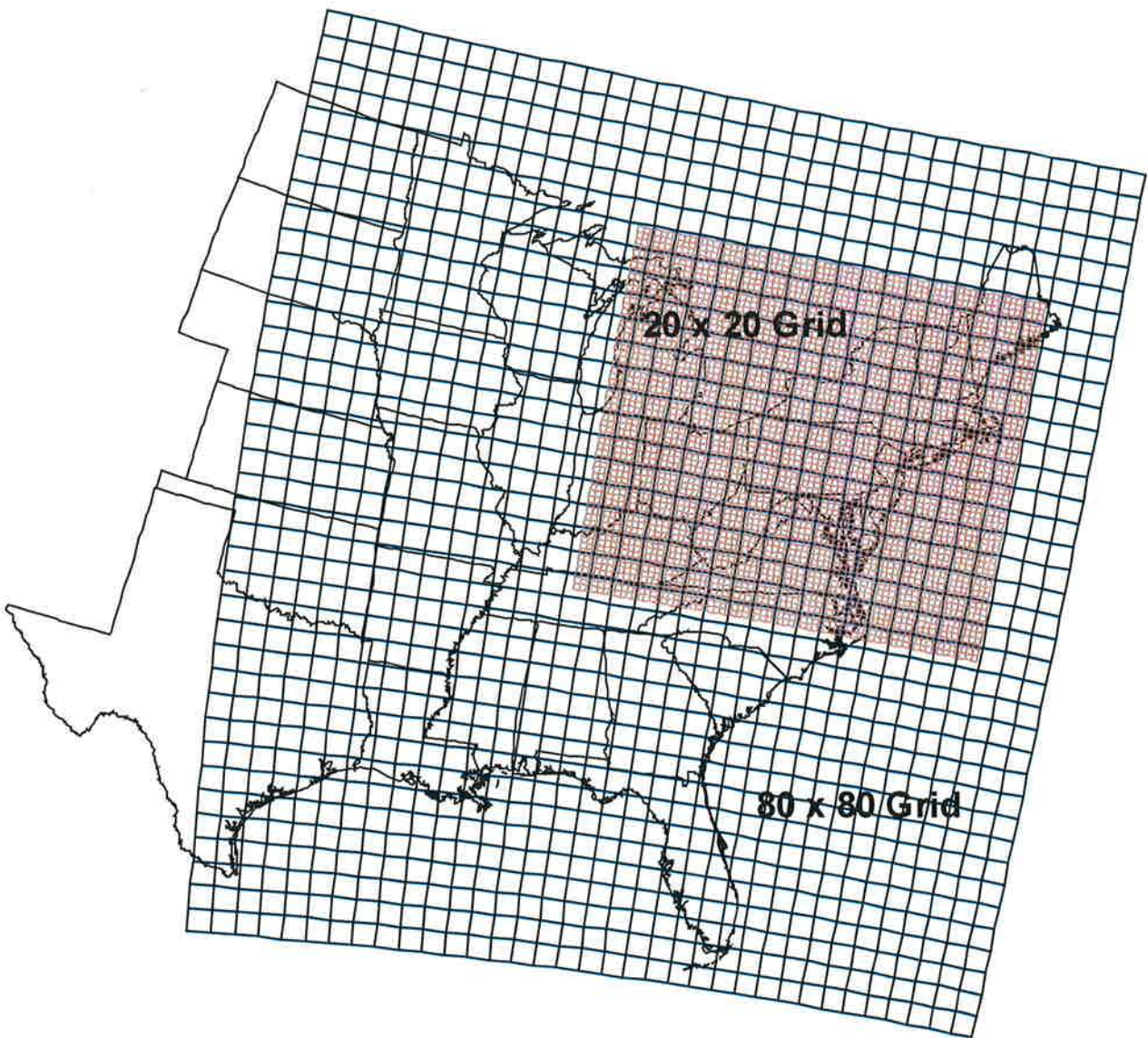
The Phase 4.2 Watershed Model results provide input information for the Bay water quality model, the Chesapeake Bay Estuary Model Package (CBEMP). In order to refine the linkage between the two models, a new and more extensive segmentation of the below fall line watershed model segments is developed. Using GIS, below fall line sub-segments are created based on 11-Digit HUCS and the relative position of adjoining water quality model grid cells. Sub-segments are wholly contained within the larger watershed model segments. The final cover contains 259 sub-segments. Each sub-segment is assigned a five-digit identification number. The first three digits are the segment in which the sub-segment falls. The last two are sequential, from the smallest to the largest sub-segment in each segment.

An overlay of the Phase 4.2 Watershed Model sub-segment's coverage and the water quality model grid cell's coverage displays the location of sub-segments relative to grid cells. The Chesapeake Bay Program modeling team assigned each sub-segment to a cell or set of cells for the purpose of loading watershed model output to the water quality model. In cases where a sub-segment delivers output to more than one cell, the load is divided equally among the number of cells associated with that sub-segment. If a cell straddles two sub-segments, a portion of load from each sub-segment is applied. Figure 13 shows the Chesapeake Bay Watershed Model sub-segments and the water quality model grid of the Chesapeake Bay Estuary Model Package.

In order to load the water quality model more accurately, sub-segment land use is developed. The Chesapeake Bay Program Land Use (CBPLU) cover is overlain with the sub-segment cover to obtain CBPLU land use by sub-segment. These data were used to proportion out the Phase 4.2 Watershed Model land use by the spatial distribution of land cover in the CBPLU. In other words, assume model segment X has two sub-segments, sub-segment 1X and sub-segment 2X. If 75% of the CBPLU woody and wetlands in Segment X are found in sub-segment 1X, then 75% of the Phase 4.2 Forest found in segment X are assigned to sub-segment 1X, and the remaining 25% is assigned to sub-

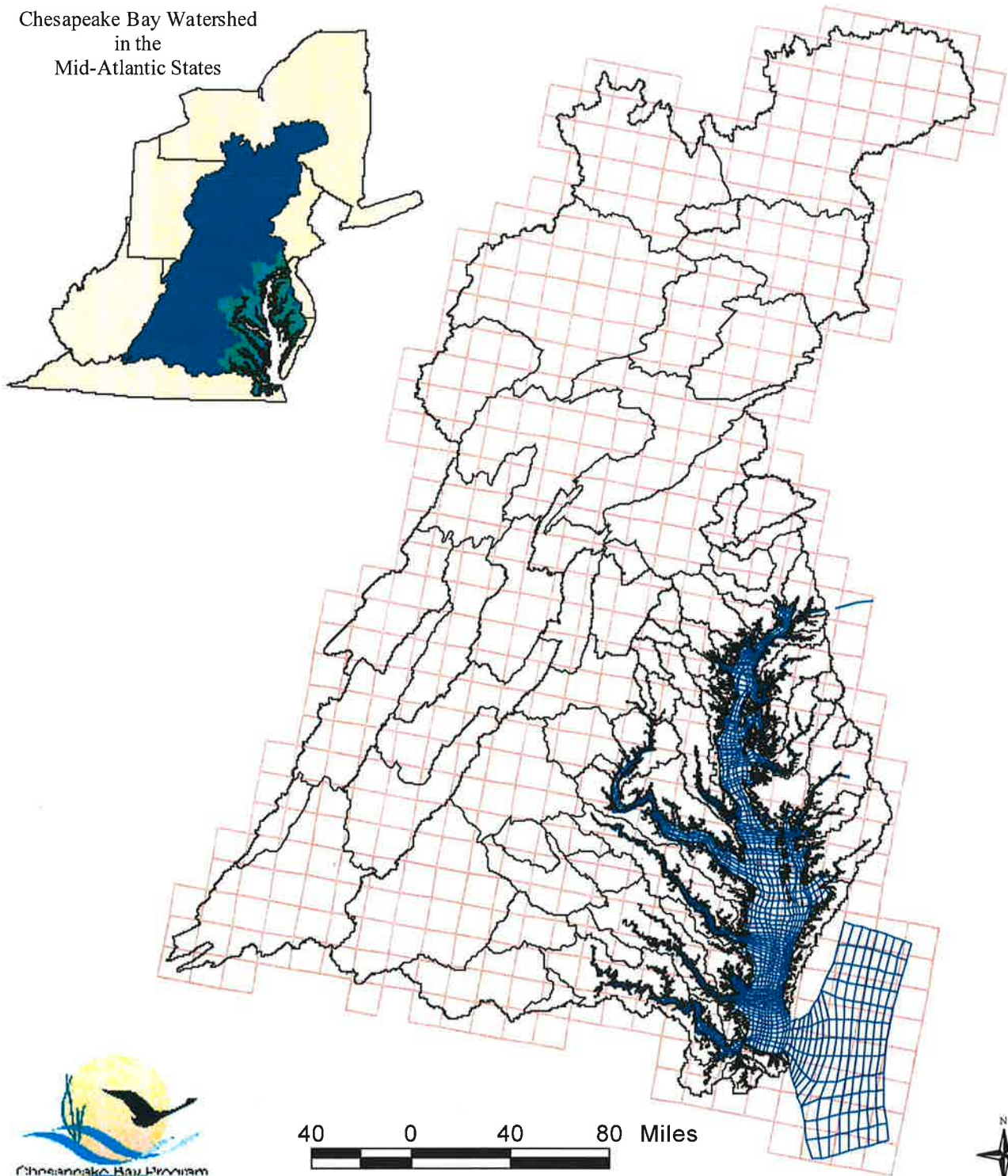
segment 2X. Similarly, if 60% of the CBPLU Herbaceous in Segment X is found in sub-segment 2X, then 60% of each agricultural Phase 4.2 land use will be assigned to sub-segment 2X and 40% to sub-segment 1X. After partitioning Phase 4.2 land use to each sub-segment, simulated total flow, nutrient, and sediment loading are delivered to the adjacent water quality model cells.

Regional Acid Deposition Model (RADM) Refined Grid (20 x 20 km) Domain



Regional Acid Deposition Model Grid, Chesapeake Bay Watershed Model Segments, and Chesapeake Bay Water Quality Model Cells

Chesapeake Bay Watershed
in the
Mid-Atlantic States

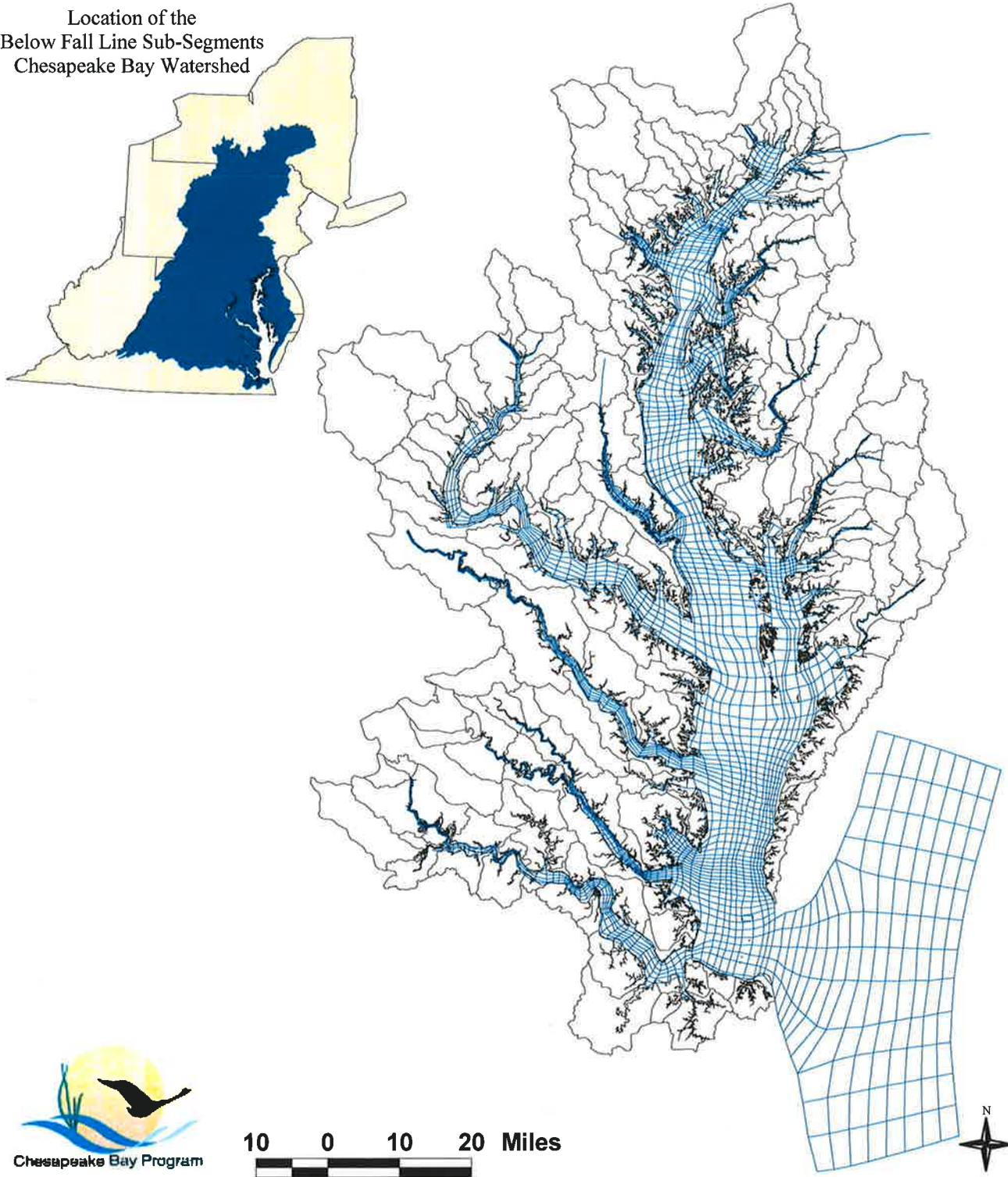


Chesapeake Bay Program

Figure 13

Phase IV Chesapeake Bay Watershed Model Below Fall Line Model Sub-Segments and Chesapeake Bay Water Quality Model Cells

Location of the
Below Fall Line Sub-Segments
Chesapeake Bay Watershed



Chesapeake Bay Program

10 0 10 20 Miles

Section 6. Chesapeake Bay Estuary Model Cells Identified as Potential SAV Habitat

In order to fully a littoral zone submerged aquatic vegetation (SAV) sub-model into the Chesapeake Bay Estuary Model Package (CBEMP), it was necessary to define those shallow water littoral zone model cells are capable of supporting SAV growth. These grow cells were then further subdivided into three categories of model cells to reflect the three representative Bay SAV species for which the Bay water quality model littoral zone SAV sub-model would be parameterized.

Identification of SAV Grow Cells

In 1992, the Chesapeake Bay Program developed a series of tiered SAV distribution restoration target maps as part of the SAV Technical Synthesis¹ based on both present and historical SAV distribution patterns and understanding of the physical habitat conditions limiting potential SAV distribution. The Tier I target, adopted by the Chesapeake Executive Council as a formal Bay Program goal in 1993, delineated restoration of SAV to areas currently or previously inhabited by SAV as mapped through regional and Bay wide aerial surveys from 1971 through 1990. The Tier II target delineated restoration of SAV to all shallow water areas delineated as existing or potential SAV habitat down to the one meter depth contour. The Tier III target delineated restoration of SAV to all shallow water areas delineated as existing or potential SAV habitat down to the two meter depth contour.

The GIS coverage of the Chesapeake Bay Water Quality Model segmentation was overlaid onto the Tier III Chesapeake Bay SAV Distribution Restoration Target map. Through visual inspection of the map overlay, the individual CBEMP cells which overlaid onto part of, or were in close proximity to, the Tier III target coverage were identified as SAV grow cells as described below. As the CBEMP segmentation and the Bay shoreline GIS shoreline coverage did not exactly correspond (and in some case diverged from each other), the following series of decision rules were developed.

In cases where there was clearly no potential SAV habitat along the Bay shoreline, the adjacent outer model cell depicting that shoreline and adjoining littoral zone habitat was designated a SAV no-grow cell and not considered further. The littoral region of Calvert Cliffs provide an example where elevation and relatively high energy beaches preclude the growth of SAV.

In cases where there was clearly potential SAV habitat along the shoreline, adjacent outer model cells that depict the shoreline and adjoining littoral zone habitat are designated a SAV grow cells, such as the Patuxent River shoreline.

In shallow water regions where potential SAV habitat extends out away from the shoreline into

¹ Batiuk et al. 1992. *Chesapeake Bay Submerged Aquatic Vegetation Habitat Requirements and Restoration Goals: A Technical Synthesis*. CBP/TRS 83/92. Chesapeake Bay Program, Annapolis, Maryland.

shallow water areas, associated model cells were designated SAV grow cells. For example, the shallow water areas of Tangier Sound and just north of South Marsh Island are designated SAV grow zones.

The compiled listing of SAV grow cells were entered into a spreadsheet and quality assured through a visual cross check and comparison of each spreadsheet listed grow cell with the original GIS Tier III/Model Segmentation overlay maps on which the SAV grow cells were identified.

Partitioning the SAV Grow Cells by the Three Modeled Species

The Chesapeake Bay Program Living Resources SAV Workgroup decided to select *Vallisneria americana*, *Potamogeton pectinatus*, and *Zostera marina* as the three species for which the Bay water quality model littoral zone SAV sub-model would be parameterized. These three species were considered the most representative species for the modeling objective as: 1) all three species are native to Chesapeake Bay; 2) their combined existing and potential habitat distribution covered the full range of Bay salinity, and 3) their minimum light requirements were generally the most conservative for their habitat range.

The Chesapeake Bay Program developed a series of distribution restoration target maps as part of the production of the 1992 SAV Technical Synthesis based on both existing and historical SAV distribution patterns. The information on actual past and present species distribution derived from aerial and ground surveys of present SAV distribution, survey from past pollen and seed records, and the published literature. Potential distribution was based on the above information and the individual species distribution limits as defined by their upper and lower salinity tolerances.

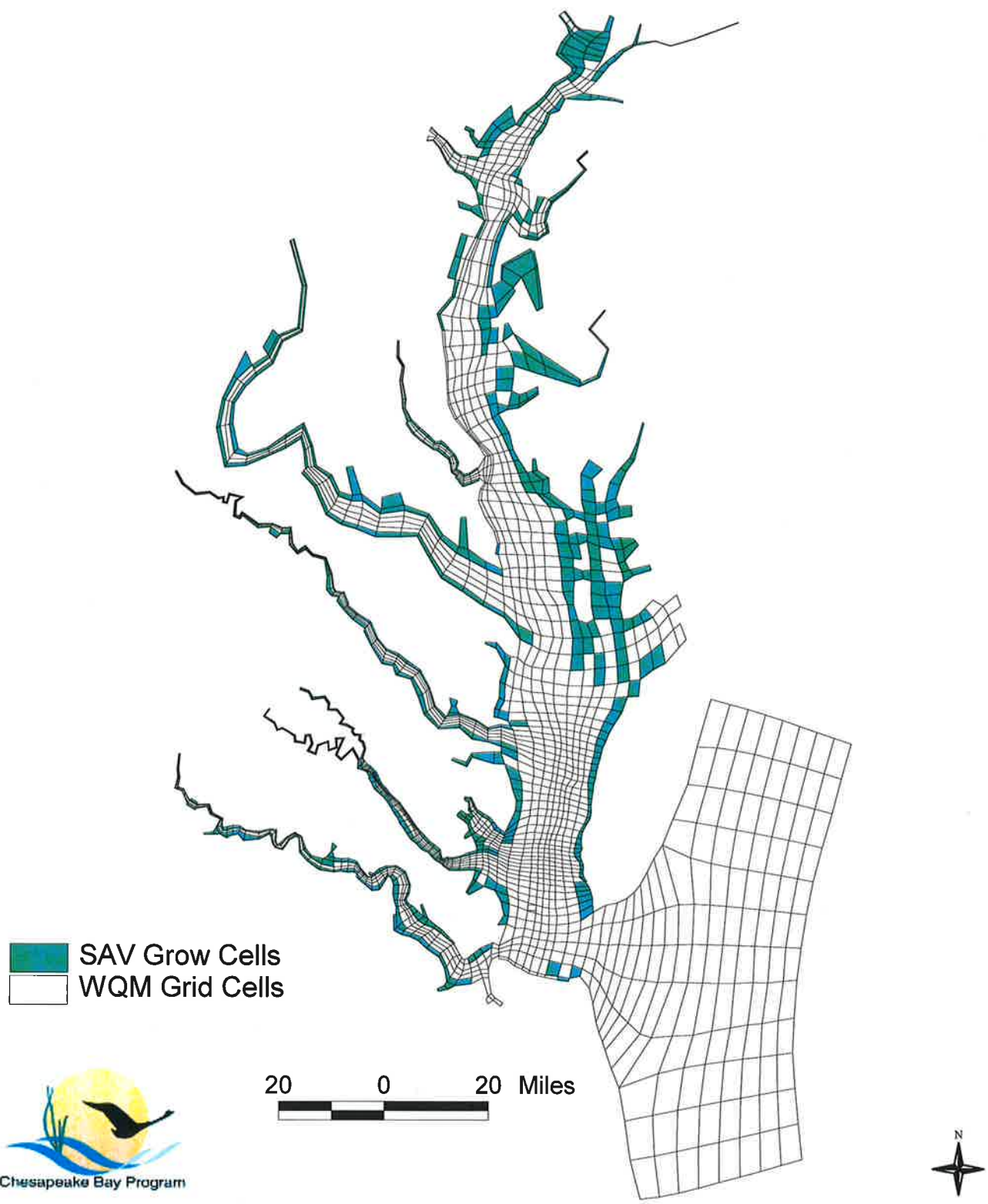
The Chesapeake Bay Program Office staff overlaid the Chesapeake Bay Distribution Restoration Target maps for *Vallisneria americana*, *Potamogeton pectinatus*, and *Zostera marina* from the SAV Technical Synthesis to produce a single map outlining the actual/potential distribution of these three species. This integrated map of the three species distribution was further refined through an analysis of distribution of 1985-1995 monthly mean salinity data from all the Chesapeake Bay Water Quality Monitoring Program stations. The integrated species distribution map was further refined to ensure that all areas of the Bay where the mean salinity was generally (between the 25th and 75th percentile) below 5 part per thousand (ppt) were delineated as *Vallisneria* habitat, areas with a mean salinity between 5 and 18 ppt were delineated as *Potamogeton* habitat, and areas with a mean salinity above 18 ppt were delineated as *Zostera* habitat. This analysis involving monthly mean salinity data resulted in relatively minor refinements to the integrated species distribution map developed originally based on the SAV Technical Synthesis species restoration target maps.

The Chesapeake Bay Program Living Resources Subcommittee's SAV Workgroup reviewed and approved the final integrated species distribution map. The integrated species distribution map was then overlaid on top of CBEMP segmentation map on which the SAV grow model cells had been delineated (Figure 14). Based on visual and then GIS analysis of the overlay, each

delineated SAV grow cell was categorized and labeled as either a *Vallisneria*, *Potamogeton*, or *Zostera* SAV grow cell.

Figure 14

Chesapeake Bay Estuary Model Package SAV Grow Cells



SAV Grow Cells
WQM Grid Cells



20 0 20 Miles



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Subcommittee. January, 2000. Chesapeake Bay Program Office,
Annapolis, MD. <http://www.chesapeakebay.net/modsc.htm> -
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