

Appendix B
*Subwatershed Delineation, Impervious Cover Analysis, and Management Classification for
the Port Tobacco Watershed*

Subwatershed Delineation, Impervious Cover Analysis, and Mangement Classification for the Port Tobacco Watershed

Subwatershed delineation methodology

The outer boundary of the Port Tobacco River watershed is the Maryland 8-digit watershed boundary. Within the Port Tobacco River watershed, nine subwatersheds have been identified based upon a combination of 12-digit watershed boundaries, zoning, land use, size, tidal boundaries, and development districts. The location, name, and size of each subwatershed are summarized below.

1. The Upper Port Tobacco Creek subwatershed (5.1 mi²) is in the northern most portion of the Port Tobacco watershed, with a southern limit along Marshall Corner Road, which is also the southern development district boundary for Charles County.
2. The Jennie Run subwatershed (4.0 mi²) is north of La Plata and includes a portion of the College of Southern Maryland, La Plata campus.
3. The Pages Swamp subwatershed (6.1 mi²) is located south of the Upper Port Tobacco Creek subwatershed, and includes the southern portion of Pages Swamp, on the Port Tobacco mainstem. The downstream point of the subwatershed is discharge point for the College of Southern Maryland's WWTP.
4. The headwaters of the La Plata subwatershed (4.9 mi²) are within La Plata, which includes a smaller catchment on an unnamed tributary that was the focus of a 2005 study.
5. The Middle Port Tobacco subwatershed (3.7 mi²) is south of the Pages Swamp subwatershed on the Port Tobacco mainstem.
6. The Hoghole Run subwatershed (4.9 mi²) is also defined by a 12-digit hydrologic unit code and includes the Thomas Stone National Historic Site.
7. The Wills Branch subwatershed (4.2 mi²) is defined by two 12-digit watershed boundaries that CWP has elected to combine for this investigation due to their similar land use and location.
8. The Lower Port Tobacco West subwatershed (9.2 mi²) is the western half of a 12-digit watershed boundary, divided by the Port Tobacco centerline. The western side includes Goose Creek and half of the tidal open water portion of the Port Tobacco River.
9. The Lower Port Tobacco East subwatershed (5.0 mi²) is the eastern half of a 12-digit watershed boundary, divided by the Port Tobacco centerline.

Table B-1 Port Tobacco Subwatersheds

Name	Area (m ²)	Area (mi ²)	Area (acre)	Reasoning
Upper Port Tobacco Creek	13,174,748	5.09	3,256	Development District
Jennie Run	10,285,736	3.97	2,541	Large, named tributary
Pages Swamp	15,684,966	6.06	3,876	PT mainstem south of development district/size/land use
La Plata	12,681,942	4.90	3,134	Development District/Land Use
Middle Port Tobacco	9,442,216	3.65	2,333	Size/land use
Hoghole Run	12,669,964	4.89	3,131	Existing 8-digit watershed boundary
Wills Branch	10,959,444	4.23	2,708	Combined two 8-digit watershed boundaries
Lower Port Tobacco East	12,824,812	4.95	3,169	Eastern half of 8-digit boundary, divided by PT centerline
Lower Port Tobacco West	23,893,804	9.23	5,904	Western half of 8-digit boundary, divided by PT centerline
Sum	121,617,630	46.96	30,052	

Impervious Cover as a Screening Tool

Perhaps the most useful screening parameter in watershed assessment is impervious cover. Impervious cover is defined as the sum of all surfaces within the watershed that do not allow water to infiltrate through the ground. Examples include roadways, driveways, houses, sidewalks, and parking lots that are covered by concrete, asphalt or other impermeable surface. In recent years, impervious cover has emerged as a key indicator to explain and sometimes predict how severely streams change in response to different levels of watershed development (CWP, 2003). The Center has integrated these research findings into a general watershed planning model, known as the impervious cover model (ICM) (Figure B-1). The ICM predicts that most stream quality indicators decline when watershed impervious cover exceeds 10%, with severe degradation expected beyond 25% impervious cover. The model classifies subwatersheds into one of three categories: sensitive, impacted, and non-supporting.

Sensitive subwatersheds have an impervious cover of 0 to 10 percent. Consequently, streams in these subwatersheds are of high quality, and are typified by stable channels, excellent habitat structure, good to excellent water quality, and diverse communities of both fish and aquatic insects (CWP, 1998). The main goal for these types of subwatersheds is to maintain predevelopment stream biodiversity and channel stability.

Impacted subwatersheds have an impervious cover ranging from 11 to 25 percent and show clear signs of degradation due to watershed urbanization. Greater storm flows have begun to alter the stream geometry. Both erosion and channel widening are evident. Stream banks become unstable, and physical habitat in the stream declines noticeably. Stream biodiversity declines to fair levels, with the most sensitive fish and aquatic insects disappearing from the stream (CWP, 1998). The main goals for these types of subwatersheds are to limit the degradation of stream habitat quality and maintain a good biological community.

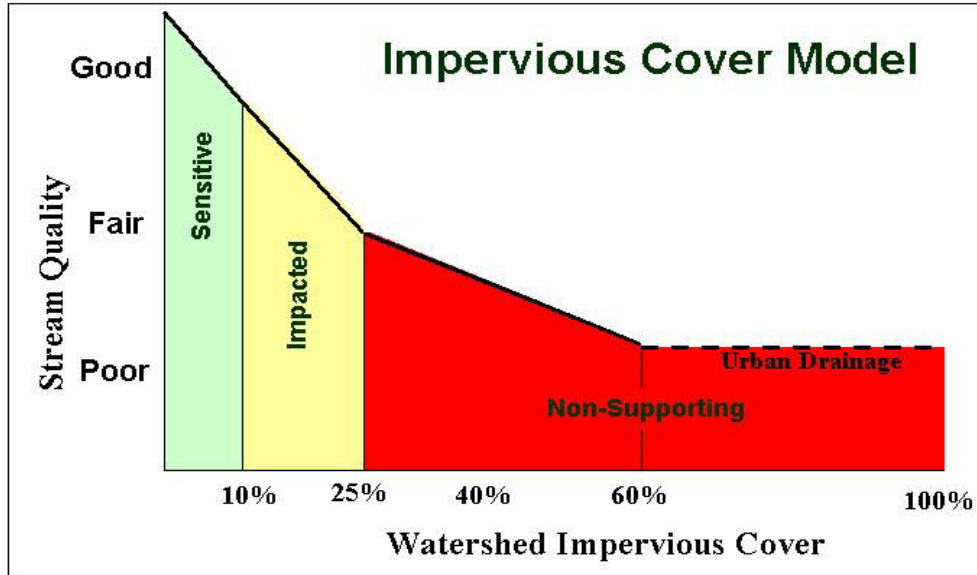
Non-supporting subwatersheds have an impervious cover greater than 25 percent. Streams in this category essentially become a conduit for conveying stormwater flow and can no longer support a diverse stream community. The stream channel becomes highly unstable and many stream reaches experience severe widening, down-cutting, and streambank erosion. The water and biological quality of non-supporting streams is generally considered poor and is dominated by pollution tolerant insects and fish. The goals for these subwatersheds are to minimize downstream pollutants, alleviate downstream flooding, and improve aesthetic appeal.

The ICM has proven to be an extremely important tool for watershed planning, since it can rapidly project how streams will change in response to future land use. The Center routinely estimates existing and future impervious cover in our watershed planning approach and finds that it is an excellent indicator of change for subwatersheds from 0 to 30%.

The ICM often forces watershed plans to directly confront land use planning and land conservation issues early in the planning process; however, impervious cover is not a perfect indicator of existing stream quality. A number of additional stream and subwatershed criteria should be evaluated in the field before a final classification decision is made particularly when the stream is on the borderline between two classifications. Some of the additional criteria might include: reported presence of rare, threatened or endangered species; fair to good, good, or good to excellent macro invertebrate scores; stream channels with little evidence of ditching, enclosure, tile drainage or channelization; fair-to-good stream habitat scores; significant conservation areas; large contiguous forest tracts; farming, ranching and livestock

operations using best management practices; and prior development with stormwater best management practices.

Figure B-1. Impervious Cover Model



The ICM is based on the following assumptions and caveats. The ICM:

1. Applies only to 1st, 2nd and 3rd order streams;
2. Requires accurate estimates of percent impervious area, which is defined as the total amount of impervious area over a subwatershed area;
3. Predicts potential rather than actual stream quality. It can and should be expected that some streams will depart from the predictions of the model. While impervious cover (IC) can be used to initially diagnose stream quality, supplemental field monitoring is recommended to actually confirm it;
4. Does not predict the precise score of an individual stream quality indicator, but rather predicts the average behavior of a group of indicators over a range of IC. Extreme care should be exercised if the ICM is used to predict the fate of individual species (e.g., trout, salmon, mussels);
5. Thresholds defined as 10 and 25% IC, are not sharp breakpoints, but reflect instead the expected transition of a composite of individual indicators in that range of IC. Thus, it is virtually impossible to distinguish real differences in stream indicators within a few percentage points of watershed IC (e.g., 9.9 vs. 10.1%);
6. Should only be applied within the ecoregions where it has been tested, including the mid-Atlantic, Northeast, Southeast, Upper Midwest, and Pacific Northwest;
7. Has not yet been validated for non-stream conditions (e.g., lakes, reservoirs, aquifers and estuaries). Additional locally-based research is needed to adapt the ICM model for these conditions; and
8. Is conservative in that it does not predict the potential mitigating impact of watershed treatment practices. At this time, researchers are not sure that they can detect the impact of watershed treatment, and none has gone so far as to assert that it dramatically shifts the basic ICM.

2002 Impervious Cover Analysis

Current impervious cover was estimated from the 2002 Maryland Department of Planning land use data in GIS format. Impervious cover was calculated by summing the total area of each current land use then multiplying it by an impervious cover coefficient (ICC). The ICC requires that the built area of each land use be multiplied by a unique ICC to yield a provisional estimate of impervious cover for each land use. The land use classifications and their associated ICC are outlined in Table B-2.

Table B-2 Maryland Department of Planning Land Use and Assigned Impervious Cover % (modified from Brown and Capiella, 2001)		
Land Use Code*	Land Use Description	% Impervious
11	Low Density Residential	14.3
12	Medium Density Residential	27.8
13	High Density Residential	40.9
14	Commercial	72.2
15	Industrial	53.4
16	Institutional	34.4
17	Extractive	1.9
18	Open Urban Land	8.6
21	Cropland	1.9
22	Pasture	1.9
242	Ag Building	1.9
41	Forest/Brush	0
42	Forest/Brush	0
43	Forest/Brush	0
44	Forest/Brush	0
50	Water	100**
60	Wetlands	0
73	Bare Ground	8.6

*Land Use/Land Cover Data Source: MDP, 2002
 **Major water bodies were excluded from this analysis

Future Impervious Cover Analysis

Future impervious cover estimates were projected based on developable land and current zoning. The ICC were developed for each major zoning category outlined in Charles County's Zoning Ordinance (Table B-3) and Town of La Plata Zoning Ordinance (Table B-4). For the purposes of this analysis, full build-out of current zoning was assumed for future conditions. Consequently, the future impervious cover estimates represent the maximum level of development that can be expected in the subwatershed. Not all land that is zoned for a particular land use will ultimately be built due to future economic conditions, access, or a lack of infrastructure.

To project future impervious cover undeveloped lands were identified within each subwatershed based on the current land use. Next, unbuildable land was subtracted from the undeveloped land. Unbuildable lands include conservation easements, parks, DNR owned land, County's Resource Protection Zone that includes the 100-year floodplain, stream buffers, and slopes greater than

25%. The remaining area was then multiplied by an estimated impervious cover coefficient (Table B-3).

Table B-3 Charles County Zoning Summary				
Charles County Zone	Description	Category	Notes	Impervious Cover (%)
BP	Business Park	Commercial		72.2
CC	Community Commercial	Commercial		72.2
CN	Neighborhood Commercial	Commercial		72.2
CV	Village Commercial	Commercial	Residential/Institutional /commercial (0.46 du/acre, 2.12 ac/lot)	72.2
IG	Light Industrial	Industrial		53.4
PMH	Planned Manufactured Home Park	High Density Residential		44.4
PUD	Planned Unit Development	75% commercial/25% medium density residential (from Mattawoman)	10%-25% industrial/commercial, 18% min open urban land (based on Charles Co. Zoning Ord.)	34.256
RC	Rural Conservation	Agricultural/Low Density Residential	0.33 du/acre or 3.03 ac/lot	10.6
RH	High Density Residential		5.0 du/acre or 0.2 ac/lot	32.6
RL	Low Density Residential	Low Density Residential	1.0 du/acre or 1 ac/lot	14.3
RM	Medium Density Residential	Medium Density Residential	3.0 du/acre or 0.33 ac/lot	27.8
RO	Residential Office	Medium Density Residential	Commercial Residential transition zone	72.2
RR	Residential Rural	Low Density Residential	1.0 du/acre or 1 ac/lot	14.3
RV	Residential Village	Low Density Residential	1.8 du/acre or 0.55 ac/lot	21.2

Table B-4 Town of La Plata Zoning Summary

La Plata Zone	Description	Category	Notes	Impervious Cover (%)
R-21	Residential District	Medium Density Residential	Single Family Detached Dwellings (0.48 ac/lot minimum), churches schools, libraries, etc.	21.2
R-10	Residential District	Medium Density Residential	Single Family Detached Dwellings (0.23 ac/lot min)	27.8
R-8	Residential District	Medium Density Residential	Single Family Detached Dwellings (0.18 ac/lot min)	32.6
R-5	Residential District	High Density Residential	Single Family Detached, Attached, Two-Family (0.11 ac/lot)	40.9
R-3	Residential District	High Density Residential	Single Family Attached, Two-Family, Multi-family (0.07 ac/lot)	44.4
MUD-1	Mixed Use District - Residential		75% max Residential/25% minimum Floodplain/Public Land	21.35
MUD-2	Mixed Use District - Residential/Commercial		10% max commercial/ 20% min Floodplain/Public Land	30.44
MUD-3	Mixed Use District - Residential/Commercial/Industrial		25% max Industrial/10% max Commercial/ 15% min Floodplain/Public Land	37.17
P-L	Public Lands District	Open Urban Land		8.6
F-P	Floodplain District	Open Urban Land		8.6
C-B	Central Business District	Commercial		72.2
C-H	Commercial Highway District	Commercial		72.2
I	Industrial District	Industrial		53.4
IP	Industrial Park District	Industrial	10% min Green Space, 5% min Landscaping	53.4
L-I	Light Industrial District	Industrial		53.4
PUD	Planned Unit Development		5 du/acre max, 4% max commercial, 8% max multi-family, 15% min single family detached, 25% min common space (urban land)	32.6

The following sources were used to extract the buildable lands from the zoning layers.

Resource Protection Zone

Based on GIS layer from Charles County Department of Planning and Growth Management (PGM) (2005)

Includes

- 100-year floodplain
- 50' stream buffer
- This GIS layer did not include steep slopes. We were not able to locate steep slopes in another manner, so they have not be included.

Protected Lands

Based on GIS layer from Charles County Dept. of PGM (Updated June 2005)

Includes

- Easements held by Maryland Environmental Trust
- Properties enrolled in the MD Agriculture Preservation Program 5 year plan (will not develop for 5 yrs)
- Properties that have been certified in the TDR program in a perpetual easement. For every 3 acres of land (includes all land, even lands that would not be developable for environmental reasons), the owner receives 1 development right that can be sold. The owner can sell some and keep some, so the entire property may be certified, but the owner may retain some of the development rights. The owner can also buy back development rights in the future.
- Historical Trust easements that preserve historical character.
- Privately held easements such as the Nature Conservancy and the Conservancy for Charles County, Inc.

Analysis Results

The results of the 2002 and future land impervious cover and vulnerability analysis are shown in Table B-5. As of 2002 most subwatersheds were in the sensitive category. However, under build-out conditions the increased impervious cover shifts several to impacted or non-supporting condition.

Table B-5 Summary of Existing and Future Impervious Cover and Vulnerability					
Subwatershed	Area - Water Excluded (mi2)	Existing Percent Imperviousness	Existing Conditions Vulnerability Classification	Future Percent Imperviousness	Future Conditions Vulnerability Classification
Hoghole Run	4.82	3.65%	Sensitive	9.37%	Sensitive/Borderline
Jennie Run	3.97	8.25%	Sensitive	21.12%	Impacted
La Plata	4.90	11.25%	Impacted	22.39%	Impacted
Lower Port Tobacco East	3.44	2.29%	Sensitive	9.80%	Sensitive/Borderline
Lower Port Tobacco West	7.64	2.44%	Sensitive	3.49%	Sensitive
Middle Port Tobacco	3.65	2.77%	Sensitive	8.41%	Sensitive/Borderline
Pages Swamp	6.06	4.92%	Sensitive	11.15%	Impacted
Upper Port Tobacco Creek	5.09	10.77%	Impacted	27.45%	Non-Supporting
Wills Branch	4.22	6.09%	Sensitive	11.68%	Impacted
Grand Total	43.78	5.82%	Sensitive	13.87%	Impacted

Methodology for Development of Additional Subwatershed Management Classifications

For the Port Tobacco Watershed, the Center developed three subwatershed management classifications, beyond the *sensitive*, *impacted*, and *non-supporting* classifications associated with the impervious cover analysis. The three additional classifications are Impacted Water Quality, Pristine, and Vulnerable to Future Development. These classifications will be used to assess priority subwatersheds and develop more specific management recommendations for the Port Tobacco Creek subwatersheds. A description of each of the three additional classifications and the data used to develop them are provided below.

Impacted Water Quality

A number of factors were evaluated to develop an impacted water quality point system. In this system, if a screening factor indicated that water quality was impacted, either five or ten points were assigned to the subwatershed, depending on the severity of the impact. The accumulated points were normalized, the highest scoring subwatershed(s) flagged and assessed during a field verification process. A description of the data and data sources used to evaluate impacted water quality are listed below:

- Length of 303d listed waters, based on data available from the EPA Basins database.
- Sewer Density, based on Maryland Property View points and the Charles County Sewer Areas from the Maryland Department of Planning (MDP).
- Waste Water Treatment Plant (WWTP) Discharges, based on WWTP locations from the EPA Basins database and flow estimates from the TMDL report prepared by the Maryland Department of the Environment (MDE, 1999).
- Phosphate, Nitrate, and E. coli concentrations collected during a Maryland Department of Natural Resources (DNR) Synoptic Survey. The DNR synoptic survey data was analyzed based on concentration (baseline, moderate, high, or excessive) and the percentage of subwatershed area sampled at each monitoring location. A subwatershed received points for a high percentage of sampled area with high or excessive concentrations.
- Nitrate, Physical Habitat Index (PHI), Fish Index of Biotic Integrity (FIBI), and Benthic Index of Biotic Integrity (BIBI) data collected from DNR Maryland Biological Stream Survey Data (MBSS). Similar to the DNR synoptic data, the MBSS data was analyzed based on concentration (good, fair, poor, very poor) and the percentage of subwatershed area sampled at each monitoring location. A subwatershed received points for a high percentage of sampled area with poor or very poor results.

Based on the scoring of these factors, the La Plata and Middle Port Tobacco subwatersheds were classified for Impacted Water Quality. A summary scoring table with results is presented in Table B-7.

Pristine

The Pristine classification was developed similarly to the Impacted Water Quality classification, though only subwatersheds classified as *sensitive* during the impervious cover analysis were evaluated for a pristine categorization. If a screening factor indicated a subwatershed had characteristics of a Pristine subwatershed, generally based on percentage of subwatershed area with high quality natural resources, either five or ten points were assigned to the subwatershed, depending on the extent of the resource. The accumulated points were normalized and the highest scoring subwatershed(s) flagged and assessed during a field verification process. A description of the data and data sources used to evaluate the pristine attributes of the subwatersheds are listed below:

- The length of impacted riparian buffers in each subwatershed was scored two ways; (1) the total impacted buffer stream length identified during a DNR Stream Corridor Assessment (SCA), and (2) the length of stream located outside of a forest/brush area, as identified in the MDP Charles County Land Use Layer from 2002. These two factors were each scored out of a possible five points (10 possible points for length of impacted buffer).
- Percentage of Contiguous Forest area in each subwatershed, based on DNR contiguous forest layer.
- Percentage of Sensitive Species Area in each subwatershed, based on DNR statewide sensitive species project review areas data.
- Percentage of Wetland area in each subwatershed, based on DNR wetlands of special state concern data.
- Percentage of Critical Area in each subwatershed, based on DNR critical areas in Charles County.
- Phosphate, Nitrate, and E. coli concentrations collected during a Maryland Department of Natural Resources (DNR) Synoptic Survey. The DNR synoptic survey data was analyzed based on concentration (baseline, moderate, high, or excessive) and the percentage of subwatershed area sampled at each monitoring location. A subwatershed received points for a high percentage of sampled area with baseline or moderate concentrations.
- Nitrate, Physical Habitat Index (PHI), Fish Index of Biotic Integrity (FIBI), and Benthic Index of Biotic Integrity (BIBI) data collected from DNR Maryland Biological Stream Survey Data (MBSS). Similar to the DNR synoptic data, the MBSS data was analyzed based on concentration (good, fair, poor, very poor) and the percentage of subwatershed area sampled at each monitoring location. A subwatershed received points for a high percentage of sampled area with good or fair results.

After scoring these items, it was decided that no subwatersheds in the Port Tobacco watershed can be considered Pristine. The subwatersheds that scored high on these measures are considered sensitive. The initial scoring is presented in Table B-8.

Vulnerable to Future Development

Similar to the previous classifications, a number of screening factors were considered to determine which subwatersheds are vulnerable to future development. If a screening factor positively indicated a subwatershed was vulnerable to future development, it was given either five or ten points. The accumulated points were normalized and the highest scoring subwatershed(s) flagged and assessed during the field verification process. A description of the data and data sources used to evaluate which subwatersheds were vulnerable to future development are listed below:

- Percentage of each subwatershed with existing or planned sewer service, based on the Charles County Sewer Areas from MDP.
- Percentage of each subwatershed with Priority Funding Areas, based on MDP Priority Funding Area data.
- Percent increase in impervious area between existing land use and build out conditions, based on Charles County and the Town of La Plata zoning. A review of Charles County and La Plata zoning categories was conducted to correlate proposed land uses (based on zoning) with an impervious cover coefficient. The selection of impervious cover coefficients was based on a study conducted by the Center, *Impervious Cover and Land Use in the Chesapeake Bay Watershed* (Cappiella and Brown, 2001). Table B-3 and Table B-4 summarize the results of the zoning review and correlated impervious cover coefficients for Charles County and La Plata, respectively.

Based on the scoring of these factors, Jennie Run, La Plata and Upper Port Tobacco Creek subwatersheds were classified as Vulnerable to Future Development. A summary scoring table with results is presented in Table B-9.

Classification Results

The final management classifications for the subwatersheds are listed in Table B-6 and depicted on a map in Figure B-2.

Table B-6 Final Management Classifications for the Port Tobacco Subwatersheds	
Subwatershed	Revised Management Classification
Hoghole Run	Sensitive
Jennie Run	Vulnerable to Future Development
La Plata	Vulnerable to Future Development AND Impacted Water Quality
Lower Port Tobacco East	Sensitive
Lower Port Tobacco West	Sensitive
Middle Port Tobacco	Impacted Water Quality
Pages Swamp	Sensitive
Upper Port Tobacco Creek	Vulnerable to Future Development
Wills Branch	Sensitive

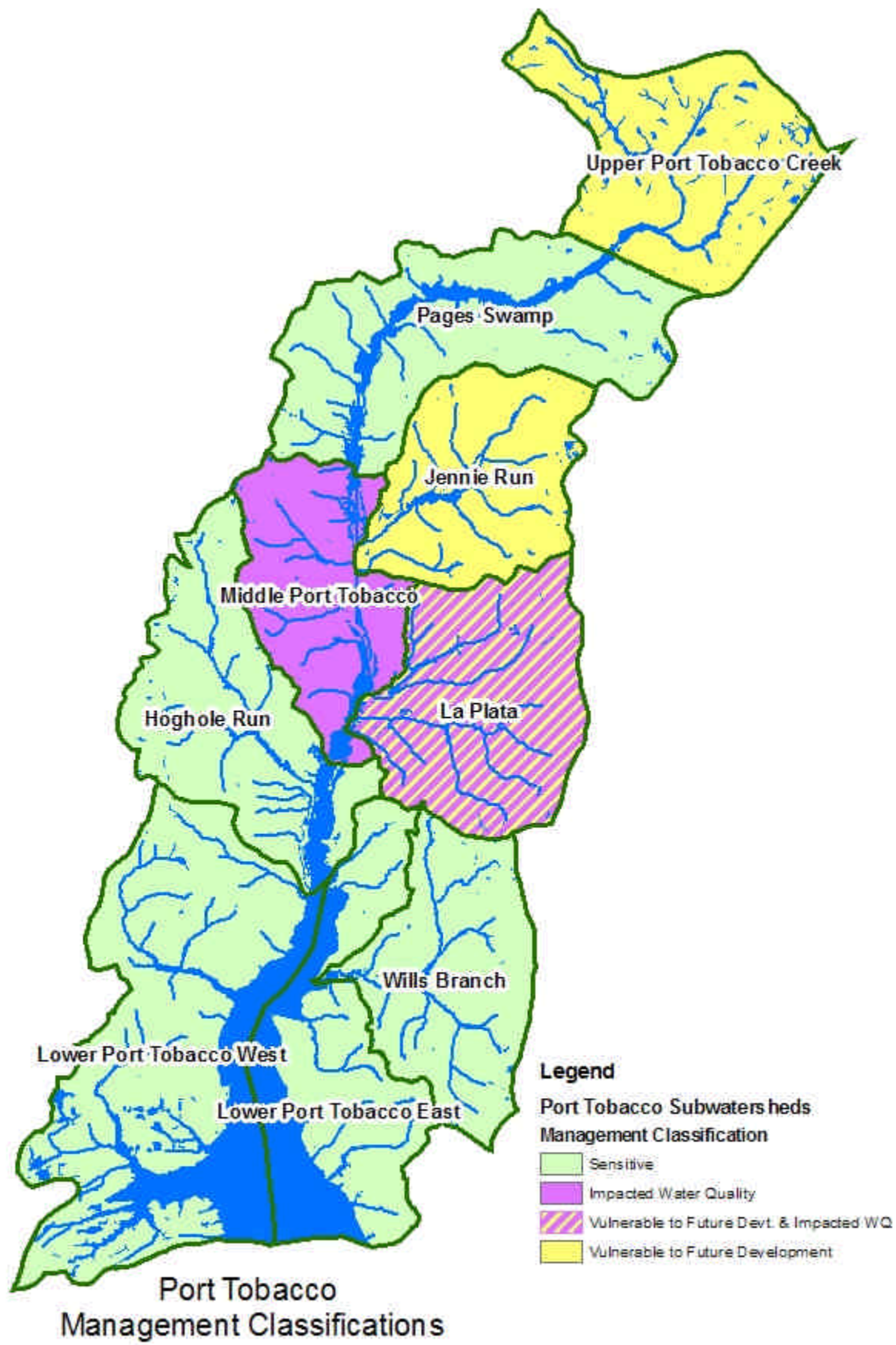


Figure B-1

Table B-7
 Port Tobacco
 Additional Subwatershed Classifications
Impacted Water Quality

Name	Stream Length (m)	Length of 303d Listed Waters (m)	% of 303d Listed Length	Points 10 pts if %303d Length > 25%, 5 pts if %303d Length > 15%, 0 pts if < 15%	Number of PropertyViewPts in 'No Planned Sewer Service' Areas	Area (m ²)	Area (mi ²)	Area (acre)	Sewer Density (Pts/mi ²)	Points 10 pts if Density > 100 pts/mi ² , 5 pts if Density > 50 pts/mi ² , 0 pts if < 50 pts/mi ²	WWTP Flow (mgd)	Points 10 pts if WWTP Flow > 0.5 mgd, 5 pts if WWTP Flow > 0, 0 pts if WWTP Flow = 0	SCA Erosion Length (m)	% SCA Eroded Length
Hoghole Run	18737.9	2248.62	12.00	0	504	12669963.7	4.89	3130.88	103.0675	10	0	0	2827.61	15.09
Jennie Run	16132.39	179.54	1.11	0	328	10285735.5	3.97	2541.44	82.61965	5	0.017	5	996.75	6.18
La Plata	18849.8	624.76	3.31	0	346	12681941.9	4.89	3134.08	70.75665	5	0.9023	10	6610.84	35.07
Lower Port Tobacco East	12881.74	0	0.00	0	143	12824812	4.95	3169.28	28.88889	0	0	0	1036.98	8.05
Lower Port Tobacco West	34311.97	0	0.00	0	322	23893803.9	9.22	5904	34.92408	0	0	0	2777.47	8.09
Middle Port Tobacco	18104.38	4366.01	24.12	5	344	9442215.61	3.64	2333.44	94.50549	5	0.0275	5	2422.04	13.38
Pages Swamp	22705.81	6842.58	30.14	10	705	15684965.5	6.05	3875.84	116.5289	10	0	0	3585.35	15.79
Upper Port Tobacco Creek	10683.03	4143.39	38.78	10	0	13174747.6	5.08	3255.68	0	0	0	0	102.09	0.96
Wills Branch	16738.15	0	0.00	0	356	10959444.2	4.23	2707.84	84.16076	5	0.0093	5	5331.42	31.85

Table B-7
 Port Tobacco
 Additional Subwatershed Classifications
Impacted Water Quality

MBSS Data (Percentage of Total Sampled Area Sampled Characterized as Good, Fair, Poor, or Very Poor or Undisturbed/Impacted)

Name	Nitrate (NO3)		Points	Physical Habitat Index (PHI)				Points	Fish Index of Biotic Integrity (FIBI)				Points
	Undisturbed	Impacted		Good	Fair	Poor	Very Poor		Good	Fair	Poor	Very Poor	
Hoghole Run	100.00%	0.00%	0	23.28%	76.72%	0.00%	0.00%	0	0.00%	0.00%	23.28%	76.72%	10
Jennie Run	--	--	--	--	--	--	--	--	--	--	--	--	--
La Plata	0.00%	100.00%	10	50.51%	49.49%	0.00%	0.00%	0	0.00%	97.39%	2.61%	0.00%	0
Lower Port Tobacco East	--	--	--	--	--	--	--	--	--	--	--	--	--
Lower Port Tobacco West	--	--	--	90.59%	9.41%	0.00%	0.00%	0	0.00%	0.00%	23.93%	76.07%	10
Middle Port Tobacco	--	--	--	--	--	--	--	--	--	--	--	--	--
Pages Swamp	--	--	--	100.00%	0.00%	0.00%	0.00%	0	0.00%	100.00%	0.00%	0.00%	0
Upper Port Tobacco Creek	--	--	--	--	--	--	--	--	--	--	--	--	--
Wills Branch	100.00%	0.00%	0	100.00%	0.00%	0.00%	0.00%	0	0.00%	0.00%	0.00%	100.00%	10

Table B-7
 Port Tobacco
 Additional Subwatershed Classifications
Impacted Water Quality

Name	Points 10 pts if % Eroded Stream Length > 25%, 5 pts if % Eroded Stream Length >15%, 0 pts if % Eroded Stream Length <15%	DNR Synoptic Survey (Percentage of Total Sampled Area with a Baseline, Moderate, High, or Excessive WQ Characterization)														
		Phosphate (mg/L)				Points	Nitrate (mg/L)				Points	Ecoli (MPN)				Points
		Baseline	Moderate	High	Excessive		Baseline	Moderate	High	Excessive		Baseline	Moderate	High	Excessive	
Hoghole Run	5	3.11%	96.89%	0.00%	0.00%	0	97.26%	2.74%	0.00%	0.00%	0	97.26%	0.00%	2.74%	0.00%	5
Jennie Run	0	6.81%	69.58%	23.62%	0.00%	0	51.46%	39.90%	0.00%	8.65%	10	85.03%	14.97%	0.00%	0.00%	0
La Plata	10	0.00%	63.29%	29.53%	7.18%	10	78.37%	21.63%	0.00%	0.00%	0	100.00%	0.00%	0.00%	0.00%	0
Lower Port Tobacco East	0	19.97%	65.91%	14.12%	0.00%	0	85.88%	14.12%	0.00%	0.00%	0	69.31%	0.00%	30.69%	0.00%	5
Lower Port Tobacco West	0	0.00%	0.00%	100.00%	0.00%	5	100.00%	0.00%	0.00%	0.00%	0	100.00%	0.00%	0.00%	0.00%	0
Middle Port Tobacco	0	0.00%	67.54%	32.46%	0.00%	0	100.00%	0.00%	0.00%	0.00%	0	62.70%	0.00%	0.00%	37.30%	10
Pages Swamp	5	55.31%	44.69%	0.00%	0.00%	0	100.00%	0.00%	0.00%	0.00%	0	100.00%	0.00%	0.00%	0.00%	0
Upper Port Tobacco Creek	0	100.00%	0.00%	0.00%	0.00%	0	100.00%	0.00%	0.00%	0.00%	0	100.00%	0.00%	0.00%	0.00%	0
Wills Branch	10	0.00%	87.67%	12.33%	0.00%	0	100.00%	0.00%	0.00%	0.00%	0	100.00%	0.00%	0.00%	0.00%	0

Table B-7
 Port Tobacco
 Additional Subwatershed Classifications
 Impacted Water Quality (Adjusted for Nitrate)

Name	Benthic Index of Biotic Integrity (BIBI)				Points	Total Possible Points	Total Points Scored	Score (% Possible)
	Good	Fair	Poor	Very Poor				
Hoghole Run	0.00%	100.00%	0.00%	0.00%	0	110	30	27.27%
Jennie Run	--	--	--	--	--	70	20	28.57%
La Plata	0.00%	0.00%	98.42%	1.58%	5	110	50	45.45%
Lower Port Tobacco East	--	--	--	--	--	70	5	7.14%
Lower Port Tobacco West	33.34%	66.66%	0.00%	0.00%	0	100	15	15.00%
Middle Port Tobacco	--	--	--	--	--	70	25	35.71%
Pages Swamp	0.00%	100.00%	0.00%	0.00%	0	100	25	25.00%
Upper Port Tobacco Creek	--	--	--	--	--	70	10	14.29%
Wills Branch	0.00%	100.00%	0.00%	0.00%	0	110	30	27.27%

Table B-8
 Port Tobacco
 Additional Subwatershed Classifications
Pristine

Name	Stream Length (m)	IB Length (m)	%IB (Based on SCA)	Points		Stream Length in Forest/Brush (m)	% Stream not in Forest/Brush (Based On Land Use)	Points		Contiguous Forest Area (m2)	Contiguous Forest Area (mi2)	% Contiguous Forest Area	Points	
				5 pts if <4%, 2.5 pts if <8%, 0 pts if >10%				5 pts if <5%, 2.5 pts if <10%, 0 pts if >10%					10 pts if >45%, 5 pts if >35%, 0 pts if <35%	
Hoghole Run	18737.9	4151.59	22.16	0.0	13412.49	28.42	0.0	7493597.89	2.89	60.05%	10			
Jennie Run	16132.39	1884.74	11.68	0.0	11934.68	26.02	0.0	3639454.14	1.41	35.38%	5			
La Plata	18849.8	3814.51	20.24	0.0	13442.53	28.69	0.0	3677581.37	1.42	29.00%	0			
Lower Port Tobacco East	12881.74	0	0.00	5.0	8488.9	34.10	0.0	3546071.41	1.37	39.79%	5			
Lower Port Tobacco West	34311.97	832.28	2.43	5.0	28829.49	15.98	0.0	9803056.85	3.78	49.55%	10			
Middle Port Tobacco	18104.38	3667.18	20.26	0.0	14041.2	22.44	0.0	4512070.72	1.74	47.79%	10			
Pages Swamp	22705.81	994.68	4.38	2.5	21358.65	5.93	2.5	6484346.99	2.50	41.34%	5			
Upper Port Tobacco Creek	10683.03	418.02	3.91	5.0	9065.04	15.15	0.0	5521879.83	2.13	41.91%	5			
Wills Branch	16738.15	1033.22	6.17	2.5	14455.11	13.64	0.0	5389779.69	2.08	49.28%	10			

Table B-8
 Port Tobacco
 Additional Subwatershed Classifications
Pristine

Name	Sensitive Species Areas (mi ²)	Points			Wetland Area (m ²)	Wetland Area (mi ²)	Points		Critical Area (m ²)	Critical Area (mi ²)	Points	
		% Sensitive Species Area	10 pts if >20%, 5 pts if >15%, 0 pts if <15%				% Wetland Area	10 pts if >9%, 5 pts if >7%, 0 pts if <6%			% Critical Area	10 pts if >25%, 5 pts if >15%, 0 pts if <15%
Hoghole Run	0.98	20.43%	10	922915.69	0.356	7.40%	5	1361296.2	0.526	10.91%	0	
Jennie Run	0.00	0.05%	0	352829.54	0.136	3.43%	0	0	0	0.00%	0	
La Plata	0.18	3.66%	0	283873.71	0.110	2.24%	0	0	0	0.00%	0	
Lower Port Tobacco East	0.00	0.00%	0	222086.77	0.086	2.49%	0	2587934.32	0.999	29.04%	10	
Lower Port Tobacco West	1.82	23.85%	10	1572758.95	0.607	7.95%	5	5454111.71	2.106	27.57%	10	
Middle Port Tobacco	1.03	28.20%	10	722523.78	0.279	7.65%	5	0	0	0.00%	0	
Pages Swamp	0.00	0.00%	0	1484422.87	0.573	9.46%	10	0	0	0.00%	0	
Upper Port Tobacco Creek	0.86	16.93%	5	1130262.89	0.436	8.58%	5	0	0	0.00%	0	
Wills Branch	0.00	0.00%	0	327186.26	0.126	2.99%	0	136665.56	0.053	1.25%	0	

Table B-8
 Port Tobacco
 Additional Subwatershed Classifications
Pristine

Name	DNR Synoptic Survey (Percentage of Total Sampled Area with a Baseline, Moderate, High or Excessive WQ Characterization)															
	Phosphate (mg/L)				Points	Nitrate (mg/L)				Points	Ecoli (MPN)				Points	
	Baseline	Moderate	High	Excessive	10 pts if Baseline = 100%, 5 pts if Moderate > High, 0 pts if Excessive+ High >	Baseline	Moderate	High	Excessive	10 pts if Baseline = 100%, 5 pts if Moderate > High, 0 pts if Excessive+ High >	Baseline	Moderate	High	Excessive	10 pts if Baseline = 100%, 5 pts if Moderate > High, 0 pts if Excessive+ High > 0%	
Hoghole Run	3.11%	96.89%	0.00%	0.00%	5	97.26%	2.74%	0.00%	0.00%	5	97.26%	0.00%	2.74%	0.00%	0	
Jennie Run	6.81%	69.58%	23.62%	0.00%	5	51.46%	39.90%	0.00%	8.65%	5	85.03%	14.97%	0.00%	0.00%	5	
La Plata	0.00%	63.29%	29.53%	7.18%	5	78.37%	21.63%	0.00%	0.00%	5	100.00%	0.00%	0.00%	0.00%	10	
Lower Port Tobacco East	19.97%	65.91%	14.12%	0.00%	5	85.88%	14.12%	0.00%	0.00%	5	69.31%	0.00%	30.69%	0.00%	0	
Lower Port Tobacco West	0.00%	0.00%	100.00%	0.00%	0	100.00%	0.00%	0.00%	0.00%	10	100.00%	0.00%	0.00%	0.00%	10	
Middle Port Tobacco	0.00%	67.54%	32.46%	0.00%	5	100.00%	0.00%	0.00%	0.00%	10	62.70%	0.00%	0.00%	37.30%	0	
Pages Swamp	55.31%	44.69%	0.00%	0.00%	5	100.00%	0.00%	0.00%	0.00%	10	100.00%	0.00%	0.00%	0.00%	10	
Upper Port Tobacco Creek	100.00%	0.00%	0.00%	0.00%	10	100.00%	0.00%	0.00%	0.00%	10	100.00%	0.00%	0.00%	0.00%	10	
Wills Branch	0.00%	87.67%	12.33%	0.00%	5	100.00%	0.00%	0.00%	0.00%	10	100.00%	0.00%	0.00%	0.00%	10	

Table B-8
 Port Tobacco
 Additional Subwatershed Classifications
Pristine

Name	Nitrate (NO3)		Points	Physical Habitat Index (PHI)				Points	Fish Index of Biotic Integrity (FIBI)				Points
	Undisturbed	Impacted		Good	Fair	Poor	Very Poor		Good	Fair	Poor	Very Poor	
			10 pts if Unimpacted > 50%, 5 pts if Unimpacted > 25%, 0 pts if Unimpacted < 25%					10 pts if Good = 100%, 5 pts if Fair > Moderate, 0 pts if Poor + Very Poor > 0%					10 pts if Good = 100%, 5 pts if Fair > Moderate, 0 pts if Poor + Very Poor > 0%
Hoghole Run	100.00%	0.00%	10	23.28%	76.72%	0.00%	0.00%	5	0.00%	0.00%	23.28%	76.72%	0
Jennie Run	--	--	--	--	--	--	--	0	--	--	--	--	0
La Plata	0.00%	100.00%	0	50.51%	49.49%	0.00%	0.00%	5	0.00%	97.39%	2.61%	0.00%	5
Lower Port Tobacco East	--	--	--	--	--	--	--	0	--	--	--	--	0
Lower Port Tobacco West	--	--	--	90.59%	9.41%	0.00%	0.00%	5	0.00%	0.00%	23.93%	76.07%	0
Middle Port Tobacco	--	--	--	--	--	--	--	0	--	--	--	--	0
Pages Swamp	--	--	--	100.00%	0.00%	0.00%	0.00%	10	0.00%	100.00%	0.00%	0.00%	5
Upper Port Tobacco Creek	--	--	--	--	--	--	--	0	--	--	--	--	0
Wills Branch	100.00%	0.00%	10	100.00%	0.00%	0.00%	0.00%	10	0.00%	0.00%	0.00%	100.00%	0

Table B-8
 Port Tobacco
 Additional Subwatershed Classifications
Pristine (ate)

Name	Benthic Index of Biotic Integrity (BIBI)				Points	Total Possible Points	Total Points Scored	Score (% Possible)
	Good	Fair	Poor	Very Poor				
Hoghole Run	0.00%	100.00%	0.00%	0.00%	5	130	55.0	42%
Jennie Run	--	--	--	--	0	90	20.0	22%
La Plata	0.00%	0.00%	98.42%	1.58%	0	130	30.0	23%
Lower Port Tobacco East	--	--	--	--	0	90	30.0	33%
Lower Port Tobacco West	33.34%	66.66%	0.00%	0.00%	5	120	70.0	58%
Middle Port Tobacco	--	--	--	--	0	90	40.0	44%
Pages Swamp	0.00%	100.00%	0.00%	0.00%	5	120	65.0	54%
Upper Port Tobacco Creek	--	--	--	--	0	90	50.0	56%
Wills Branch	0.00%	100.00%	0.00%	0.00%	5	130	62.5	48%

10 pts if Good = 100%, 5 pts if Fair > Moderate, 0 pts if Poor + Very Poor > 0%

* Upper PT "Impacted" based on existing Land Use IC.

Table B-9
Port Tobacco
Additional Subwatershed Classifications
Vulnerable to Future Development

	No Planned Sewer Service Area (m2)	Existing or Planned Sewer Service Area (aka Development Boundary) (m2)	% Subwatershed with Existing or Planned Sewer Service	Points 10 pts if >50%, 5 pts if >25%, 0 pts if <25%	Priority Funding Area (m2)	% Subwatershed in Priority Funding Area	Points 10 pts if >50%, 5 pts if >25%, 0 pts if <25%	Charles County Zoning		Future Impervious Area ** (m2)	Future Impervious Area (acre)	Future Impervious Area (%)	Existing Impervious Cover (acre)	Existing Impervious Area (%)	Existing Vulnerability Classification	Future Vulnerability Classification	Impervious Area Increase (%)	Points 10 pts if >10%, 5 pts if >5%, 0 pts if <5%	Total Possible Points	Total Points Scored	Score (% Possible)
								Future Impervious Total (m ²)	La Plata Zoning Future Impervious Total (m ²)												
Hoghole Run	12,515,680.12	0.00	0.00%	0	739,267.35	5.92%	0	1,168,706.57	0.00	1,168,706.57	288.79	9.37%	112.51	3.65%	Sensitive	Tweener	5.72%	5	30	5	17%
Jennie Run	8,699,250.23	1,586,485.23	15.42%	0	1,287,275.64	12.52%	0	1,931,141.46	241,685.73	2,172,827.19	536.92	21.12%	209.56	8.25%	Sensitive	Impacted	12.88%	10	30	10	33%
La Plata	7,677,333.62	5,004,608.30	39.46%	5	6,266,628.19	49.41%	5	703,905.73	2,135,931.45	2,839,837.17	701.74	22.39%	352.41	11.25%	Impacted	Impacted	11.15%	10	30	20	67%
Lower Port Tobacco East	8,855,928.93	0.00	0.00%	0	7,878.03	0.09%	0	871,270.18	2,399.73	873,669.92	215.89	9.80%	50.42	2.29%	Sensitive	Tweener	7.51%	5	30	5	17%
Lower Port Tobacco West	19,844,820.07	0.00	0.00%	0	9,690.82	0.05%	0	413,970.70	0.00	689,434.40	170.36	3.49%	119.05	2.44%	Sensitive	Sensitive	1.05%	0	30	0	0%
Middle Port Tobacco	9,172,196.00	270,019.58	2.86%	0	56,499.79	0.60%	0	793,908.42	0.00	793,908.42	196.18	8.41%	64.54	2.77%	Sensitive	Tweener	5.64%	5	30	5	17%
Pages Swamp	14,552,604.97	1,132,360.51	7.22%	0	69,217.82	0.44%	0	1,748,572.62	0.00	1,748,572.62	432.08	11.15%	190.68	4.92%	Sensitive	Impacted	6.23%	5	30	5	17%
Upper Port Tobacco Creek	832.26	13,173,915.36	99.99%	10	11,888,209.19	90.23%	10	3,616,543.80	0.00	3,616,543.80	893.67	27.45%	350.65	10.77%	Impacted	Non Supporting	16.68%	10	30	30	100%
Wills Branch	10,688,914.49	266,821.74	2.44%	0	321,859.92	2.94%	0	1,258,136.82	19,204.59	1,277,341.41	315.64	11.68%	164.66	6.09%	Sensitive	Impacted	5.59%	5	30	5	17%

** Zoning Information not available for entire extent of Lower Port Tobacco West Subwatershed. Existing Land Use Impervious Cover Estimates used where zoning not available.