

**FINAL**

**Water Quality Analysis of Eutrophication  
Youghiogheny River Main Stem (Maryland Portion)**



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## List of Abbreviations

7Q10	7-day consecutive lowest flow expected to occur every 10 years, also known as the “design stream flow”
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CBOD	Carbonaceous BOD
CWA	Clean Water Act
MDNR	Maryland Department of Natural Resources
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
MDA	Maryland Department of Agriculture
MDE	Maryland Department of the Environment
NBOD	Nitrogenous BOD
NH <sub>3</sub> - N	Total Ammonia as Nitrogen
NO <sub>23</sub> - N	(Nitrate + Nitrite) as Nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
ON- N	Organic Nitrogen as Nitrogen
OP- P	Organic Phosphorus as Phosphorus
PO <sub>4</sub> - P	Orthophosphate or Inorganic Phosphorus as Phosphorus
PS	Point Source
TMDL	Total Maximum Daily Load
TKN	Total Kjeldahl Nitrogen (Combination of NH <sub>3</sub> and ON) as N
USGS	United States Geological Survey
WWTP	Wastewater Treatment Plant

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## EXECUTIVE SUMMARY

Section 303(d) of the federal Clean Water Act (the Act) directs States to identify and list waters, known as water quality limited segments (WQLSs), in which current required controls of a specified substance are inadequate to achieve water quality standards. For each WQLS, the State is to either establish a Total Maximum Daily Load (TMDL) of the specified substance that the waterbody can receive without violating water quality standards, or provide justification for removal from the 303(d) list.

The Youghiogheny River was identified on the State's 1996 list of WQLSs as impaired by nutrients, among other substances. The Youghiogheny River is a freshwater stream traversing mountainous Garrett County in the western part of Maryland. It is a tributary of the Mononghela River that merges into the Ohio River. It starts in Maryland then flows north into West Virginia then back into Maryland and Pennsylvania before merging into the Mononghela River in Pennsylvania about 66 miles from the Maryland border.

This report provides an analysis of recent monitoring data, which shows that the dissolved oxygen criterion and designated uses associated with nutrients are being met in the Youghiogheny River. This analysis supports the conclusion that a TMDL for nutrients is not necessary to achieve water quality standards in this case. This report provides more recent information that supports the removal of the nutrients' listing for the Youghiogheny River when the 303(d) list is revised in 2002. Although the waters of the Youghiogheny River do not display signs of eutrophication, the State reserves the right to require future controls in the Youghiogheny watershed if evidence suggests nutrients from the basin are contributing to downstream water quality problems.

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## 1.0 INTRODUCTION

The Clean Water Act (CWA) Section 303(d) directs each State to develop a list of impaired waters, called the 303(d) list. The Youghiogheny River was first identified on the 1996 303(d) list, submitted to EPA by the Maryland Department of the Environment (MDE). Among other substances still under examination, the Youghiogheny River was listed as being impaired by nutrients. This report provides more recent information that supports the removal of the nutrients' listing for the Youghiogheny River when the 303(d) list is revised in 2002.

In addition to the successful implementation of a TMDL, there are at least four scenarios by which a previously listed waterbody can be removed from the 303 (d) list. Waters may be removed from the list based on 1) more recent data indicating that the impairment no longer exists; 2) more recent and updated water quality modeling which demonstrates that the segment is now attaining standards; 3) refinements to water quality standards, or the interpretation of those standards, which result in standards being met; or 4) correction to errors made in the initial listing. The first scenario most closely applies to the present case, with the qualification that the initial listing for nutrients was suspect due to the lack of data.

The remainder of this report lays out the general setting of the waterbody within the Youghiogheny watershed, presents a discussion of the water quality characterization process, and provides conclusions with regard to the characterization. The data establish that the Youghiogheny River is achieving water quality standards.

## 2.0 GENERAL SETTING

The Youghiogheny River, which flows towards the north, is a tributary of the Mononghela River that merges into the Ohio River in Pennsylvania. It is a fast free flowing river traversing mostly mountain terrain, originating in Maryland then flowing into West Virginia, then into Maryland, then back into West Virginia and moving back into Maryland before flowing to the Youghiogheny Reservoir then moving into Pennsylvania and finally flowing into the Mononghela River in Pennsylvania. Most of the stream bed consists of rocky bottoms that provides turbulence and creates good aeration and high dissolved oxygen in the stream. The Youghiogheny River drainage area is primarily a forested area dominated by woodlands and few farms. However, there are increases in recreational and other nonfarm uses of the land, particularly close to the Deep Creek Lake area, and this trend will probably continue. It is approximately 125 miles in length with nearly 75 miles in Pennsylvania and approximately 44 miles in Maryland and about 6 miles in West Virginia. The watershed of the Youghiogheny has a drainage area of approximately 295 sq. miles before entering into the Youghiogheny Reservoir, out of which approximately 76 sq. miles (26% of the area) is in West Virginia. Refer to Figures 5, 6 and 7 for the Youghiogheny River watershed. Figures 5 and 6 also show the land use in Maryland. The land use/land cover data for each watershed in Maryland and West Virginia is abstracted from the Maryland Department of Planning, and EPA GIRAS data. The watershed's land use is forest (179 sq. miles or 61%), agriculture (63 sq. miles or 21%), and urban

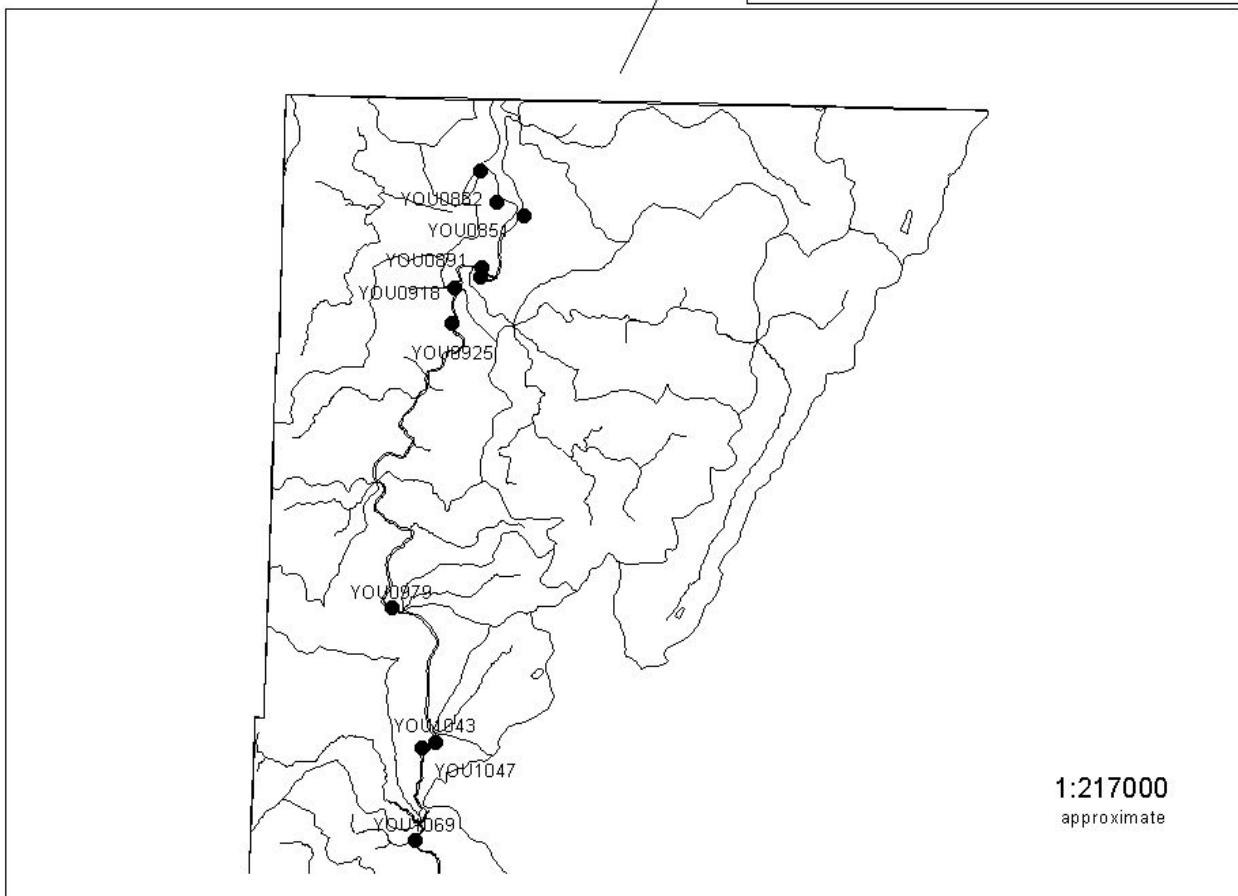
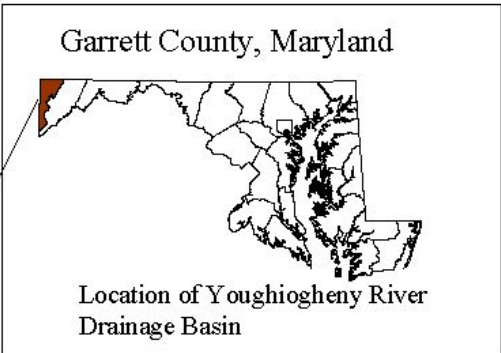
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(12 sq. miles or 4%). The remaining land use for the watershed (approximately 14%) is miscellaneous use that includes water and wetland. The forest cover in Maryland is approximately 149 sq. miles, and in West Virginia approximately 30 sq. miles. Refer to Figure 5 for the North Youghiogheny River watershed and Figure 6 for the South Youghiogheny River watershed land use in Maryland, and to Table 1 for land uses in the Youghiogheny River watershed before the Pennsylvania border. The agriculture land use in Maryland is approximately 57 sq. miles and in West Virginia approximately 6 sq. miles. The urban area in Maryland is approximately 11 sq. miles and in West Virginia approximately 1.5 sq. miles. They are summarized in Table 1. From this information, it is evident that the land use in the basin is mostly forest.

In Maryland, the Youghiogheny River has rocky bottoms with steep slopes, good for white water rafting, with estimated average stream velocities ranging from 1.0 to 3.5 fps during low-flow conditions. The watershed soils are typically classified as rocky consisting of carbonate and silliclastic. The streambeds predominately consist of gray to yellowish sandstone and shale rocks. For simplicity, the whole drainage area of the river is divided into north and south watersheds and in graphical form shown in Fig. 1 and Fig. 2 along with locations of the water quality stations. These stations were monitored extensively during the 1998 survey for various water quality parameters to gain in-depth knowledge of the water quality condition of the stream.

# Youghiogheny River Watershed Water Quality Stations (North Section)

05-02-02-01



**Legend**

- Subwatersheds
- Streams
- Water Quality Stations

4 0 4 8 12 16 Kilometers

This map depicts the Youghiogheny River Watershed in relation to Garrett County and the State of Maryland. For further information contact MDE's Water Mangement Administration @ 410-631-3671.

Data Sources:  
Watershed Boundaries: Maryland Department of Natural Resources  
Streams : Maryland Office of Planning  
Water Quality Stations: Maryland Department of the Environment

MDE  
Map Date  
June 2000

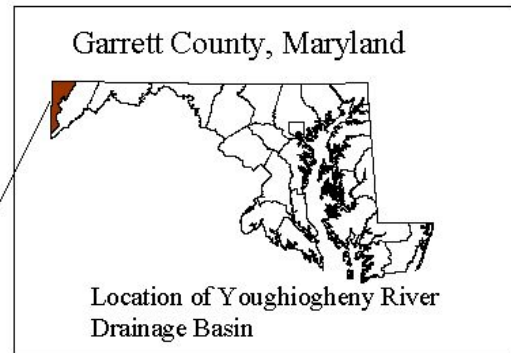
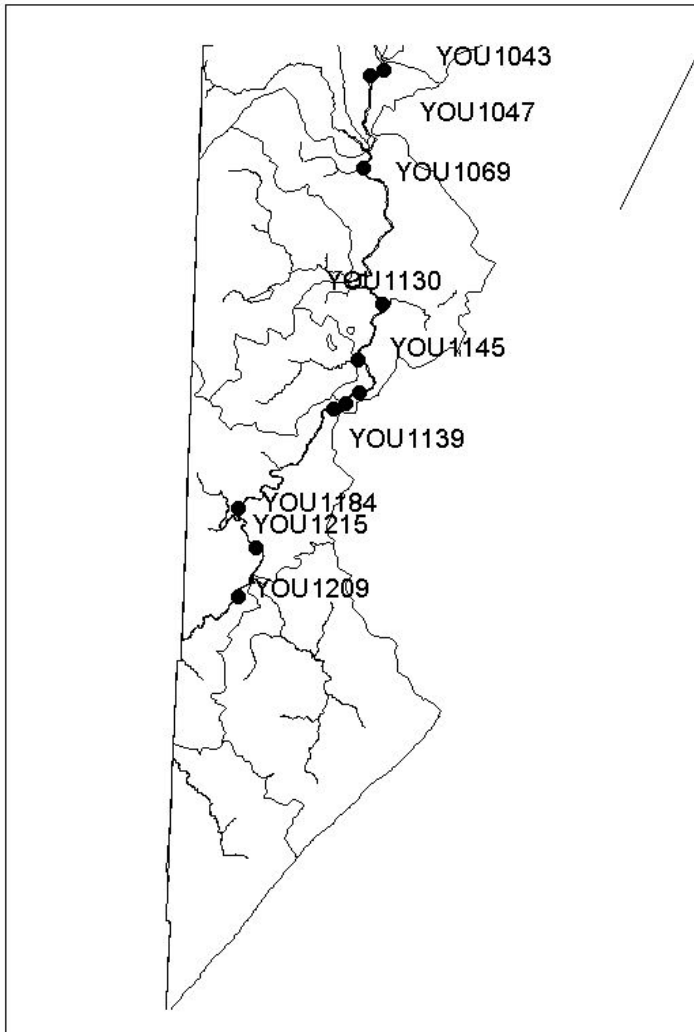
Figure 1: North Watershed for the Youghiogheny River showing water quality stations.



# Youghiogheny River Watershed Water Quality Stations

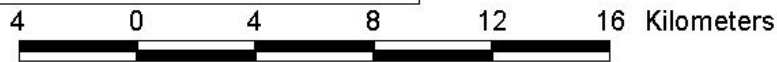
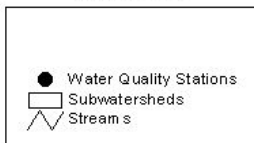
(South Section)

05-02-02-01



1:217000  
approximate

### Legend



This map depicts the Youghiogheny River Watershed in relation to Garrett County and the State of Maryland. For further information contact MDE's Water Management Administration @ 410-631-3671.

Data Sources:  
Watershed Boundaries: Maryland Department of Natural Resources  
Streams: Maryland Office of Planning  
Water Quality Stations: Maryland Department of the Environment

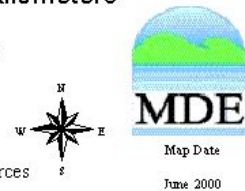


Figure 2: South Watershed for the Youghiogheny River showing water quality stations.

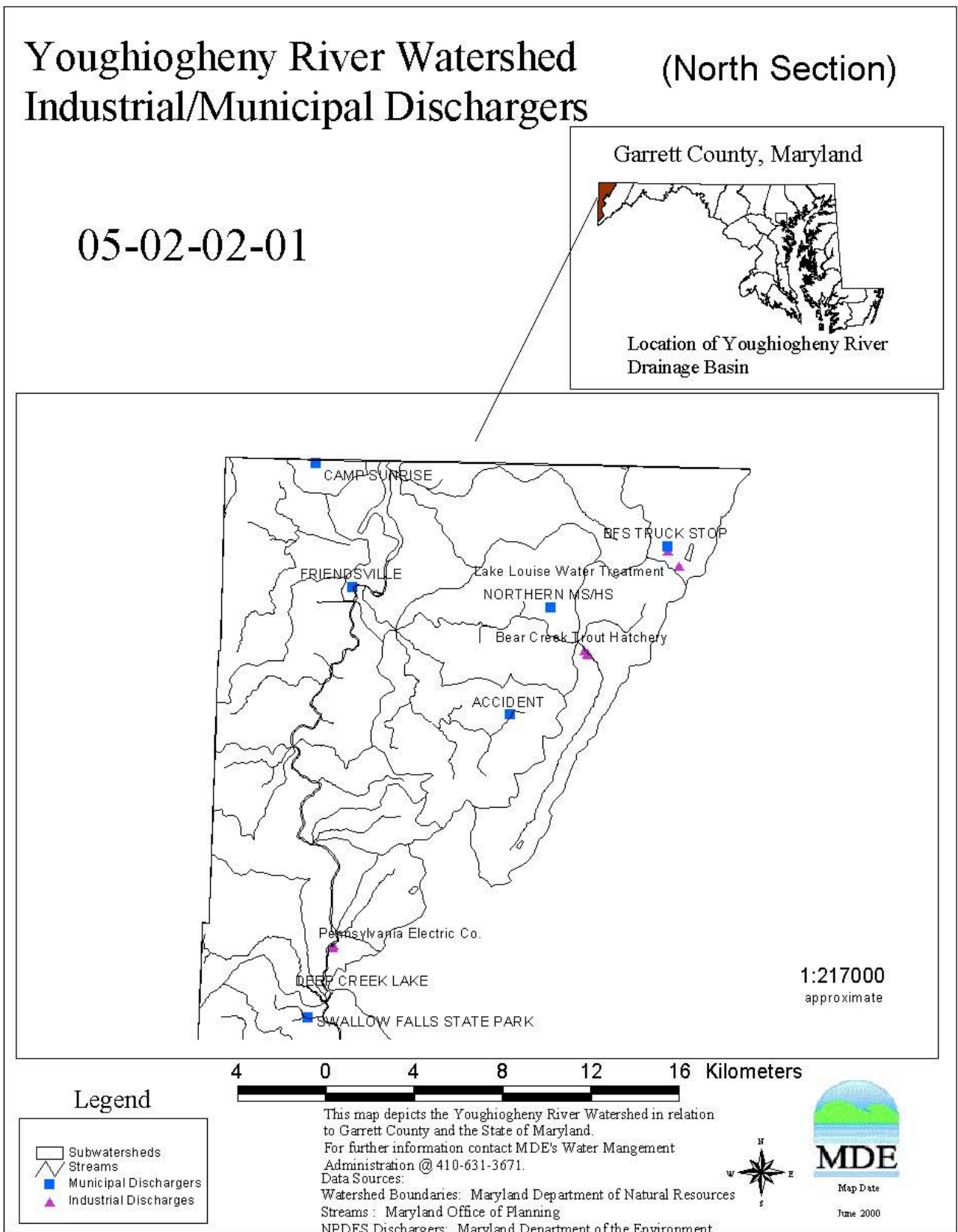


Figure 3: North Watershed for the Youghiogheny River showing point source discharges.

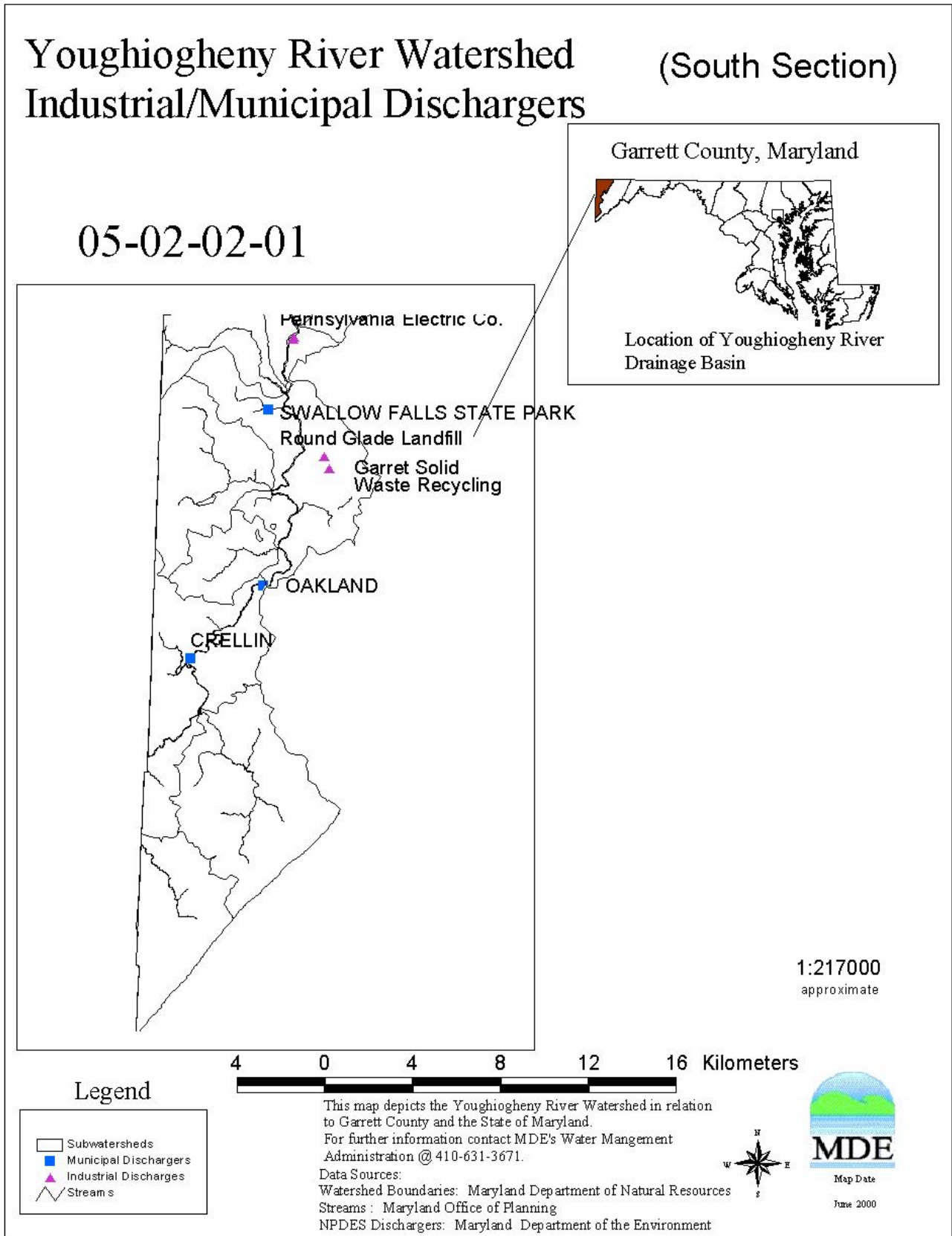
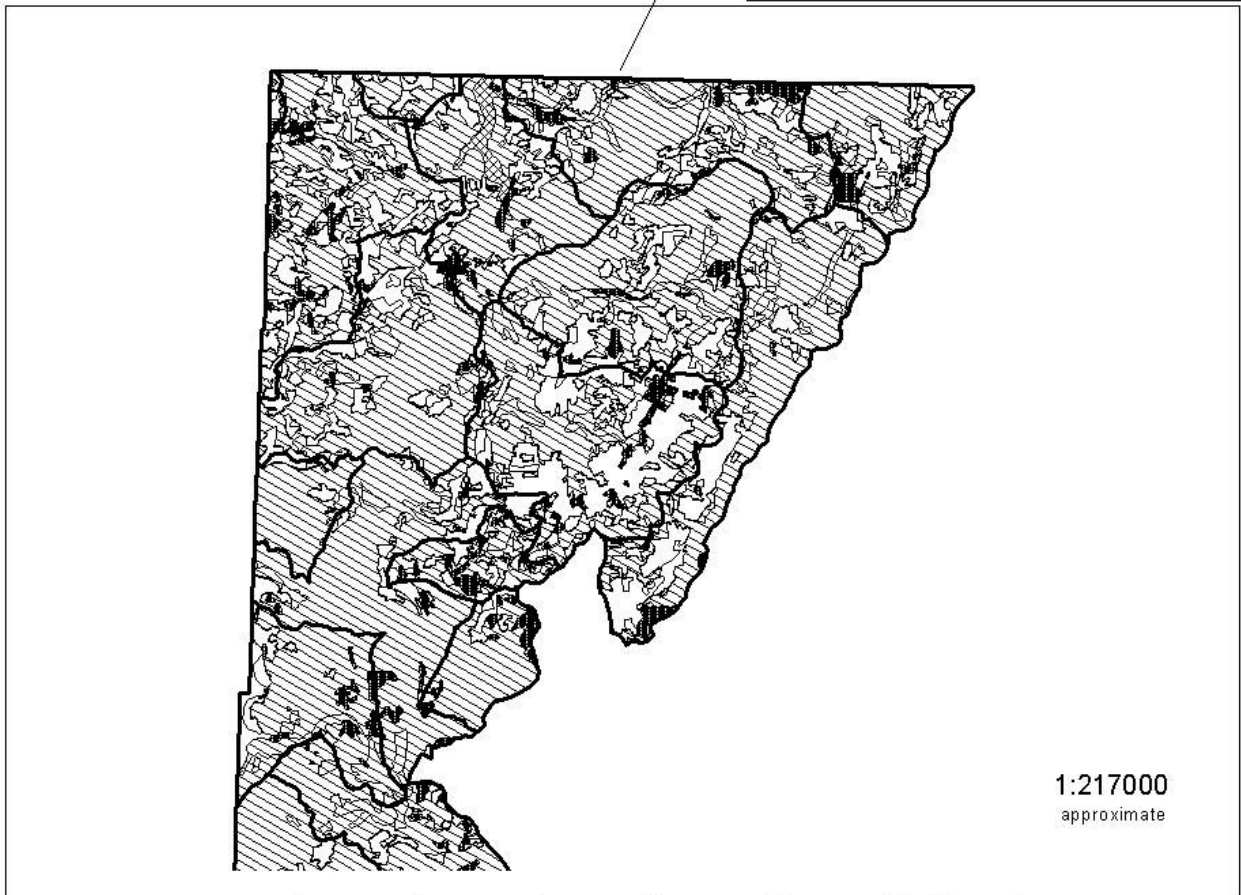
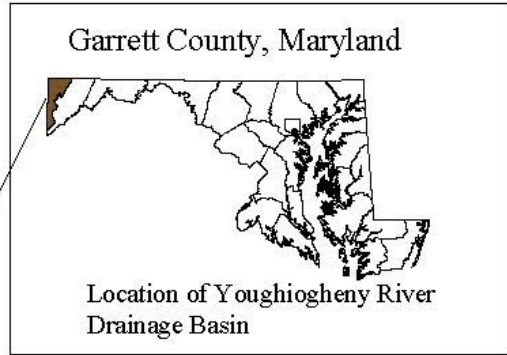


Figure 4: South Watershed for the Youghiogheny River showing water quality stations.

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# Youghiogheny River Watershed (North Section) Land Use/Land Cover

05-02-02-01



1:217000  
approximate



### Legend

- Subwatersheds
- 1997 Landuse/Land Cover
- Urban
- Agriculture
- Forest
- Water

This map depicts the Youghiogheny River Watershed in relation to Garrett County and the State of Maryland. For further information contact MDE's Water Mangement Administration @ 410-631-3671.

Data Sources:  
Watershed Boundaries: Maryland Department of Natural Resources  
Land Use/Land Cover: Maryland Office of Planning



Map Date  
June 2000

Figure 5: North Watershed for the Youghiogheny River showing land use.

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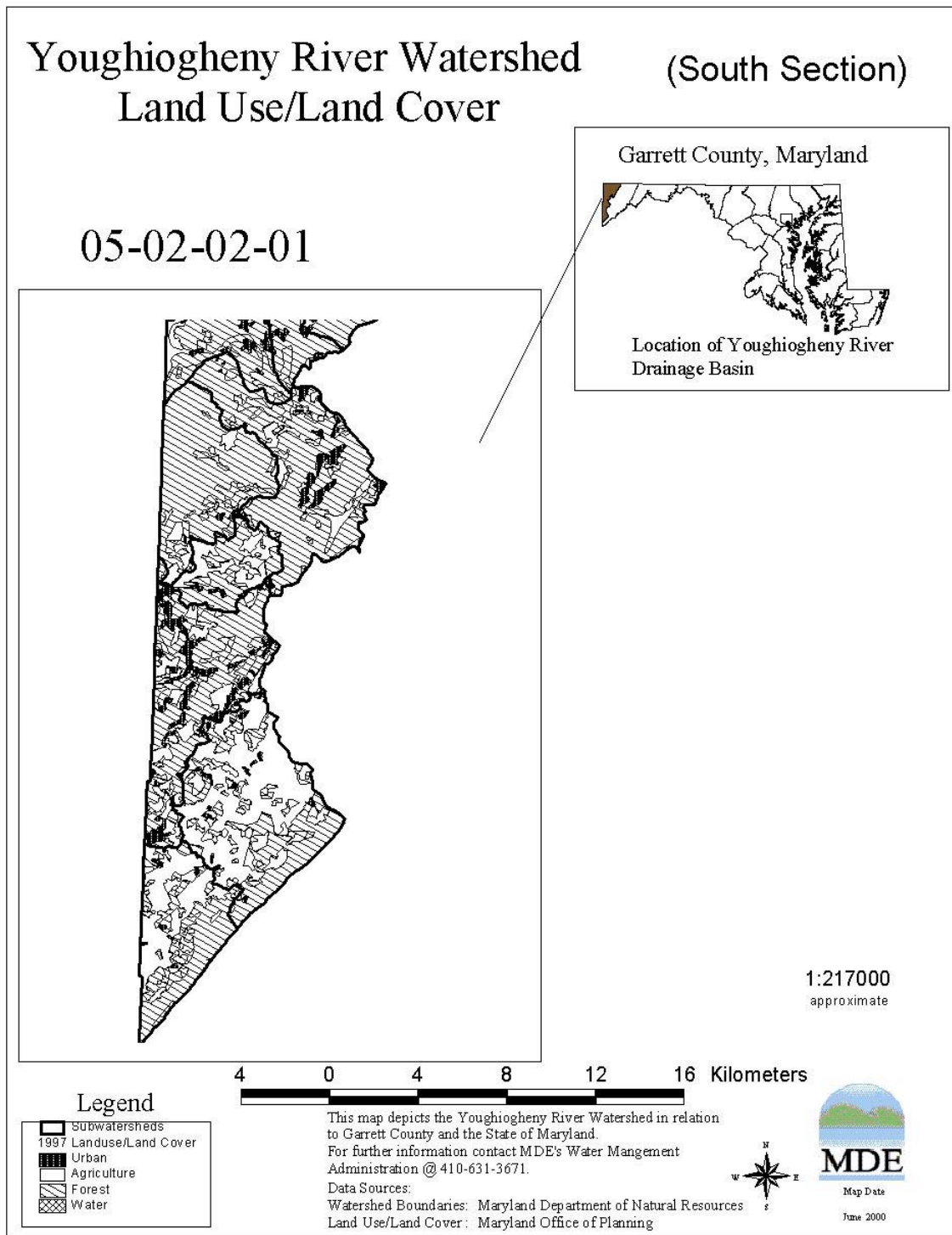
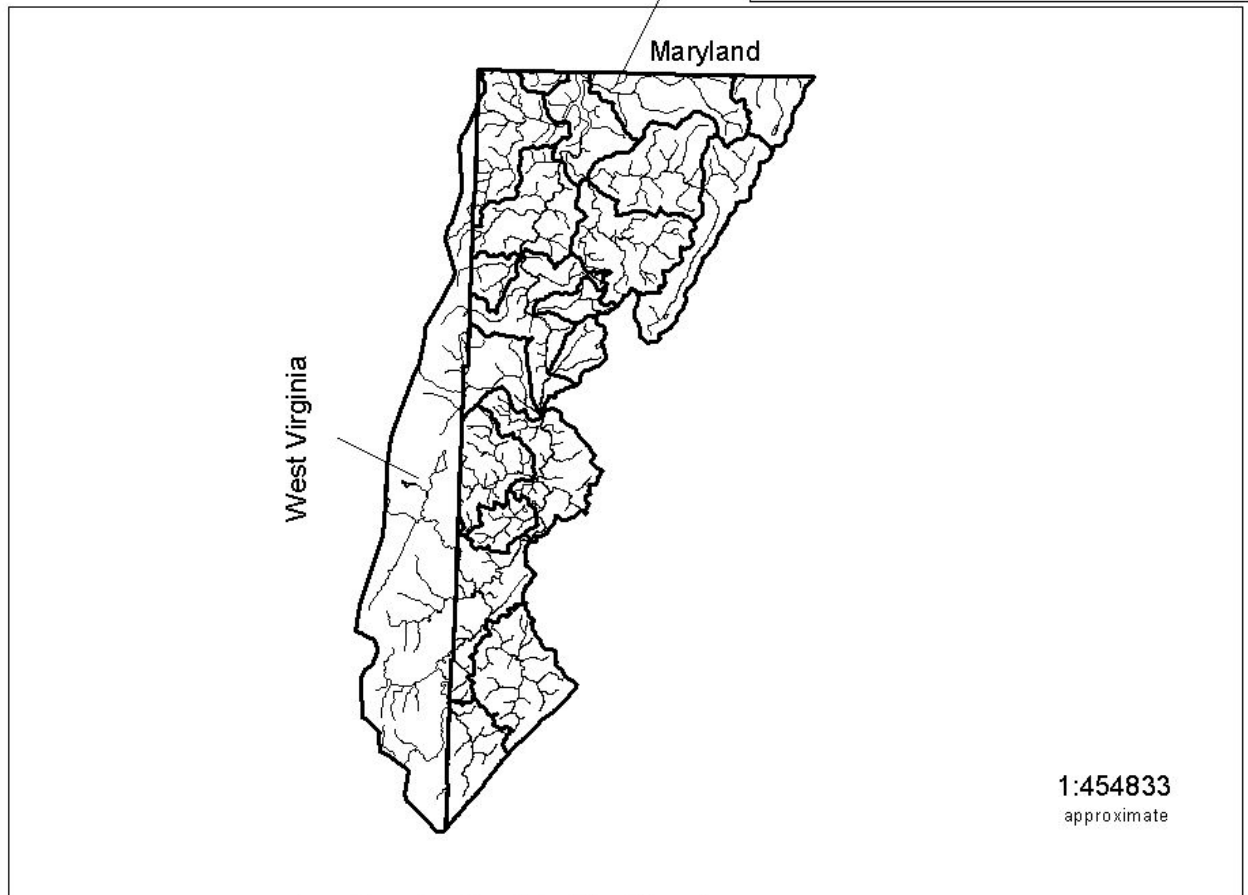
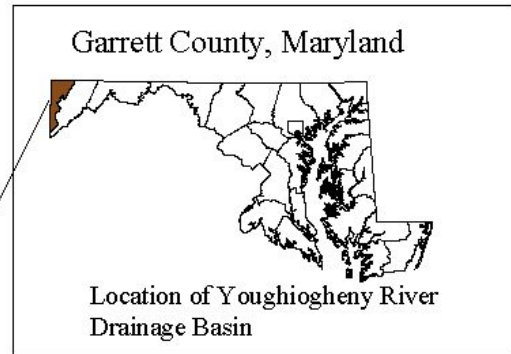


Figure 6: South Watershed for the Youghiogheny River showing land use.

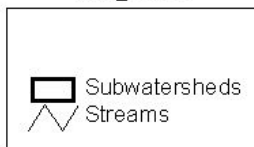
# Youghiogheny River Watershed Vicinity Map

05-02-02-01



4 0 4 8 12 16 Kilometers

## Legend



This map depicts the Youghiogheny River Watershed in relation to Garrett County and the State of Maryland. For further information contact MDE's Water Management Administration @ 410-631-3671.

Data Sources:  
Watershed Boundaries: Maryland Department of Natural Resources  
Streams : Maryland Office of Planning  
WV Streams: EPA Reachfile  
WV Watersheds: USGS



Figure 7: Map showing drainage area of the Youghiogheny River in W.V.  
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**Table 1: Predominant Land-Uses in Youghieny River Watershed\***

Land-Use		Drainage Area, Hectares			Drainage Area, Square Miles		
Category	Sub-Category	Maryland	W. V.	Total	Maryland	V.W.	Total
Agriculture	Cropland	11992	1523	13515	46	6	52
	Pasture, Orch.	2941		2941	11		11
<b>Agriculture (Total)</b>		<b>14933</b>	<b>1523</b>	<b>16456</b>	<b>57</b>	<b>6</b>	<b>63</b>
Forest	With Trees	34009	7696	41705	131	30	161
	Fern etc.	4758	0	4758	18	0	18
<b>Forest (Total)</b>		<b>38767</b>	<b>7696</b>	<b>46463</b>	<b>149</b>	<b>30</b>	<b>179</b>
Urban	Residential	2354	75	2429	9	0.3	9.3
	Commercial	135		135	0.52		0.52
	Industrial, Inst.	114		114	0.44		0.44
	Open Land	251	313	564	0.97	1.2	2.17
<b>Urban (Total)</b>		<b>2854</b>	<b>388</b>	<b>3242</b>	<b>11</b>	<b>1.5</b>	<b>12.5</b>
Miscellaneous	Water	264	102	366	1	0.4	1.4
	Wetland, other	282	9662	9944	1.1	38	39.1
<b>(Total)</b>		<b>546</b>	<b>9764</b>	<b>10310</b>	<b>2.1</b>	<b>38.4</b>	<b>40.5</b>
<b>Total</b>		<b>57100</b>	<b>19371</b>	<b>76471</b>	<b>219.1</b>	<b>75.9</b>	<b>295</b>

\* Source "Youghioghny Land Use Office of Planning 1994 for Maryland Portion"

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## 3.0 WATER QUALITY CHARACTERIZATION

Maryland's water quality standards presently do not impose a limit on the concentration of nutrients in the water column. Rather, Maryland manages nutrients indirectly by limiting their effect expressed in terms of excessive algal growth and resultant low dissolved oxygen. BOD and sediment oxygen demand (SOD) also consume DO; they must also be taken into account if low DO is observed in a water body. Water column quality in general reflects contributions from point sources and non point sources.

The Maryland Surface Water Use Designation (COMAR 26.08.02.08R(4)) for the Youghiogheny River is Use III-P – *water protected for contact recreation, fishing, protection of aquatic life and wildlife, natural trout propagation, and public water supply*. According to the numeric criteria for DO for Use III-P waters, concentrations should not be less than 5.0 mg/l at any time, with a minimum daily average of not less than 6.0 mg/l (COMAR26.08.02.03-3E(2) and COMAR 26.08.02.03-3D(2)) unless resulting from natural conditions (COMAR 26.08.02.03.A(2)). The water quality data presented in this section show that the numeric criteria for DO and the designated uses of this water body are being met.

All readily available water quality data for the last five years were considered for this analysis. Water quality surveys conducted at seven (7) stations along the Youghiogheny River in 1998 were used to conduct the analysis. The listing and location of stations used in this analysis is tabulated below in Table 2 and all stations are shown in Figures 1 and 2.

Table 2: Location of Water Quality Stations

Station I.D.	GPS coordinates	Station description
YOU0918	39°39.847' 79°24.458'	Youghiogheny at Friendsville bridge
YOU0979	39°33.994' 79°25.963'	Youghiogheny at Sang Run Road
YOU1069	39°29.671' 79°25.074'	Youghiogheny at Swallow Falls
YOU1155	39°25.249' 79°25.441'	Youghiogheny at Oakland USGS Gage
YOU1209	39°21.856' 79°27.733'	Youghiogheny at Underwood Rd
YOU1286	39°19.111' 79°29.247'	Youghiogheny at Rt. 50
YOU1328	39°16.222' 79°28.565'	Youghiogheny at Gnegy Road



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## 4.0 WATER QUALITY ANALYSIS

### 4.1 Nutrients

A total phosphorus profile for the river is shown in Graph 1, and shows the range between 0.005 - 0.075 mg/l. The graph also shows a calculated average linear concentration showing a range of 0.025 - 0.031 mg/l. Total nitrogen concentration profile for the river is shown in Graph 2. The range is 0.3 - 1.5 mg/l with one exceptional value of 3.7 mg/l at water quality station YOU1069, with a calculated linear average of 0.75 - 1.2 mg/l. Tabular data is shown in Appendix A.

### 4.2 Dissolved Oxygen

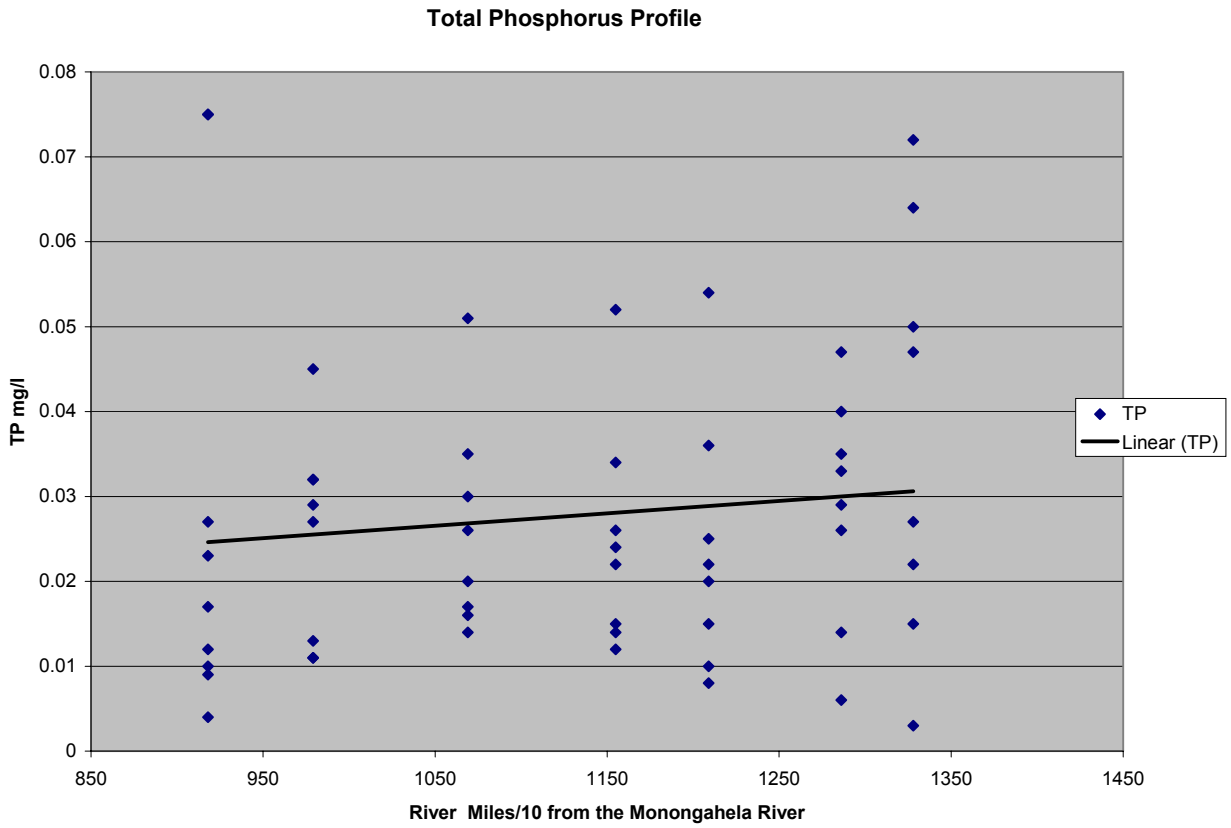
The water quality data do not show dissolved oxygen standard violations of 5.0 mg/l at any time. Given low Chlorophyll *a*, diurnal variations are not expected, and therefore it is not expected to have DO below the 6 mg/l daily average. The water quality data clearly show that the stream is meeting the standards at present. The dissolved oxygen is shown in Graph 3 and tabular data is shown in Appendix A. The minimum dissolved oxygen observed during the survey was 6.3 mg/l, well above the 5.0 minimum at any time, and 6.0 mg/l minimum daily average as required by the stream standards. If we take the average linear profile, the minimum is 8.6 mg/l throughout the stream.

### 4.3 Chlorophyll *a*

A chlorophyll *a* profile for the stream has also been plotted in Graph 4. The range is 0 - 2.5  $\mu$ /l with one exceptional value of 6.9 microgram per liter at water quality station YOU1328. The average linear range is 1 - 1.5  $\mu$ /l. Chlorophyll *a* tabular data is shown in Appendix A.

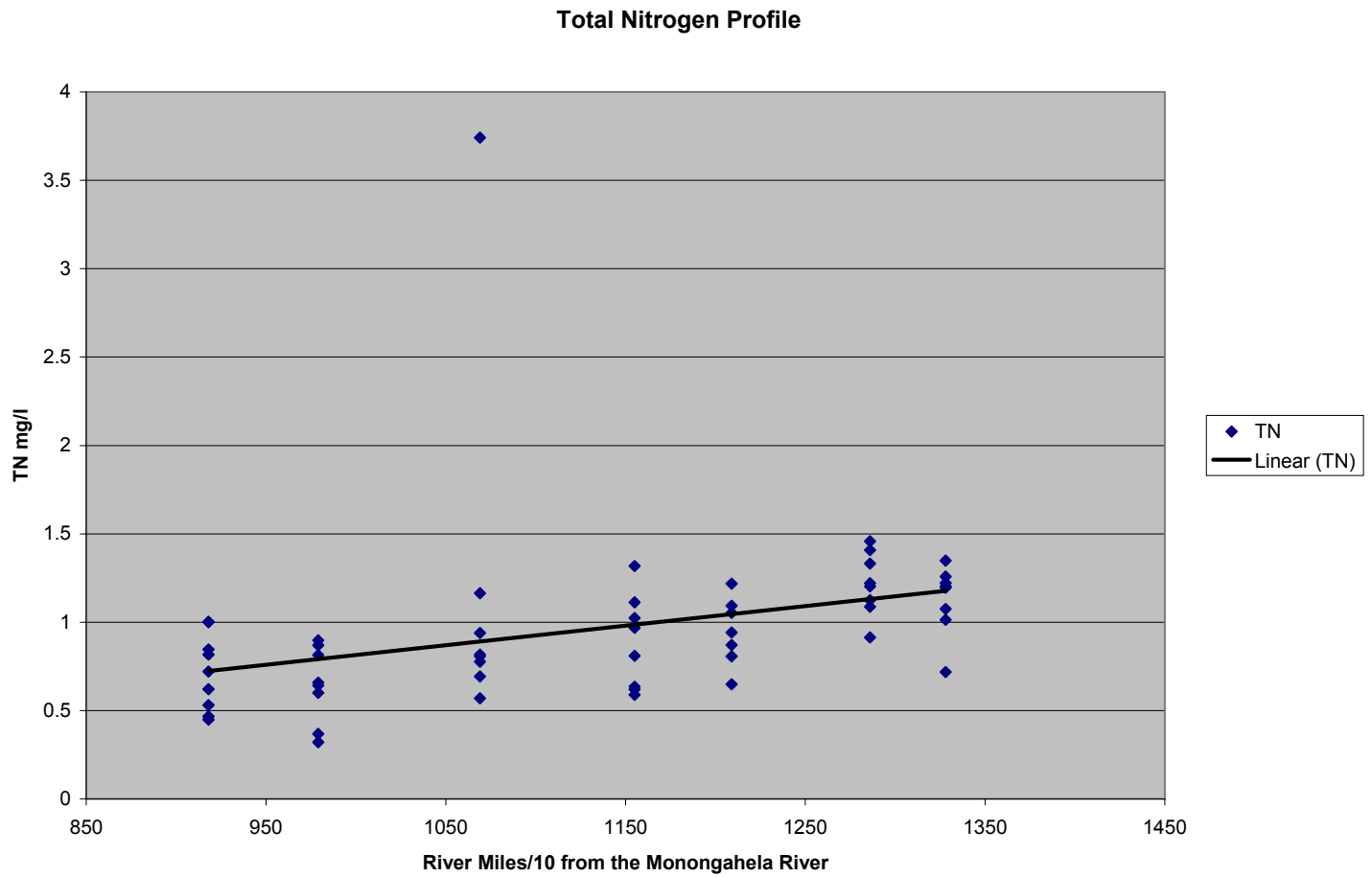
### 4.4 Biochemical Oxygen Demand

Because biochemical oxygen demand (BOD) also consumes DO, this potentially confounding factor must be considered in the analysis if low DO is observed. However, because low DO is not indicated in the Youghiogheny River, BOD does not enter into this analysis.



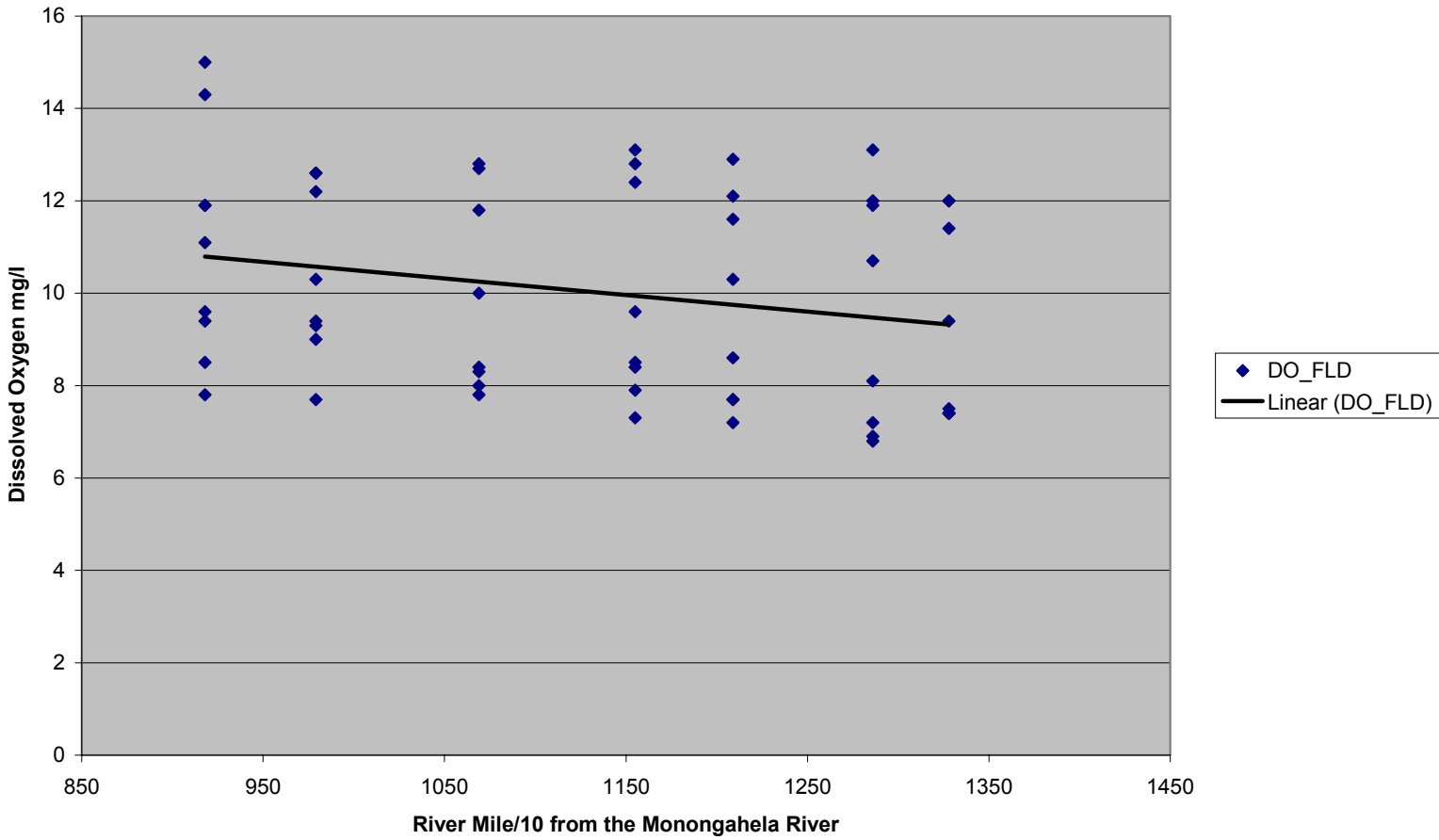
Graph 1: Total Phosphorus Concentration profile of Youghiogheny River, 1998 data.

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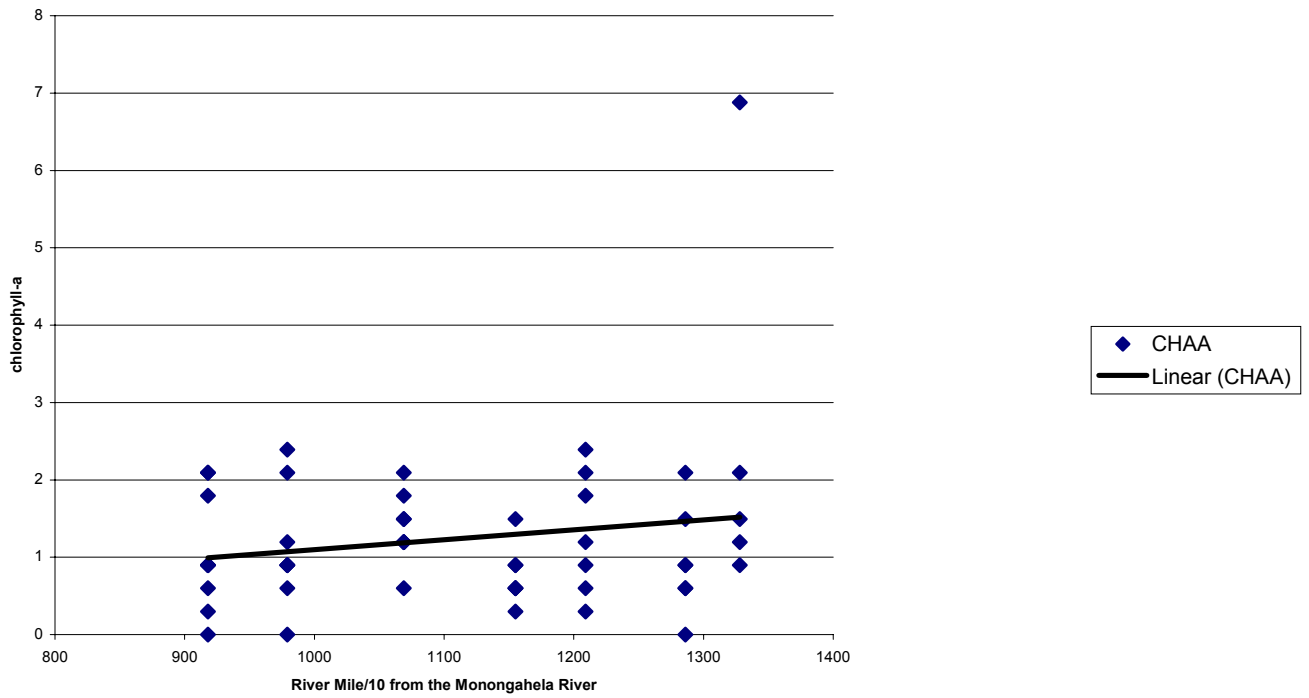
Graph 2: Total Nitrogen Concentration profile of the Youghiogheny River, 1998 data.

### Dissolved Oxygen Profile



Graph 3: Dissolved Oxygen concentration profile of the Youghiogheny River, 1998 data.

### Chlorophyll-a Profile



Graph 4: Chlorophyll-a Concentration profile of the Youghiogheny River, 1998 data.

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## 5.0 CONCLUSION

The data presented above clearly demonstrate that there is no excessive algal growth in the Youghiogheny River, as indicated by low chlorophyll-*a*. Similarly, dissolved oxygen concentrations are well within the stream standards. Based on the synoptic survey conducted during 1998, water quality data indicate the River has no eutrophication water quality problems. Barring any contradictory future data, this report will be used as supporting material when MDE proposes the revision of Maryland's 2002 303(d) list for public review.

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## *REFERENCES*

Maryland Department of the Environment, "Water Quality Database for Maryland Tributaries, August 1999".

Soil Survey of Garrett County, USDA August 1974.

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## **Appendix A**



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STATION	DATE	FLOW	CHAA	CHLA	CHLB	CHLC	CHTO	PHEA	BOD5	DO_FLD	TN	NH4	NO2	NO3	NO23	TP	PO4	TOC	COND_FLD	TSS	PH_FLD	WATEMP
BRC0011	03/09/1998	31710	2.3923	3.0773	0	0.4135	4.032	0.9569	1	11.6	1.513	0.013	0.007	1.316	1.323	0.025	0.024	1.96	60	16	7.1	7.1
BRC0011	03/16/1998	93930		1.0436	0	0.0399	1.344		1	14.7	1.361	0.008	0.004	1.337	1.341	0.021	0.01	1.52	50	3	6.8	2
BRC0011	03/23/1998		1.4952	1.54	0	0	2.184	0	1	13.4	0.934	9016	0.001	0.9185	0.919	0.017	0.01	2.01	60	2	7.1	3.1
BRC0011	03/30/1998		1.7942	2.3	0	0.0616	3.36	0.7177	1	11.1	1.349	0.005	0.005	1.184	1.189	0.011	0.009	1.67	65	5	7.1	10.7
BRC0011	07/21/1998	16790	0.5981	0.9109	0	0.0586	1.344	0.4486	1	9	1.414	0.007	0.003	1.041	1.044	0.023	0.01	2.5	90	3	7.2	18.9
BRC0011	08/24/1998	13640	0.5981				1.176	0.4486	1	8.7	1.407	0.083	0.004	1.103	1.107	0.035	0.023	2.31	110	7	7.2	18.6
BRC0011	08/31/1998	87270	1.1962				1.848	0.4785	1	9	1.147	0.009	0.003	0.984	0.987	0.026	0.01	2.02	115	8	7.2	18.9
BRC0011	09/14/1998	71780	0.5981	0.8154	0	0	1.008	0.2392	1	9	0.284	0.006	0.044	0.09	0.134	0.024	0.014	2.07	110	1	7.2	15.3
CHC0008	03/10/1998		2.0933	2.281	0.1696	0.5257	3.024	0.2093		12	2.26	0.053	0.013	1.797	1.81	0.042	0.03	2.48	65	28	6.8	2.4
CHC0008	03/16/1998						0.84			13.3	2.213	0.035	0.01	1.993	2.003	0.031	0.018	1.92	50	5	6.9	2.7
CHC0008	03/23/1998		1.4952	1.7692	0.2369	0.1364	2.352	0.3888		11.9	1.476	0.061	0.003	1.273	1.276	0.046	0.035	2.54	60	12	6.8	4.5
CHC0008	03/30/1998		2.6914	2.9627	0	0.2427	4.032	0.2392	1	10.8	1.96	0.023	0.011	1.679	1.69	0.022	0.019	2.2	70	7	7.1	13.4
CHC0008	07/21/1998		1.1962	1.9209	0.0001	0	2.688	1.1064		7.5	2.087	0.024	0.023	1.614	1.637	0.034	0.011	4.35	110	1	6.7	22.3
CHC0008	08/24/1998		0.8971	1.9382	0	0	2.688	1.6148	1	6.2	1.986	0.078	0.028	1.448	1.476	0.059	0.033	3.96	115	8	6.8	20.3
CHC0008	08/31/1998		0.8971	2.4509	0	0	3.36	2.4521	1	6.4	2.003	0.062	0.028	1.365	1.393	0.072	0.012	3.96	120	17	6.8	20.1
CHC0008	09/15/1998	12500	1.7942	2.9464	0	0	3.696	1.7643	1	6	1.429	0.077	0.015	0.904	0.919	0.066	0.014	3.99	120	6	6.8	18.5
DPR0005	03/09/1998		2.9904	3.1746	0.1851	0.4992	4.2	0.1495		11.2	2.344	1.004	0.022	0.812	0.834	0.444	0.28	3.25	75	17	7.2	6.6
DPR0005	03/16/1998		1.1962				1.512	0		12.6	1.924	0.019	0.005	1.759	1.764	0.043	0.029	2.24	80	2	7.1	1.7
DPR0005	03/23/1998		0.299				0.84	0.3289		12.3	0.7	0.02	0.001	0.6895	0.69	0.036	0.03	2.36	50	1	6.9	4
DPR0005	03/30/1998		0.8971	1.4245	0	0	2.016	0.7775		11	2.379	0.021	0.007	2.182	2.189	0.12	0.103	2.18	90	3	6.9	9.8
DPR0005	07/21/1998		3.5885	5.1911	0.5061	0.7877	6.72	2.482	1	8.3	7.843	0.018	0.03	6.693	6.723	1.93	1.613	4.84	380	21	7.4	19.5
DPR0005	08/24/1998		0.8971	2.2027	0	0	2.856	2.0335	1	7.6	1.368	0.017	0.006	0.492	0.498	2.79	2.519	5.06	445	18	7.7	18
DPR0005	08/31/1998		1.1962	2.0527	0	0	2.688	1.3158	1	8	2.929	0.011	0.006	2.403	2.409	1.52	0.756	4.07	345	13	7.5	17.8
DPR0005	09/14/1998	25600	0.8971				2.52	1.4055	1	8.6	0.989	0.069	0.026	0.043	0.069	3.18	2.68	5.13	500	3	7.8	16.4
LYO0011	03/10/1998		2.0933	2.1655	0	0.6296	2.856	0		13.2	1.164	0.011	0.009	0.965	0.974	0.035	0.017	2.3	75	33	6.7	3
LYO0011	03/16/1998		5.3827	5.6539	1.2348	0.0978	7.56	0.2691	1	13.5	1.41	0.106	0.01	1.04	1.05	0.048	0.028	2.2	55	8	7.1	2.7
LYO0011	03/23/1998		1.7942	1.9373	0	0.0133	2.52	0.0897	1	12.6	0.79	0.029	0.002	0.688	0.69	0.023	0.018	2.77	70	10	7.1	3.8
LYO0011	03/30/1998		10.167	10.421	0.6901	0.3725	13.776	0	1	11.2	1.306	0.028	0.01	0.896	0.906	0.044	0.018	2.4	85	10	7.2	13.6
LYO0011	07/21/1998		2.0933	2.9464	0	0	3.864	1.256	1	8.8	1.263	0.017	0.011	0.632	0.643	0.058	0.007	4.5	150	1	7.3	26.4
LYO0011	08/24/1998		4.4856	7.0156	0.1556	0.081	9.408	3.8875	1	6.4		0.048	0.012			0.079	0.031	4.19	190	17	7	21.5
LYO0011	08/31/1998		6.8779	9.2811	0.6203	0	12.264	3.5885	1	7.6	1.028	0.023	0.01	0.518	0.528	0.073	0.011	4.26	210	22	7.2	22.6
LYO0011	09/15/1998	42900	2.6914	4.831	0.3367	0	6.216	3.3792	5	3.9	2.006	0.579	0.019	0.387	0.406	0.161	0.033	6.18	230	10	7	19
MYC0002	03/09/1998						0.336			11.5	0.343	0.013	0.006	0.247	0.253	0.046	0.021	3.36	15	15	6.2	7.1
MYC0002	03/16/1998		0.299				0.504	0		12.9	0.464	0.016	0.004	0.36	0.364	0.021	0.015	1.97	15	6	6.4	2.3
MYC0002	03/23/1998		0.299				0.336	0		12.8	0.234	0.013	0.003	0.211	0.214	0.006	0.006	2.56	25	2	6.1	3.7
MYC0002	03/30/1998		0.299				1.176	0.9569		10.2	0.469	0.004	0.005	0.284	0.289	0.006	0.009	2.41	20	9	6.6	12.4
MYC0002	07/21/1998		1.4952	1.6546	0.092	0	2.352	0.1794		8.3	0.667	0.005	0.005	0.222	0.227	0.014	0.006	4.05	30	1	6.7	21.5
MYC0002	08/24/1998		0.5981				1.008	0.2392	1	8.6	0.588	0.009	0.005	0.153	0.158	0.013	0.007	5.76	35	6	6.7	19.4
MYC0002	08/31/1998		0.8971	1.2918	0	0	1.68	0.5682	1	8.6	0.487	0.005	0.003	0.174	0.177	0.021	0.006	5.52	35	6	6.9	19.7
MYC0002	09/14/1998	19900	0	0.2845	0	0	0.504	0.4187	1	8.8	0.826	0.008	0.02	0.376	0.396	0.026	0.01	4.62	35	13	6.8	18.6
SNO0000	03/10/1998		0.8971	1.1409	0.0997	0.1256	1.512	0.3588	1	11.9	0.61	0.017	0.006	0.484	0.49	0.02	0.004	2.07	35	35	6.2	2.7
SNO0000	03/10/1998		0.5981	1.0082	0.1605	0.1443	1.512	0.6579	1	11.9	0.664	0.02	0.006	0.478	0.484	0.029	0.008	2.09	35	36	6.2	2.7
SNO0000	03/16/1998			0.5127	0	0.1147	0.672		1	12.8	0.622	0.039	0.007	0.485	0.492	0.024	0.011	1.84	50	6	5.7	2.7
SNO0000	03/16/1998						0.504		1	12.8	0.594	0.041	0.007	0.487	0.494	0.022	0.007	1.72	50	7	5.7	2.7
SNO0000	03/23/1998		0.5981	0.76	0.0466	0.2668	1.008	0.2392	1	12.1	0.375	0.029	0.002	0.343	0.345	0.016	0.002	2.37	40	8	6.2	3
SNO0000	03/23/1998		0.8971	0.7782	0	0.0773	1.008	0	1	12.1	0.357	0.03	0.002	0.335	0.337	0.021	0.002	2.11	40	9	6.2	3

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SNO0000	03/30/1998	0.5981	1.1763	0	0.0212	1.512	0.8672	1	9.9	0.685	0.032	0.006	0.419	0.425	0.013	0.001	2.21	70	14	5.5	12.8	
SNO0000	03/30/1998	0.5981				1.344	0.6579	1	9.9	0.611	0.042	0.006	0.415	0.421	0.013	0.005	2.27	70	14	5.5	12.8	
SNO0000	07/21/1998		1.0436	0	0.0399	1.344		1	8.6	0.622	0.028	0.002	0.22	0.222	0.016	0	2.84	150	2.8	4.4	22.5	
SNO0000	07/21/1998		1.0255	0	0.2294	1.176		1	8.6	0.545	0.042	0.002	0.213	0.215	0.019	0	2.79	150	1	4.4	22.5	
SNO0000	08/24/1998	0	0.5672	0	0	0.84	0.8373		8	0.609	0.033	0.001	0.3285	0.329	0.004	0.001	2.54	125	6	5	20.2	
SNO0000	08/24/1998	0.299	0.549	0	0	0.672	0.3289	1	8	0.526	0.029	0.001	0.3355	0.336	0.01	0.001	2.26	125	4	5	20.2	
SNO0000	08/31/1998	0.5981	0.6472	0	0	0.672	0.0299	1	9.1	0.43	0.025	0.002	0.218	0.22	0.013	0.002	2.13	165	9	4.5	19.7	
SNO0000	08/31/1998	0	0.4163	0	0	0.672	0.628	1	9.1	0.39	0.02	0.002	0.218	0.22	0.012	0.002	2.09	165	9	4.5	19.7	
SNO0000	09/15/1998	54100						1	8.6	0.422	0.019	0.002	0.23	0.232	0.01	0.003	1.99	200	2	4.5	18	
SNO0000	09/15/1998	54100				0.168		1	8.6	0.385	0.019	0.002	0.233	0.235	0.009	0.003	1.98	200	1.5	4.5	18	
TOL0001	03/09/1998	0	0	0	0	0	0		11.8	0.16	0.008	0.003	0.087	0.09	0.011	0.008	2.58	15	6	4.6	5.9	
TOL0001	03/16/1998		0	0	0	0	0		13.1	0.139	0.015	0.002	0.107	0.109	0.018	0.007	1.87	10	2	5.1	1.3	
TOL0001	03/23/1998								12.9	0.07	0.014	0.001	0.0695	0.07	0.003	0.006	2.31	15	1	5.1	2.5	
TOL0001	03/30/1998		0	0	0	0	0		10.6	0.191	0.009	0.003	0.088	0.091	0.01	0.002	1.98	20	4	5	9.4	
TOL0001	07/21/1998	4.7846	5.6902	0.8233	0	7.56	1.2859		8.2	0.569	0.074	0.004	0.015	0.019	0.061	0.007	4.13	25	1	6.3	19.7	
TOL0001	08/24/1998	4.1866	5.7401	0.0571	0.5234	7.896	2.3026	1	8.3	0.765	0.087	0.004	0.131	0.135	0.033	0.003	4.37	25	13	5.8	17.4	
TOL0001	08/31/1998	1.7942	2.0527	0	0	2.688	0.299	1	8.1	0.498	0.102	0.004	0.124	0.128	0.026	0.003	5.75	25	15	5.9	18.2	
TOL0001	09/14/1998	55300	0.8971	1.2918	0	0	1.68	0.5682	1	8.3	0.854	0.25	0.003	0.171	0.174	0.035	0.01	5.72	30	4	6.2	15.8
YOU0918	03/09/1998	23220	2.0933	2.4938	0.7248	0.5076	3.528	0.628	1	11.9	1.001	0.029	0.016	0.645	0.661	0.075	0.044	2.75	50	30	7	6.7
YOU0918	03/09/1998	23220	2.0933	2.4938	0.7248	0.5076	3.528	0.628	1	11.9	1.001	0.029	0.016	0.645	0.661	0.075	0.044	2.75	50	30	7	6.7
YOU0918	03/16/1998	46440	0.8971	0.8936	0.0156	0	1.176	0	1	15	0.845	0.011	0.005	0.77	0.775	0.023	0.011	1.89	40	6	7	1.9
YOU0918	03/23/1998	15250	0			1.512	1.884	1	14.3	0.531	0.018	0.001	0.5055	0.506	0.017	0.015	2.41	40	9	6.9	2.7	
YOU0918	03/30/1998	55880	1.7942	1.8054	0	0	2.52	0	1	11.1	0.816	0.007	0.005	0.601	0.606	0.01	0.008	1.97	50	6	6.9	12.3
YOU0918	07/21/1998	10870	0.8971	0.7591	0.0168	0.5414	1.176	0	1	9.6	0.621	0.001	0.002	0.229	0.231	0.027	0.004	3.43	75	1	6.4	20.2
YOU0918	08/24/1998	95170	0.5981	0.8317	0	0	0.84	0.2392	1	7.8	0.72	0.008	0.006	0.304	0.31	0.004	0.002	2.95	90	1	6.5	22
YOU0918	08/31/1998	95170	0.8971	1.3091	0	0.0025	1.512	0.5682	1	9.4	0.467	0.008	0.002	0.235	0.237	0.009	0.003	2.86	90	4	6.7	20.7
YOU0918	09/14/1998	49500	0.299	0.6826	0	0	0.672	0.5383	1	8.5	0.449	0.005	0.064	0.145	0.209	0.012	0.006	2.77	125	2	7	18.4
YOU0979	03/09/1998		0.8971	1.0082	0.1605	0.1443	1.512	0.1495	1	12.2	0.6	0.032	0.007	0.423	0.43	0.032	0.019	2.57	40	13	6.9	5.9
YOU0979	03/16/1998		0.8971				1.176	0	1	12.6	0.658	0.027	0.004	0.454	0.458	0.029	0.01	2.36	40	9	6.7	2.5
YOU0979	03/23/1998		0.5981				1.176	0.2392	1	12.6	0.368	0.029	0.001	0.3225	0.323	0.013	0.007	2.74	40	4	6.8	4
YOU0979	03/30/1998		2.3923	3.5737	0.0325	0.1684	4.704	1.7942	1	10.3	0.869	0.01	0.006	0.613	0.619	0.027	0.015	1.98	50	19	7	13.2
YOU0979	07/21/1998		2.0933	2.3182	0	0	3.024	0.2093	1	9	0.813	0.005	0.004	0.459	0.463	0.032	0	3.28	95	1	7.1	21.8
YOU0979	08/24/1998		0	0.8154	0	0	0.84	1.256	1	7.7	0.897	0.008	0.005	0.512	0.517	0.045	0.005	3.44	95	1	7	19.9
YOU0979	08/31/1998		1.1962				1.848	0.2691	1	9.3	0.641	0.007	0.003	0.368	0.371	0.011	0.003	3.34	100	4	7.2	19.5
YOU0979	09/14/1998	67650	0.8971				1.68	0.3588	1	9.4	0.321	0.004	0.03	0.051	0.081	0.011	0.005	3.17	105	3	7.2	16.9
YOU1069	03/09/1998		1.7942	2.0164	0.321	0.2885	2.688	0.299	1	11.8	3.742	0.036	0.011	0.701	0.712	0.051	0.028	2.71	45	21	7.1	6.7
YOU1069	03/16/1998		1.1962				1.344	0	1	12.8	0.939	0.043	0.006	0.813	0.819	0.026	0.012	1.8	45	6	6.9	2
YOU1069	03/23/1998		1.4952	1.5391	0	0.0694	2.016	0	1	12.7	0.569	0.03	0.002	0.532	0.534	0.02	0.014	2.48	40	12	6.8	3.4
YOU1069	03/30/1998		1.4952	2.3182	0	0	3.024	1.2261	1	10	0.817	0.011	0.006	0.651	0.657	0.016	0.007	2	55	8	7.1	13.5
YOU1069	07/21/1998		1.1962				1.68	0.0598	1	7.8	0.807	0.014	0.005	0.412	0.417	0.035	0	3.41	110	1	7	24.4
YOU1069	08/24/1998		1.1962	1.3108	0	0	1.68	0.0598	1	8	1.163	0.02	0.006	0.617	0.623	0.03	0.004	3.42	100	1	7.2	22.3
YOU1069	08/31/1998		2.0933	2.6809	0.0467	0	3.696	0.8373	1	8.3	0.693	0.016	0.004	0.449	0.453	0.017	0.004	3.32	130	5.5	7.2	23.4
YOU1069	09/14/1998		0.5981				1.512	0.6579	1	8.4	0.776	0.006	0.002	0.484	0.486	0.014	0.005	3.35	160	1	7.7	23.5
YOU1155	03/10/1998	10620	1.4952	2.0164	0.321	0.2885	2.856	0.8074	1	12.8	1.112	0.035	0.017	0.735	0.752	0.052	0.035	2.79	40	56	6.6	2.9
YOU1155	03/16/1998	26580	0.5981				0.672	0	1	13.1	0.968	0.054	0.006	0.852	0.858	0.024	0.011	1.73	45	7	6.6	2.5
YOU1155	03/23/1998	82980	0.5981	1.0255	0	0.2294	1.344	0.6579	1	12.4	0.619	0.03	0.002	0.577	0.579	0.022	0.012	2.35	40	10		
YOU1155	03/30/1998	30570	0.5981				1.008	0.0299	1	9.6	1.318	0.019	0.005	0.703	0.708	0.026	0.005	2.21	60	10	6.6	15.1
YOU1155	07/21/1998	46260		1.1763	0	0.0212	1.344		1	8.5	0.81	0.008	0.004	0.446	0.45	0.034		2.86	115	1	6.8	23.5
YOU1155	08/24/1998	48050	0.299	1.0799	0	0	1.512	1.1663		7.3	1.023	0.024	0.006	0.597	0.603	0.015	0.003	2.85	100	4	6.8	21.5
YOU1155	08/31/1998	26100	0.8971	1.5572	0	0	2.184	0.9868	1	7.9	0.634	0.015	0.003	0.411	0.414	0.014	0.003	2.69	130	7	6.8	22.7

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YOU1155	09/14/1998	16980	0.8971				1.344	0.3588	1	8.4	0.588	0.009	0.002	0.326	0.328	0.012	0.006	2.82	150	2	7	24.3
YOU1209	03/10/1998		1.1962	1.751	0.4426	0.3259	2.352	0.8971	1	11.6	1.217	0.047	0.018	0.879	0.897	0.054	0.043	2.53	40	35	6.9	2.7
YOU1209	03/16/1998			0.1509	0	0	0.168		1	12.9	1.053	0.027	0.007	0.936	0.943	0.022	0.014	1.96	40	2	6.9	2.5
YOU1209	03/23/1998		0.299	0.6273	0.1074	0.2855	1.008	0.5383	1	12.1	0.648	0.02	0.002	0.621	0.623	0.015	0.014	2.3	35	10	6.8	4.2
YOU1209	03/30/1998		0.8971	0.8163	0	0	0.84	0	1	10.3		0.008	0.007	0.757	0.764	0.01	0.01	2.02	45	6	6.9	14.4
YOU1209	07/21/1998		2.3923	2.6991	0	0	3.36	0.3289	1	8.6	0.806	0.005	0.006	0.51	0.516	0.02	0.005	3.31	85	1	6.8	22.8
YOU1209	08/24/1998		0.5981				2.688	2.3325	1	7.7	1.092	0.02	0.006	0.746	0.752	0.025	0.012	3.1	75	2	6.8	19.8
YOU1209	08/31/1998		1.7942	3.46	0	0	4.704	2.6016	1	7.7	0.87	0.022	0.005	0.565	0.57	0.036	0.006	3.53	90	10	6.7	19.9
YOU1209	09/15/1998	75000	2.0933	3.2291	0	0	4.032	1.6746	1	7.2	0.941	0.025	0.005	0.426	0.431	0.008	0.006	3.5	95	2	6.7	18.1
YOU1286	03/10/1998		0.8971	1.1237	0.3352	0.0404	1.68	0.3588		12	1.408	0.037	0.013	1.165	1.178	0.035	0.028	2.2	40	21	6.9	2.1
YOU1286	03/16/1998		0	0.1509	0	0	0.168	0.2093		13.1	1.332	0.029	0.008	1.174	1.182	0.029	0.015	1.9	40	4	7.1	2.7
YOU1286	03/23/1998		0.5981	0.9901	0.3662	0.3338	1.512	0.6579		11.9	0.913	0.034	0.002	0.791	0.793	0.006	0.026	2.65	40	13	6.9	4.4
YOU1286	03/30/1998			0.4362	0	0	0.336			10.7	1.202	0.014	0.009	1.013	1.022	0.014	0.012	2.12	50	7	6.9	13.8
YOU1286	07/21/1998		0.8971	1.3091	0	0.0025	1.68	0.5682		8.1	1.221	0.025	0.01	0.721	0.731	0.026	0.005	4.1	80	1	6.7	24.5
YOU1286	08/24/1998		0.5981	1.3091	0	0.0025	1.512	1.0765	1	6.9	1.458	0.046	0.01	1.008	1.018	0.04	0.023	3.77	85	10	6.7	21.6
YOU1286	08/31/1998		1.4952	2.3182	0	0	3.024	1.2261	1	6.8	1.087	0.043	0.009	0.678	0.687	0.047	0.008	4.05	90	11	6.7	22.2
YOU1286	09/15/1998		2.0933	2.9464	0	0	3.696	1.256	1	7.2	1.125	0.044	0.009	0.496	0.505	0.033	0.007	4.31	95	5	6.9	20.8
YOU1328	03/10/1998			0.8755	0.2213	0.163	1.176		1	12	1.258	0.017	0.009	1.029	1.038	0.022	0.018	2.13	50	16	7	2.6
YOU1328	03/16/1998			0.7773	0	0.3519	1.008		1	12	1.196	0.026	0.008	1.058	1.066	0.027	0.012	1.96	40	4	7	4.2
YOU1328	03/23/1998		0.8971	1.1228	0.3054	0.3151	1.68	0.3588	1	11.4	0.718	0.027	0.002	0.596	0.598	0.003	0.021	3.24	40	24	6.9	4.3
YOU1328	03/30/1998						1.68		1	9.4	1.348	0.021	0.008	0.88	0.888	0.015	0.01	2.48	55	10	7	17.4
YOU1328	07/21/1998		1.1962	1.7864	0.0013	0.2215	2.352	0.8971	1	7.5	1.222	0.043	0.015	0.607	0.622	0.05	0.01	5.16	80	1	6.8	23.5
YOU1328	08/24/1998		6.8779	8.8546	0	0.2832	11.592	2.7512	1	7.4	1.203	0.048	0.013	0.61	0.623	0.047	0.022	5.09	80	1	6.9	20.2
YOU1328	08/31/1998		1.4952	2.8482	0	0.0719	3.696	2.0634	1	7.4	1.013	0.044	0.014	0.439	0.453	0.072	0.012	6.63	90	7	6.9	20.8
YOU1328	09/15/1998	3050	2.0933	3.7237	0	0.2349	4.872	2.5119	2	7.4	1.074	0.035	0.011	0.383	0.394	0.064	0.02	6.27	100	6.5	7	19.3