Comprehensive State Forest Inventory for the State of Maryland

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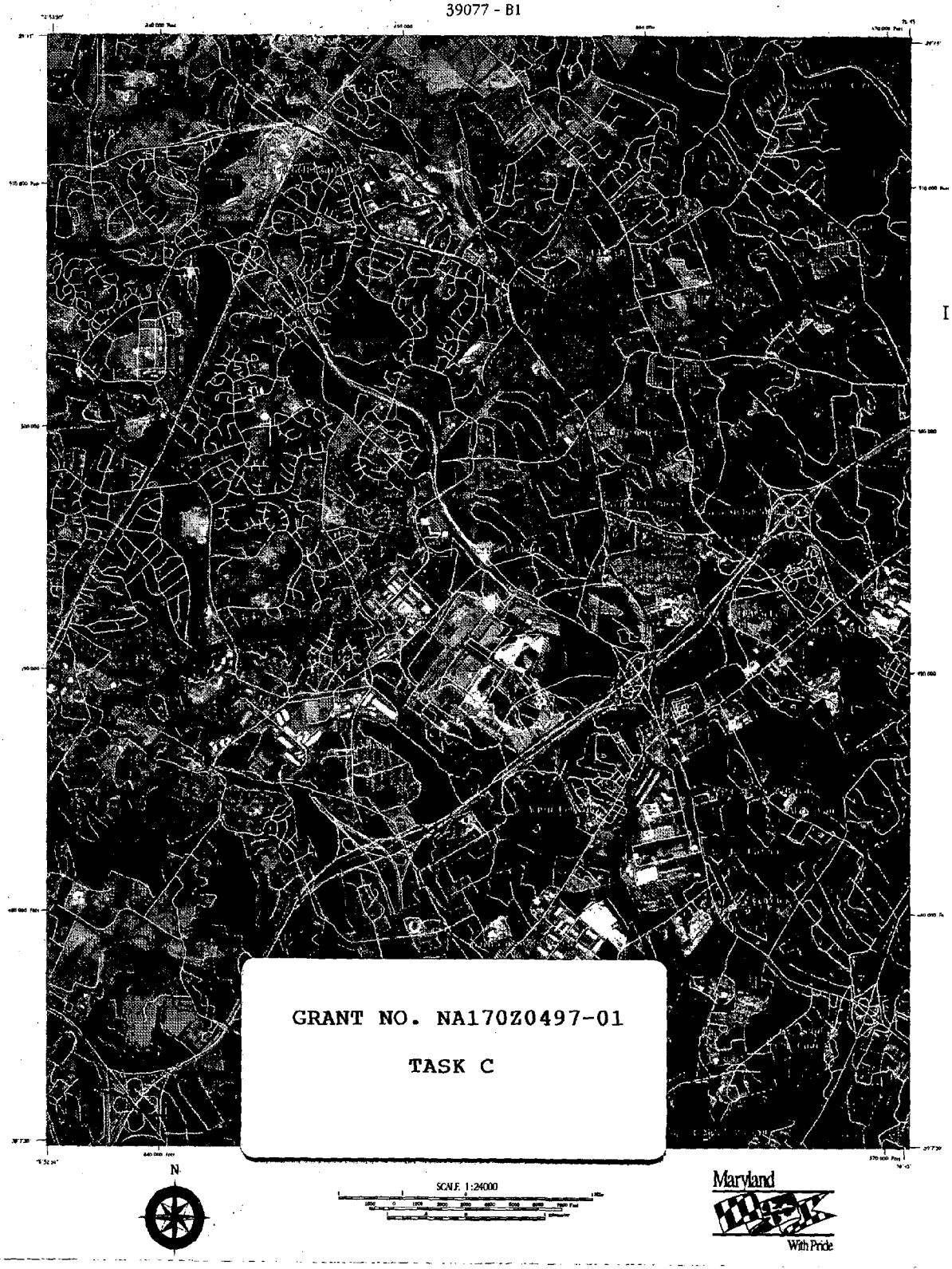

This Project was funded in part by a Coastal Zone Management Program Implementation Grant, Office of Coastal Resources Management, National Oceanographic and Atmospheric Administration (NOAA).

Comprehensive State Forest Inventory for the State of Maryland

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Background

Salisbury State University's Image Processing & Remote Sensing Center was contracted in 1992 by the Maryland Department of Natural Resources' Forest Service to perform a complete forest inventory of the State as part of, and in compliance with, the Forest Conservation Act of 1991. Funding for the inventory came from a number of sources, including the State's 1992 309 CZM Grant. The first year's effort is designed to provided to both the State and various jurisdictions (especially Counties) a series of maps and aggregate statistics on the type and distribution of forest cover throughout the State. The inventory is based on the derivation of forest signatures through computerized means from digital Landsat satellite data through the use of image processing, remote sensing and statistical techniques suitable for inclusion in a standard Geographic Information System (GIS). The data derived are being managed so that in a second year's effort they can be further analyzed for tracking purposes and to provide more detailed information on prioritized afforestation/reforestation sites and characteristics of the buffer areas adjacent to streams. This information will also be useful in the State's efforts to meet its nutrient reduction commitment under the 1987 Chesapeake Bay Agreement.

Overview & Summary of Tasks

1. Acquire recent passes (leaf on and leaf off) TM to cover the entire state.
2. Delineate forested areas with a minimum mapping unit of one acre for non-stream associated areas and 100 feet for linear areas associated with streams and forest corridors.
3. Utilize TM data to classify forested areas with respect to type.
4. Produce statistical summaries for each county and subwatershed.
5. Characterize 100 foot and 300 foot riparian buffers according to presence/absence of forest cover. Identify reforestation/afforestation sites for the entire state.
6. Produce hard copy maps and associated digital data files and statistical summaries.

Objectives and Methods:

The inventory produced at Salisbury State University's Image Processing & Remote Sensing Center used MIPS and ARC/INFO software to create maps and statistical summaries and their associated digital data. Statistical summaries were generated by county, watershed and subwatershed so that specific information could be obtained for forest types within subwatershed components within individual counties. The data could also be aggregated to larger geographic and political units. Examples of the statistical tables for the Patuxent River Watershed can be found in the appendices.

The minimum mapping unit is one acre for non-stream associated areas and one hundred feet for linear features associated with streams and forest corridors. Forest typing was done by using leaf on state-wide coverage from three full Landsat Thematic Mapper scenes and two map sheets acquired in Fall 1991. A second complete leaf-off data set was acquired for Spring 1992 to allow for future refinement of the forest cover in order to generate maximum cover type differentiation. Adjustments to the delineation and typing to permit mapping at a scale of 1:24000 were made by overlaying the analytically derived forest clusters from the Landsat data set over SPOT 10 meter panchromatic base maps.

Sequential Procedure for Preparation of Digital Files:

The process by which the final digital files representing polygonal forest data were created was as follows:

1. Acquisition of digital Landsat Thematic Mapper data from EOSAT Corp. to include full State of Maryland Coverage. Appendix I shows the scene selection process.

2. Transfer of the digital data from open reel tape to disk. This was done on the SSU Academic Vax.

3. Rotation to true north and algorithmic correction for scene spectral variation, as well as edge enhancement and contrast stretching. These routines were done on the VAX minicomputer using ASTEP software.

4. Signature extraction through unsupervised clustering techniques. The Vax was used to derive signatures by developing covariance matrixes of spectrally significant classes of landcover. The resulting classes were mapped and those corresponding to vegetative groups were analyzed and compared to sites for which there existed detailed knowledge from field visits.

5. Signature grouping and reextraction based on ground-truthing of test sites. Two test sites (quads) for each county were initially selected and field data from these sites was compared to the data generated by cluster analysis from the Landsat scenes. Scene-tolerant signatures corresponding to Anderson categories 41: Deciduous forest, 42: Coniferous forest, 43: Mixed Forest, and 44: Shrub/Scrub & Regenerating forest were computed and the scenes reprocessed to derive pixel-specific classification "maps".

6. Overlay of Watershed, Subwatershed and County boundary files. The rasterized data was combined with polygons representing the State's watersheds, subwatersheds, and counties. Pixel counts were then made of classified pixels that corresponded to the forest type and assigned membership according to their inclusion in one or more of the overlay files.

7. Polygon generation of forest types. A raster-to-vector conversion process was developed on the VAX that created polygons for each cluster of three or more pixels that had been identified as belonging to one of the four forest type categories. Islands of less than three pixels were filled and reclassified with the adjoining classification except when adjacent to streams. In those instances where pixels of three or less grouping were adjacent to streams they were allowed to form string polygons.

8. Classification of polygons according to forest type. A set of decision rules was employed to allow the forest class polygons to be classified according to their prevailing forest type. Generally, the computer was instructed to examine each polygon and evaluate the percentages and distributions of each of the forest types within that polygon. If one type predominated, the polygon was labeled by that type. If one type was most characteristic of the area, a comparison table was examined in an attempt to achieve a minimum 40% representation by the classification type. Cases of high density inclusion of specific types and cases of large inclusion of non-forest islands were handled separately by tagging for manual inspection and determination. Polygons were classified as mixed forest type when no clear predominance of a type could be established.

9. Export of polygons and polygon attributes. Forest polygons derived in the previous steps were exported in ASCII format by coordinate pair representation to PC-DOS compatible format using network interchange protocols.

10. Import of Vax-generated polygons into PC-ArcInfo. The polygon files developed above were brought into a coverage format file using ArcInfo's Import algorithm. The data was cleaned and new polygons built.

11. Joining and edge-matching of forest polygons. ArcInfo was used to assemble the polygon data from the three Landsat scenes and two Landsat map sheets into 18 files that were adjusted to cover the map extents of the 18 watersheds of the State. The files covered geographically rectangular areas and thus overlapped to some extent.

12. Intersection of County and Subwatershed Boundaries. Each watershed was intersected with the subwatershed and county boundary files to allow categorization of polygons into subwatershed and county units (multiple attribute assignment). Polygons were rebuilt where they were intersected using ArcInfo.

13. Conversion of ArcInfo Generate polygon files to MIPS .rvf files. The polygon files developed in step #12 were imported into MIPS .rvf format and converted to be compatible with the projection and unit of measure inherent in the .rvf SPOT satellite raster files (i.e. NAD 1927 State Plane and linear meters). Reregistration was undertaken to match the two data sets. In most cases the registration adjustments were minor since both data sets had been projected onto a Space Oblique Mercator sphere.

14. Visual inspection of forest polygons with manual adjustment of boundaries. The forest polygons originating from classified TM data were overlain onto the SPOT panchromatic base and then adjusted where boundary mismatches occurred. The adjustments followed general photogrammetric interpretive principles.

15. After adjustment the files were converted back to ArcInfo coverage format and a final statistical series was produced. Appendix II summarizes the acreage statistics for forest type grouped by County, Watershed, and Subwatershed. Appendix III contains a more detailed statistical breakdown for the Patuxent River Watershed. Similar statistical breakdowns are available for the other major watersheds of the State. Appendix III also contains a map showing the geographic location of the Patuxent River watershed along with maps showing the distribution of subwatersheds in the counties in which the Patuxent River watershed is located. Similar maps are available for all the counties in Maryland.

Forest Buffer Characterization:

A second undertaking involved the computation of forest buffers and the typing of streams according to their forested buffers. The procedure followed was:

1. Computation of 100 and 300 foot stream buffers. ArcInfo was used to generate two files for each watershed containing the polygon data representing the 100 and 300 foot stream buffers. The source data was the stream file currently used within the State and developed through the efforts of the Maryland Office of Planning.

2. Export of the buffer files and transfer of classified raster image files from the minicomputer to the PC. The ArcInfo buffer files were exported to a MIPS

.rvf format and introduced as overlays on the imported classified Landsat TM files previously resident on the VAX. The resulting files were visually interpreted and node points set at the start and stop of forested buffer zones.

3. Examination and classification of forested buffer zones. Appendix IV provides an example of the resulting tabulation of the stream buffer characterization for the Patuxent River watershed along with a map showing the distribution of streams and subwatersheds in the Watershed. Stream reaches were classified as to whether they had forest buffers on one or both sides and with widths of at least 100 or 300 feet.

Hardcopy Map Generation:

The final process in generating the data onto a map base was done in two steps.

1. A procedure was developed to generate mylar plots using ArcInfo by subwatershed of the streams, 300 foot buffers, forest polygons by forest type and subwatershed boundaries at a scale of 1:62500. The mylar may be placed over the appropriate County topographic map.

2. A second procedure was developed to overlay the forest data, subwatershed and watershed boundaries, streams, and 300 foot stream buffer on 7.5 minute quad SPOT base imagery using MIPS software. Appropriate cultural (e.g. transportation) and geographic (e.g. streams) are included. An example of a forest inventory 7.5 minute quadmap is also included in Appendix V.

Digital Layers:

The data plotted and printed in the previous steps is also available as digital layered information for analysis and display using a GIS. Enhancement of the data through common registration will allow comparison with the 100 year flood plain and critical area boundaries as well

as data for threatened/endangered species and data concerning Forest Interior Dwelling Birds. Likewise, comparison to the Maryland Office of Planning data sets is also possible, and may be especially useful in reference to MOP's Land Use/Land Cover data

Utilization of Forest Inventory in Associated Study of Forest Interior Dwelling Bird Habitat:

In an associated study, Salisbury State University's Image Processing Center has agreed to map Forest Interior Dwelling Bird habitat by the following process:

1. Using photo interpretation and ground truthing, develop techniques for delineating size classes. These size classes are expected to be at least sufficient to identify less than pole, pole, and greater than pole sizes of forest stands.

2. Combine forest size class data and cover type data with acreage guidelines provided by the Nongame & Urban Wildlife Program to delineate Forest Interior Dwelling Bird habitat.

3. Produce digital files at a minimum scale of 1:24000, 7.5 minute quad based, of Forest Interior Dwelling Bird Habitat.

4. Produce hard-copy maps delineating Forest Interior Dwelling Bird habitat by county at a scale of 1:62500 (1:63360).

5. Provide summary statistics for Forest Interior Dwelling Bird habitat statewide and by county, physiographic region, and Critical Area.

PROJECT SCOPE - 1993 CONTINUATION EFFORT:

Background

In addition to performing a complete forest inventory of the state as detailed above, the Forest Conservation Act of 1991 requires the Department of Natural Resources to develop procedures to review State sponsored development plans and associated forest stand delineations and forest conservation plans, and to review local forest conservation programs and assess their effectiveness in promoting the conservation of forests as required by the Act. The following objectives and tasks were developed by the DNR Forest Service and Salisbury State University's Image Processing & Remote Sensing Center AND 1993 CZM Section 309 grant funding requested in order to address these requirements.

Objectives

To facilitate the use of the forest inventory by the Forest Service and counties in tracking development activities, and in prioritizing sites for and monitoring the integrity of retained and planted forests.

Tasks

1. Modify the existing forest resource inventory database to include refinements of the delineation based on a comparison of two dates of Thematic Mapper information (one leaf on, one leaf off). Relevant ancillary information will be included as appropriate.

2. Develop methodologies for using the forest inventory in conjunction with other data bases to prioritize the areas best suited for forest retention, and for reforestation and afforestation activities.

3. Develop project tracking systems for the State and local jurisdictions to ensure compliance with the provisions of the Forest Conservation Act and the long-term protection of designated retention, reforestation and afforestation areas, as well as areas protected and exempted under declarations of intent.

4. Develop a computerized data base on land use, land ownership and other features pertinent to conservation of forest cover, linked to the forest inventory geographic data base, for those counties within the State for which the Service has direct responsibility.

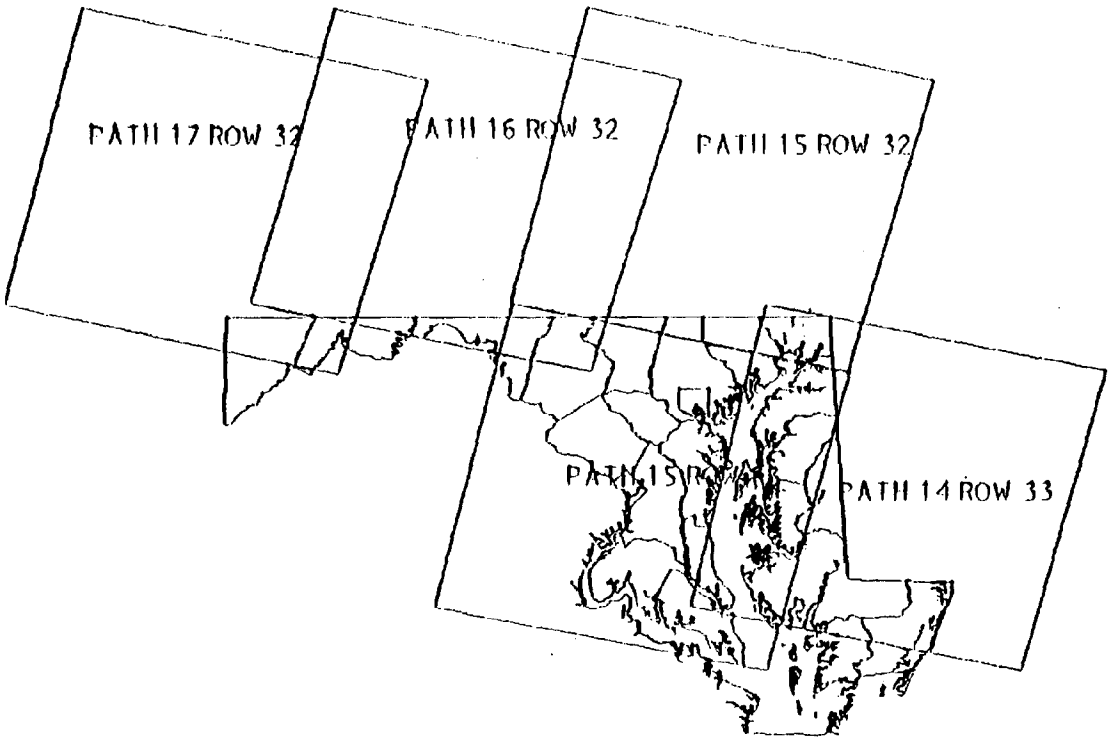
5. Demonstrate the content and utility of the forest resource inventory to personnel of the Forest Service and local jurisdictions, and solicit suggestions on what additional information and capabilities are needed to ensure effective tracking of development projects and associated forested areas in order to meet the requirements of the State Forest Conservation Act..

6. Incorporate changes suggested by users of the inventory and develop ancillary data layers and methodologies to increase the utility of the inventory and improve effectiveness of the tracking systems.

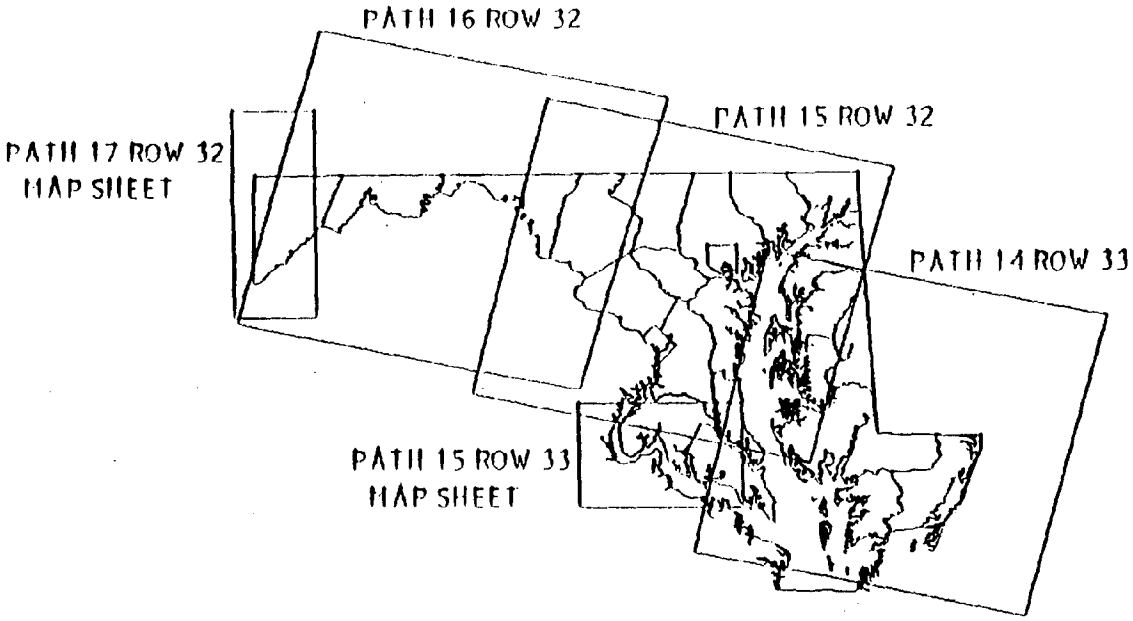
APPENDIX I

LANDSAT TM SCENE DISTRIBUTION

1) "LEAF-ON" COVERAGE FOR 1991				
PATH/ROW	**SHIFT**	**ID NUMBER**	**DATE**	**CLOUD COVER CHECKED**
14/33 Full Scene	30%	5014033009125210	9/9/91	Color Proof
15/32 Full Scene	80%	5015032009117910	6/28/91	Color Proof
15/33 Map Sheet	50%	5015033009125910	9/16/91	Color Proof
16/32 Full Scene	50%	5016032009125010	9/7/91	Xerox Proof
17/32 Map Sheet	50%	5017032009127310	9/30/91	Xerox Proof
2) "LEAF-OFF" COVERAGE FOR 1992				
PATH/ROW	**SHIFT**	**ID NUMBER**	**DATE**	**CLOUD COVER CHECKED**
14/33 Full Scene	30%	5014033009201510	1/15/92	Color Proof
15/32 Full Scene	80%	5015032009229410	10/20/92	EOSAT Sugestion
15/33 Map Sheet	50%	5015033009229410	10/20/92	EOSAT Sugestion
16/32 Full Scene	50%	5016032009206110	3/1/92	Xerox Proof
17/32 Map Sheet	50%	5017032009230810	11/3/92	EOSAT Sugestion



THIS DIAGRAM ILLUSTRATES THE PLACEMENT OF THE FIVE SCENES THAT WE WILL NEED SHIFTED TO ACQUIRE FULL MARYLAND STATE COVERAGE.



THESE ARE THE SAME FIVE SCENES AFTER THEY HAVE BEEN SHIFTED.

PLEASE NOTE THAT PATH 17 ROW 32 IS A NARROW MAP SHEET (1°lat. by ½° long.)

ALSO NOTE THAT PATH 15 ROW 33 IS A WIDE MAP SHEET (½°lat. by 1° long)

APPENDIX II

COUNTY ACREAGE DISTRIBUTION OF MARYLAND FOREST TYPES BY ANALYSIS OF LANDSAT THEMATIC MAPPER IMAGERY

County	Watershed	SubWs	41: Deciduous	42:Coniferous	43:Mixed	44:Shrub/Scrub	Side Totals	Land Area
Allegany								
	Upper Potomac							
		2140508	9,818.04	429.39	7,917.26	226.99	18,392	20,684
		2140510	2,121.60	369.45	2,636.16	70.09	5,197	8,791
		2140511	14,191.43	312.23	16,233.10	673.14	31,410	33,389
		2140512	13,834.26	202.71	19,357.40	389.07	33,783	43,446
	TM Vector Total		**39,965.33**	**1,313.78**	**46,143.92**	**1,359.29**	**88,782**	**106,310**
	N. Branch Potomac							
		2141001	42,991.77	158.37	10,403.31	1,947.66	55,501	73,025
		2141002	7,131.57	162.84	5,866.48	640.33	13,801	20,666
		2141003	24,096.11	320.70	2,050.25	2,966.25	29,433	38,795
		2141004	15,703.29	256.81	68.62	3,009.89	19,039	35,471
		2141006	153.35	78.31	12.34	54.88	299	820
	TM Vector Total		**90,076.09**	**977.03**	**18,401.00**	**8,619.01**	**118,073**	**168,777**
TM Vector total for county			**130,041.42**	**2,290.81**	**64,544.92**	**9,978.30**	**206,855**	**275,087**
Anne Arundel								
	Patapsco							
		2130902	1,084.68	179.23	1,540.15	38.22	2,842	5,946
		2130903	3,096.28	1,147.34	4,770.44	256.92	9,271	30,596
		2130906	3,609.37	772.77	2,116.49	237.41	6,736	15,193
	TM Vector Total		**7,790.34**	**2,099.34**	**8,427.08**	**532.55**	**18,849**	**51,735**
	W. Chesapeake Bay							
		2131001	3,446.51	492.56	3,498.54	179.80	7,617	23,213
		2131002	5,755.33	836.43	8,408.61	374.34	15,375	44,908
		2131003	1,946.03	496.71	13,276.26	111.68	15,831	38,035
		2131004	2,932.39	688.64	4,268.34	56.95	7,946	16,814
		2131005	4,565.39	58.19	2,015.15	35.90	6,675	15,027
	TM Vector Total		**18,645.65**	**2,572.54**	**31,488.90**	**758.68**	**53,444**	**137,997**
	Patuxent							
		2131101	874.75	138.49	232.14	26.83	1,272	3,097
		2131102	9,935.13	588.69	1,438.97	440.51	12,403	27,023
		2131104	6,795.37	1,374.73	5,044.98	254.96	13,470	22,176
		2131105	7,171.97	2,003.81	5,550.69	561.83	15,288	28,230
	TM Vector Total		**24,777.22**	**4,105.72**	**12,266.77**	**1,284.13**	**42,434**	**80,526**
TM Vector total for county			**51,213.21**	**8,777.60**	**52,160.76**	**2,575.34**	**114,727**	
Baltimore(city)								
	Patapsco							
		2130901	412.90	90.79	141.91	152.72	798	
		2130903	53.93	312.74	182.41	452.80	1,002	
		2130904	733.62	77.65	55.64	25.65	893	
		2130905	1,574.24	16.54	98.49	45.85	1,735	
		2130906	20.05	49.44	39.20	86.86	196	
	TM Vector Total		**2,794.74**	**547.16**	**517.65**	**763.89**	**4,623**	
TM Vector total for county			**2,794.74**	**547.16**	**517.65**	**763.89**	**4,623**	
Baltimore(cnty)								
	Susquehanna							
		2120202	1,673.04	377.96	71.13	86.52	2,209	7,144
	TM Vector Total		**1,673.04**	**465.05**	**87.52**	**106.45**	**2,332**	**7,144**
	Gunpowder							
		2130801	3,021.19	64.16	400.81	432.73	3,919	6,338
		2130802	13,782.50	553.47	117.51	193.24	14,647	29,178
		2130803	6,738.51	112.85	123.43	1,269.26	8,244	16,057
		2130804	7,633.80	53.64	63.52	50.55	7,802	17,442
		2130805	47,272.62	3,174.67	1,526.43	2,831.90	54,806	139,767
		2130806	8,386.86	2,217.32	764.53	682.66	12,051	25,539
		2130807	2,745.79	150.33	101.00	267.75	3,265	10,055
	TM Vector Total		**89,581.28**	**6,326.42**	**3,097.23**	**5,728.09**	**104,733**	**244,376**

County	Watershed	SubWs	41: Deciduous	42:Coniferous	43:Mixed	44:Shrub/Scrub	Side Totals	Land Area
	Patapsco							
		2130901	4,827.48	152.43	31.58	793.22	5,805	34,221
		2130903	923.85	127.01	6.54	362.33	1,420	25,071
		2130904	7,988.63	205.48	20.07	120.00	8,334	38,792
		2130905	6,317.74	744.50	80.12	822.66	7,965	40,684
		2130906	16,279.67	50.69	218.32	1,123.55	17,672	35,096
		2130907	8,663.04	1,356.23	172.89	547.92	10,740	17,736
	TM Vector Total		45,000.42	2,636.34	529.51	3,769.68	51,936	191,600
TM Vector total for county			136,254.75	6,842.16	3,403.07	6,958.10	153,458	
Calvert								
	W. Chesapeake Bay							
		2131005	23,977.71	258.69	2,108.61	302.45	26,647	37,298
	TM Vector Total		23,977.71	258.69	2,108.61	302.45	26,647	37,298
	Patuxent							
		2131101	55,560.40	3,276.89	10,025.08	1,667.91	70,530	96,656
		2131102	3,279.53	129.98	165.82	138.06	3,713	5,976
	TM Vector Total		58,839.93	3,406.87	10,190.89	1,805.97	74,244	102,632
TM Vector total for county			82,817.64	3,665.55	12,299.50	2,108.42	100,891	
Caroline								
	Nanticoke							
		2130305	44.12	12.15	18.31	55.32	130	142
		2130306	4,999.73	166.88	10,235.66	928.96	16,331	40,479
	TM Vector Total		5,043.85	179.03	10,253.97	984.28	16,461	40,621
	Choptank							
		2130403	680.64	24.83	961.95	116.56	1,784	8,354
		2130404	26,009.61	2,018.59	19,548.51	1,461.97	49,039	121,148
		2130405	6,654.81	296.06	2,466.06	250.12	9,667	36,285
	TM Vector Total		33,345.05	2,339.48	22,976.51	1,828.65	60,490	165,787
TM Vector total for county			38,388.90	2,518.51	33,230.48	2,812.93	76,951	
Carroll								
	Gunpowder							
		2130805	73.71	18.23	21.82	150.98	265	558
		2130806	5,590.50	96.54	29.12	129.11	5,845	21,022
	TM Vector Total		5,664.21	114.76	50.94	280.09	6,110	21,580
	Patapsco							
		2130906	393.62	57.60	19.71	30.02	501	513
		2130907	17,628.53	1,603.79	2,258.48	1,174.24	22,665	87,111
		2130908	12,148.41	185.22	822.69	1,315.10	14,471	38,744
	TM Vector Total		30,170.55	1,846.61	3,100.88	2,519.36	37,637	126,368
	Middle Potomac							
		2140302	1,154.43	10.16	393.54	143.64	1,702	5,432
		2140303	3,713.63	120.51	239.48	306.10	4,380	27,403
		2140304	20,223.59	688.13	1,407.15	1,065.48	23,384	108,958
	TM Vector Total		25,091.65	818.79	2,040.17	1,515.22	29,466	141,793
TM Vector total for county			60,926.41	2,780.17	5,191.99	4,314.67	73,213	
Cecil								
	Susquehanna							
		2120201	4,116.58	2.22	98.24	184.94	4,402	12,582
		2120203	5,725.98	9.00	24.78	102.04	5,862	22,423
		2120204	2,296.27	150.97	272.06	7.01	2,726	6,230
	TM Vector Total		12,138.83	162.19	395.08	293.99	12,990	41,235

County	Watershed	SubWs	41: Deciduous	42:Coniferous	43:Mixed	44:Shrub/Scrub	Side Totals	Land Area
	Elk							
		2130601	8,427.08	399.30	1,071.38	62.22	9,960	26,487
		2130602	3,392.78	21.49	1,129.64	18.96	4,563	27,105
		2130603	7,454.26	78.54	737.01	575.63	8,845	20,500
		2130604	2,134.16	181.09	170.11	429.16	2,915	8,804
		2130605	3,629.42	7.70	17.32	63.30	3,718	15,138
		2130606	2,734.63	4.71	209.21	58.78	3,007	11,414
		2130607	815.78	186.26	5.73	181.14	1,189	5,045
		2130608	15,128.23	79.09	1,500.84	363.34	17,072	40,040
		2130609	4,464.73	40.37	145.11	289.48	4,940	14,153
		2130610	3,030.74	153.02	66.45	9.18	3,259	17,541
	TM Vector Total		**51,211.81**	**1,151.55**	**5,052.81**	**2,051.20**	**59,467**	**186,227**
TM Vector total for county			**63,350.84**	**1,313.74**	**5,447.89**	**2,345.19**	**72,457**	
Charles								
	Patuxent							
		2131101	865.94	114.22	5,870.52	120.20	6,971	18,086
	TM Vector Total		**865.94**	**114.22**	**5,870.52**	**120.20**	**6,971**	**18,086**
	Lower Potomac							
		2140101	4,292.29	166.79	8,165.95	512.69	13,138	28,697
		2140102	9,078.37	188.04	4,988.90	706.58	14,962	19,546
		2140106	3,850.75	59.92	3,303.16	152.87	7,367	17,453
		2140107	9,846.36	89.44	2,793.79	186.61	12,916	24,937
		2140108	29,670.20	322.40	11,859.17	1,632.08	43,484	65,240
		2140109	17,048.40	98.21	3,032.22	291.78	20,471	28,520
		2140110	11,719.74	1,060.00	21,621.01	1,503.16	35,904	46,471
		2140111	27,872.97	310.32	2,426.99	177.89	30,788	44,479
	TM Vector Total		**113,379.09**	**2,295.12**	**58,191.19**	**5,163.66**	**179,029**	**275,343**
	Washington Metro							
		2140201	619.59	31.04	160.68	36.60	848	1,096
	TM Vector Total		**619.59**	**31.04**	**160.68**	**36.60**	**848**	**1,096**
TM Vector total for county			**114,864.61**	**2,440.38**	**64,222.39**	**5,320.47**	**186,848**	
Dorchester								
	Nanticoke							
		2130305	2,857.88	1,989.11	5,897.46	2,216.81	12,961	38,949
		2130306	1,101.43	1,156.36	12,581.11	2,403.20	17,242	38,775
		2130307	13,098.48	16,234.86	13,761.29	2,833.87	45,928	102,336
		2130308	13,353.36	6,328.27	14,073.48	3,367.98	37,123	72,053
	TM Vector Total		**30,411.15**	**25,708.60**	**46,313.33**	**10,821.86**	**113,255**	**252,113**
	Choptank							
		2130401	0.26	7,420.00	1,014.32	719.53	9,154	27,072
		2130402	3,616.48	7,714.36	11,552.73	2,826.46	25,710	47,518
		2130403	3,758.32	2,287.07	5,340.21	2,214.89	13,600	39,306
	TM Vector Total		**7,375.05**	**17,421.42**	**17,907.26**	**5,760.89**	**48,465**	**113,896**
TM Vector total for county			**37,786.20**	**43,130.02**	**64,220.60**	**16,582.75**	**161,720**	
Frederick								
	Washington Metro							
		2140202	257.45	44.80	32.83	25.98	361	445
	TM Vector Total		**257.45**	**44.80**	**32.83**	**25.98**	**361**	**445**
	Middle Potomac							
		2140301	6,177.75	34.98	218.97	170.16	6,602	33,114
		2140302	31,259.03	1,261.49	805.99	1,380.18	34,707	169,130
		2140303	41,004.20	465.72	1,634.54	493.18	43,598	147,328
		2140304	1,352.07	38.92	101.42	97.42	1,590	17,861
		2140305	16,760.43	205.01	864.77	563.32	18,394	76,904
	TM Vector Total		**96,553.47**	**2,006.11**	**3,625.69**	**2,704.25**	**104,890**	**444,337**
TM Vector total for county			**96,810.92**	**2,050.91**	**3,658.51**	**2,730.22**	**105,251**	

County	Watershed	SubWs	41: Deciduous	42:Coniferous	43:Mixed	44:Shrub/Scrub	Side Totals	Land Area
Garrett								
	N. Branch Potomac							
		2141001	155.69	47.68	13.65	31.42	248	279
		2141004	8,519.06	296.18	64.70	1,520.47	10,400	11,968
		2141005	52,494.09	1,305.17	2,081.01	1,774.98	57,655	67,380
		2141006	48,135.62	1,576.27	6,486.83	2,206.91	58,406	73,264
	TM Vector Total		109,304.46	3,225.30	8,646.19	5,533.78	126,710	152,891
	Youghiogheny							
		5020201	91,158.06	3,492.16	5,327.04	4,117.08	104,094	154,485
		5020202	5,745.42	294.71	52.04	568.57	6,661	13,103
		5020203	19,032.80	500.23	1,237.18	1,169.27	21,939	40,933
		5020204	28,296.80	1,218.48	7,060.76	2,611.61	39,188	58,805
	TM Vector Total		144,233.07	5,505.58	13,677.03	8,466.53	171,882	267,326
TM Vector total for county			253,537.53	8,730.88	22,323.22	14,000.31	298,592	
Harford								
	Susquehanna							
		2120201	3,967.42	13.38	27.43	42.81	4,051	8,333
		2120202	33,223.16	288.05	2413.02	572.72	36,497	85,885
		2120204	3,463.73	26.40	106.60	14.73	3,611	8,629
		2120205	10,474.41	194.03	462.19	273.57	11,404	26,059
	TM Vector Total		51,128.72	521.86	3,009.25	903.83	55,584	128,906
	Bush							
		2130701	21,183.94	36.01	1508.68	260.84	22,989	36,374
		2130702	4,758.13	30.68	472.49	79.23	5,341	8,552
		2130703	9,332.86	36.47	242.87	209.43	9,822	29,830
		2130704	2,122.22	11.53	43.26	233.32	2,410	13,822
		2130705	12,770.77	385.05	1076.07	240.57	14,472	21,783
		2130706	8,459.91	20.78	344.67	75.57	8,901	16,134
	TM Vector Total		58,627.83	520.51	3,688.03	1,098.96	63,935	126,495
	Gunpowder							
		2130801	3,333.86	290.54	540.73	23.27	4,188	8,362
		2130802	63.95	17.14	42.62	3.74	127	80
		2130804	7,593.67	80.22	153.61	74.39	7,902	19,865
		2130805	97.54	36.15	101.02	26.91	262	841
	TM Vector Total		11,089.02	424.05	837.97	128.32	12,479	29,148
TM Vector total for county			120,845.57	945.90	3,847.22	1,032.15	126,671	
Howard								
	Patapsco							
		2130906	7,374.25	126.00	3,636.74	897.28	12,034	24,330
		2130908	4,480.78	39.88	296.04	157.94	4,975	16,216
	TM Vector Total		11,855.03	165.87	3,932.78	1,055.22	17,009	40,546
	Patuxent							
		2131104	254.43	18.08	481.04	2.34	756	1,643
		2131105	6,080.94	541.31	2,609.04	3,067.48	12,299	37,984
		2131106	9,264.72	451.64	925.83	1,098.65	11,741	37,074
		2131107	2,140.17	151.66	904.41	229.00	3,425	8,021
		2131108	7,371.22	148.17	2,242.91	1,126.79	10,889	36,990
	TM Vector Total		25,111.48	1,310.86	7,163.23	5,524.26	39,110	121,712
TM Vector total for county			36,966.51	1,476.73	11,096.01	6,579.48	56,119	
Kent								
	Chester							
		2130505	4,367.17	575.41	2,833.31	56.37	7,832	22,612
		2130506	3,990.30	216.96	2,014.79	75.23	6,297	24,361
		2130509	4,036.23	25.70	150.46	35.75	4,248	30,054
		2130510	10,475.69	67.03	1,162.87	72.26	11,778	34,731
	TM Vector Total		22,869.38	885.11	6,161.42	239.60	30,156	111,758

County	Watershed	SubWs	41: Deciduous	42:Coniferous	43:Mixed	44:Shrub/Scrub	Side Totals	Land Area
	Elk							
		2130610	9,232.99	136.79	197.87	92.71	9,660	32,869
		2130611	10,330.65	82.33	215.63	244.68	10,873	37,190
	TM Vector Total		19,563.64	219.12	413.50	337.39	20,534	70,059
TM Vector total for county			42,433.02	1,104.23	6,574.92	576.99	50,689	
Montgomery								
	Patuxent							
		2131107	4,196.66	136.99	1,846.31	448.74	6,629	25,716
		2131108	1,757.39	247.05	270.06	627.61	2,902	13,522
	TM Vector Total		5,954.05	384.04	2,116.37	1,076.35	9,531	39,238
	Washington Metro							
		2140202	13,250.59	320.21	3,171.11	2,245.36	18,987	84,660
		2140205	4,167.70	20.91	1,567.55	1,102.34	6,858	38,352
		2140206	3,738.35	595.81	284.23	1,031.04	5,649	39,705
		2140207	1,540.31	62.74	328.06	258.84	2,190	16,415
		2140208	11,361.16	1,322.16	2,862.00	2,225.99	17,771	83,730
	TM Vector Total		34,058.10	2,321.83	8,212.94	6,863.57	51,456	262,862
	Middle Potomac							
		2140302	3,678.81	332.67	955.92	467.49	5,435	20,182
	TM Vector Total		3,678.81	332.67	955.92	467.49	5,435	20,182
TM Vector total for county			43,690.97	3,038.54	11,285.23	8,407.41	66,422	
Prince Georges								
	Patuxent							
		2131101	3,155.46	159.13	18,269.65	177.67	21,762	30,938
		2131102	9,242.60	145.19	10,758.18	249.27	20,395	35,654
		2131103	15,004.68	127.32	7,224.87	409.08	22,766	59,544
		2131104	4,570.83	156.97	9,833.67	325.98	14,887	32,205
		2131107	78.34	19.47	197.18	42.15	337	861
	TM Vector Total		32,051.90	608.09	46,283.54	1,204.15	80,148	159,202
	Lower Potomac							
		2140108	93.27	184.63	2,879.55	10.04	3,167	4,657
		2140111	7,109.18	616.88	3,244.49	146.55	11,117	15,656
	TM Vector Total		7,665.54	807.77	6,358.08	200.76	15,032	20,313
	Washington Metro							
		2140201	6,302.87	146.59	2,304.53	87.36	8,841	26,695
		2140203	14,456.54	455.75	6,001.34	315.12	21,229	43,628
		2140204	757.78	24.53	666.73	53.02	1,502	6,447
		2140205	7,349.66	488.95	6,955.77	682.54	15,477	54,247
	TM Vector Total		28,866.85	1,115.82	15,928.37	1,138.03	47,049	131,017
TM Vector total for county			68,584.30	2,531.68	68,569.99	2,542.94	142,229	
Queen Annes								
	Choptank							
		2130404	1,218.33	106.81	69.69	70.19	1,465	1,920
		2130405	16,226.67	273.11	2,039.06	138.48	18,677	45,878
	TM Vector Total		17,445.00	379.92	2,108.75	208.67	20,142	47,798
	Chester							
		2130501	1,370.19	261.50	1,334.98	177.60	3,144	11,425
		2130503	8,900.00	35.20	3,352.63	41.22	12,329	27,032
		2130504	329.58	183.19	2,352.60	387.02	3,252	8,068
		2130505	5,692.82	426.97	2,680.09	264.15	9,064	17,611
		2130507	6,030.36	536.20	4,097.05	52.88	10,716	24,456
		2130508	11,679.38	161.40	2,667.13	49.84	14,558	35,296
		2130509	816.07	276.85	687.42	444.34	2,225	8,046
		2130510	22,706.78	549.48	404.86	196.74	23,858	52,108
		2130511	1,157.36	31.15	306.65	46.77	1,542	5,541
	TM Vector Total		58,682.53	2,461.95	17,883.40	1,660.56	80,688	189,583
TM Vector total for county			76,127.53	2,841.87	19,992.15	1,869.23	100,831	

County	Watershed	SubWs	41: Deciduous	42:Coniferous	43:Mixed	44:Shrub/Scrub	Side Totals	Land Area
St. Marys								
	Patuxent							
		2131101	10,019.20	1,941.62	26,741.00	709.92	39,412	61,687
	TM Vector Total		10,019.20	1,941.62	26,741.00	709.92	39,412	61,687
	Lower Potomac							
		2140101	2,851.58	1,302.35	9,318.20	395.91	13,868	27,236
		2140103	858.69	2,970.07	22,202.62	852.02	26,883	46,652
		2140104	15,474.41	3,585.45	9,500.02	745.38	29,305	36,289
		2140105	12,493.46	1,488.56	6,963.43	603.17	21,549	29,507
		2140106	13,544.31	564.64	2,866.24	547.08	17,522	32,167
		2140107	1,189.12	260.91	141.41	39.31	1,631	2,820
	TM Vector Total		46,411.57	10,171.98	50,991.93	3,182.87	110,758	174,671
TM Vector total for county			56,430.77	12,113.60	77,732.93	3,892.79	150,170	
Somerset								
	Pocomoke							
		2130201	9,229.15	8,792.88	2,557.03	2,594.00	23,173	35,138
		2130202	7,709.72	2,057.51	1,293.77	1,450.57	12,512	19,279
		2130204	3,574.83	1,028.64	2,977.23	1,539.18	9,120	10,860
		2130206	263.16	739.66	450.55	102.36	1,556	19,284
		2130207	3,877.60	3,126.46	1,730.25	1,034.59	9,769	22,945
		2130208	15,172.91	5,475.51	4,899.59	5,285.66	30,834	60,958
	TM Vector Total		39,827.36	21,220.66	13,908.42	12,006.37	86,963	168,464
	Nanticoke							
		2130301	921.47	19.86	196.61	27.21	1,165	3,740
		2130302	3,586.05	1,508.96	1,486.51	1,187.82	7,769	19,646
		2130303	3,673.43	1,286.89	1,627.31	1,636.65	8,224	11,789
	TM Vector Total		8,180.95	2,815.70	3,310.43	2,851.68	17,159	35,175
TM Vector total for county			48,008.31	24,036.36	17,218.85	14,858.05	104,122	
Talbot								
	Choptank							
		2130403	3,696.56	3,115.37	11,517.55	365.28	18,695	71,322
		2130404	5,031.88	354.10	4,939.90	409.30	10,735	36,093
		2130405	1,033.30	18.56	1,714.97	177.68	2,944	15,966
	TM Vector Total		9,761.74	3,488.02	18,172.42	952.26	32,374	123,381
	Chester							
		2130501	172.76	208.48	653.35	28.43	1,063	3,105
		2130502	4,038.64	487.76	4,545.27	312.89	9,385	28,440
		2130503	4,708.03	72.66	720.86	46.68	5,548	20,977
	TM Vector Total		8,919.43	768.90	5,919.49	388.01	15,996	52,522
TM Vector total for county			18,681.18	4,256.93	24,091.90	1,340.26	48,370	
Washington								
	Middle Potomac							
		2140301	4,723.96	22.03	46.57	76.23	4,869	9,897
	TM Vector Total		4,723.96	22.03	46.57	76.23	4,869	9,897
	Upper Potomac							
		2140501	19,404.60	950.10	2,674.98	1,474.79	24,504	58,752
		2140501A	4,422.30	367.92	2,421.91	173.17	7,385	11,640
		2140502	25,786.60	247.82	780.22	2,638.47	29,453	118,587
		2140503	1,519.99	38.34	22.75	420.32	2,001	13,275
		2140505	3,234.73	23.32	12.56	68.29	3,339	10,709
		2140506	9,955.13	222.11	2,703.22	80.19	12,961	17,912
		2140507	63.66	60.94	712.02	344.41	1,181	1,339
		2140509	2,580.12	277.82	2,621.94	123.16	5,603	9,931
		2140510	1,766.88	222.84	1,719.84	440.58	4,150	5,291
	TM Vector Total		69,162.33	2,235.31	11,738.62	7,731.88	90,868	247,436
TM Vector total for county			73,886.29	2,257.35	11,785.19	7,808.11	95,737	

County	Watershed	SubWs	41: Deciduous	42:Coniferous	43:Mixed	44:Shrub/Scrub	Side Totals	Land Area
Wicomico								
	Pocomoke							
		2130203	6,658.51	1,635.27	8,475.84	2,509.16	19,279	43,190
		2130204	16.86	317.45	725.44	165.55	1,225	2,332
		2130205	2,052.66	3,384.96	5,368.45	1,843.36	12,649	18,433
	TM Vector Total		8,728.03	5,337.67	14,569.72	4,518.06	33,153	63,955
	Nanticoke							
		2130301	3,177.60	6,806.67	11,129.73	2,975.30	24,089	70,274
		2130303	1,485.38	365.59	1,547.30	347.48	3,746	8,744
		2130304	383.30	2,046.33	6,072.27	850.31	9,352	25,857
		2130305	9,672.02	6,463.50	12,626.03	5,054.26	33,816	75,291
	TM Vector Total		14,718.29	15,682.09	31,375.33	9,227.34	71,003	180,166
TM Vector total for county			23,446.33	21,019.76	45,945.05	13,745.41	104,157	
Worcester								
	Ocean/Coastal							
		2130101	23.36	10.79	1.55	7.59	43	0
		2130102	9.81	210.01	831.85	331.48	1,383	6,910
		2130103	1,363.45	1,846.42	8,958.76	644.15	12,813	34,793
		2130104	185.20	277.30	1,403.79	693.97	2,560	8,298
		2130105	1,033.78	1,061.00	8,137.76	427.66	10,660	27,290
		2130106	376.11	2,831.90	8,865.01	3,568.36	15,641	37,554
	TM Vector Total		2,991.71	6,237.43	28,198.72	5,673.23	43,101	114,845
	Pocomoke							
		2130202	13,330.30	11,198.20	26,727.65	9,099.34	60,355	80,410
		2130203	12,961.60	5,791.01	17,136.87	4,572.11	40,462	51,969
		2130204	2,856.09	8,692.44	9,803.53	3,574.31	24,926	26,891
		2130205	2,816.66	2,749.97	9,246.50	3,457.13	18,270	25,321
	TM Vector Total		31,964.65	28,431.63	62,914.56	20,702.90	144,014	184,591
TM Vector total for county			34,956.37	34,669.06	91,113.28	26,376.12	187,115	

APPENDIX III

VECTOR STATISTICS FOR FOREST TYPES IN THE PATUXENT RIVER WATERSHED

Subwatershed	County	Forest Type	# Acres by Forest Type (TM)	Total Area of Subwtrshd in Co.	Total Forests of Subwtrshd in Co.
02131101 Lower Patuxent River	Anne Arundel	41: Deciduous	*874.75*	28.25%	68.76%
		42: Coniferous	*138.49*	4.47%	10.89%
		43: Mixed	*232.14*	7.50%	18.25%
		44: Shrub/Scrub	*26.83*	0.87%	2.11%
		Total Forest	**1,272.21**	**41.08%**	
		Total Area	**3,097.00**		
	Calvert	41: Deciduous	*59,825.91*	61.90%	82.96%
		42: Coniferous	*1,373.17*	1.42%	1.90%
		43: Mixed	*9,694.58*	10.03%	13.44%
		44: Shrub/Scrub	*1,223.13*	1.27%	1.70%
		Total Forest	**72,116.79**	**74.61%**	
		Total Area	**96,656.00**		
	Charles	41: Deciduous	*865.94*	4.79%	12.42%
		42: Coniferous	*114.22*	0.63%	1.64%
		43: Mixed	*5,870.52*	32.46%	84.21%
		44: Shrub/Scrub	*120.20*	0.66%	1.72%
		Total Forest	**6,970.88**	**38.54%**	
		Total Area	**18,086.00**		
	Prince Georges	41: Deciduous	*3,155.46*	10.20%	14.50%
		42: Coniferous	*159.13*	0.51%	0.73%
		43: Mixed	*18,269.65*	59.05%	83.95%
		44: Shrub/Scrub	*177.67*	0.57%	0.82%
		Total Forest	**21,761.90**	**70.34%**	
		Total Area	**30,938.00**		
	St Marys	41: Deciduous	*10,019.20*	16.24%	25.42%
		42: Coniferous	*1,941.62*	3.15%	4.93%
		43: Mixed	*26,741.00*	43.35%	67.85%
		44: Shrub/Scrub	*709.92*	1.15%	1.80%
		Total Forest	**39,411.74**	**63.89%**	
		Total Area	**61,687.00**		
	TOTAL	41: Deciduous	74,741.26	35.51%	52.81%
		42: Coniferous	3,726.63	1.77%	2.63%
		43: Mixed	60,807.88	28.89%	42.96%
		44: Shrub/Scrub	2,257.75	1.07%	1.60%
		Total Forest	**141,533.52**	**67.25%**	
		Total Area	**210,464.00**		

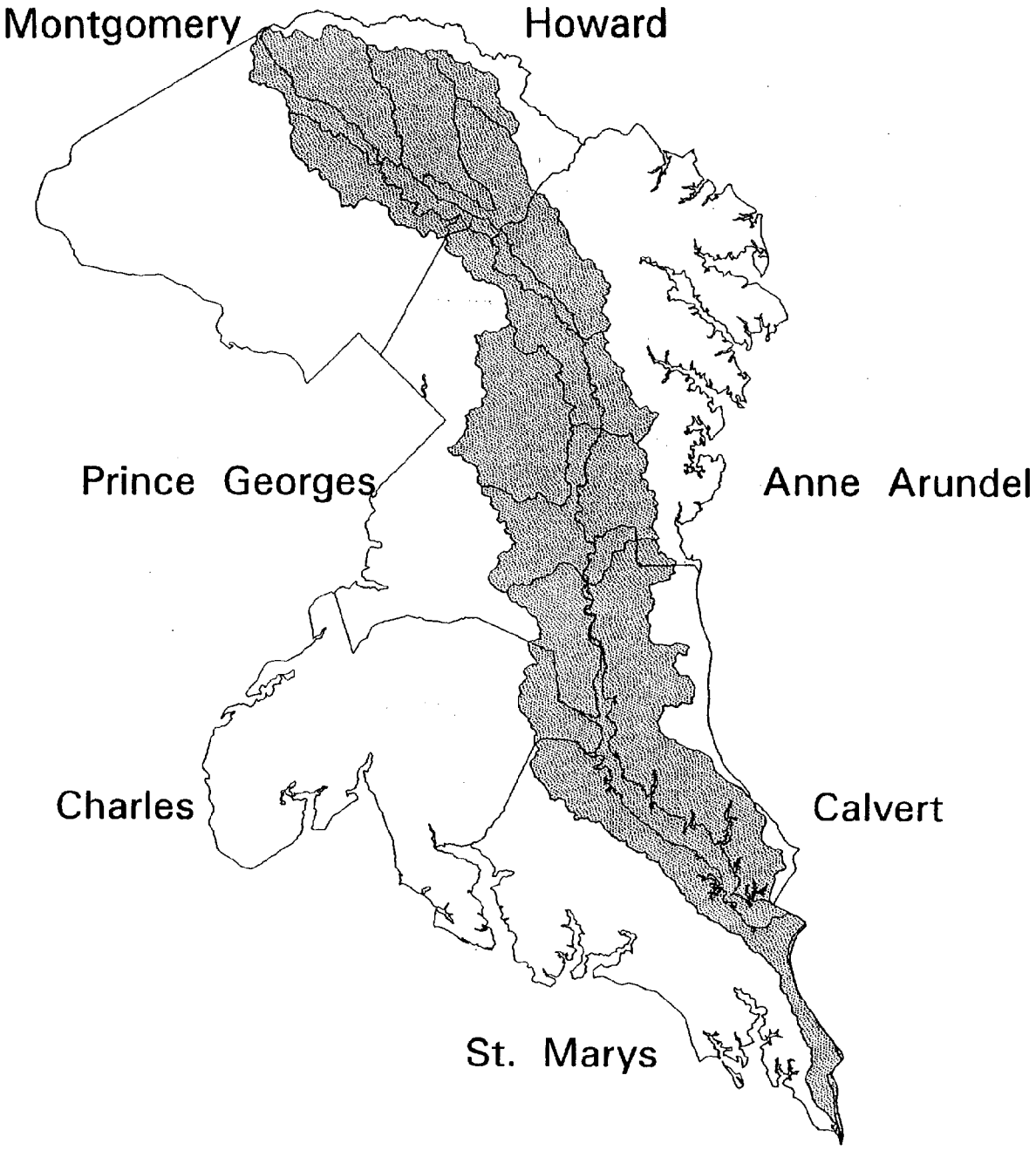
Subwatershed	County	Forest Type	# Acres by Forest Type (TM)	Total Area of Subwtrshd in Co.	Total Forests of Subwtrshd in Co.
02131102 Middle Patuxent River	Anne Arundel	41: Deciduous	*9,935.13*	36.77%	80.10%
		42: Coniferous	*588.69*	2.18%	4.75%
		43: Mixed	*1,438.97*	5.32%	11.60%
		44: Shrub/Scrub	*440.51*	1.63%	3.55%
		Total Forest	**12,403.29**	**45.90%**	
		Total Area	**27,023.00**		
	Calvert	41: Deciduous	*3,279.53*	54.88%	88.32%
		42: Coniferous	*129.98*	2.18%	3.50%
		43: Mixed	*165.82*	2.77%	4.47%
		44: Shrub/Scrub	*138.06*	2.31%	3.72%
		Total Forest	**3,713.39**	**62.14%**	
		Total Area	**5,976.00**		
	Prince Georges	41: Deciduous	*9,242.60*	25.92%	45.32%
		42: Coniferous	*145.19*	0.41%	0.71%
		43: Mixed	*10,758.18*	30.17%	52.75%
		44: Shrub/Scrub	*249.27*	0.70%	1.22%
		Total Forest	**20,396.24**	**57.20%**	
		Total Area	**35,654.00**		
	TOTAL	41: Deciduous	22,457.26	32.71%	61.51%
		42: Coniferous	863.86	1.26%	2.37%
		43: Mixed	12,362.96	18.01%	33.86%
		44: Shrub/Scrub	827.84	1.21%	2.27%
		Total Forest	**36,511.92**	**53.18%**	
		Total Area	**68,653.00**		
02131103 Western Branch	Prince Georges	41: Deciduous	*15,004.68*	25.20%	65.91%
		42: Coniferous	*127.32*	0.21%	0.56%
		43: Mixed	*7,224.87*	12.13%	31.74%
		44: Shrub/Scrub	*409.08*	0.69%	1.80%
		Total Forest	**22,765.94**	**38.23%**	
		Total Area	**59,544.00**		

Subwatershed	County	Forest Type	# Acres by Forest Type (TM)	Total Area of Subwtrshd in Co.	Total Forests of Subwtrshd in Co.
02131104 Upper Patuxent River	Anne Arundel	41: Deciduous	*6,795.37*	30.64%	50.45%
		42: Coniferous	*1,374.73*	6.20%	10.21%
		43: Mixed	*5,044.98*	22.75%	37.45%
		44: Shrub/Scrub	*254.96*	1.15%	1.89%
		Total Forest	**13,470.04**	**60.74%**	
		Total Area	**22,176.00**		
	Howard	41: Deciduous	*254.43*	15.49%	33.66%
		42: Coniferous	*18.08*	1.10%	2.39%
		43: Mixed	*481.04*	29.28%	63.64%
		44: Shrub/Scrub	*2.34*	0.14%	0.31%
		Total Forest	**755.89**	**46.01%**	
		Total Area	**1,643.00**		
	Prince Georges	41: Deciduous	*4,570.83*	14.19%	30.70%
		42: Coniferous	*156.97*	0.49%	1.05%
		43: Mixed	*9,833.67*	30.53%	66.05%
		44: Shrub/Scrub	*325.98*	1.01%	2.19%
		Total Forest	**14,887.46**	**46.23%**	
		Total Area	**32,205.00**		
	TOTAL	41: Deciduous	11,620.63	20.74%	39.92%
		42: Coniferous	1,549.78	2.77%	5.32%
		43: Mixed	15,359.69	27.42%	52.76%
		44: Shrub/Scrub	583.29	1.04%	2.00%
		Total Forest	**29,113.39**	**51.97%**	
		Total Area	**56,024.00**		
02131105 Little Patuxent River	Anne Arundel	41: Deciduous	*7,171.97*	25.41%	46.91%
		42: Coniferous	*2,003.81*	7.10%	13.11%
		43: Mixed	*5,550.69*	19.66%	36.31%
		44: Shrub/Scrub	*561.83*	1.99%	3.67%
		Total Forest	**15,288.31**	**54.16%**	
		Total Area	**28,230.00**		
	Howard	41: Deciduous	*6,080.94*	16.01%	49.44%
		42: Coniferous	*541.31*	1.43%	4.40%
		43: Mixed	*2,609.04*	6.87%	21.21%
		44: Shrub/Scrub	*3,067.48*	8.08%	24.94%
		Total Forest	**12,298.77**	**32.38%**	
		Total Area	**37,984.00**		
	TOTAL	41: Deciduous	13,252.91	20.02%	48.04%
		42: Coniferous	2,545.12	3.84%	9.23%
		43: Mixed	8,159.73	12.32%	29.58%
		44: Shrub/Scrub	3,629.31	5.48%	13.16%
		Total Forest	**27,587.08**	**41.66%**	
		Total Area	**66,214.00**		

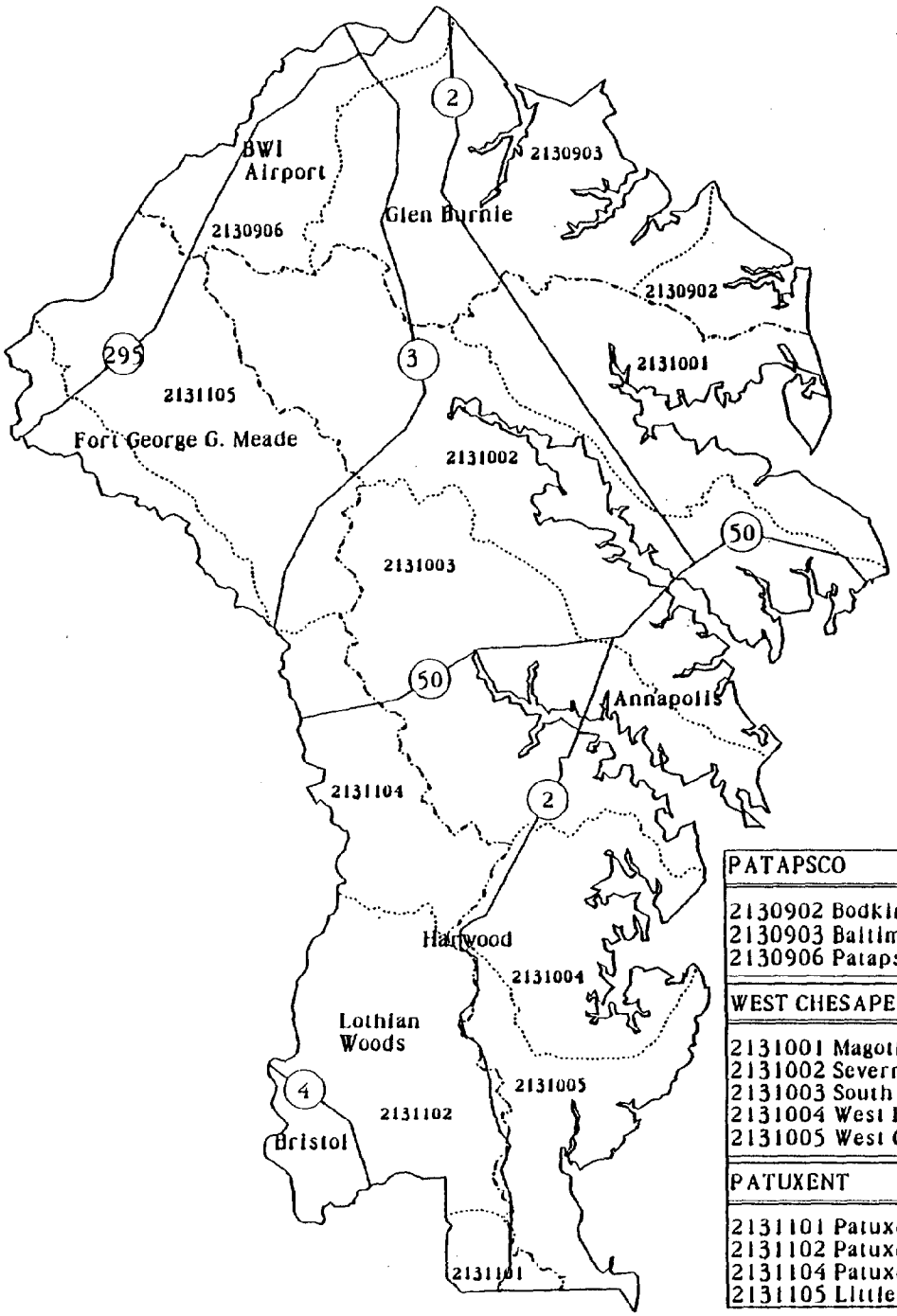
Subwatershed	County	Forest Type	# Acres by Forest Type (TM)	Total Area of Subwtrshd in Co.	Total Forests of Subwtrshd in Co.
01231106 Middle Patuxent River	Howard	41: Deciduous	*9,264.72*	24.99%	78.91%
		42: Coniferous	*451.64*	1.22%	3.85%
		43: Mixed	*925.83*	2.50%	7.89%
		44: Shrub/Scrub	*1,098.65*	2.96%	9.36%
		Total Forest	**11,740.84**	**31.67%**	
		Total Area	**37,074.00**		
02131107 Rocky Gorge Dam	Howard	41: Deciduous	*2,140.17*	26.68%	62.48%
		42: Coniferous	*151.66*	1.89%	4.43%
		43: Mixed	*904.41*	11.28%	26.40%
		44: Shrub/Scrub	*229.00*	2.85%	6.69%
		Total Forest	**3,425.24**	**42.70%**	
		Total Area	**8,021.00**		
	Montgomery	41: Deciduous	*4,196.66*	16.32%	63.31%
		42: Coniferous	*136.99*	0.53%	2.07%
		43: Mixed	*1,846.31*	7.18%	27.85%
		44: Shrub/Scrub	*448.74*	1.74%	6.77%
		Total Forest	**6,628.69**	**25.78%**	
		Total Area	**25,716.00**		
	Prince Georges	41: Deciduous	*78.34*	9.10%	23.24%
		42: Coniferous	*19.47*	2.26%	5.78%
		43: Mixed	*197.18*	22.90%	58.49%
		44: Shrub/Scrub	*42.15*	4.90%	12.50%
		Total Forest	**337.14**	**39.16%**	
		Total Area	**861.00**		
	TOTAL	41: Deciduous	6,415.16	18.54%	61.74%
		42: Coniferous	308.12	0.89%	2.97%
		43: Mixed	2,947.90	8.52%	28.37%
		44: Shrub/Scrub	719.88	2.08%	6.93%
		Total Forest	**10,391.07**	**30.03%**	
		Total Area	**34,598.00**		
02131108 Brighton Dam	Howard	41: Deciduous	*7,371.22*	19.93%	67.69%
		42: Coniferous	*148.17*	0.40%	1.36%
		43: Mixed	*2,242.91*	6.06%	20.60%
		44: Shrub/Scrub	*1,126.79*	3.05%	10.35%
		Total Forest	**10,889.09**	**29.44%**	
		Total Area	**36,990.00**		
	Montgomery	41: Deciduous	*1,757.39*	13.00%	60.56%
		42: Coniferous	*247.05*	1.83%	8.51%
		43: Mixed	*270.06*	2.00%	9.31%
		44: Shrub/Scrub	*627.61*	4.64%	21.63%
		Total Forest	**2,902.12**	**21.46%**	
		Total Area	**13,522.00**		
	TOTAL	41: Deciduous	9,128.61	18.07%	66.19%
		42: Coniferous	395.22	0.78%	2.87%
		43: Mixed	2,512.97	4.97%	18.22%
		44: Shrub/Scrub	1,754.40	3.47%	12.72%
		Total Forest	**13,791.21**	**27.30%**	
		Total Area	**50,512.00**		

Subwatershed	County	Forest Type	# Acres by Forest Type (TM)	Total Area of Subwtrshd in Co.	Total Forests of Subwtrshd in Co.
Watershed Totals		41: Deciduous	161,885.23	27.76%	55.17%
		42: Coniferous	9,967.70	1.71%	3.40%
		43: Mixed	110,301.83	18.92%	37.59%
		44: Shrub/Scrub	11,280.21	1.93%	3.84%
		Total Forest	293,434.97	**50.32%**	
		Total Area	583,083.00		
County Totals	Anne Arundel	41: Deciduous	24,777.22		
		42: Coniferous	4,105.72		
		43: Mixed	12,266.77		
		44: Shrub/Scrub	1,284.13		
		Total Forest	**42,433.84**		
	Calvert	41: Deciduous	63,105.44		
		42: Coniferous	1,503.16		
		43: Mixed	9,860.39		
		44: Shrub/Scrub	1,361.19		
		Total Forest	**75,830.18**		
	Charles	41: Deciduous	865.94		
		42: Coniferous	114.22		
		43: Mixed	5,870.52		
		44: Shrub/Scrub	120.20		
		Total Forest	**6,970.88**		
	Howard	41: Deciduous	25,111.48		
		42: Coniferous	1,310.86		
		43: Mixed	7,163.23		
		44: Shrub/Scrub	5,524.26		
		Total Forest	**39,109.83**		
	Montgomery	41: Deciduous	5,954.05		
		42: Coniferous	384.04		
		43: Mixed	2,116.37		
		44: Shrub/Scrub	1,076.35		
		Total Forest	**9,530.81**		
	Prince Georges	41: Deciduous	32,051.90		
		42: Coniferous	608.09		
		43: Mixed	46,283.54		
		44: Shrub/Scrub	1,204.15		
		Total Forest	**80,147.68**		
	St Marys	41: Deciduous	10,019.20		
		42: Coniferous	1,941.62		
		43: Mixed	26,741.00		
		44: Shrub/Scrub	709.92		
		Total Forest	39,411.74		

Patuxent Watershed



Anne Arundel County



PATAPSCO
2130902 Bodkin Creek
2130903 Baltimore Harbor
2130906 Patapsco R. Lower N. Brch.
WEST CHESAPEAKE BAY
2131001 Magothy River
2131002 Severn River
2131003 South River
2131004 West River
2131005 West Chesapeake Bay
PATUXENT
2131101 Patuxent River Lower
2131102 Patuxent River Middle
2131104 Patuxent River Upper
2131105 Little Patuxent River

Roads
Watershed boundaries
Subwatershed boundaries

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Forest Service,
Maryland Department of Natural Resources
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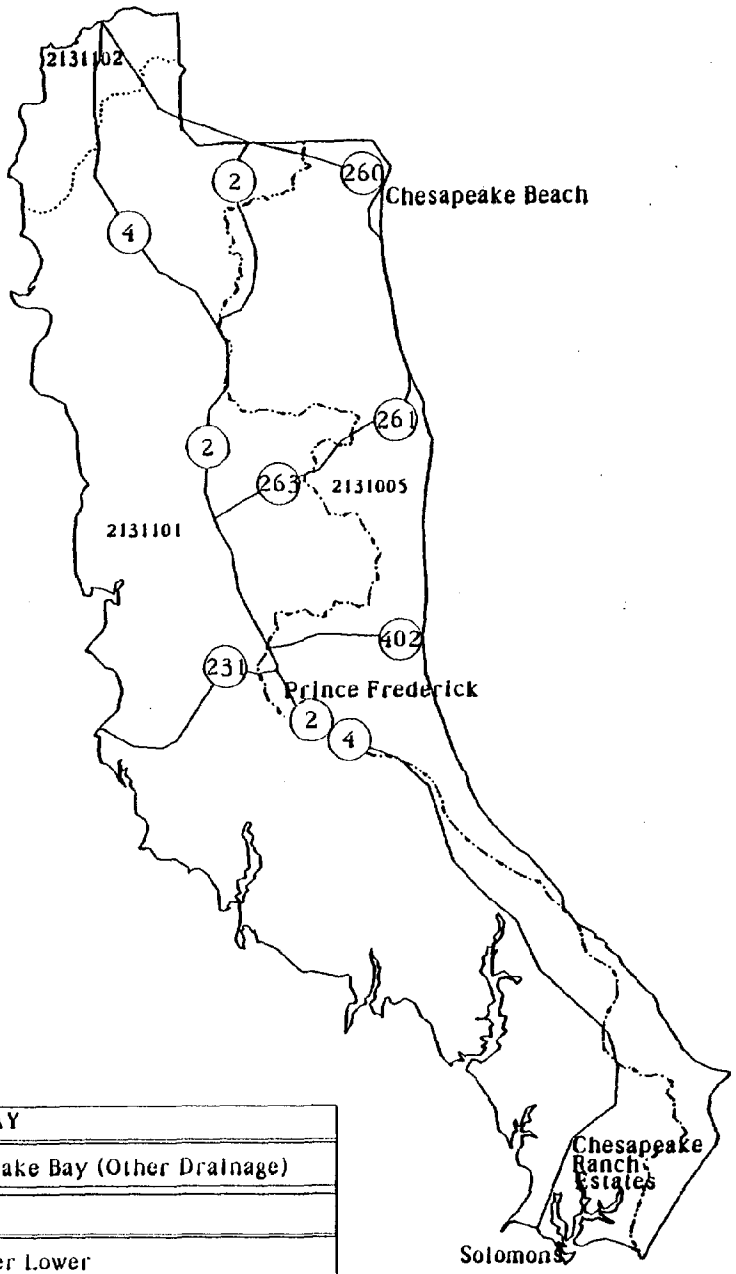
Salisbury State University

Calvert County



WEST CHESAPEAKE BAY
2131005 West Chesapeake Bay (Other Drainage)
PATUXENT
2131101 Patuxent River Lower 2131102 Patuxent River Mdl (Rt 214 to Ferry Lndn)

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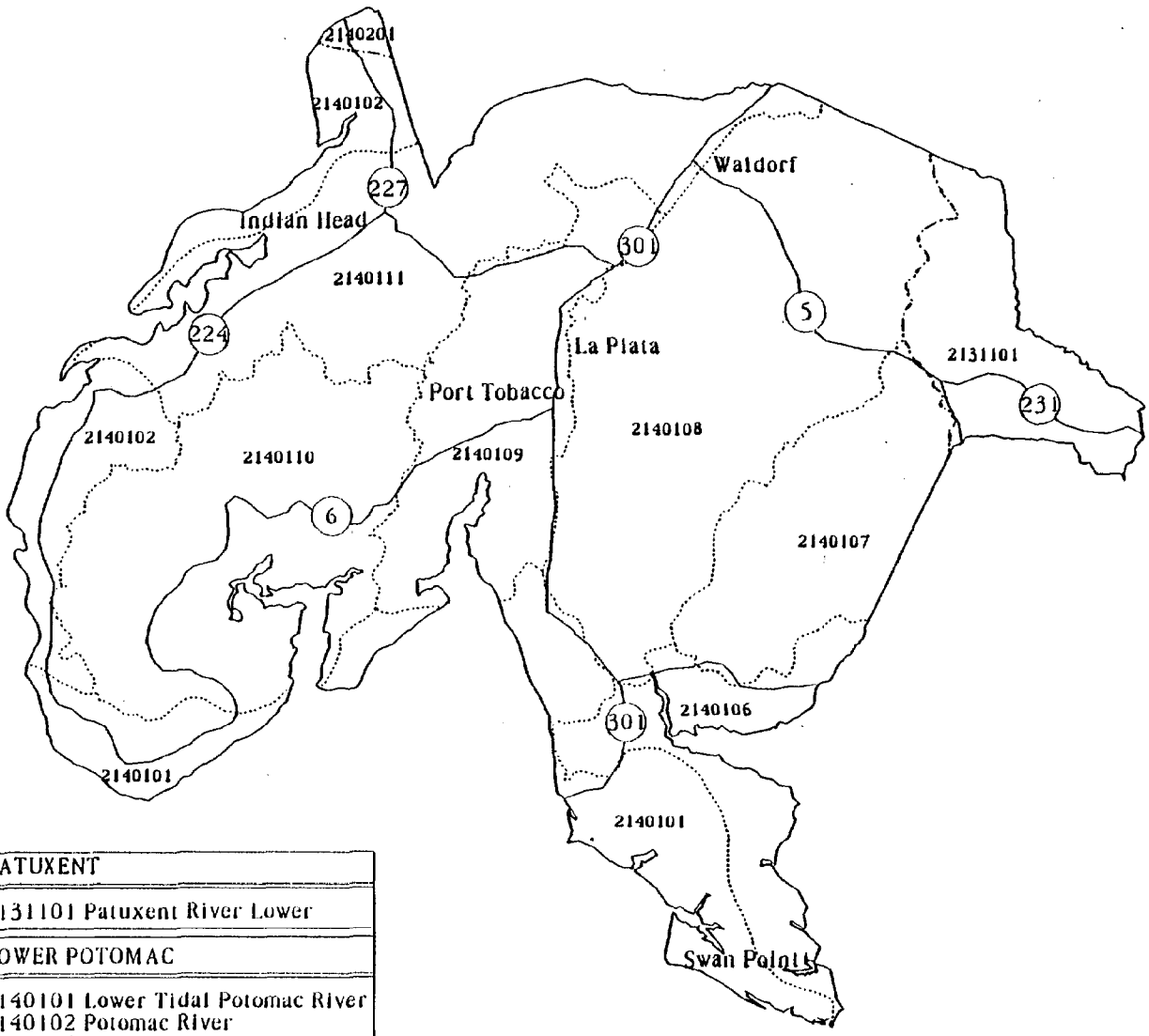
Roads
Watershed boundaries
Subwatershed boundaries

Charles County



PATUXENT
2131101 Patuxent River Lower
LOWER POTOMAC
2140101 Lower Tidal Potomac River 2140102 Potomac River 2140106 Wicomico River 2140107 Gilbert Swamp 2140108 Zekiah Swamp 2140109 Port Tobacco River 2140110 Nanjemoy Creek 2140111 Mattawoman Creek
WASHINGTON METRO
2140201 Upper Tidal Potomac River

Roads
Watershed boundaries
Subwatershed boundaries

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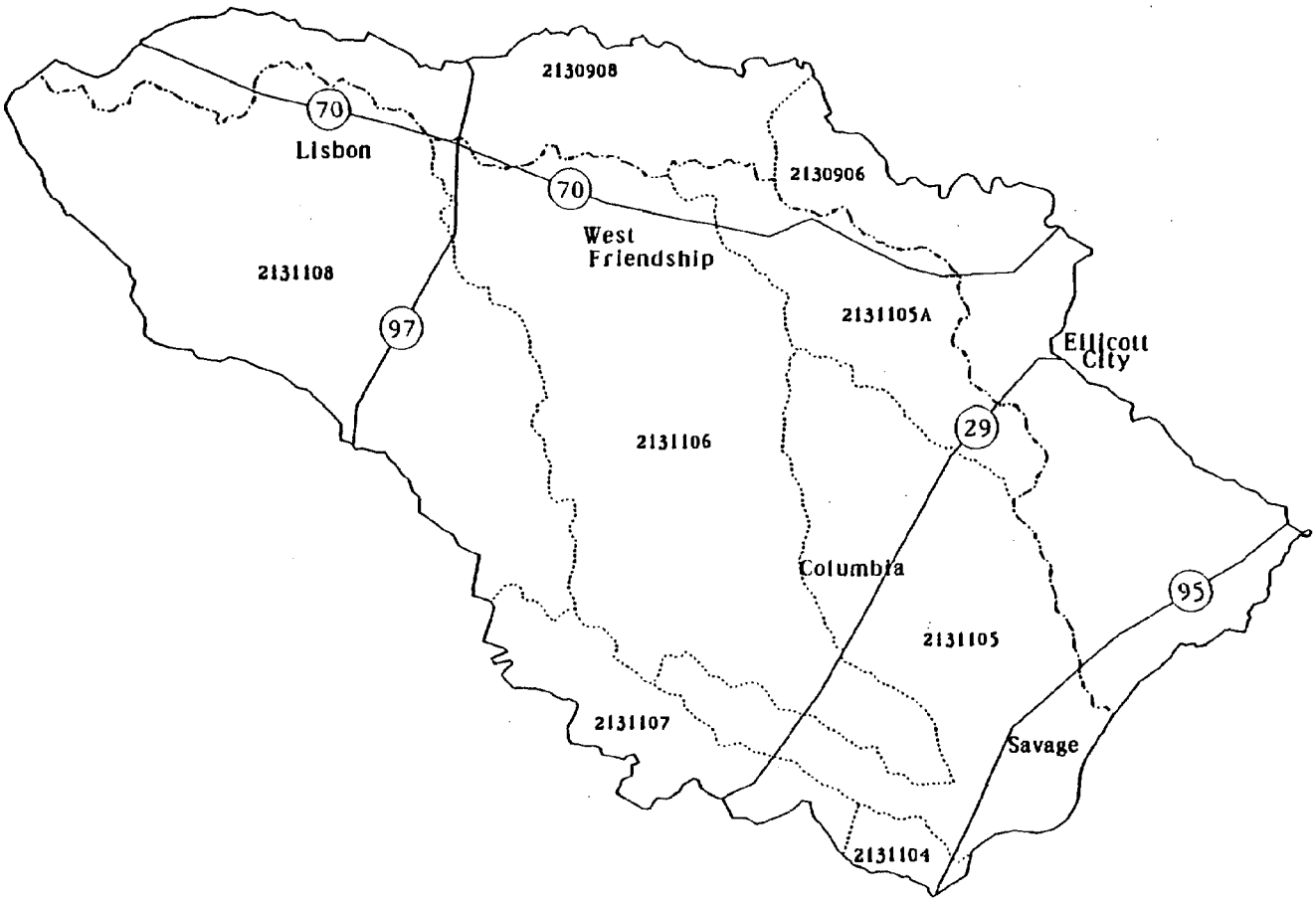
Howard County



PATAPSCO
2130906 Patapsco River Lower N. Branch 2130908 South Branch Patapsco River
PATUXENT
2131104 Patuxent Rvr Upr (Rt 214-Rocky Gorge Dam) 2131105 Little Patuxent River 2131105A Little Patuxent River 2131106 Middle Patuxent River 2131107 Rocky Gorge Dam 2131108 Brighton Dam

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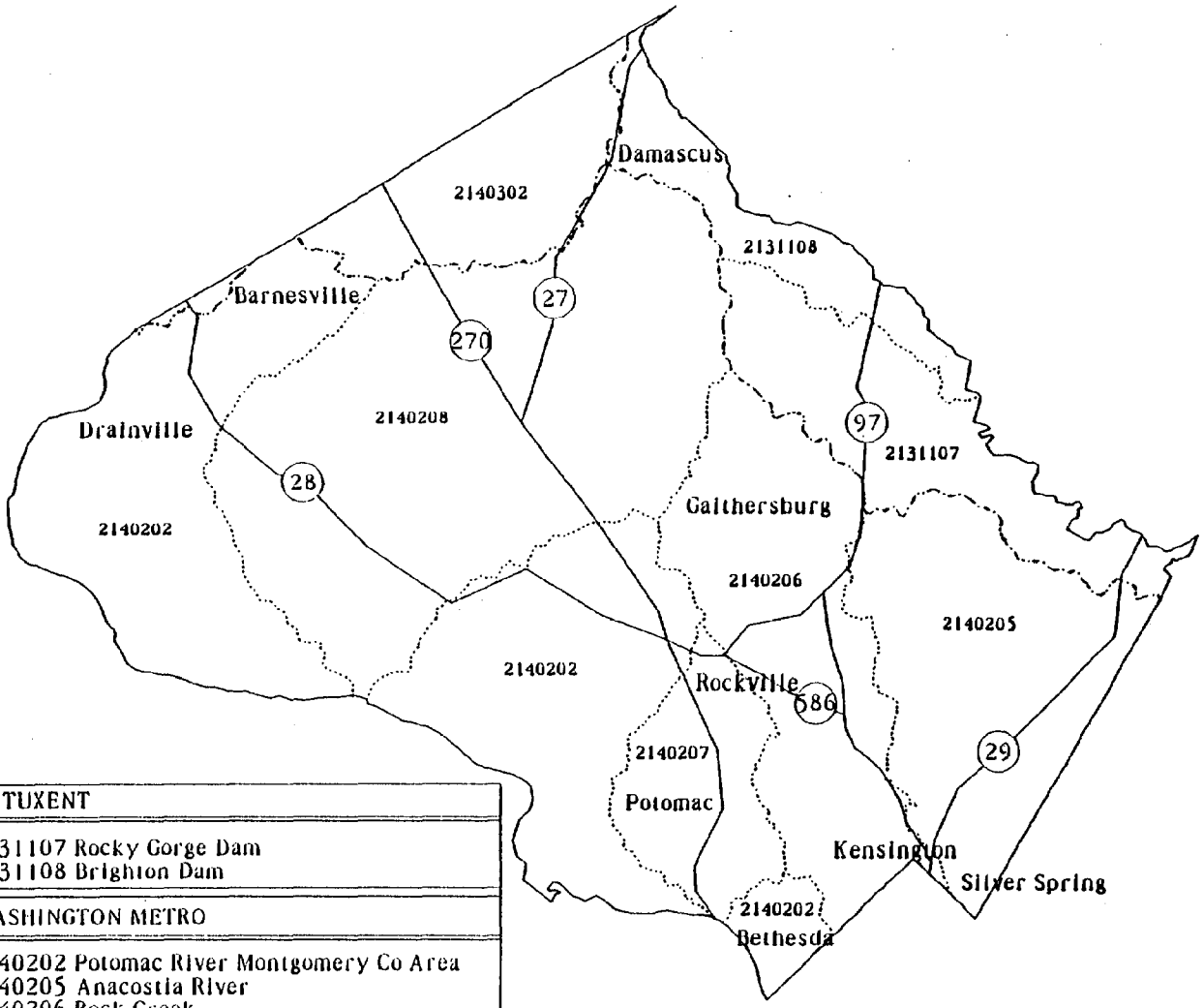
Roads
Watershed boundaries
Subwatershed boundaries

Montgomery County



PATUXENT
2131107 Rocky Gorge Dam 2131108 Brighton Dam
WASHINGTON METRO
2140202 Potomac River Montgomery Co Area 2140205 Anacostia River 2140206 Rock Creek 2140207 Cabin John Creek 2140208 Seneca Creek
MIDDLE POTOMAC
2140302 Lower Monocacy River(Rt 26 to mouth)

Roads
Watershed boundaries
Subwatershed boundaries

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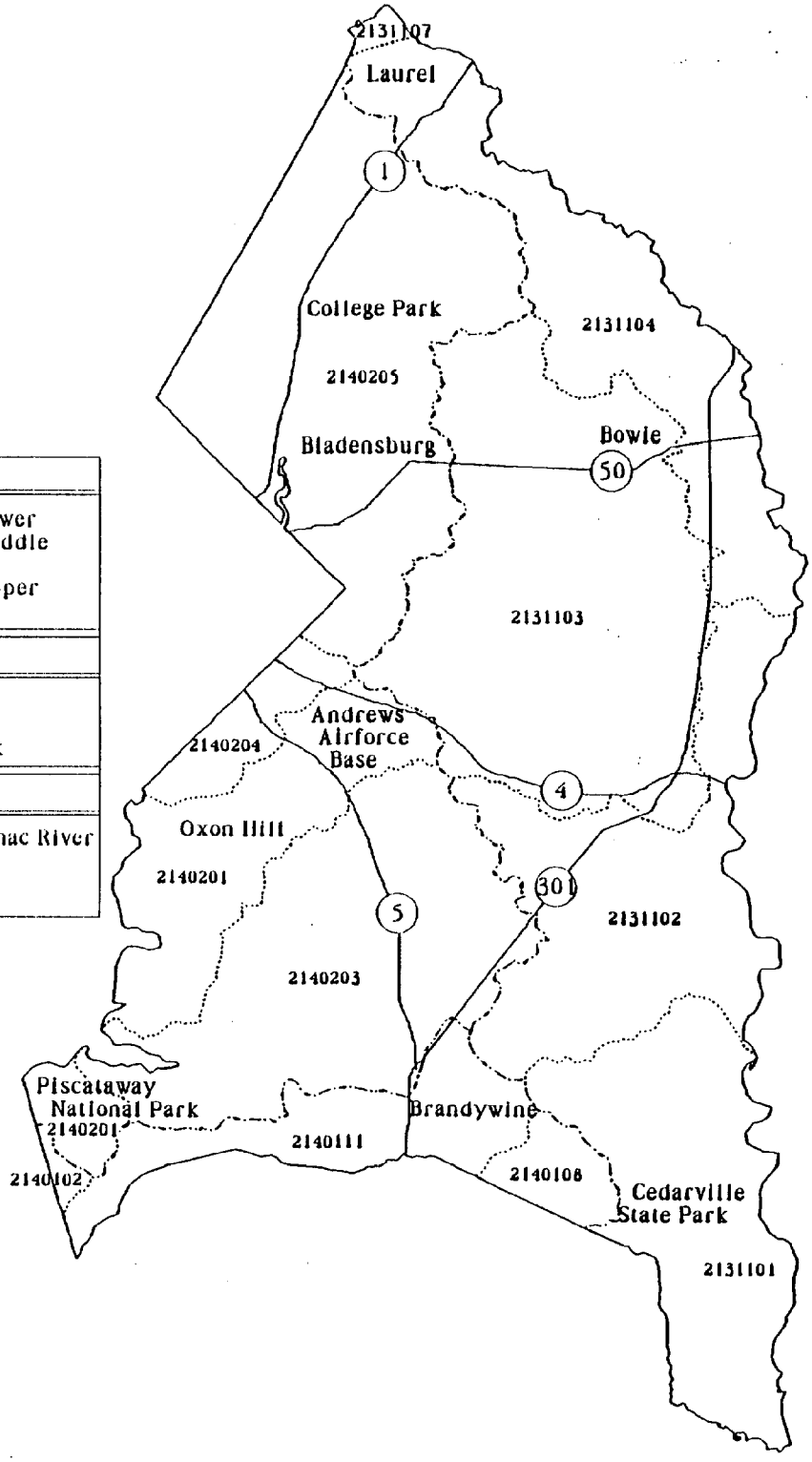
Prince George's County



PATUXENT
2131101 Patuxent River Lower 2131102 Patuxent River Middle 2131103 Western Branch 2131104 Patuxent River Upper 2131107 Rocky Gorge Dam
LOWER POTOMAC
2140102 Potomac River 2140108 Zekiah Swamp 2140111 Mattawoman Creek
WASHINGTON METRO
2140201 Upper Tidal Potomac River 2140203 Piscataway Creek 2140204 Oxen Creek Dr 2140205 Anacostia River

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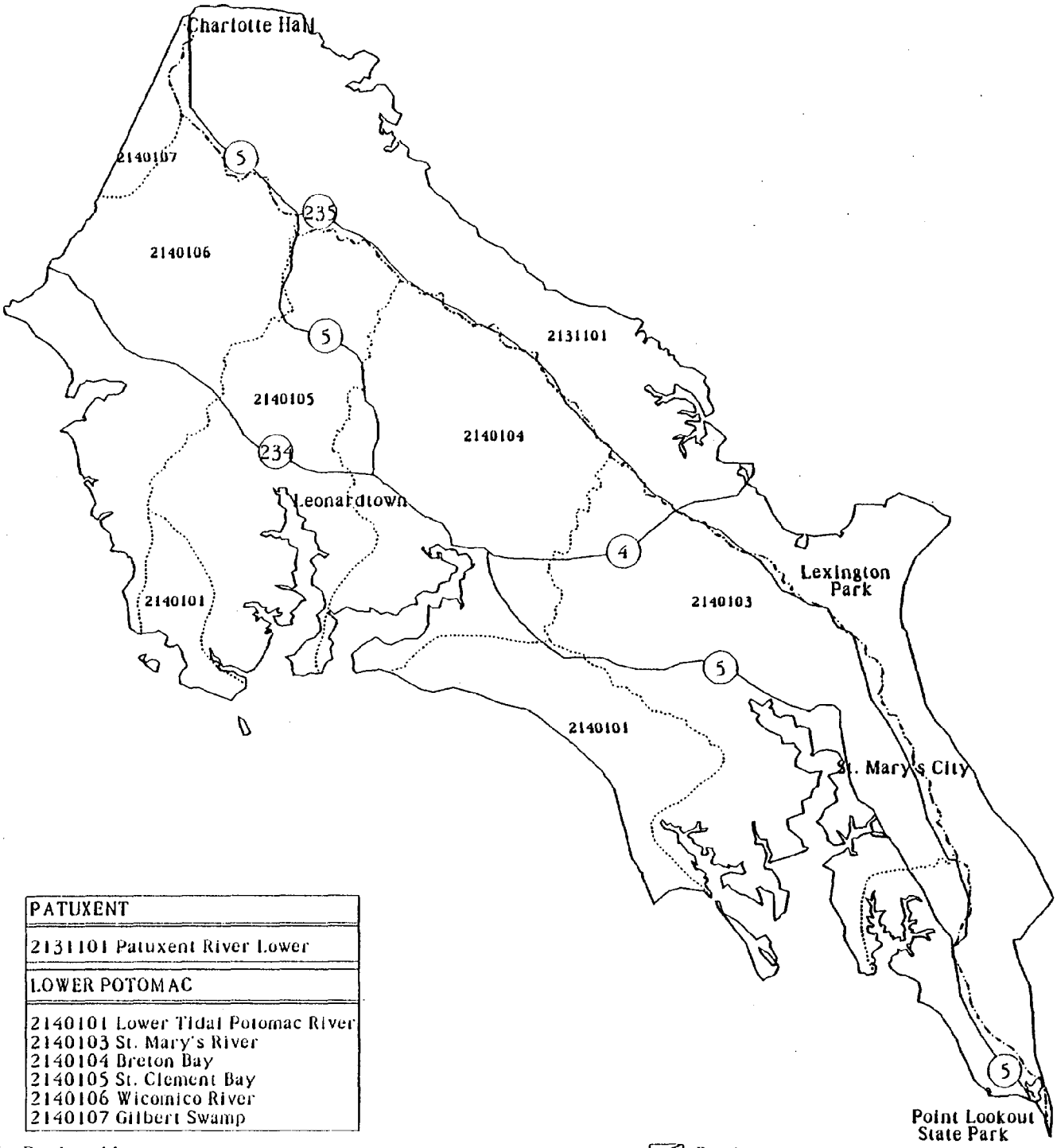
Roads
Watershed boundaries
Subwatershed boundaries

St. Mary's County



PATUXENT
2131101 Patuxent River Lower
LOWER POTOMAC
2140101 Lower Tidal Potomac River 2140103 St. Mary's River 2140104 Breton Bay 2140105 St. Clement Bay 2140106 Wicomico River 2140107 Gilbert Swamp

Roads
Watershed boundaries
Subwatershed boundaries

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Salisbury State University

APPENDIX IV

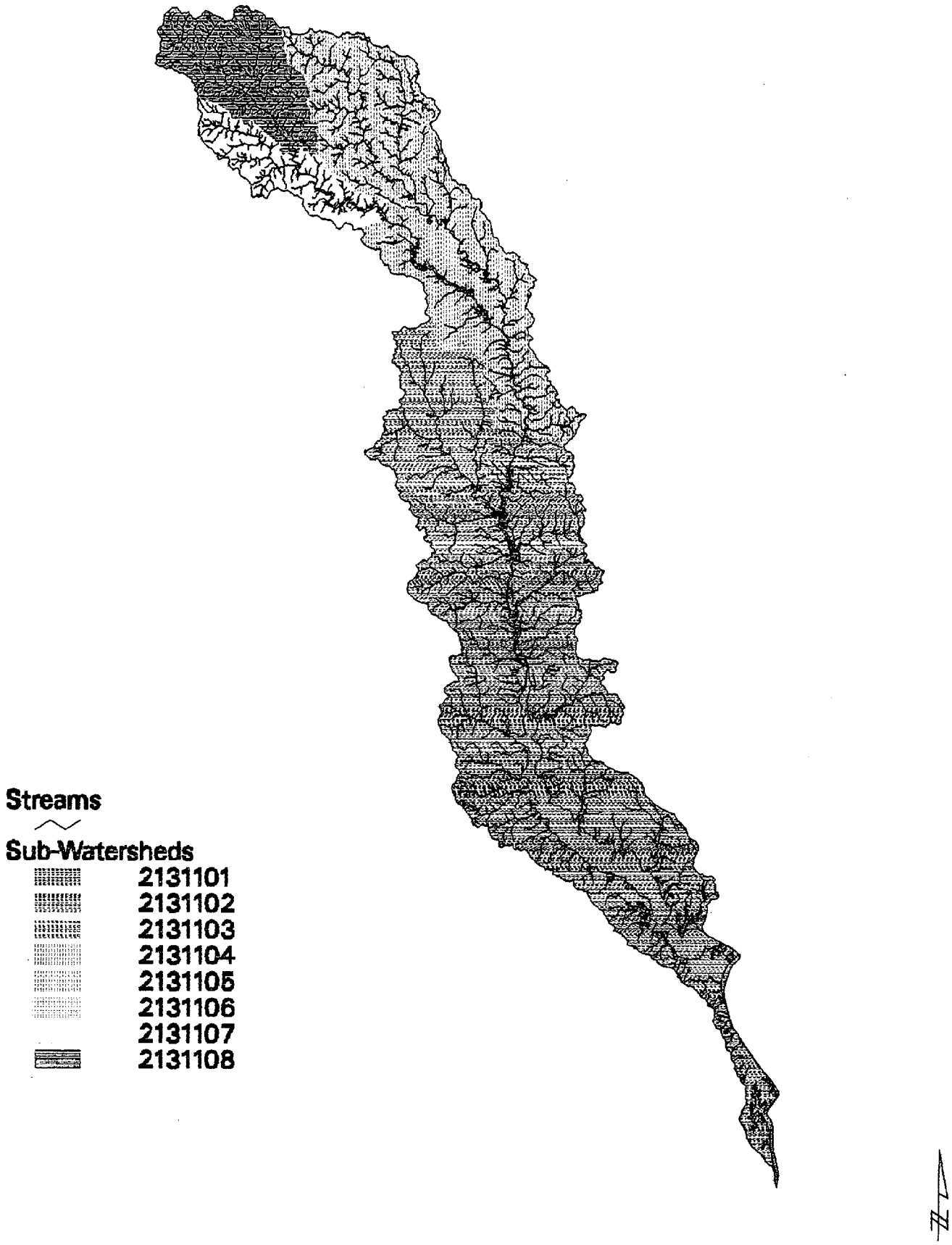
STREAM BUFFER CHARACTERIZATION FOR THE PATUXENT RIVER WATERSHED

Stream Buffer Characterization	Anne Arundel	Calvert	Charles	Howard	Montgomery	Prince Georges	Total
Subwatershed: 0231101 - Lower Patuxent							
Stream Miles	7.24	219.75	42.67			80.72	350.39
Both sides < 100' forested or no forest evident	2.53	88.55	17.87			20.04	128.99
One side < 100'; other side >100' & <300' fores	1.67	46.39	8.82			21.16	78.05
One side < 100'; other side > 300' forested	0.78	21.54	4.11			9.73	36.16
Inadequate Buffers	*4.98*	*156.48*	*30.80*			*50.94*	*243.19*
% Inadequate Buffers	*68.77%*	*71.21%*	*72.17%*			*63.10%*	*69.41%*
Both sides >100' & < 300' forested	0.81	22.53	4.30			11.98	39.62
One side > 100' & < 300'; other side > 300' for	0.79	21.83	4.08			10.12	36.81
Both sides > 300' forested	0.66	18.92	3.49			7.69	30.76
Adequate Buffers both sides	*2.26*	*63.27*	*11.87*			*29.78*	*107.19*
% Adequate Buffers both sides	*31.23%*	*28.79%*	*27.83%*			*36.90%*	*30.59%*
Adequate Buffers at least one side	*4.71*	*131.20*	*24.80*			*60.68*	*221.40*
% Adequate Buffers at least one side	*65.08%*	*59.70%*	*58.12%*			*75.17%*	*63.19%*
Subwatershed: 0231102 - Patuxent Middle							
Stream Miles	82.91	14.94				90.89	188.75
Both sides < 100' forested or no forest evident	20.58	3.65				36.63	60.86
One side < 100'; one side 100'-300' forested	21.74	4.26				19.19	45.18
One side < 100'; one side > 300' forested	10.00	1.62				8.91	20.53
Inadequate Buffers	*52.32*	*9.52*				*64.72*	*126.56*
% Inadequate Buffers	*63.10%*	*63.71%*				*71.21%*	*67.05%*
Both sides 100' - 300' forested	12.30	1.87				9.32	23.49
One side > 300'; one side 100' - 300' forested	10.40	1.75				9.03	21.18
Both sides > 300' forested	7.89	1.80				7.82	17.52
Adequate Buffers both sides	*30.59*	*5.42*				*26.17*	*62.18*
% Adequate Buffers both sides	*36.90%*	*36.29%*				*28.79%*	*32.95%*
Adequate Buffers at least one side	*62.33*	*11.30*				*54.27*	*127.89*
% Adequate Buffers at least one side	*75.17%*	*75.60%*				*59.70%*	*67.76%*
Subwatershed: 0231103 - Western Branch							
Stream Miles						100.42	100.42
Both sides < 100' forested or no forest evident						42.05	42.05
One side < 100'; one side 100'-300' forested						20.76	20.76
One side < 100'; one side > 300' forested						9.67	9.67
Inadequate Buffers						*72.48*	*72.48*
% Inadequate Buffers						*72.17%*	*72.17%*
Both sides 100' - 300' forested						10.12	10.12
One side > 300'; one side 100' - 300' forested						9.60	9.60
Both sides > 300' forested						8.22	8.22
Adequate Buffers both sides						*27.94*	*27.94*
% Adequate Buffers both sides						*27.83%*	*27.83%*
Adequate Buffers at least one side						*58.37*	*58.37*
% Adequate Buffers at least one side						*58.12%*	*58.12%*
Stream Buffer Characterization	**Anne Arundel**	**Calvert**	**Charles**	**Howard**	**Montgomery**	**Prince Georges**	**Total**
Subwatershed: 0231104 - Upper Patuxent							
Stream Miles	64.26			2.25		71.38	137.90
Both sides < 100' forested or no forest evident	22.44			0.91		17.72	41.07
One side < 100'; one side 100'-300' forested	14.86			0.48		18.72	34.05
One side < 100'; one side > 300' forested	6.90			0.22		8.61	15.72
Inadequate Buffers	*44.19*			*1.60*		*45.04*	*90.84*
% Inadequate Buffers	*68.77%*			*71.21%*		*63.10%*	*65.88%*
Both sides 100' - 300' forested	7.22			0.23		10.59	18.04
One side > 300'; one side 100' - 300' forested	6.99			0.22		8.95	16.16
Both sides > 300' forested	5.87			0.19		6.80	12.86
Adequate Buffers both sides	*20.07*			*0.65*		*26.34*	*47.06*
% Adequate Buffers both sides	*31.23%*			*28.79%*		*36.90%*	*34.12%*

Adequate Buffers at least one side	*41.82*			*1.34*		*53.66*	*96.83*
% Adequate Buffers at least one side	*65.08%*			*59.70%*		*75.17%*	*70.22%*
Subwatershed: 0231105 Little Patuxent							
Stream Miles	51.98			74.12			126.11
Both sides < 100' forested or no forest evident	21.77			18.40			40.17
One side < 100'; one side 100'-300' forested	10.74			19.43			30.18
One side < 100'; one side > 300' forested	5.00			8.94			13.94
Inadequate Buffers	*37.52*			*46.78*			*84.29*
% Inadequate Buffers	*72.17%*			*63.10%*			*66.84%*
Both sides 100' - 300' forested	5.24			11.00			16.23
One side > 300'; one side 100' - 300' forested	4.97			9.29			14.26
Both sides > 300' forested	4.26			7.06			11.32
Adequate Buffers both sides	*14.46*			*27.35*			*41.81*
% Adequate Buffers both sides	*27.83%*			*36.90%*			*33.16%*
Adequate Buffers at least one side	*30.21*			*55.72*			*85.93*
% Adequate Buffers at least one side	*58.12%*			*75.17%*			*68.14%*
Subwatershed: 0231106 - Middle Patuxent							
Stream Miles				110.67			110.67
Both sides < 100' forested or no forest evident				27.01			27.01
One side < 100'; one side 100'-300' forested				31.51			31.51
One side < 100'; one side > 300' forested				11.99			11.99
Inadequate Buffers				*70.51*			*70.51*
% Inadequate Buffers				*63.71%*			*63.71%*
Both sides 100' - 300' forested				13.84			13.84
One side > 300'; one side 100' - 300' forested				12.98			12.98
Both sides > 300' forested				13.35			13.35
Adequate Buffers both sides				40.16			40.16
% Adequate Buffers both sides				*36.29%*			*36.29%*
Adequate Buffers at least one side				*83.67*			*83.67*
% Adequate Buffers at least one side				*75.60%*			*75.60%*
Stream Buffer Characterization	**Anne Arundel**	**Calvert**	**Charles**	**Howard**	**Montgomery**		**Total**
Subwatershed: 0231107 - Rocky Gorge Dam							
Stream Miles				20.50	77.88		98.38
Both sides < 100' forested or no forest evident				7.16	31.38		38.54
One side < 100'; one side 100'-300' forested				4.74	16.44		21.18
One side < 100'; one side > 300' forested				2.20	7.63		9.83
Inadequate Buffers				*14.10*	*55.46*		*69.55*
% Inadequate Buffers				*68.77%*	*71.21%*		*70.70%*
Both sides 100' - 300' forested				2.30	7.99		10.29
One side > 300'; one side 100' - 300' forested				2.23	7.74		9.96
Both sides > 300' forested				1.87	6.70		8.57
Adequate Buffers both sides				*6.40*	*22.42*		*28.83*
% Adequate Buffers both sides				*31.23%*	*28.79%*		*29.30%*
Adequate Buffers at least one side				*13.34*	*46.50*		*59.84*
% Adequate Buffers at least one side				*65.08%*	*59.70%*		*60.83%*
Subwatershed: 0231108 - Brighton Dam							
Stream Miles				121.35	40.03		161.38
Both sides < 100' forested or no forest evident				30.13	9.77		39.90
One side < 100'; one side 100'-300' forested				31.82	11.40		43.22
One side < 100'; one side > 300' forested				14.63	4.34		18.97
Inadequate Buffers				*76.58*	*25.50*		*102.08*
% Inadequate Buffers				*63.10%*	*63.71%*		*63.25%*
Both sides 100' - 300' forested				18.00	5.00		23.01
One side > 300'; one side 100' - 300' forested				15.22	4.69		19.91
Both sides > 300' forested				11.56	4.83		16.38
Adequate Buffers both sides				*44.78*	*14.52*		*59.30*

% Adequate Buffers both sides				*36.90%*	*36.29%*		*36.75%*
Adequate Buffers at least one side				*91.22*	*30.26*		*121.48*
% Adequate Buffers at least one side				*75.17%*	*75.60%*		*75.28%*
Subwatershed: 0231105A - Little Patuxent							
Stream Miles				29.08			29.08
Both sides < 100' forested or no forest evident				11.72			11.72
One side < 100'; one side 100'-300' forested				6.14			6.14
One side < 100'; one side > 300' forested				2.85			2.85
Inadequate Buffers				*20.71*			*20.71*
% Inadequate Buffers				*71.21%*			*71.21%*
Both sides 100' - 300' forested				2.98			2.98
One side > 300'; one side 100' - 300' forested				2.89			2.89
Both sides > 300' forested				2.50			2.50
Adequate Buffers both sides				*8.37*			*8.37*
% Adequate Buffers both sides				*28.79%*			*28.79%*
Adequate Buffers at least one side				*17.36*			*17.36*
% Adequate Buffers at least one side				*59.70%*			*59.70%*
Stream Buffer Characterization	**Anne Arundel**	**Calvert**	**Charles**	**Howard**	**Montgomery**	**Prince Georges**	**Total**
TOTAL Stream Miles	**206.40**	**234.70**	**42.67**	**357.98**	**117.91**	**343.42**	**1,303.07**
Inadequate Buffers	*139.01*	*166.00*	*30.80*	*230.28*	*80.96*	*233.19*	*880.23*
% Inadequate Buffers	*67.35%*	*70.73%*	*72.17%*	*64.33%*	*68.66%*	*67.90%*	*67.55%*
Adequate Buffers both sides	*67.39*	*68.70*	*11.87*	*127.71*	*36.95*	*110.24*	*422.85*
% Adequate Buffers both sides	*32.65%*	*29.27%*	*27.83%*	*35.67%*	*31.34%*	*32.10%*	*32.45%*
Adequate Buffers at least one side	*139.08*	*142.50*	*24.80*	*262.66*	*76.76*	*226.98*	*872.77*
% Adequate Buffers at least one side	*67.38%*	*60.72%*	*58.12%*	*73.37%*	*65.10%*	*66.09%*	*66.98%*
Last computed: 5/26/93 at 16:08:00							

Patuxent River Watershed
Component Streams and Sub-Watersheds

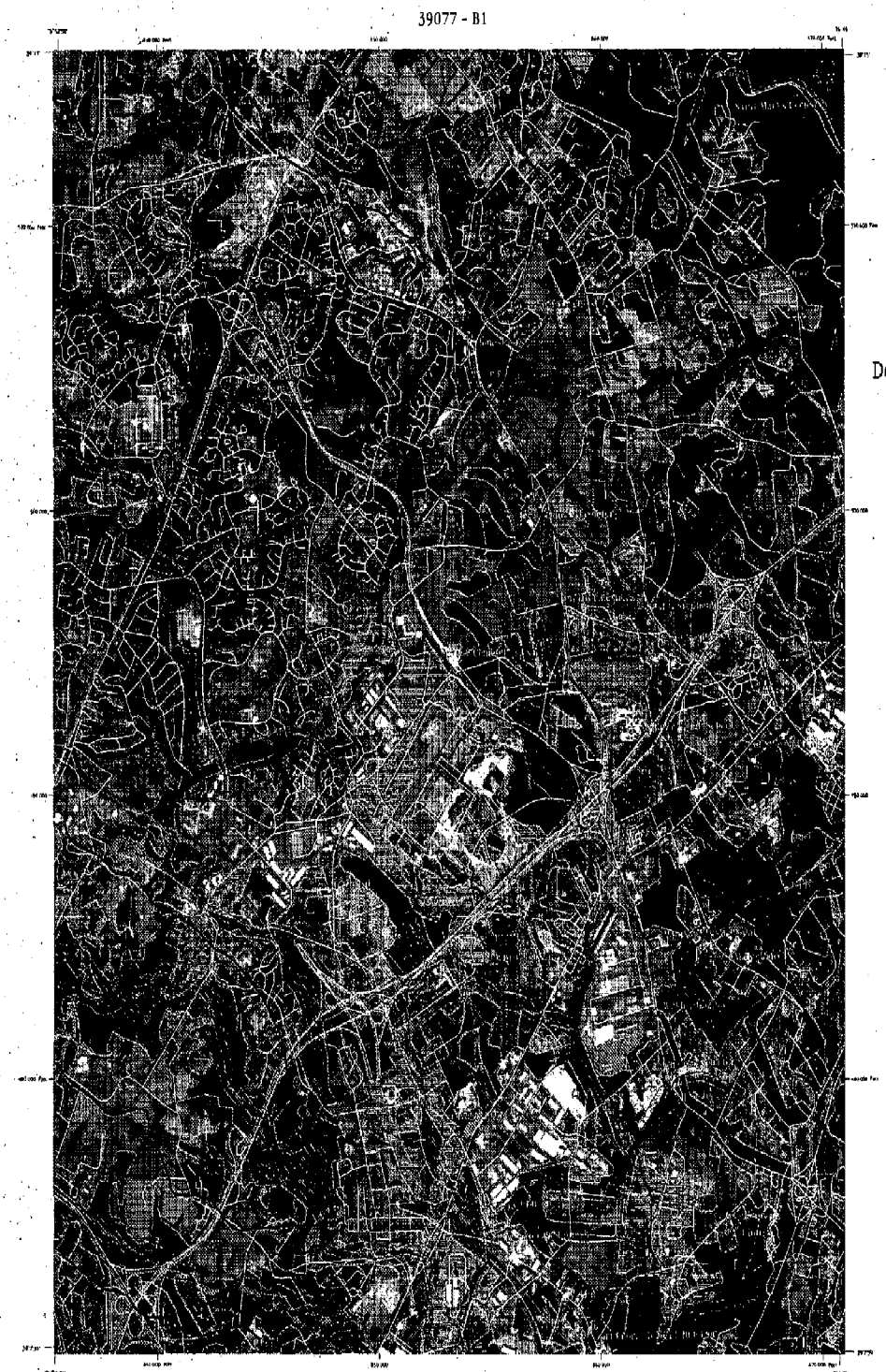


APPENDIX V

EXAMPLE OF A FOREST INVENTORY 7.5 MINUTE QUAD MAP

SAVAGE, MD

39077 - B1



Forest Inventory Guidance Map

State of Maryland

Department of Natural Resources

Forest Service

1992

- Deciduous Forest
- Coniferous Forest
- Mixed Forest
- Shrub/Scrub & Regenerating
- Streams & Rivers
- Shorelines
- 300 Foot Stream Buffers
- Watersheds
- Subwatersheds
- Roads & Trails

SOURCES OF DATA:

Base Image (digital SPOT Panchromatic Satellite data):
SPOT Imagery Dated: March 22, 1988
Forest Delineations (digital Landsat TM Satellite data):
Imagery Dated: 1991
Stream Network and Watershed Boundaries
Maryland Office of Planning

PLEASE NOTE:

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Maryland Department of Natural Resources
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United States Environmental Protection Agency
Maryland Department of Natural Resources
Fish, Heritage and Wildlife,
Wildlife Division
Maryland Department of Natural Resources
Tidewater Administration
Coastal & Watershed Resources Division

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Restoring The Chesapeake

N

SCALE 1:24000

Maryland

With Pride

PLOT AUTHOR: Microimages, Inc.
PLOT WIDTH = DEM; # SCANS/BAND; DENSITY = 400 DOTS/INCH

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