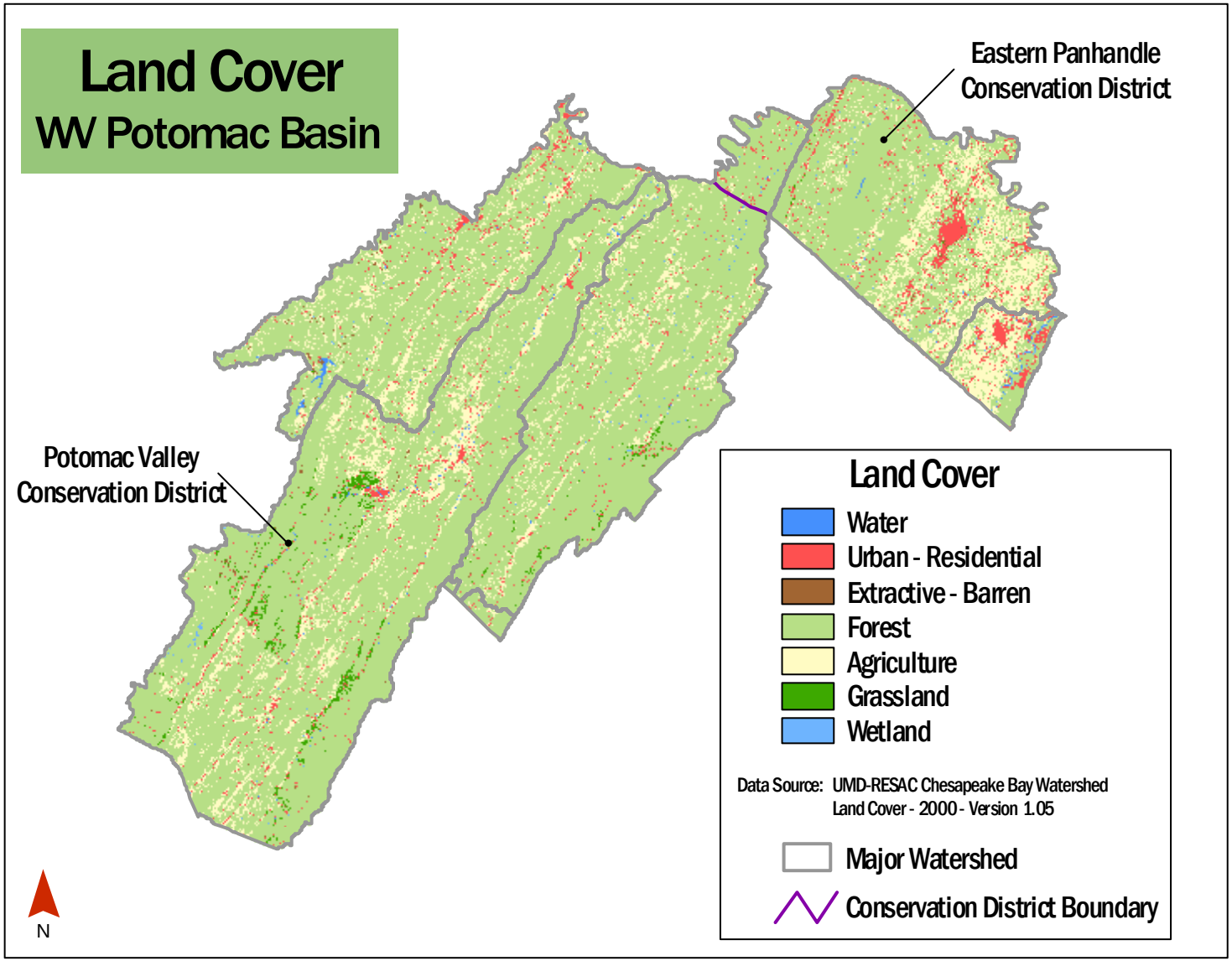
Appendix 1. Land Use – WV Potomac Basin



Appendix 2. Water Quality Monitoring Programs

West Virginia Department of Environmental Protection

The State of West Virginia has adopted a comprehensive approach to managing the state's waters and their surrounding ecosystem, known as the Watershed Management Framework. The goal is to develop and implement management strategies through a cooperative long-range planning effort that includes government agencies, businesses, environmental groups, watershed associations, and citizens. Among other activities, cooperating organizations participate in identifying streams that require restoration, protection, or enhancement. One component of the Watershed Management Framework is the WVDEP watershed assessment program.

In 2002, WVDEP's Watershed Assessment Section (WAS) completed their first five-year cycle of watershed assessments. The cycle began in 1996 with the goal of monitoring each of the state's 32 major watersheds within a five-year period. This program collects a wide variety of data, including nutrient and sediment parameters of specific interest to the Tributary Strategy process. The following table provides a summary of data collected by this program in Potomac watersheds.

Summary of monitoring data collected by WVDEP WAS program in Potomac watersheds. SOURCE WVDEP

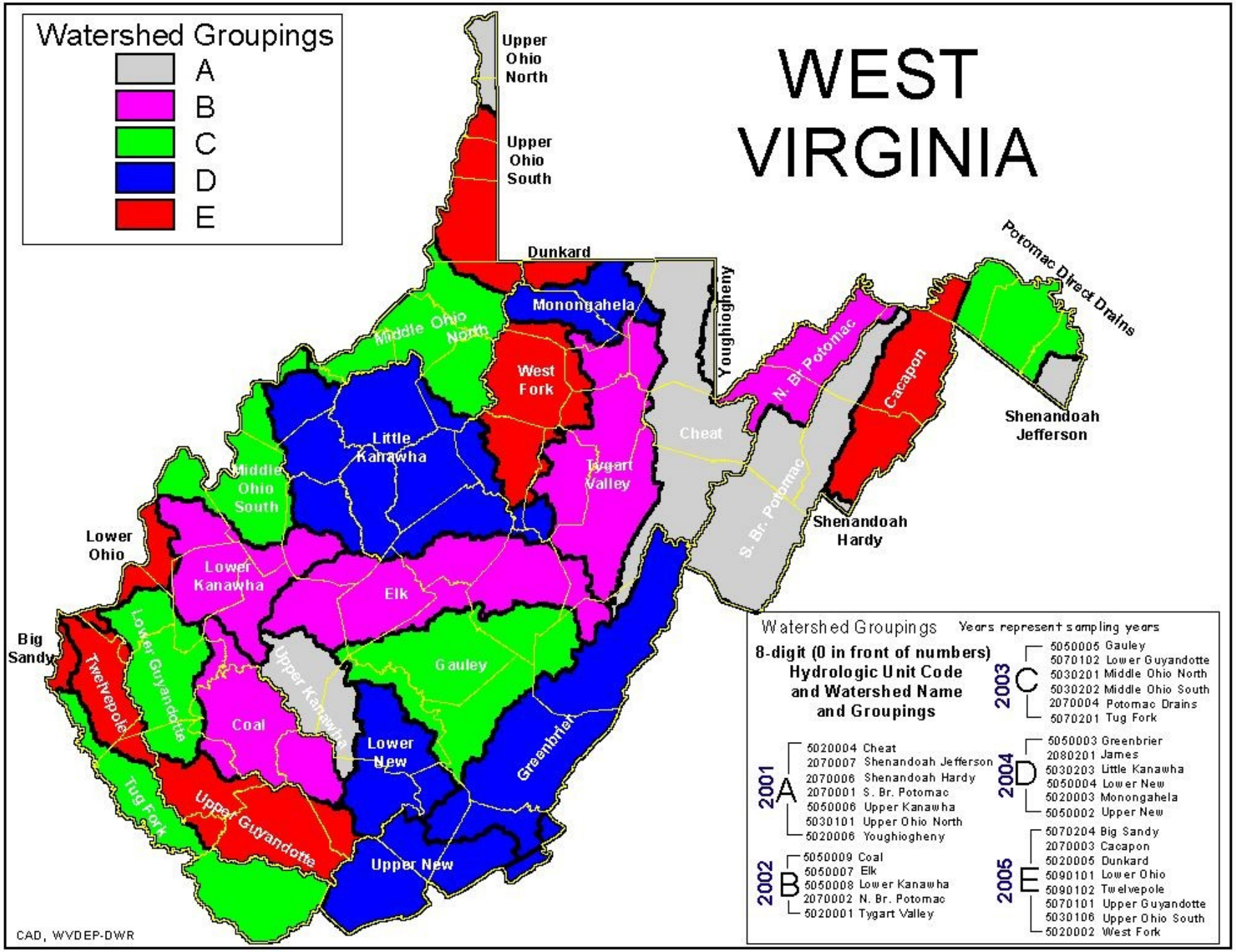
	South Branch of Potomac	**North Branch of Potomac**	**Cacapon/Little Cacapon**	**Direct Drains**	**Shenandoah**
Year Assessed	1996	1997	2000	1998	1996
No. of Stream segments Assessed	106 (36%)	47	48	41	12 (70%)
Miles assessed	657.4	307.97	346.3	276.4	74.8
%Fully supporting designated uses	24.2%	23.2%	47.6%	44.9%	32.6%
%Threatened or impaired	75.8%	76.8%	52.4%	55.1%	67.4%
Causes of Impairment	Habitat alteration, fecal coliform, nutrients	Dioxins, metals, pH, siltation	Fecal coliform, metals, unknown cause	Fecal coliform, agriculture, urban runoff/storm sewers	Contaminated sediments, grazing related sources
Main pollution sources	Loss of riparian vegetation, agriculture, construction	Industrial point sources, abandoned mining, acid mine drainage	Not noted	Not noted	Not noted
Public Health/Aquatic life impacts	None reported	Fish consumption advisory due to dioxin	None reported	None reported	Fish consumption advisory due to PCBs
No. streams on 303(d) list	38	14*[1]	3	0*[2]	3
TMDLs completed	6	0	1	0	0
Cause of TMDL	Fecal coliform from agriculture		Fecal coliform		

*[1] North Fork mainstem is under fish consumption advisory, but belongs to Maryland and is therefore not included on WV's 303(d) list.
*[2] Potomac River mainstem is under fish consumption advisory, but belongs to State of Maryland and is not on WV's 303(d) list.

During the second five-year cycle more emphasis is being placed on pre-TMDL monitoring and less emphasis on general stream monitoring. Whereas general stream monitoring involves visiting sites only one time, pre-TMDL monitoring involves visiting each site monthly for a period of up to one year. Pre-TMDL monitoring also focuses on specific parameters attributed to known impairments, as opposed to a general suite of parameters.

Water pollution control in the State is primarily achieved through the National Pollutant Discharge Elimination System (NPDES) permitting program. These permits emphasize the use of either the best available technology approach to point source control, or water quality based requirements, particularly on smaller streams. West Virginia's surface water monitoring program is comprised of compliance inspections, intensive biological and/or chemical surveys on a site-specific basis, ambient chemical monitoring, rotating watershed surveys, total maximum daily load (TMDL) support studies, and citizens Monitoring (WV 2000 305b Annual Report).

See following page for **DEP Watershed Framework Map.**


Watershed Groupings
A
B
C
D
E
WEST VIRGINIA
Upper Ohio North
Upper Ohio South
Dunkard
Monongahela
Youghiogheny
Middle Ohio North
West Fork
Little Kanawha
Middle Ohio South
Tygart Valley
Cheat
N. Br. Potomac
Cacapon
Potomac Direct Drains
Shenandoah Jefferson
S. Br. Potomac
Shenandoah Hardy
Lower Ohio
Lower Kanawha
Elk
Big Sandy
Twelvepole
Lower Guyandotte
Upper Kanawha
Gauley
Coal
Lower New
Greenbrier
Tug Fork
Upper Guyandotte
Upper New
CAD, WVDEP-DWR
Watershed Groupings
Years represent sampling years
8-digit (0 in front of numbers) Hydrologic Unit Code and Watershed Name and Groupings
2001 A
5020004 Cheat
2070007 Shenandoah Jefferson
2070006 Shenandoah Hardy
2070001 S. Br. Potomac
5050006 Upper Kanawha
5030101 Upper Ohio North
5020006 Youghiogheny
2002 B
5050009 Coal
5050007 Elk
5050008 Lower Kanawha
2070002 N. Br. Potomac
5020001 Tygart Valley
2003 C
5050005 Gauley
5070102 Lower Guyandotte
5030201 Middle Ohio North
5030202 Middle Ohio South
2070004 Potomac Drains
5070201 Tug Fork
2004 D
5050003 Greenbrier
2080201 James
5030203 Little Kanawha
5050004 Lower New
5020003 Monongahela
5050002 Upper New
2005 E
5070204 Big Sandy
2070003 Cacapon
5020005 Dunkard
5090101 Lower Ohio
5090102 Twelvepole
5070101 Upper Guyandotte
5030106 Upper Ohio South
5020002 West Fork

West Virginia Department of Agriculture

Water Sampling Program Summary

The operation of the West Virginia Department of Agriculture (WVDA) Moorefield Laboratory began in 1993. This involved the employment of a chemist and the installation of equipment for the testing of nutrients in animal manures. In 1994-95, the United States Geological Survey (USGS) conducted a water quality study in the Potomac Headwaters region. All water quality parameters, other than fecal coliform bacteria, were found to be in compliance with West Virginia's standards. However, as a result of the USGS study, segments of the Lost River, South Branch of the Potomac, North Fork of the South Branch, South Fork of the South Branch, Mill Creek, Lunice Creek and Anderson Run were placed on West Virginia's 303(d) list of water bodies impaired due to fecal coliform bacteria. Since 1998, the WVDA has conducted a comprehensive water quality monitoring program within the region. The purpose of this program has been to monitor the seven impaired streams in order to investigate potential sources of fecal coliform bacteria. In addition to bacteria sampling, these streams are tested for pH, Conductivity, Temperature, Total Phosphorous, Ammonia and Nitrate. Samples are collected five times per month in the Lost River (6 sites), South Branch of the Potomac (13 sites), Mill Creek (10 sites), Lunice Creek (9 sites) and Anderson Run (3 sites) watersheds. The North Fork of the South Branch (5 sites) and South Fork of the South Branch (10 sites) are sampled one time per month.

From October 1999 to October 2004, the WVDA collected surveillance samples at sixteen sites in the Eastern Panhandle to be representative of all drainage leaving WV. These sample sites were on North Branch tributaries, the Potomac River itself, Potomac River direct drains and the Shenandoah. This initiative was discontinued to transition into the Chesapeake Bay Non Tidal Network.

Chesapeake Bay Non Tidal Network

For several years, the Chesapeake Bay Program has led an initiative to design and implement a Non-Tidal Water Quality Monitoring Network to better represent trends and calculate loads at multiple sampling stations throughout all 7 jurisdictions in the Chesapeake Bay Watershed. The nontidal water-quality network will play an essential role in measuring and assessing nutrient and sediment concentration and load reductions in the tributary strategy basins across the watershed. Data from this program will be used to improve CBP watershed models (see Section V) that are used to predict the effectiveness of management actions to reduce loads.

Need for Network

The CBP has commitments to meet water-quality criteria (dissolved oxygen, chlorophyll and water clarity) in the Bay and its tidal tributaries by 2010. The CBP is working to reduce loads of nutrients and sediment to achieve these criteria. A tidal water quality network is being developed for measuring attainment of the criteria in the Bay and tidal tributaries. While watershed model runs are used to predict the effectiveness of management actions to reduce loads, a nontidal water-quality network is critical to measure and assess the actual nutrient and sediment concentration and load reductions in the tributary strategy basins across the watershed. Therefore a nontidal water-quality network is being designed for the Bay watershed.

Objectives of Network

The objectives of the network are (1) Measure and assess the status and trends of nutrient and sediment concentrations and loads in the tributary strategy basins across the watershed (2) Assess

the factors affecting nutrient and sediment status and trends (3) Improve calibration and verification of partners' watershed models.

Criteria for Meeting Monitoring Objectives

The objectives will be met by having a network producing data for:

- Computing trend in concentrations and stream flow
- Estimating nutrient and sediment loads and computing trends in loads,
- Providing information to improve calibration and verification of the watershed models.
- Providing information that can be used with other data to determine the factors affecting the trend in concentration and load
- Developing indicators that can be used to communicate progress to the CBP.

The network will be designed so data are collected at all sites to meet the criteria to compute trends in concentration and flow (referred to as "trend sites"). At a subset of these sites, data collection will be enhanced to meet the criteria for load computation (referred to as "load sites"). Data from both of these site types, and in particular load sites, will be used to improve watershed models, help understand the factors affecting trends and loads, and develop indicators to communicate the information to the CBP.

Trend Sites

Concentration trends are analyzed to determine if changes in nutrients and sediment are occurring over time. Trends will be determined for both a raw "unadjusted for flow" concentration and a "flow-adjusted" concentration. In addition to both concentration trends, daily stream flow data will be used to compute a trend in stream flow. The surface-water flow measurements are also needed to compute a flow-adjusted concentration trend. Having these three types of trends will document the changes in nutrients and sediment over time and help understand the influence of hydrology and management actions. At least 5 years of monthly concentration data are needed to compute a trend in concentration and flow (add reference from Mike Langland).

To be included as a trend site, a station must meet the following criteria:

-The station must be associated with a stream-flow gage to allow computation of trends. Water quality sampling must be conducted close to the stream-flow gage so that the water quality and discharge information are compatible.
-Samples need to be collected at least monthly over a five-year time span.
-At a minimum, the samples should be analyzed for total nitrogen, total phosphorous, and TSS
- Samples should be collected using methods to ensure they represent water quality conditions at the station
-The preferred list of parameters for each site is listed in table 1. (Mary Ellen's table)

Load Sites

Load sites would be used to quantify the amount of nutrients and sediment entering the Bay, leaving tributary strategy basins, and be used to calibrate watershed models. In order to compute loads, water-quality samples need to be collected over a range of flow (including storms) because of the change in concentration during storms. This is especially important for phosphorus and sediment. In addition to the water-quality samples, continuous stream flow data are needed to utilize the statistical tools to estimate stream loads. At least 3 years of data are needed to compute a load and at least 5 years are needed to compute a trend in load.

To be included as a load site, a station must meet the following criteria:

-The station must be associated with a stream-flow gage to allow computation of trends. Water quality sampling must be conducted close to the stream-flow gage so that the water quality and discharge information are compatible.
- A total of 20 samples should be collected each year, including 12 monthly samples and eight storm samples based on an average flow year (the actual number of samples could be less during low flow years and more during high flow years as funds are available).
- In general, the storm samples should attempt to target at least four different storms (one each season). More than one sample can be collected per storm but no more than one per day (this is a requirement of the statistical load estimation program).
-At a minimum, the samples should be analyzed for total nitrogen, total phosphorous, ammonium, nitrate, phosphate and total suspended solids. Storm samples should also include suspended sediment and particle size.
- Samples should be collected to ensure that they represent water quality conditions at the station.

Considerations for location of sites

There are several considerations regarding the locations of sites. These considerations are:

a. Outlets of major streams draining the tributary strategy basins.
b. Areas within the tributary strategy basins that have the highest nutrient delivery to the bay and tidal tributaries.
c. Represent the overall range of conditions in the Bay watershed. This would include range of loads from different land cover types (urban, agriculture, and forest land covers), physiographic/geologic setting, and range of watershed sizes.

The initial selection of sites is to support a network for the tributary basins. Once these sites have been chosen they will be evaluated for representativeness of watershed characteristics, which is important for model calibration and simulation. The network may be modified to ensure both of these objectives are meet.

Approach to Selecting Candidate Sites

A nontidal database of existing and water quality that was originally constructed for the CBP Nutrient Subcommittee (Langland and others, 1995) was updated with more recent data, stream flow sites, and linked to a GIS to help design the nontidal network. The database was used to conduct an initial evaluation of the current monitoring sites and the proposed site criteria for the network. Then a list of potential sites for the network was generated that included potential sites with some current monitoring and also new sites. The sites within each State were provided to the respective CBP State workgroup member so they could review and revise the list of candidate sites for the network. The State lists were then complied into a draft list of candidate sites for the entire watershed. This list of candidate sites will also be evaluated for how well they represent different watershed conditions.

Initial Evaluation

Some of the major findings from the initial evaluation of existing sites with the monitoring criteria included:

a. Many water quality-sampling sites are not co-located with a steam gage preventing the proper determine of loads and trends of loads, concentrations, and flow;
b. The majority of existing sites do not collect samples during storms preventing proper determination of nutrients and sediment loads
c. The frequency of sample collection at some sites is being decreased and this will impair the ability to compute and detect a concentration trend.

d. Samples at some sites are not analyzed for total TN and TP
e. The determination of sediment is not consistent at many sites.
f. There are a lack of sites to determine loads and trends of nutrients and sediment from key areas of the watershed including the Coastal Plain and rivers draining tributary strategy basins.

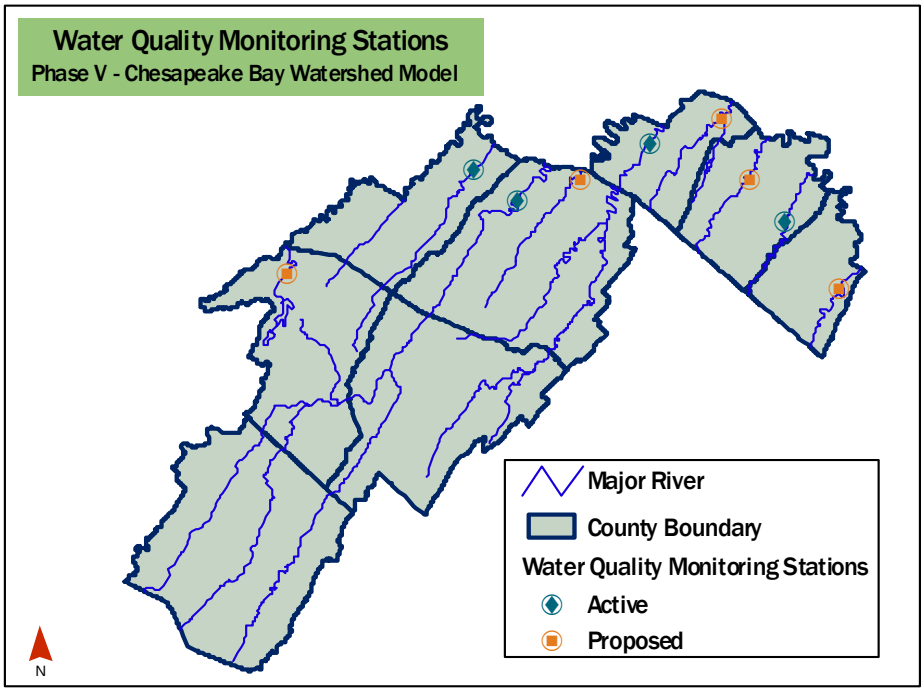
Selected Sites

The following streams were chosen as West Virginia's nine candidate sites:

- South Branch of the Potomac near Springfield
- Cacapon River at Great Cacapon
- Opequon Creek Near Martinsburg
- Shenandoah River at Millville
- Patterson Creek near Headsville
- Stony River near Mt. Storm
- Back Creek near Jones Spring
- Sleepy Creek
- Little Cacapon River

From this list, West Virginia could only fund 4 sites for the 2005 to 2006 grant year. The four streams that were chosen for monitoring are:

- South Branch of the Potomac River at Springfield
- Opequon Creek near Martinsburg
- Cacapon River at Great Cacapon
- Patterson Creek near Headsville



Other Sampling Programs

The USDA-NRCS contracted with the **U.S. Geological Survey (USGS)** to conduct a surveillance level water quality study in 1994 and 1995 to assess the condition of the Potomac watershed's rivers in West Virginia. Nineteen sites in the South Branch drainage and four in the Lost River (headwaters of the Cacapon) drainage were sampled monthly for varying periods of time (Mathes, 1996). Their study "did not indicate high nutrient concentrations at any site." However, they noted significant algal growth at many sites during the summertime and suggested this might be related to nutrient loading to the streams. Nitrate concentrations were positively correlated with numbers of feedlots and poultry houses. However, nitrogen concentrations were considerably lower than concentrations to the east of the study area in the Shenandoah River's Great Valley region, another agricultural region with integrated poultry agriculture. In conclusion, they suggested that "future water quality sampling could include a network of several small tributary basins with varying degrees of agricultural land use, where samples collected during the same time period might provide statistical verification of suggested or apparent relations seen in this reconnaissance study."[1]

Cacapon Institute (CI) is a non-profit corporation and WV certified laboratory that has conducted a number of water quality studies in area streams, starting with a comprehensive baseline study of the Cacapon River between 1989 and 1992.[2] CI began a Cacapon River monitoring study in July 1996 at five permanent sites located throughout the watershed; these sampling sites were also included in the baseline study. Seven additional sites were added to this program in 2002.

Between March 1997 and July 2002, CI conducted studies in several watersheds to answer a number of questions, including: 1- are nutrients applied to the basin's agricultural soils entering the river; 2- do streams with different land use characteristics have different nutrient concentrations? The 179 square mile Lost River watershed was selected due to the intensive nature of agriculture in parts of the watershed. The 205 square mile North River (largest tributary of the Cacapon) watershed was added in June 1998 to serve as a relatively low intensity agriculture control. Both of the above watersheds have small, mostly scattered human habitation with only a few small towns and no significant point sources. Between May 1998 and March 2000, CI conducted a similar project in the South Branch of the Potomac watershed. Unlike the Lost/North watersheds, the South Branch watershed contains municipal and industrial point sources.

Thirty-two tributary and mainstem sampling sites with different land use characteristics, ranging from heavily forested (>95%) to intensively farmed, were included. Sampling protocols included regularly scheduled dates and storm sampling. Land uses in the Lost/North watersheds were digitized from NAPP photography and DOQQ imagery. Chemical parameters included total and reactive phosphorus, nitrate nitrogen and turbidity (an indirect measure of sediment in the water).

Key findings in the Lost/North study:

- In general, phosphorus and turbidity were low except during active runoff events at all sample sites, despite the presence of sites with presumed high phosphorus levels in the soils following many years of poultry litter application.
- The most intensive agricultural indicator site had slightly higher median reactive phosphorus and distinctly higher nitrate concentrations than other sites.

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[1] Mathes, 1996. Streamwater Quality in the Headwaters of the South Branch Potomac River Basin, West Virginia, 1994-1995, and the Lost River Basin, West Virginia, 1995. USGS Administrative Report.

[2] Constantz, G., N. Ailes & D. Malakoff, 1993. *Portrait of a River: The Ecological Baseline of the Cacapon River.* 30p

- In addition to the obvious source of fertilized lands, phosphorus was found associated with naturally phosphorus rich soils running off a construction site (Gillies, 1998c) and in springs feeding certain streams.
- Nitrate nitrogen was much more variable than phosphorus and many stream sites showed a substantial increase in nitrate concentration following periods of precipitation. Correlation analysis suggested cropland was an important source of nitrogen. Sites with little agriculture, particularly row crops, never or rarely had elevated nitrate concentrations.

Key findings in the South Branch:

- High concentrations of phosphorus and turbidity associated with precipitation were observed infrequently in the South Branch, and the study was hampered by extended period of dry weather
- Persistently high nutrient concentrations were associated with point sources (a trout hatchery and poultry processing plants).
- Nitrate concentrations at many sites increased for an extended period of time following heavy precipitation in January 1999.

Detailed reports on these and other studies are available on Cacapon Institute's website (www.cacaponinstitute.org).

Appendix 3. Urban & Mixed Open Best Management Practices

Best Management Practices used in the Urban and Mixed Open Implementation Strategy.	
Urban BMP Category	**Description**
Wet Ponds and Wetlands	Practices that have a combination of a permanent pool, extended detention or shallow wetland equivalent to the entire water quality storage volume. Practices that include significant shallow wetland areas to treat urban storm water but often may also incorporate small permanent pools and/or extended detention storage.
Dry Extended Detention Ponds	Dry extended detention ponds (a.k.a. dry ponds, extended detention basins, detention ponds, extended detention ponds) are basins whose outlets are designed to detain the stormwater runoff from a water quality "storm" for some minimum duration (e.g., 24 hours) which allow sediment particles and associated pollutants to settle out. Unlike wet ponds, dry extended detention ponds do not have a permanent pool. However, dry extended detention ponds are often designed with small pools at the inlet and outlet of the pond, and can also be used to provide flood control by including additional detention storage above the extended detention level.
Infiltration Practices	Infiltration practices are used to capture and temporarily store the water quality volume before allowing it to infiltrate into the soil, promoting pollutant treatment and groundwater recharge.
Filtering Practices	Practices like swales (vegetated open channels that reduce stormwater runoff and promote infiltration), rain gardens, and sand or organic matter filters that capture and temporarily store water , promoting pollutant treatment and groundwater recharge.
Erosion and Sediment Control	Erosion and sediment control practices such as silt fences, slope drains, and vegetation that protect water resources from sediment pollution and increases in runoff associated with land development activities. By retaining soil on-site, sediment and attached nutrients are prevented from leaving disturbed areas and polluting streams.
Natural Area Conservation	Maintaining areas such as forests, grasslands and meadows that encourage stormwater infiltration.
Stream Restoration	Restoring natural stream hydrology, morphology, and the riparian landscape.
Septic Connections/Hookups	Septic connections/hookups represent the replacement of traditional septic systems with connection to and treatment at wastewater treatment plants.
Septic Denitrification	Septic denitrification systems provide enhanced nutrient removal over traditional septic systems by adding advanced treatment technology.
Septic Tank Pumping	Septic systems achieve nutrient reductions through several types of management practices, including frequent maintenance and pumping. On average, septic tanks need to be pumped once every three to five years to maintain effectiveness. The pumping of septic tanks is one of several measures that can be implemented to protect soil absorption systems from failure. When septic tanks are pumped and sewage removed, the septic system's capacity to remove settable and floatable solids from wastewater is increased.
Urban and Mixed Open Nutrient Management	Nutrient management involves the reduction of fertilizer applications to grass lawns and other areas. The implementation of nutrient management is based on public education and awareness, targeting suburban residences and businesses, with emphasis on reducing excessive fertilizer use. Nutrient management plans recommend appropriate rates of nutrient application, timing of applications, and placement of nutrients to address plant nutrient needs while minimizing nutrient export to the environment.
Riparian Forest Buffers	Converting developed lands to linear wooded areas along rivers and streams to help filter nutrients, sediments, and other pollutants from runoff as well as remove nutrients from groundwater. Riparian buffers also help to maintain the integrity of stream channels; and supply food, cover, and thermal protection to fish and other wildlife.
Tree Planting	Planting trees on lands not adjacent to waterways and converting the land use from urban and mixed open to forest. If the trees are planted as part of the urban landscape, with no intention to covert the area to forest, then this does not count as urban tree planting.

Appendix 4. Point Source Facilities
Permitted for 50,000 Gallons Per Day or Greater.

Watershed		Facility Name	Responsible Party	Permit ID
Cacapon River	1	Capon Bridge, Town of	Capon Bridge, Town of	WV0103730
	2	Wardensville, Town of	Wardensville, Town of	WV0045501
North Branch Potomac	1	%Corporate Jet	Potomac Highlands Airport	WVG610086
	2	Bayard, Gormania & Elk Garden	Mountain Top PSD	WV0101524
	3	Buffalo Coal Co.	Wymer Surface Mine	WV0051381
	4	Buffalo Coal Co.	C-1 Surface Mine	WV0051403
	5	Buffalo Coal Co.	A-34 Coal Prep. Plant	WV0060372
	6	D&L Coal Co.	Jones, Stollenbarger	WV0094781
	7	Fort Ashby PSD	Fort Ashby PSD	WV0041521
	8	Green Springs Plant	Koppers Industries Inc.	WV0073482
	9	Hercules, Inc. - Ridgeley	ATK Tactical Sys. Co. LLC	WV0020371
	10	Island Creek	Alpine Complex	WV0005541
	11	Island Creek	Potomac Mine	WV0005606
	12	Keyser, City of	Keyser, City of	WV0024392
	13	Knobley Estates	Knobley Estates Sanitary Corp.	WV0088897
	14	Laurel Run Mining Co.	Laurel Run Complex	WV0093556
	15	Mt. Storm Power Station	VA Elec. & Power Co.	WV0005525
	16	North Branch Power Station	VEPCO	WV0115321
	17	Vindex Energy	Prep. Plant	WV0051101
Potomac Direct Drains	1	167AWICES	WV Air National Guard	WV0005665
	2	Baker Heights STP	Berkeley Co. PSSD	WV0020061
	3	Buffalo Coal Co.	Stony River Dam	WV0068471
	4	Cacapon Resort State Park	WV DNR	WVG551181
	5	Coolfont Recreation, Inc.	Coolfont Recreation, Inc.	WV0081337
	6	General Motors Service Parts	General Motors Service Parts	WV0073229
	7	Honeywood WWTP	Berkeley Co. PSSD	WVG551294
	8	Knouse Foods Coop., Inc.	Knouse Foods Coop., Inc.	WV0077500
	9	Leetown Science Center	US Dept of Interior	WV0005649
	10	Martinsburg Facility	World Kitchen, Inc.	WV0005576
	11	Martinsburg, City of	Martinsburg, City of	WV0023167
	12	National Ed & Training Center	US Fish & Wildlife Service	WV0105112
	13	Opequon/Hedgesville PSD	Berkeley Co. PSSD	WV0082759
	14	Paw Paw, Town of	Paw Paw, Town of	WV0027405
	15	Potomac River WTP	Berkeley Co. PSSD	WV0115550
	16	River Bend Park	Riverbend Membership Corp.	WV0105384
	17	Rocky Glen Mobile Hope Park	McFillan, M V Jr.	WV0102032
	18	Shepherdstown Corp. of	Shepherdstown Corp. of	WV0024775
	19	Spectratech International, Inc.	Spectratech International, Inc.	WV0005533
	20	Spring Mills & Woods II	Berkeley Co. PSSD	WV0103161
	21	Warm Springs PSD	Warm Springs PSD	WV0027707
Shennandoah Jefferson	1	Charles Town, City of	Charles Town, City of	WV0022349
	2	Halltown Mill	Halltown Paperboard Co.	WV0005517
	3	Harpers Ferry_Bolivar PSD	Harpers Ferry-Boliver PSD	WV0039136
	4	PNGI Charles Town Gaming Ltd	PNGI Charles Town Gaming Ltd	WV0088757
	5	Tuscawilla Utilities	Charles Town, City of	WV0088013
	6	Willow Springs PSC	Willow Springs PSC	WV0086452
South Branch Potomac	1	Franklin, Town of	Franklin, Town of	WV0024970
	2	Moorefield, City of	Moorefield, City of	WV0020150
	3	Naval Security Group	US Dept. of Navy	WVG551203
	4	Petersburg, City of	Petersburg, City of	WV0021792
	5	Pilgrim's Pride Corp.	Pilgrim's Pride Corp.	WV0005495
	6	Pilgrim's Pride Corp.	Pilgrim's Pride Corp.	WV0047236
	7	Reeds Creek Hatchery	WV DNR	WV0111821
	8	Romney, City of	Romney, City of	WV0020699
	9	Spring Run Hatchery	WV DNR	WV0112500
Total # Permits in Potomac Basin	**55**			

Appendix 5. Agriculture Cost Share Programs

In addition to the programs noted in the main document, the following agricultural cost share programs are also available to defray costs associated with implementation of BMPs:

- **The Conservation Reserve Enhancement Program (CREP)** is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water. The program is a partnership among producers; tribal, state, and federal governments; and, in some cases, private groups.
- **The Environmental Quality Incentives Program (EQIP)** was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP may cost-share up to 75 percent of the costs of certain conservation practices and incentive payments may be provided for up to three years to encourage producers to participate. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan.
- **Agricultural Management Assistance (AMA)** provides cost-share payments to agricultural producers to voluntarily address issues such as water management, water quality, and erosion control by incorporating conservation into their farming operations. USDA's Natural Resources Conservation Service (NRCS) has leadership for the conservation provisions of AMA.
- **The Conservation Reserve Program (CRP)** is a voluntary program that encourages farmers to plant long-term resource-conserving covers to improve soil, water, and wildlife resources. The CRP is administered by the CCC through the Farm Service Agency (FSA). CCC makes available assistance up to 50 percent of the participant's costs, as well as annual rental payments and incentive payments for certain activities. Contract duration is between 10 and 15 years. Partners include the NRCS, the Extension Service, state forestry agencies, and local conservation districts.
- **The Wildlife Habitat Incentives Program (WHIP)** is a voluntary program that encourages creation of high quality wildlife habitats that support wildlife populations of National, State, Tribal, and local significance. Through WHIP, NRCS provides technical and cost-share payments to landowners and others to develop upland, wetland, riparian, and aquatic habitat areas on their property. Agreements are usually 5 to 10 years in duration.

Appendix 6. Agricultural Best Management Practices

Best Management Practices used in the Agricultural Implementation Strategy.	
Agricultural BMP	**Description**
Conservation Tillage	Planting and growing crops with minimal disturbance of the surface soil. Includes no-till and minimum till farming.
Riparian Forest Buffers	Linear wooded areas along rivers, stream and shorelines that help filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. 35 foot width minimum
Riparian Grass Buffers	Linear strips of grass or other non-woody vegetation maintained along rivers, stream and shorelines that help filter nutrients, sediment and other pollutant from runoff. 35 feet minimum width.
Wetland Restoration	Re-establish the natural hydraulic condition in a field that existed prior to the installation of subsurface or surface drainage. Any wetland classification including forested, scrub-shrub or emergent marsh
Land Retirement	Takes marginal and highly erosive cropland out of production by planting permanent vegetative cover such as shrubs, grasses, and/or trees.
Tree Planting	Growing trees and converting the land use from agricultural to forest, targeting lands that are highly erodible or identified as critical resource areas. Does not include forested riparian buffers.
Nutrient Management Plan	A comprehensive plan that describes the optimum use of nutrients to minimize nutrient loss while maintaining yield
Cereal Cover Crops	Planting and growing of cereal crops (non-harvested) with minimal disturbance of the surface soil; reduces erosion and the leaching of nutrients to groundwater, captures nitrogen in plant tissues.
Commodity Cover Crops	Modify normal small grain production practices by eliminating fall and winter fertilization so that crops function similarly to cereal cover crops; may be harvested for grain, hay or silage; may receive nutrient applications after March 1; captures nitrogen in plant tissues.
Conservation Plans	A combination of agronomic, management and engineered practices that protect and improve soil productivity and water quality; the plan must meet agency technical standards.
Animal Waste Management Systems	Practices designed for proper handling, storage, and utilization of wastes generated from confined animal operations and include a means of collecting, scraping or washing wastes and contaminated runoff from confinement areas into appropriate waste storage structures.
Phytase Feed Additives	**This enzyme is added** to reduce phosphorus needs in poultry feeds. A reduction of 30% in resulting manure phosphorus may be possible.
Yield Reserve	A reduction in nitrogen applied to cropland below the nutrient management recommendation, currently defined at 15% in nitrogen. An incentive or crop insurance is used to cover the risk of yield loss.
Alternative Uses Of Manure/Manure Transport	Either transporting excess manure outside of the Chesapeake Bay watershed or finding an alternative use – such as new fuel technologies.
Stream Protection With Fencing With Off Stream Watering	Both alternative watering and installation of fencing that involves narrow strips of land along streams to exclude livestock. The fenced areas may be planted with trees or grass, but are typically not wide enough to provide the benefits of buffers.
Off Stream Watering In Pasture Without Fencing	The use of alternative drinking water troughs or tanks away from streams; may also include options to provide shade for livestock away from streams.
Off Stream Watering With Stream Fencing And Rotational Grazing	Combines stream fencing and alternative watering with cross fencing systems to create paddocks to enable rapid grazing of small areas in sequence; beneficial in removing animals from stream areas, but increases animal stocking rate and manure concentration per acre - may adversely impact the quality of surface water runoff.

Appendix 7. Forestry

This appendix provides background information relevant to the Forestry Implementation Strategy.

Logging Statistics

Year	Total Acres	Forested Acres	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	11 Yr. Avg	County Totals	Projected Harvest over 7 years
County			Acres												Acres	
Berkeley	207,859.20	91,458	1,228	1,340	1,723	2,136	1,079	2,165	1,543	823	878	1,340	722	1,498	14,977	8,160
Grant	305,920.00	241,677	4,074	4,964	2,001	1,871	4,058	3,883	3,016	5,468	1,502	1,762	3,548	3,614	36,147	20,400
Hampshire	410,521.60	295,576	4,624	4,281	3,186	4,125	2,048	5,474	3,865	3,434	4,226	3,181	4,151	4,259	42,595	23,120
Hardy	368,332.80	294,666	5,024	4,605	5,278	4,478	2,655	2,965	2,191	3,699	4,241	4,880	8,475	4,849	48,491	25,840
Jefferson	135,942.40	59,815	222	233	732	252	228	429	78	15	72	60	559	288	2,880	1,360
Mineral	211,200.00	164,736	2,652	2,708	1,474	1,239	607	466	715	1,926	3,638	2,215	1,751	1,939	19,391	10,880
Morgan	148,006.40	115,445	1,419	2,187	827	1,779	2,249	2,359	4,759	3,102	2,817	2,786	439	2,472	24,723	13,600
Pendleton	446,003.20	365,723	4,215	3,272	4,847	8,153	5,585	8,728	5,867	5,146	3,247	6,193	4,618	5,987	59,871	32,640
	2,233,785.60	1,629,096	23,458	23,590	20,068	24,033	18,509	26,469	22,033	23,613	20,621	22,416	24,262	24,907	249,075	136,000

Number of Wildfires												
COUNTY	11 Yr Average	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
BERKELEY	37	7	6	39	29	25	13	79	55	36	109	7
GRANT	8	5	5	7	6	4	1	12	16	5	21	1
HAMPSHIRE	24	9	3	20	9	11	20	58	60	30	38	7
HARDY	10	1	8	17	8	11	5	16	14	12	15	1
JEFFERSON	21	5	0	13	16	13	5	50	35	15	67	8
MINERAL	15	10	8	20	8	5	13	28	42	8	23	3
MORGAN	14	8	0	14	11	3	14	26	21	13	32	12
PENDLETON	7	7	5	14	2	4	2	14	10	4	13	4
TOTALS	135	52	35	144	89	76	73	283	253	123	318	43

Number of Acres Lost to Wildfires												
COUNTY	11 Yr Average	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
BERKELEY	48.8	7.2	13.2	87.9	56.1	17.5	7.8	42	26.4	54.3	198.3	26.2
GRANT	187.0	11	20.1	131.1	10.1	1.5	0.1	33.6	14.6	20.3	1814.8	0.2
HAMPSHIRE	68.3	23.3	9.5	36.4	5.5	13	29.1	221.1	263.6	58.6	74.2	17.2
HARDY	364.3	1	40.4	575.6	22.8	14.7	4.7	39.9	2782.1	36	490.2	0.1
JEFFERSON	70.6	14.5	0	4.9	436.3	28.8	14.9	86.1	45.7	37.7	74.4	33.7
MINERAL	28.0	7.4	65.4	32.2	12.7	9.8	6.8	96.7	29.7	3.8	42.6	0.7
MORGAN	20.1	11.2	0	44.9	6.6	9	12.6	27.6	34.2	14.3	53.6	7
PENDLETON	43.8	1.8	4.7	8.2	0.6	2.3	0.3	430.4	2.8	6.3	20.6	3.7
TOTALS	831.0	77.4	153.3	921.2	550.7	96.6	76.3	977.4	3,199	231.3	2,768	88.8

Landowner Forestry Stewardship Plans		
County	**Number of plans**	**Acreage**
Berkeley	**53**	**8492.3**
Grant	**61**	**11873.88**
Hampshire	**352**	**73460.445**
Hardy	**84**	**34955.32**
Jefferson	**15**	**1612.69**
Mineral	**122**	**18423.94**
Morgan	**88**	**12477.06**
Pendleton	**108**	**30923.58**
Totals	**883**	**192219.21**

Managed Timberland Acres		
County	**Managed Timberland (Acres)**	**Landowner Contracts**
Berkeley	**6,805.21**	**48**
Grant	**42,925.56**	**35**
Hampshire	**93,147.98**	**386**
Hardy	**56,764.91**	**107**
Jefferson	**467.01**	**3**
Mineral	**26,901.74**	**116**
Morgan	**23,636.19**	**172**
Pendleton	**27,235.77**	**63**
Totals	**227,884.37**	**930**

Appendix 8. Public Comments

The compilation of public comments on the West Virginia Potomac Tributary Strategy drafts is available as a separate document. It includes:

- First Public Comments April 2004, page 1
- Round 2 Comments May 2004, page 59
- Final Draft Comments September 2005, page 82

Appendix 8 is available at the same websites from which the Appendices 1-7 document can be downloaded. These websites are:

www.wvdep.org/item.cfm?ssid=11&ss1id=851

and

www.wvnet.org/wvts_otherdocs.htm