Appendix X: Non-Point Source Pollution

Sources

Nonpoint source of pollution, unlike pollution from industrial and sewage treatment plants, comes from many different sources. Nonpoint source pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes and streams. Common non-point pollutant sources are:

Wind and Water Erosion: Mainly where exposed soils are left to the elements, typically along streams and lakes, agricultural fields and disturbed land such as roads. Sediment in waterbodies can cause low dissolved oxygen and an excess amount of nutrients leading to biological impairments and drinking water restrictions.

Groundwater withdrawal: Groundwater has a lower water temperature than surface water in the summer. When large amounts of groundwater are withdrawn and applied to the surface for irrigation, stream temperatures can increase due to heat pollution and cause stress to fish communities.

Fertilizer and/or manure runoff: Fertilizer and manure contains high concentrations of phosphorus, nitrogen, and bacteria that can runoff into lakes and streams when not properly managed.

Failing septic systems: Septic systems that are not maintained or failing near a lake or stream can contribute excess phosphorus, nitrogen, and bacteria.

Peatlands/wetlands: Peatlands and wetlands have high levels of phosphorus and low levels of dissolved oxygen that can pollute downstream streams and lakes.

Internal loading: Lake sediments contain large amounts of phosphorus that can be released into the lake water through physical mixing or under certain chemical conditions.

Upstream lake loading: Some lakes receive most of their phosphorus from upstream lakes. For these lakes, restoration and protection efforts should focus on improving the water quality of the upstream lake.

Livestock overgrazing in stream: Livestock overgrazing in the stream can cause localized damage and erosion of the stream bank, and is a source of phosphorus and bacteria pollutants.

Wildlife fecal runoff: Dense or localized populations of wildlife, such as beavers or geese, can contribute phosphorus and bacteria pollutants to streams or ponds.

Strategy Key

Parameter	Strategy Key	
	Description	Example BMPs/actions
Total Suspended Solids (TSS)	Improve upland/field surface runoff controls: Soil and water conservation practices that reduce soil erosion and field runoff, or otherwise minimize sediment from leaving farmland	Cover crops
		Water and sediment basins, terraces
		Rotations including perennials
		Conservation cover easements
		Grassed waterways
		Strategies to reduce flow- some of flow reduction strategies should be targeted to ravine subwatersheds
		Residue management - conservation tillage
		Forage and biomass planting
		Open tile inlet controls - riser pipes, french drains
		Contour farming
		Field edge buffers, borders, windbreaks and/or filter strips
		Stripcropping
	Protect/stabilize banks/bluffs: Reduce collapse of bluffs and erosion of streambank by reducing peak river flows and using vegetation to stabilize these areas.	Strategies for altered hydrology (reducing peak flow)
		Streambank stabilization
		Riparian forest buffer
		Livestock exclusion - controlled stream crossings
	Stabilize ravines: Reducing erosion of ravines by dispersing and infiltrating field runoff and increasing vegetative cover near ravines. Also, may include earthwork/regrading and revegetation of ravine.	Field edge buffers, borders, windbreaks and/or filter strips
		Contour farming and contour buffer strips
		Diversions
		Water and sediment control basin
		Terrace
		Conservation crop rotation
		Cover crop
		Residue management - conservation tillage
	Stream Channel Restoration	Addressing road crossings (direct erosion) and floodplain cut-offs
		Clear water discharge: urban areas, ag tiling etc – direct energy dissipation
		Two-stage ditches

		Large-scale restoration – channel dimensions match current hydrology &
		Stream channel restoration using vertical energy dissipation: step pool
	Improve forestry management	Proper Water Crossings and road construction
		Forest Roads - Cross-Drainage
		Maintaining and aligning active Forest Roads
		Closure of Inactive Roads & Post-Harvest
		Location & Sizing of Landings
		Riparian Management Zone Widths and/or filter strips
	Improve urban stormwater management [to reduce sediment and flow]	See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs
Nitrogen (TN) or Nitrate	Increase fertilizer and manure efficiency: Adding fertilizer and manure additions at rates and ways that maximize crop uptake while minimizing leaching losses to waters	Nitrogen rates at Maximum Return to Nitrogen (U of MN rec's)
		Timing of application closer to crop use (spring or split applications)
		Nitrification inhibitors
		Manure application based on nutrient testing, calibrated equipment, recommended rates, etc.
	Store and treat tile drainage waters: Managing tile drainage waters so that nitrate can be denitrified or so that water volumes and loads from tile drains are reduced	Saturated buffers
		Restored or constructed wetlands
		Controlled drainage
		Woodchip bioreactors
		Two-stage ditch
	Increase vegetative cover/root duration: Planting crops and vegetation that maximize vegetative cover and capturing of soil nitrate by roots during the spring, summer and fall.	Conservation cover (easements/buffers of native grass & trees, pollinator habitat)
		Perennials grown on marginal lands and riparian lands
		Cover crops
		Rotations that include perennials
Phosphorus (TP)	Improve upland/field surface runoff controls: Soil and water conservation practices that reduce soil erosion and field runoff, or otherwise minimize sediment from leaving farmland	Strategies to reduce sediment from fields (see above - upland field surface runoff)
		Constructed wetlands
		Pasture management
	Reduce bank/bluff/ravine erosion	Strategies to reduce TSS from banks/bluffs/ravines (see above for sediment)
	Increase vegetative cover/root duration: Planting crops and vegetation that maximize vegetative cover and minimize erosion and soil	Conservation cover (easements/buffers of native grass & trees, pollinator habitat)
		Perennials grown on marginal lands and riparian lands
		Cover crops
		Rotations that include perennials

	losses to waters, especially during the spring and fall.	
	Preventing feedlot runoff: Using manure storage, water diversions, reduced lot sizes and vegetative filter strips to reduce open lot phosphorus losses	Open lot runoff management to meet 7020 rules
		Manure storage in ways that prevent runoff
	Improve fertilizer and manure application management: Applying phosphorus fertilizer and manure onto soils where it is most needed using techniques which limit exposure of phosphorus to rainfall and runoff.	Soil P testing and applying nutrients on fields needing phosphorus
		Incorporating/injecting nutrients below the soil
		Manure application meeting all 7020 rule setback requirements
	Address failing septic systems: Fixing septic systems so that on-site sewage is not released to surface waters. Includes straight pipes.	Sewering around lakes
		Eliminating straight pipes, surface seepages
	Reduce in-water loading: Minimizing the internal release of phosphorus within lakes	Rough fish management
		Curly-leaf pondweed management
		Alum treatment
		Lake drawdown
		Hypolimnetic withdrawal
	Improve forestry management	See forest strategies for sediment control
	Reduce Industrial/Municipal wastewater TP	Municipal and industrial treatment of wastewater P
		Upgrades/expansion. Address inflow/infiltration.
	Treat tile drainage waters: Treating tile drainage waters to reduce phosphorus entering water by running water through a medium which captures phosphorus	Bioreactor
	Improve urban stormwater management	See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs
E. coli	Reducing livestock bacteria in surface runoff: Preventing manure from entering streams by keeping it in storage or below the soil surface and	Strategies to reduce field TSS (applied to manured fields, see above)
		Improved field manure (nutrient) management
		Adhere/increase application setbacks
		Improve feedlot runoff control
		Animal mortality facility
		Manure spreading setbacks and incorporation near wells and sinkholes

	by limiting access of animals to waters.	Rotational grazing and livestock exclusion (pasture management)
	Reduce urban bacteria: Limiting exposure of pet or waterfowl waste to rainfall	Pet waste management
		Filter strips and buffers
		See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs
	Address failing septic systems: Fixing septic systems so that on-site sewage is not released to surface waters. Includes straight pipes.	Replace failing septic (SSTS) systems
		Maintain septic (SSTS) systems
	Reduce Industrial/Municipal wastewater bacteria	Reduce straight pipe (untreated) residential discharges
		Reduce WWTP untreated (emergency) releases
Dissolved Oxygen	Reduce phosphorus	See strategies above for reducing phosphorus
	Increase river flow during low flow years	See strategies above for altered hydrology
	In-channel restoration: Actions to address altered portions of streams.	Goal of channel stability: transporting the water and sediment of a watershed without aggrading or degrading.
		Restore riffle substrate
Chloride	Road salt management	[Strategies currently under development within Twin Cities Metro Area Chloride Management Plan]