



# Forestry Best Management Practices in the Chesapeake Bay Watershed: *Tracking Accomplishments*



**Forestry Work Group  
Nutrient Subcommittee  
Chesapeake Bay Program**

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Forests in the Chesapeake Bay watershed have been recognized as the most beneficial use of the landscape in terms of water quality and an important contributor to protection of the Bay's health and resilience. Forests occupy almost 60% of the land base in the watershed. As a result of their total volume, the cumulative nutrient loading attributed to forest lands is sizable, even though acre for acre the rate of nutrient export from these lands is very low. In the Bay watershed model, this nutrient load is considered to be a "background" or "uncontrollable" load, one that is due to sources such as air deposition and geologic weathering rather than one directly "controlled" by land use. The nutrient retention/reduction value of these forests is undisputed. Forests retain an average of 70% of all nutrients deposited on them from the air. Riparian forests are important filtering mechanisms for runoff and subsurface flow. The retention of forest land and conversion of

open land to forest significantly increases the potential of the Bay watershed to filter and utilize nutrients before they reach surface and groundwater.

In addition to their ecological or watershed values, many of the Chesapeake's forests are also working landscapes, providing wood, fiber, recreation, wildlife habitat and other benefits. Forest industries still rank in the top 5 for economic return to each of the states in the Bay watershed - second only to agriculture in Pennsylvania and Virginia and just ahead of the seafood industry in Maryland. Reaping benefits from forests through management has the potential to alter forest soil stability and nutrient retention. Forestry activities, such as timber harvesting, construction of forest roads, site preparation and planting, and other forest management actions are estimated to contribute 3-5% of the Bay's total non-point source (NPS) pollution load.

## **PURPOSE**

The intent of this report is to document the current levels of monitoring carried out by Bay jurisdictions for the purpose of tracking forestry BMP implementation and effectiveness. To determine tracking potential, sources of BMP data will be discussed in terms of the type of information available, its extent and availability.

**Forestry Best Management Practices** are considered by the Nutrient Subcommittee and in the Tributary Strategies of the Chesapeake Bay Program as actions which focus on reducing nutrient and sediment runoff from the forests and open lands of the Chesapeake Bay watershed. This can be accomplished through 1) the use of BMP's before, during, and after timber harvest and other silvicultural operations, 2) the retention/conservation of existing forest lands, 3) afforestation of non-forest lands, and 4) the establishment of forested riparian buffers along the Bay's shorelines and tributary rivers or streams.

Other forestry activities currently in practice may contribute to achieving Bay restoration goals or related objectives, but are not currently included as BMP's or as part of the tributary strategies. Examples include: 1) providing incentives to retain forest land, 2) education and training actions,

3) the use of BMP's during prescribed fire operations, 4) exclusion of livestock from forest lands, 5) the use of BMP's on forest recreation sites and trails, and 6) enhancing "urban forests."

## **FORESTRY BMP's IN THE TRIBUTARY STRATEGIES**

Of the Chesapeake Bay States (including D.C.), only two have formally adopted forestry-related activities in their tributary strategies. Maryland and Virginia have adopted

the use of BMP's during commercial forest harvest operations as a management action accounted for in their tributary strategies. Additionally, the Maryland and Virginia strategies include the establishment of forested riparian buffers. Pennsylvania suggests the use of forest buffers through an "enhanced stream corridor protection" program but has not yet specifically identified forest buffers in its accounting for nutrient reductions. Maryland also proposes retention of forest lands (reduction of loss due to development or conversion) as a nutrient reduction tool.

### FORESTRY-RELATED ACTIONS ADOPTED IN TRIBUTARY STRATEGIES

<b>STATE</b>	<b>HARVEST BMP'S</b>	<b>RIPARIAN BUFFERS</b>	<b>OTHER TREE PLANTING</b>	<b>FOREST RETENTION</b>
<b>MARYLAND</b>	<i>YES</i>	<i>YES</i>	<i>YES</i>	<i>YES</i>
<b>PENNSYLVANIA</b>	<i>NO</i>	BEING DEVELOPED	<i>NO</i>	<i>NO</i>
<b>VIRGINIA</b>	<i>YES</i>	<i>YES</i>	<i>NO</i>	<i>NO</i>
<b>DC</b>	<i>NO</i>	<i>NO</i>	<i>NO</i>	<i>NO</i>

### FOREST HARVEST BMP's

To adequately account for nutrient reductions achieved through forest harvest BMP's requires:

- 1) tracking to determine the acreage impacted annually by timber harvesting,
- 2) monitoring to determine the extent of BMP implementation, and
- 3) reporting of accomplishments and the nutrient reductions achieved.

Monitoring to determine the effectiveness of the BMP's implemented in controlling NPS pollution is also an important component of any long-term evaluation. Accurately assessing these aspects of BMP implementation is complicated by varying authorities for compliance in the states, different reporting mechanisms and funding/priority levels for tracking activities, slightly different BMP standards, and different definitions for what constitutes BMP compliance.

## **Are timber harvest acres tracked?**

Assessing the implementation of forest harvesting BMP's requires knowledge of the extent and location of harvest operations.

### **MARYLAND**

**Private lands.** The Maryland Forest Service (MD FS) records information related to planned and ongoing silvicultural activities where state assistance has been provided for harvest planning. Forest Stewardship Plans also provide harvest data as well as other management information. MD FS is developing a database to track written and approved plans that would allow linkage to the state-wide forest GIS database and could be georeferenced in any desired format.

Harvested acres are recommended in management plans on a future schedule of actions but landowners may not elect to execute their plan on that schedule. Timber harvest plans prepared by private consultants are not routinely submitted to the state unless they occur in the Critical Area, occur in a county without an FCA Plan, or involve wetlands. It is unknown what percent of lands harvested have received state assistance in a given year. Therefore, forest management plans do not provide a consistent or comprehensive source of data for harvested acres on private lands.

Maryland Department of the Environment (MDE) also requires a "sediment control plan" to be developed for all harvest operations which disturb over 5000 sq. ft. of soil (usually >2-3 acre harvest). These plans are prepared by the forest owner, operator or forest manager and submitted to the local Soil Conservation District (SCD) offices. The S&EC Plan contains information on 1) harvest acreage, 2) erosion control measures and 3) subwatershed location of the harvest. These local SCD offices could provide data annually on the number and acres planned for harvest based on sediment-erosion plans they have approved. Further information could be requested to report planned harvest acres on a (sub) watershed basis. However, no system or procedure is currently in place to routinely compile and report data in this way. Currently there are no annual summaries of the plans submitted to Districts or procedure to consolidate this information at the state level.

Thus, at this time, some information is available in a variety of forms which can assist in determining the extent of timber harvesting on private lands on a watershed, county or state-wide basis. Collection and reporting on a regular basis would require additional record-keeping by MD FS and reporting by local agencies. Still, these records would represent only a part of the harvest activities on private lands in the state.

**Public lands.** Ten percent, or 344,000 acres, of Maryland's forest land is publicly owned

and managed. Timber harvest information is available for activities conducted within State Forests or Wildlife Management Areas. This data is consolidated and tracked by the Maryland Forest Service on an annual basis. Harvest data on public lands can be sorted by county or watershed. However, harvest from State lands is estimated to represent less than 10% of the total timber harvest in the state. Additional lands held by Department of Defense (DOD) provide detailed records of harvest. No current mechanisms are in place to collect this information; however, in each case the information could be acquired and compiled for the Bay Program.

## VIRGINIA

**Private lands.** Forest harvest activity in Virginia is tracked through a harvest reporting system which monitors all operations over 5 acres in the state. Plans are submitted to the Virginia Department of Forestry (VA DOF) and entered into a data base program. Currently, this harvest data can be summarized on various levels, including state, regional, county and watershed. Harvest of timber on industrial lands is tracked in detail by forest product companies and in the state tracking system. VA DOF also enforces a silvicultural water quality law under which they can stop harvesting, impose corrective action and enact a civil penalty if sediment is causing water quality degradation. A water quality complaint system is also in place to respond to the public. In terms of internal administrative priorities within VA DOF, only an ongoing wildfire is more important than a water quality complaint generated by the public.

**Public lands.** Virginia manages approximately 188,000 acres of state forests and parks land within the Chesapeake Bay watershed. Local governments manage another 75,000. Timber harvest on these lands are tracked by detailed records of harvest acres, species, size, and volume on a county and state-wide basis. This information is not sorted by watershed at the current time but could be with some minor adjustments to the tracking system. Data for harvest of timber from almost 700,000 acres of National Forest lands in Virginia is retained by the George Washington-Jefferson National Forest office and is available upon request. Data is easily reported by watershed or county. Additional lands held by Department of Defense (DOD) provide detailed records of harvest. No current mechanisms are in place to collect this information; however, in each case the information could be acquired and compiled for the Bay Program.

## PENNSYLVANIA

**Private lands.** The state does not have reporting requirements or systems for tracking timber harvest that occurs on private or industrial forest lands, although the Sustainable Forestry Initiative (SFI) proposes future inspections of timber sales on private land. PA law does, however, require that any earth-moving activity, including timber harvest, have an erosion control plan. These plans are only required to be on-site. There is no standard form or minimum requirement for such a plan, and there is no requirement to submit or notify anyone regarding the time, nature, or extent of the activity. The Clean Streams Law further

requires that when 25 acres or more will be disturbed, the plan must be submitted for approval, and a permit must be issued. Although the PA Department of Environmental Protection (PA DEP) is responsible for enforcement of this law, County Conservation Districts frequently act as the agent of PA DEP in issuing the permit. If requested, a standard form with recommended elements is provided. Erosion control plans, however, may or may not identify whether or not timber harvest is the reason for the action or the number of acres and cutting prescription to be employed. Because of the wide diversity of local entities charged with administering this system and the variety of data that may be included, there are many levels of operation and record-keeping. These inconsistencies make the use of this method for tracking harvest extremely difficult.

With no system for tracking timber harvest on private lands through per-harvest planning, permitting, or voluntary reporting, the only estimates of total annual harvest are derived from utilization, or the volume of goods produced from state lumber and paper mills in the state.

**Public lands.** Pennsylvania manages more than 2 million acres of state forests, parks, and game lands within the Chesapeake Bay watershed, representing over 20% of all forest lands. Timber harvest on these lands have significant and detailed records of harvest acres, species, size, and volume on a county, township and state-wide basis. This information is not sorted by watershed at the current time but could be with some minor adjustments to the tracking system.

## FINDINGS

Forest Management and Stewardship Management Plans, written by state or private consulting foresters provide a means of assessing the relative magnitude of harvest actions that may take place over time on a given forest parcel, county, region, or watershed. However, only a portion of forest lands in the state may have a Stewardship Management Plan at any time. Sediment and erosion control plans provide another source of information, but no mechanisms

### Tracking Timber Harvest Acres

	Public land	Private land
<b>PA</b>	<i>Yes</i>	<i>No</i>
<b>MD</b>	<i>Yes</i>	<i>Yes *but not compiled state-wide</i>
<b>VA</b>	<i>Yes</i>	<i>Yes</i>

currently exist to consolidate and report this data. Forest industry contract records represent another source of data, but one that is often unavailable to the state. In conclusion, tracking the actual acres of timber harvest on private lands and their location within the watershed would be a complicated and difficult task under the current system of tracking. At best, a state-wide estimate could be developed based on a sampling of existing information.

Harvest of public lands is well-documented and could be compiled with relative ease. Providing data for the Chesapeake Bay watershed in a geographically accurate manner is possible but unfortunately represents only a small percentage of the total forest lands.

### **Is the implementation of forest harvest BMP's measured?**

With a reliance on voluntary programs, State Forestry Agencies view their role with private forest management primarily as one of education and technical assistance. Except for VA, no state has given authority or responsibility to the Forestry agency to inspect or enforce BMP implementation for protection of water quality. Consequently, many inspections of forestry BMP's occur at the local level only when a complaint is made or if a water quality problem is identified.

Although State BMP's for timber harvesting primarily consist of voluntary guidance in each of the Bay States (MD requires S&EC Plans with BMP's), local governments often place restrictions on the type of harvest activities allowed and mandate specific requirements for erosion control, stream crossings, streamside management zones and aesthetics. Although one might consider regulatory controls as providing water quality protection, this county-by-county difference can lead to confusion among the forestry community.

Each of the Bay states provides a multitude of educational and technical guidance on forestry BMP implementation in the form of manuals, guides, videos, and handbooks. Training programs are also routine, and all states utilize some form of logger "certification" to encourage additional participation in training programs.

### **MARYLAND**

**Private lands.** Harvest sites in Maryland are not routinely inspected for compliance with sediment or erosion control plans except where a critical resource, extra staffing, or a site complaint exists. Inspections are conducted by local agencies such as Planning and Zoning, Department of Public Works, etc. and fall within the authority of the MDE. MDE does the inspecting, except in counties with delegated authority. The MD FS currently does not have the authority to inspect harvest operations for plan compliance.

In 1995, a coordinating project by the Maryland Forest Service called "TEAM" began testing to explore ways to involve the MD FS in the site inspection process. This effort is intended to increase plan implementation and BMP documentation. However, even "TEAM" is not expected to provide inspections of all harvest sites in the state.

While documenting "plans" can provide information on the number and acres of commercial timber harvesting in Maryland, it does not adequately assess the implementation of the

BMP's. The Maryland Forest Service recently completed its first statistical assessment of 99 randomly selected harvest operations to evaluate BMP implementation. The assessment rated the level of BMP implementation in five broad categories 1) haul roads and skid trails, 2) stream crossings, 3) streamside management zones, 4) landings and log decks, and 5) soil stabilization. From the data collected, general projections can be made of the extent of BMP implementation and the potential nutrient reductions achieved. However, monitored sites were selected from a data subset of only 23% of landowners who responded to a mail survey. Most of these landowners received forester assistance in harvest planning and implementation. Project accuracy may be improved in the future by fully randomizing the site selection process. Repeat BMP implementation surveys like this one are planned at least once every three years. Data collected during the first year of this program showed compliance with state BMP's ranged from 70-90% among the sites inspected. This 1995 Assessment Report is available from the Maryland Forest Service.

**Public lands.** Detailed harvest and erosion and sediment control plans are prepared as part of an environmental analysis and planning process for all timber harvest activities conducted on state lands. Harvests are supervised by state forestry personnel. Inspection reports are maintained in paper files. No analysis, computer database, or annual reporting currently exists or has been prepared in the past.

## **VIRGINIA**

**Private lands.** Virginia's forest harvesting best management practices are well documented, as are supporting training programs for loggers. Applying to all of Virginia lands, voluntary BMP's are described in a BMP Guidelines Handbook. A revised forestry BMP manual is due out in 1996. In the Tidewater region of VA, Resource Protection Areas (RPA's) are designated under the VA Chesapeake Bay Preservation Act. Forest harvesting BMP's are required in these areas. The 1993 Silvicultural Water Quality law references "generally accepted water quality protection techniques" (Article 12) as required in harvest activities. BMP's recommended in both Forestry and Erosion and Sediment Control Handbooks are considered the source of these practices. Current efforts reinforce aspects of per-harvest planning and increased technical guidance for loggers and landowners, such as culvert and SMZ sizing, etc.

Of all the states, Virginia's program for monitoring implementation is the most comprehensive. Since 1988, every harvest operation over five acres in size has been inspected by a VA DOF staff member at least twice during operations. Since 1995 these same sites have been visited at least once by a VA DOF, industry or consultant forester. Follow-up inspections are only conducted on sites with a watercourse or identified BMP problem. Each inspection report includes a review of BMP's implemented and a subjective pass or fail grade based on whether the harvest activity is causing or is likely to cause a water quality problem. Also, forest industry personnel provide these inspections on private lands that they have contracted for harvest using the VA DOF format and report results to VA DOF for their records. This provides some measurement of overall BMP



implementation success and, hence, nutrient reduction levels.

Secondly, a follow-up audit of 30 randomly selected harvest sites occurs twice a year. The audit program provides a statistically valid sampling for all monitoring activities. These audits, together with the above harvest inspections, provide data on the rate of implementation of BMP practices for harvest operations. Each audit is conducted by a team of state engineering and forestry personnel, industry representatives, forest consultants and other interested personnel. The teams visit and survey the entire harvested area, objectively assess BMP implementation, and make general observations on the effectiveness of the applied BMP's for protecting water quality.

Detailed records stored in a computer database provide annual assessments of the rates of compliance with a wide range of forest harvest BMP's. This data is currently available on a county, regional, watershed, and state-wide basis. VA DOF publishes annual reports which characterize its BMP compliance monitoring results.

**Public lands.** BMP compliance for timber harvest actions on VA state lands is monitored on an identical basis as private lands during harvest operations by VA DOF personnel. These records are kept as paper files by the VA DOF. No published reports are currently prepared by the state from this information.

Timber harvest on National Forest lands is carried out under a strict set of BMP's required by the Forest Service. In addition to water quality protection practices, harvests must meet extensive environmental standards and guidelines for habitat, diversity, aesthetics, and recreation as outlined in the Forest Land Management Plan and project Environmental Assessment. Harvest activities are supervised by Forest Service Sale Inspectors, and BMP monitoring is carried out by an interdisciplinary team of resource professionals. Data from National Forest lands in Virginia is retained by the George Washington-Jefferson NF office and is available upon request. Data is easily reported by watershed or county.

## **PENNSYLVANIA**

**Private lands.** BMP guideline manuals are available and provided to private land owners for Erosion and Sediment Control, Silvicultural Activities, and Timber Harvest in Wetlands. These documents represent state recommended BMP's for forestry. Implementation is voluntary, and no systems currently exist for tracking the degree of implementation or compliance. Individual local townships, SW Conservation Districts, forestry offices, or DEP conducts infrequent site visits, but generally only in response to specific complaints. Complaints are reported to DEP Regional Offices and tracked annually by the state, but they do not adequately constitute monitoring of BMP implementation. Because most harvest planning and supervision is conducted by private forestry consultants, records are not routinely kept during harvest operations and, if kept, are not easily obtained.

**Public lands.** Approximately 28% of PA's forest land in the Bay watershed is publicly owned. BMP compliance for timber harvest actions on state lands is a major focus of the PA Bureau of Forestry (PA BOF). Inspections of harvest areas are conducted by state foresters on a weekly basis during the operating period. A final inspection must also be conducted to ensure completion of all timber sale requirements and BMP compliance at the

conclusion of harvest and to release the environmental bond to the logger. These records are kept as paper files by the PA BOF. No reports are currently prepared by the state from this information.

### Tracking BMP Implementation

	Public land	Private land
<b>PA</b>	<i>Yes</i>	<i>No</i>
<b>MD</b>	<i>Yes</i>	<i>Yes *but records are not compiled state-wide</i>
<b>VA</b>	<i>Yes</i>	<i>Yes</i>

## FINDINGS

Each state maintains significant harvest planning, administration, monitoring, and compliance responsibilities for harvest actions occurring on public lands (state forests and parks). This information could be gathered on a state-wide basis in a uniform format with minimal changes to existing reporting systems. Additional analysis and accounting procedures would be necessary to characterize the records in a format usable for the Bay Program.

Inconsistencies exist among the states for availability of BMP implementation monitoring data. These data gaps would be difficult to overcome in some jurisdictions without changes in legislative authority or a significant commitment of resources at the state and local level for data collection, analysis and reporting. In general, it can be said that very little data is available to document BMP implementation except on the small amount of public lands. Only Virginia has consistent records for private lands.

### How is the effectiveness of timber harvest BMP's evaluated?

The effectiveness of forest harvest BMP's has been continually documented in the northeast for over 30 years. Studies conducted in North Carolina, West Virginia, Pennsylvania, and New Hampshire provide a wealth of information used in EPA permitting and assessments. Additional studies being conducted in Maryland and Virginia are adding to this base of watershed-scale knowledge.

## MARYLAND

The accuracy of Maryland's projected nutrient reduction gains from forest harvest BMP's may improve after the completion of a BMP effectiveness monitoring project planned for 1995-1999. This paired watershed study being conducted by the Maryland Forest Service will assess the effectiveness of prescribed forestry BMP's for minimizing NPS pollution. This study will follow the water quality assessment protocols and guidelines established by the U.S. Forest Service in 1994. Data with which to judge BMP effectiveness has primarily come from research studies conducted by universities or the USDA Forest Service Experimental Watershed program in West Virginia, North Carolina, and New Hampshire.

## VIRGINIA

The Virginia Department of Forestry maintains 8 watersheds equipped with instrumentation to monitor above-below water conditions to assess the effectiveness of installed BMP's for protecting water quality. These efforts are providing a wealth of reliable information on nutrient reduction achieved from the use of BMP's during forest harvest operations. In addition to individual stream studies, VA DOF has cooperated with Chesapeake Corporation and Virginia Tech for 5 years in a paired watershed study at Nomini Creek. Harvesting at this study site was completed in 1994, and post-harvest water quality data analysis is expected in the near future. As mentioned earlier, an audit is performed twice yearly to determine BMP implementation rate and effectiveness.

## PENNSYLVANIA

The PA Bureau of Forestry does not conduct any ongoing monitoring activities related to forest harvest BMP effectiveness. Several studies have been conducted by Penn State University in cooperation with the Bureau. The results of these studies (e.g. Leading Ridge, etc.) are available in published literature.

### Evaluating BMP Effectiveness

	Past Studies	Ongoing Monitoring
<b>Pennsylvania</b>	<i>Yes</i>	<i>No</i>
<b>Maryland</b>	<i>Yes</i>	<i>No</i>
<b>Virginia</b>	<i>Yes</i>	<i>Yes</i>

## FINDINGS

Studies which document the effectiveness of forestry BMP's in reducing sediment, nutrients, and other chemicals have been conducted in each state. Maryland and Virginia have ongoing programs targeted to assessment of forestry activities. Some are extensive.

## ESTABLISHMENT OF RIPARIAN FOREST BUFFERS

The establishment of forested riparian buffers along the shorelines and tributaries of the Chesapeake Bay is a practice formally included in Maryland and Virginia tributary strategies. Pennsylvania may include forest buffer plantings in its strategies for stream corridor protection and expansion of the stream fencing program but has not yet addressed this practice specifically.

**Riparian Forest Buffer Programs.** A few organized programs or efforts have components targeted specifically toward the establishment of forested buffers. These are:

- Stewardship Incentive Program (SIP)
- Conservation Reserve Program (CRP)
- Agricultural Conservation Program (ACP)
- MD Buffer Incentive Program (BIP)
- MD Forest Conservation Act
- VA Agricultural Cost Share Program
- VA Chesapeake Bay Preservation Act

For these programs, data is available in a variety of forms and levels of detail. For example, the acreage, linear feet and county where plantings occur are tracked through Maryland Forest Service internal reporting (TARS) for the BIP, SIP and FCA programs. MD FS will soon have the GIS capability to accurately track all plantings planned or implemented by their foresters on county and small watershed basis. SIP is a federal program administered through the Farm Service Agency (FSA) and MD FS, while BIP and FCA are MD FS programs. CRP can provide data on areas planted to trees by county and, starting in 1996, can differentiate riparian buffers from other lands.

The VA Preservation Act provides some data on buffers that are planted to forest, but the information is incomplete and inconsistent. Most data is kept at the local government level. This is because the system was developed to track whether buffers met the standards of the Act for width and management but not necessarily if trees were planted in them. The VA Ag Cost-share for riparian forest buffers can provide data on a county and state-wide basis.

<b>Establishment of Forest Buffers (ability to report)</b>
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	Acres of Buffer	Location of Buffer
<b>PA</b>	<i>Some*</i>	<i>Some*</i>
<b>MD</b>	<i>Some*</i>	<i>Some*</i>
<b>VA</b>	<i>Some*</i>	<i>Some*</i>

*\* State assisted plantings only.*

ACP data for cost-shared BMP's is tracked in a variety of ways across the states. The Natural Resources Conservation Service (NRCS) and CFSA utilize computerized databases which are available at the field level in most areas. Reports on riparian buffer establishment

are possible from these systems, although reporting would not be consistent across the watershed. These programs offer the most promising source of information, although none currently report riparian forest buffer accomplishments on a regular basis.

**Other Tree-Planting Programs.** A large number of state and federal cost-share programs provide funds for tree planting. In most if not all cases, data from these programs does not differentiate between trees planted for a buffer, trees planted on an eroding slope, and trees planted on a harvested site. Some information may exist in individual files but would likely be difficult to compile. Some of these programs are as follows:

- Woodland Incentive Program (MD)
- Forestry Incentive Program (FIP)
- Agricultural Water Quality Cost-Share Program (MD)
- Treemendous (MD)
- Income Tax Modification for Restoration and Timber Stand Improvement (MD)
- Small Creeks and Estuaries Water Quality Restoration Program (MD)
- Stream Fencing Program (PA)

Each of these programs provides data which may be useful to estimate buffer acreage, but none is routinely compiled in a readily reportable or consistent format. Many report only the number of trees planted and not total acreage. Programs like PA Stream Fencing focus on miles of fence and do not routinely track acres planted to forest as a follow-up activity to a fencing project.

In general, riparian forest buffer plantings completed with State forestry assistance in each county are tracked through an internal reporting system (for example, Mitigation Accomplishment Reporting System (MARS) in PA). Currently, these programs do not require routine tracking of buffer plantings and would need to refine their reporting systems to do so. An annual query of these incentive programs would need to be developed to improve tracking and reporting.

Many unreported tree planting projects are accomplished by private groups, consultant foresters, communities, landowners and conservation groups without government assistance. These activities are not tracked or reported.

## **LAND USE CHANGE**

Tracking land use change from forest to other uses (agriculture or urban) is no more than a distant hope for most land managers. No systems currently exist that are comprehensive enough to provide regular reliable data on forest loss, and it is unlikely that this capability will be within reach in the near future. Forest land change, from the standpoint of land converted to trees, is more likely but also problematic. As discussed above, numerous

tree-planting programs exist and record data in varying levels of detail. Some document if the tree-planting resulted in afforestation, i.e. a conversion of land to forest from open land, rather than planting of street trees or reforestation of a recently harvested area. Therefore, a total acreage of afforestation may be possible to track on an annual base with current systems and reference to its general location.

**Maryland Forest Conservation Act.** One source of future land use change information may be the Maryland Forest Conservation Act of 1991. This Act encourages the retention of forest land through incorporation of forests in the land development planning and approval process. Local governments have been required to annually report to the state the extent of forest land cleared, conserved and planted since enforcement of the Act began in 1992. To date reporting is sporadic. Under new requirements local governments will begin reporting program information to the MD FS. If successful, this may allow state forestry officials to assess rate of forest loss and enhance reporting of new forest plantings, including riparian forest buffers. This database is just beginning to develop. Maryland is the only state that has taken formal state-wide action to conserve forests as a landscape important for water quality protection.

**Tax Programs.** State tax policies which reduce property taxes on forest lands have been successful in many areas for retaining forest land. Although states have records for such programs, the extent of program participation is inconsistent and not summarized or tracked in a consistent manner among Bay states. It is likely that information could only be developed at the local level and reported to the state for compilation. No mechanism currently exists to accomplish this.

**Satellite Imagery.** One type of satellite imagery is EMAP. The EMAP program, conducted by EPA in cooperation with other federal and State agencies, provides a satellite view of land use on a scale of 1:100,000 accuracy. It represents the first attempt to repeat analysis of the landscape at 3-5 year intervals. Analysis of data from this project will provide a substantial improvement

in our ability to track and quantify land use change over watershed and state scales. Data has now been collected for 1990 and 1994.

## CONCLUSIONS

Numerous programs and activities exist in every state to conserve forest land, reforest open ground and riparian areas, and minimize soil and nutrient runoff from working forests. Unfortunately, organizing a consistent tracking system for these activities will be difficult and very time consuming. For some BMP's, accurate tracking of implementation will require changes in government authority as it relates to private land management. The level of tracking, evaluation and reporting of accomplishments is highly variable among states and agencies within states. Much useful data is only sporadically collected. Data that is

available is not routinely compiled in a format useful to the Bay Program. It is incomplete in its coverage and inconsistent in format from program to program or state to state. It is likely that State data could be summarized in individual tracking reports but would not necessarily be comparable on a watershed-wide basis.

Two primary challenges are presented by this situation: first, improving the consistency and usefulness of data currently collected and second, initiating tracking systems where there are currently insufficient efforts.

Overall, the tracking of BMP's for harvest acres and harvest BMP's on public lands is possible now. Providing a standard format in which all states would report this information would greatly improve consistency and usefulness in tracking.

Tracking harvest acres and BMP implementation on private lands is very problematic. Information can be provided in Virginia now and would only require some additional work in formatting and analysis to provide useful information to the Bay Program. However, providing comparable information in Pennsylvania and Maryland would require changes in state authority and oversight of voluntary programs on private lands. It is feasible that, if additional resources were provided, random sampling programs like that tested in Maryland in 1994-95 could be implemented in these states to allow generalized BMP tracking information to be developed. It would also be appropriate to delegate new authorities to State Forestry agencies in these states to accomplish these tasks.

It would also be possible (but challenging) to track a large majority of accomplishments related to riparian forest buffer and afforestation activities. This would require development of a standard set of information required and a commitment on the part of a number of federal and state agencies/programs to follow through in reporting. Currently, information is collected, stored, and reported at different scales and in different formats in every program that implements these BMP's.

### TRACKING FORESTRY-RELATED BMP's

STATE	FOREST ACRES HARVESTED	TIMBER HARVEST BMP'S	RIPARIAN BUFFERS PLANTED	OTHER TREE PLANTINGS	FOREST LAND USE CHANGE
MD	Private land- yes (but not compiled)  Public lands - yes	Yes - two levels of monitoring	State assisted plantings only	State assisted plantings only	Some- local & state level

<b>PA</b>	No private - state lands only	No private-some record for state land	State assisted plantings only	State assisted plantings only	No
<b>VA</b>	Yes- region and state level	Yes- three levels of monitoring	State assisted plantings only	State assisted plantings only	Yes

A good deal of state and county level data may be relatively easy to acquire. However, it will require a commitment of resources to analyze and compile it with a reasonable level of accuracy. Data on a watershed or sub-watershed basis may require significantly more time and expense than is warranted.

## **RECOMMENDATIONS**

Identification of reporting frequency, detail required and development of standard reporting formats are the logical first steps to filling the need for BMP tracking data. A standard reporting format and system for data collection should be developed with and provided to appropriate agencies and conservation districts. This is especially true for riparian forest buffers and afforestation, as these have not historically been tracked by many programs. In lieu of detailed record-keeping, monitoring should be implemented that would follow a statistical sampling format for harvest and harvest BMP data.

### **Forest Harvest BMP's:**

1. Develop a standard voluntary reporting system for forest harvest data. At a minimum, where harvest or sediment control plans are required, summarized harvest data should include the acreage and number of harvest operations by county. In some areas the same information may be available on a watershed basis. A random sampling method could be used to periodically assess the comprehensiveness of the data.
2. Standardizing an annual reporting system for Soil and Water Conservation Districts for pertinent erosion and sediment control plans. Additional funding will be necessary to provide this data.
3. Monitoring of BMP implementation and effectiveness should follow the guidelines prescribed in "Effectiveness Monitoring of Forestry Best Management Practices- June 1994" (USFS).
4. As a minimum, track and report an overall rating of timber harvesting BMP implementation on a state and county or physiographic region. Additional information could include BMP implementation rates for: 1) skid trails, 2) log landings, 3) streamside management zones, 4) erosion control measures, and 5) forest roads.



5. Recommend that state forest lands conduct re-inspections of their lands every five years.

**Afforestation Efforts:**

6. Develop standard formats for state and federal programs to report afforestation efforts. At a minimum, reports should include 1) acres and linear feet of riparian buffers planted and 2) acres planted to trees from other land uses in the Chesapeake Bay watershed.

7. Request additional tree planting detail to report: 1) the county and watershed where the plantings were established and 2) the acres protected/filtered by the planted buffers.

8. Set a minimum tree planting standard to qualify as a planting resulting in afforestation (e.g. 300 trees/acre).

9. Inventory tree planting promotional efforts coordinated outside the State Forestry agency, and conduct an annual query to track tree planting projects completed by these efforts.

10. Investigate property tax data bases to determine if they can be used to determine retention and loss of forest land.

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