Indiana Department of Natural Resources
Division of Forestry

State Forest Management and Water Quality Protection

1. *How do forests protect water quality?*

Forest canopies intercept rainfall and reduce the force with which water impacts the forest floor. Once rain does reach the forest floor it is very quickly infiltrated due to the layers of organic matter and many root channels and insect and animal tunnels. This greatly reduces or eliminates any erosion or sedimentation. The forest soils act as a sponge and filter, slowly releasing clean water back into the surface waters, reducing flooding. While the water is in forest soils, many pollutants from runoff, flood waters, or atmospheric deposition can be removed biologically by plants and various processes that occur in forest soils. Because of these and many other characteristics forest soils are perfectly suited for creating high quality water supplies (Neary et al. 2009). Even though wooded areas more often occupy land that has a higher potential for erosion, cultivated land releases more than five times more sediment into the watercourse than wooded areas, (Figure 1), (Gianessi et al 1986, Brown, Binkley 1994).

2. *How do State Forests help protect water quality?*

Indiana State Forests are generally located in areas that are ecologically significant and would be severely impacted if they were developed. State Forest designation protects these lands from land use conversion and improper forest management. While recreation trails and timber harvests do occur on State Forest lands, great effort is made to ensure that the soil and water resources of each site are protected. Managed forests have significantly lower sedimentation rates than other land uses (Figure 1) (Gianessi et al. 1986, Binkley & Brown 1994). Water quality on State Forests receives significant attention through all phases of management.

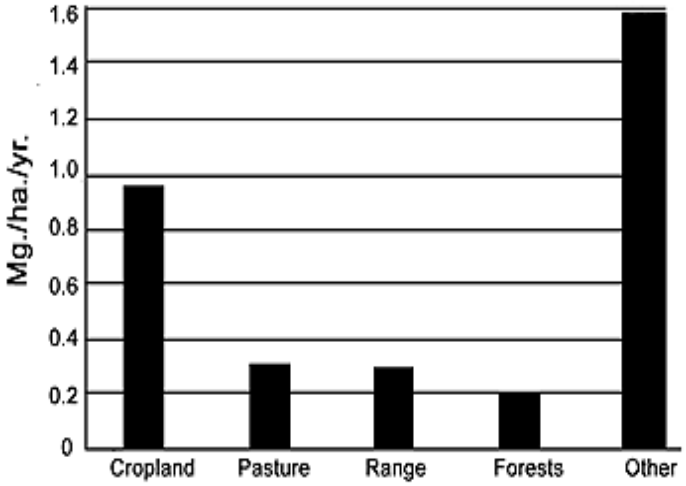


Figure 1: Annual sediment yields from non-federal rural lands into U.S. Rivers (Gianessi et al 1986). "Other" includes mines, quarries, farmsteads and other intensively used sites.

3. *What do we do on State Forests to protect water quality during harvests?*

The impact of forest harvest on water quality is considered at every stage of harvest on State Forests. Pre-harvest planning and conferences with logging crews discuss the layout and execution of harvest and how these can be done with least impact to water quality. Water features, soil disturbance and logging layout are examined during both the pre-harvest and implementation phases. Post harvest begins with closeout of the logging site, with special emphasis on erosion control and protection of any bared soils (e.g. logging trails and log landings). After closeout of the site there are inspections by staff, including, but not limited to Best Management Practice (BMP) monitoring. BMPs are practices put in place to limit erosion and sedimentation of the site. Research has shown huge reductions in in-stream total suspended solids concentration (TSS) with the implementation of forestry BMPs. TSS measurements varied from 56,000 mg/L where no BMPs were employed to 15 mg/L when BMPs are in place (Hornbeck, Reinhart 1964). These practices include, seeding, bridging streams, water diversions and many others. After these inspections, any problems

found on site are addressed and remediated. Studies have found that the largest amount of sedimentation occurs within the first 1-2 years after a harvest and that sedimentation rates decrease exponentially over time (Croke et al. 2001, Megahan 1974, Friedricksen 1970). Therefore it is essential that BMPs be in place immediately after harvest concludes and are monitored within 1-2 years after closeout for BMP compliance. This is the current policy on Indiana State Forest lands. While BMPs do not completely prevent off-site impacts, the impacts were relatively small and are generally of no direct concern to water quality standards (Lynch et al. 1975, 1985).

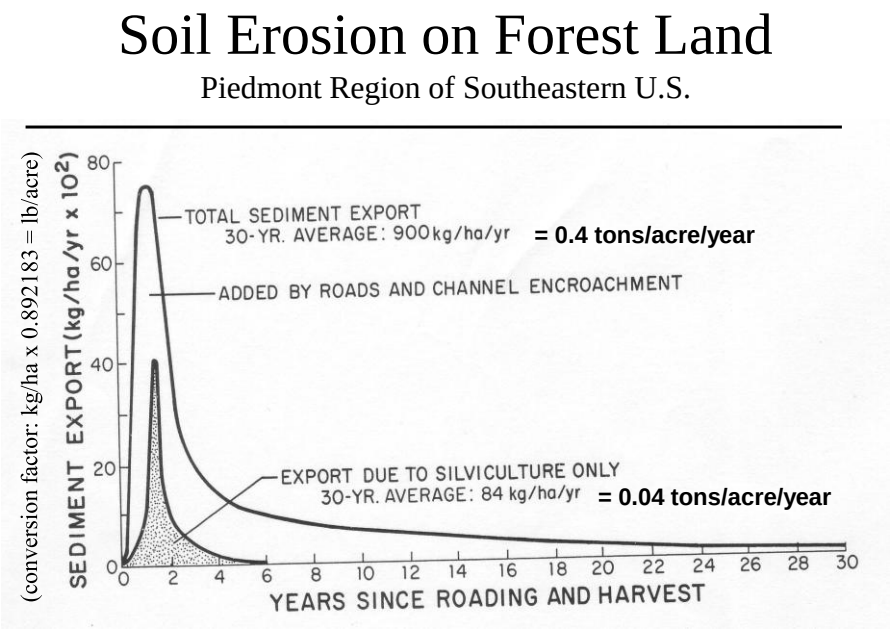
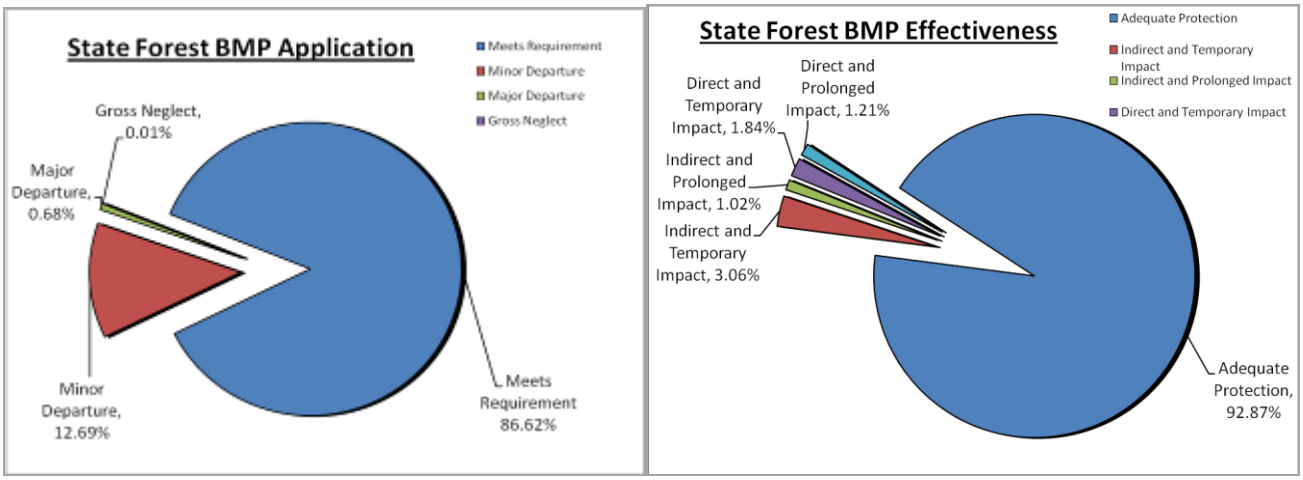


Figure 2. Yearly sediment export by silvicultural practices and forest roads (Hewlett 1982).

4. How do we monitor the BMP practices to protect water quality?

Since 1999, every site that is harvested on Indiana State Forests is monitored to determine how well BMPs were applied and how effective they were at protecting the water resources of the site, for a total of 442 sites (Sobecki, McCoy 2013). Five main areas of a forest harvest are examined. Access roads, log landings, skid trails, stream crossings and riparian management zones are all monitored for BMP compliance. Data collected from all these sites are analyzed and reported on a yearly basis (Figures 3 & 4).



Figures 3 and 4. BMP application and effectiveness rates for all Indiana State Forest harvest sites monitored from 1996 – 2013 (Sobecki, McCoy 2013).

5. *How do we work to protect or improve quality?*

Continual monitoring and yearly data analysis helps to isolate potential challenges so that those can be addressed and resolved. Indiana forestry personnel stay current on new research and products that are useful and pertinent for timber management and water quality protection. More than 500 Forest industry professionals as well as Indiana DNR Forestry employees have received forestry BMP training to date.

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