

APPENDIX A – BEST MANAGEMENT PRACTICES

A.1 BEST MANAGEMENT PRACTICES

Table A.1 BMPs

BMP	Description	References: Guidance documents, internet resources, NRCS Practice Standard(s), other literature	Pollutant								Consultant or Engineer Typically Needed Y/N/?	
			Nitrogen	Phosphorus	Sediment	Temperature	pH	Salinity	BOD	Pathogens		Toxic Chemicals
<i>Agriculture</i>												
Clean Water Diversion	Berms, rain gutters, rain barrels, roofing, reservoirs, infiltration basins, vegetated strips, or other structures used to prevent clean runoff or precipitation from picking up pollutants.	Diversion (NRCS 362), Roof Runoff Structure (NRCS 558), Water and Sediment Control Basin (NRCS 638)	X	X	X	X			X	X		?
Corral / Pen Relocation	Moving part or all of an animal confinement facility to prevent or reduce inundation and subsequent off-site transport of pollutants.	Obstruction Removal (NRCS 500), Fence (NRCS 382)	X	X	X	X			X	X		N
Stream Crossing	A stabilized area or structure constructed across a stream to provide a travel way for people, livestock, equipment, or vehicles.	Stream Crossing (NRCS 578), Fence (NRCS 382)		X	X							?
Off-Stream Watering Facility	A permanent or portable device to provide an adequate amount and quality of drinking water for livestock and wildlife. The purpose of the device and its location should be to encourage or enable livestock to obtain water from a source other than a surface water body, or improve livestock distribution.	Watering Facility (NRCS 614)	X	X	X	X			X	X		N
Filter Strip	A strip of permanent, perennial vegetation placed on the downgradient edge of a field, pasture, barnyard, or animal confinement area. The purpose of the strip is to slow down surface runoff, filter out particulate matter, or absorb and use nutrients. If the purpose of the strip is to take up nutrients, then the vegetation must be periodically harvested in order to prevent nutrient buildup. In this situation, grazing would not	Field Border (NRCS 386), Filter Strip (NRCS 393), Hedgerow Planting (NRCS 422), Vegetated Treatment Area (NRCS 635)	X	X	X	X			X	X		N

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	constitute harvesting, because nutrients are deposited as well as removed.												
Forage Utilization / Livestock Distribution Improvements	This practice includes such things as rotational grazing, cross-fencing, watering facility development and other techniques designed to promote uniform forage utilization and nutrient deposition, which then leads to more vigorous plant growth and nutrient uptake, as well as reduced soil erosion and pollutant runoff.	Fence (NRCS 382), Prescribed Grazing (NRCS 528)	X	X	X	X				X			?
Water Gap	A controlled access point from which livestock can obtain drinking water directly from a waterbody. Where possible, the gap should be designed to admit only one animal at a time.	Access Control (NRCS 472), Fence (NRCS 382)	X	X	X	X				X	X		N
Riparian Fencing	Fencing used to permanently or temporarily control livestock access to riparian areas. Fencing may be used to prevent streambank trampling, reduce nutrient and pathogen pollution, or promote vegetative growth and plant species diversity.	Access Control (NRCS 472), Fence (NRCS 382)	X	X	X	X				X	X		N
Heavy Use Area Protection	The stabilization of areas frequently and intensively used by people, animals, or vehicles by establishing vegetative cover, by surfacing with suitable materials, and/or by installing needed structures.	Heavy Use Area Protection (NRCS 561)	X	X	X					X			?

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Grazing Management Plan	A plan describing how livestock grazing will occur on a particular property or set of properties. The plan must identify the stocking density, season, duration and location of grazing activities on a field by field basis. Where necessary, it must contain contingency plans to deal with periodic drought. The plan must identify grazing management strategies that will be employed to prevent nonpoint source pollution. The plan must contain a map in which all fields, watering facilities, heavy use areas, surface waters, riparian buffers, fence lines and other pertinent structures are labeled.	Prescribed Grazing (NRCS 528), Silvo-pasture Establishment (NRCS 381)	X	X	X	X			X	X		Y
Livestock Protection	Permanent shelter structures to protect livestock from weather. This does not include barns, sheds or other enclosed structures. It also does not include general fencing. The purpose of the structure must have some benefit to water quality (e.g. a replacement for shelter previously provided by riparian vegetation).	Windbreak/Shelterbelt Establishment (NRCS 380), Windbreak/Shelterbelt Renovation (NRCS 650)	X	X	X	X			X	X		N
Cover Crop	Vegetation planted on what would otherwise be fallow ground. Designed to prevent mobilization and transport of pollutants by precipitation and runoff during periods when the primary agricultural crop is unable or unavailable to perform similar function.	Cover Crop (NRCS 340), Conservation Crop Rotation (NRCS 328), Conservation Cover (NRCS 327)	X	X	X			X	X			N

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Conservation Tillage	Tillage practices designed to prevent soil erosion, reduce surface or subsurface runoff potential, or otherwise prevent nonpoint source pollution. These practices may include, but are not limited to reduced tillage or minimum till, no till, strip till, direct seeding, mulch till, or ridge till.	Residue and Tillage Management, No Till/Strip Till/Direct Seed (NRCS 329), Residue and Tillage Management, Ridge Till (NRCS 346), Residue and Tillage Management, Mulch Till (NRCS 345)		X	X								?
Alley Cropping	Trees, shrubs or tall, rigid, perennial, herbaceous vegetation planted in sets of single or multiple rows with agronomic, horticultural crops or forages produced in the alleys between the sets of woody plants. Alley cropping must be designed to significantly reduce soil erosion.	Alley Cropping (NRCS 311), Herbaceous Wind Barrier (NRCS 603)		X	X								N
Windbreak	A strip of stiff, permanent, perennial vegetation placed perpendicular to the prevailing wind direction or parallel to the edge of a waterbody. The purpose of the strip is to either capture and retain wind-borne pollutants that might otherwise blow into surface waters, or lessen the force of the wind thereby preventing wind erosion of downwind fields.	Cross Wind Trap Strips (NRCS 589C), Field Border (NRCS 386), Hedgerow Planting (NRCS 422)	X	X	X				X				N
Contour Farming	Tilling, seeding, fertilizing, subsoiling, and harvesting along the contour of a hill. The practice must be applied to reduce sheet, rill and wind erosion that would otherwise add sediment and other pollutants to surface waters.			X	X								N
Stripcropping	Growing planned rotations of row crops, forages, small grains, or fallow in a systematic arrangement of	Stripcropping (NRCS 585)		X	X								N

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	equal width strips across a field. The practice should be applied to reduce sheet, rill and wind erosion that would otherwise add sediment and other pollutants to surface waters.											
Irrigation Diversion Maintenance or Replacement	Repair or replacement of a structure designed to divert surface water for the purpose of watering crops or livestock. The repair or replacement must have a clear benefit to water quality in a stream or lake. The cost of the repair or replacement must be weighed against the potential benefits to water quality.	Dam, Diversion (NRCS 348)			X	X						Y
Irrigation Canal Conversion	Adding an impermeable liner to an unlined irrigation canal or replacing an irrigation canal with an underground pipe. The conversion must tied to one or more of the following: 1) a reduction in water removal from a stream or lake; 2) prevention of irrigation-induced saline seeps that contribute salts to surface water; 3) a reduction in the temperature of irrigation return flows; 4) a reduction in irrigation-induced sediment pollution.	Irrigation Pipeline (NRCS 430), Irrigation Water Conveyance Ditch and Canal Lining, Flexible Membrane (NRCS 428B), Irrigation Water Conveyance Ditch and Canal Lining, Plain Concrete (NRCS 428A)			X	X						Y
Irrigation System Conversion	Conversion from one type of irrigation system to another, resulting in significant improvements to water quality. For example, conversion from flood irrigation to sprinkler irrigation in order to reduce the amount of contaminated tailwater leaving a field and entering a waterbody. Projects must not trade one NPS pollution problem for another (e.g. going from flood irrigation to sprinkler irrigation and thereby creating a salinity problem).	Irrigation System, Micro-irrigation (NRCS 441), Irrigation System, Sprinkler (NRCS 442), Irrigation Water Management (NRCS 449)	X	X	X	X		X				?

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Irrigation Tailwater Control	Structures, vegetation, or managerial controls designed to prevent sediment, nutrient, or temperature pollution from irrigation tailwater. These practices may include, but are not limited to: wasteway rehabilitation, tailwater capture and reuse, settling basins, remotely controlled headgates, or revegetation of tailwater-induced erosional features. Projects must not trade one NPS pollution problem for another (e.g. going from flood irrigation to sprinkler irrigation and thereby creating a salinity problem, or installing a large, shallow sediment trap that leads to higher return flow temperatures). These projects must have clear, significant, long-term water quality benefits.	Critical Area Planting (NRCS 342), Irrigation Water Management (NRCS 449), Lined Waterway or Outlet (NRCS 468), Structure for Water Control (NRCS 587), Water and Sediment Control Basin (NRCS 638)	X	X	X	X		X		X		Y
Grassed Waterway	A shaped or graded channel that is permanently vegetated, and is designed to convey water at a non-erosive velocity to a stable outlet. The vegetation in the channel must be capable of withstanding periodic inundation, as well as the reasonably expected erosive forces associated with foreseeable flow events.	Grassed Waterway (NRCS 412)		X	X							?
Waste Utilization	Storing, transporting and using agricultural wastes such as manure, wastewater, and organic residues in a manner that reduces nonpoint source pollution. Also includes equipment necessary in order to ensure proper waste transfer and utilization (e.g. small manure spreaders).	Waste Utilization (NRCS 633), Waste Storage Facility (NRCS 313), Waste Transfer (NRCS 634)	X	X					X	X		?

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Riparian Buffer	A strip of perennial vegetation located adjacent to and up-gradient from a waterbody. The strip must be designed to reduce nonpoint source pollution. Buffer width, slope, species composition and target pollutants must be considered in the design.	Access Control (NRCS 472), Critical Area Planting (NRCS 342), Field Border (NRCS 386), Hedgerow Planting (NRCS 422), Fence (NRCS 382), Riparian Forest Buffer (NRCS 391), Riparian Herbaceous Cover (NRCS 390)	X	X	X	X			X	X		?
Composting Facility	A facility to process raw manure or other raw organic by-products into biologically stable organic material. The facility must be designed to prevent run-off or infiltration from nutrients and/or bacteria.	Composting Facility (NRCS 317), Animal Mortality Facility (NRCS 316)	X	X					X	X		Y
Revegetation	Establishing permanent vegetative cover in order to prevent soil erosion. Where appropriate, revegetation efforts should focus on establishing native vegetation communities matched to site-specific resource goals and conditions.	Conservation Cover (NRCS 327), Critical Area Planting (NRCS 342), Silviculture Establishment (NRCS 381)	X	X	X	X						Y
Nutrient Management Plan	A plan describing how plant nutrients will be managed in order to prevent nonpoint source pollution. The plan must identify the amount, source, placement, form and timing of all nutrient applications on a given farm or set of farms. This practice does not include the creation of Nutrient Management Plans where the plans are required in order to obtain permit coverage.	Nutrient Management (NRCS 590)	X	X					X	X		Y
Erodible Land Conversion	Conversion of highly erodible lands to permanent vegetative cover.	Range Planting (NRCS 550), Pasture and Hay	X	X	X			X				N

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		Planting (NRCS 512)											
Salinity and Sodic Soil Management	Management of land, water and plants to reduce accumulations of salts and/or sodium on the soil surface. This may include monitoring to identify saline seep recharge areas, making changes in cropping or irrigation practices to dry up saline seeps, and/or installing practices to prevent saline or sodic sediment from reaching surface water.	Salinity and Sodic Soil Management (NRCS 610)							X				Y
Hydrologic Function Restoration (Swamp "un-busting")	Alterations made to groundwater or surface water hydrology or channel morphology in order to reestablish hydraulic connectivity, groundwater elevation, stream flow, wetland function, stream channel function, or other waterbody attributes that were once eliminated in order to facilitate agricultural production. The cost of this practice must be carefully balanced against the value of the particular hydrologic functions in preventing nonpoint source pollution.	Wetland Restoration (NRCS 657), Wetland Enhancement (NRCS 659)	X	X	X	X			X	X			Y
<i>Urban/Stormwater</i>													
Setbacks and Zoning	Laws and ordinances limiting or prohibiting certain activities adjacent to streams, lakes, floodplains, and/or wetlands.	Please see Appendix A - 3.0 for a detailed description of current setback and zoning regulations in Montana.	X	X	X	X				X	X	X	Y

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Disposal of Household Hazardous Wastes	Storing, transporting, recycling, and permanent disposal of household chemicals, batteries, used motor oil, paint, pesticides, herbicides, fertilizer, cleaning solutions, personal care products, medications, and other potentially toxic substances to prevent surface water or groundwater contamination.										X	?	
Pet Waste Management	Removal and disposal of pet excrement, kitty litter, and soiled bedding materials to prevent them from entering surface water or groundwater.		X	X						X	X	N	
Septic System Maintenance	Regular inspection and cleanout of onsite wastewater treatment systems (septic systems). Repair of leaking or otherwise malfunctioning components.		X	X						X	X	X	Y
Storm Drain Inlet Protection	Installation of grates or trash racks to catch large debris. Regular cleanout of storm drain inlets. Painting or onsite posting of information regarding storm drains discharges (e.g. a stenciled label stating "Drains to fish stream").		X	X	X					X	X	X	N
Lawn and Garden Fertilizer Management	Application of lawn and garden fertilizers to minimize off-site transport and deep percolation of nutrients. May include managing the amount, placement and timing of fertilizer applications.		X	X								X	N
Lawn and Garden Irrigation Water Management	Adjusting the amount, timing and placement of irrigation water to prevent excess surface runoff and leaching of nutrients and pesticides below the root zone. Also, choosing lawn and garden plant varieties that require the least amount of water (e.g. xeriscaping).		X	X	X	X				X		X	N

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Litter Control	Prevention and removal of litter (trash). For example, providing adequate number and placement of trash receptacles in public spaces, or holding park cleanup days.								X		X	N	
Vehicle and Equipment Maintenance and Operation	Maintaining and operating vehicles and equipment in a manner that prevents leakage of fuel and lubricants. Storage and transport of fuel in suitable receptacles to prevent leakage into the environment.										X	N	
Construction Site Stormwater Runoff Control	Silt fences, straw wattles, clean water diversions, sediment settling basins, road maintenance, mulching, and other practices designed to prevent water from entering or exiting a construction site.	EPA Construction Site Stormwater Runoff Control BMP Fact Sheets, available at http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=min_measure&min_measure_id=4	X	X	X					X		X	?
Street Sweeping	Regular removal and appropriate disposal of trash, road sand, and other debris from roads.				X			X	X		X	Y	
Hookup Failing Septic Systems to Sanitary Sewer	Decommissioning of failing septic systems and hookup to a sanitary sewer system. Sanitary sewer (e.g. municipal wastewater systems) may offer a higher level of treatment.		X	X					X	X	X	Y	
Parking Lot Cleanup	Regular removal and safe disposal of sand, trash, and other accumulated materials from parking lots.				X			X			X	N	
Permeable Landscaping	Installation and maintenance of green belts, parks, permeable pavement, public gardens, and other forms of landscape that allow gradual percolation of precipitation and reduce concentrated runoff flow.		X	X	X	X			X	X	X	?	

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Regulation of Phosphorus-containing Detergents	Laws and ordinances limiting or prohibiting the sale and/or use of phosphorus-containing detergents.			X									Y
Stormwater System Retrofitting	Design and installation of new stormwater control technology.		X	X	X	X		X	X	X	X		Y
Preservation of Existing Vegetation	Preservation of existing riparian vegetation.		X	X	X	X			X	X	X		N
Conservation Easements	Establishing legally binding restrictions, attached to a piece of real estate, that either temporarily or permanently limit the activities that may take place, in order to prevent NPS pollution.		X	X	X	X			X	X	X		Y
Illicit Dumping Investigation and Cleanup	Identification, assessment and cleanup of illicit dump sites. Practice may include dump sites for waste, hazardous waste, animal/human fecal matter, or other substances that could be a source of NPS pollution.		X	X			X	X	X	X	X		?
Illicit Stormwater System Connection Investigation and Elimination	Identification and elimination of illicit discharges of waste to stormwater collection and transfer systems.		X	X	X	X			X	X	X		Y
Stormwater Reuse Systems	Practices such as rain gardens, rain barrels, constructed wetlands, vegetated swales, and filter strips designed to contain, treat and/or reuse stormwater that might otherwise carry pollutants to streams.	Filter Strip (NRCS 393), Constructed Wetland (NRCS 656), Roof Runoff Structure (NRCS 558), Runoff Management	X	X	X				X		X		Y

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		System (NRCS 570)											
Settling Basins or Sediment Traps	Constructed pits, depressions, straw wattles, silt fences or other containment devices used to trap or settle out sediment from urban runoff. These structures must be periodically cleaned out in order to maintain function.	Runoff Management System (NRCS 570), Water and Sediment Control Basin (NRCS 638), Sediment Basin (NRCS 350)		X	X							N	
Washwater Containment Facilities	Designated areas or facilities used at large construction sites, public works facilities, and heavy equipment garages to contain, treat or properly dispose of washwater from cleaning of trucks, concrete mixers and heavy equipment.				X						X	?	
Composting	Composting and subsequent reuse of organic waste.	Composting Facility (NRCS 317)	X	X							X	N	
<i>Transportation</i>													
Road Sand Management	Judicious application and prompt removal of road traction sand to prevent release of sand into surface water, while still providing traction necessary to ensure public safety.				X				X			X	Y
Road De-icing Chemical Management	Application and removal of road de-icing chemicals to prevent release of chemicals into surface water, while still providing traction necessary to ensure public safety.								X			X	Y
Road Repair and Maintenance	Timely repair of water bars, sediment traps, road ditches, culverts, and other runoff control structures.			X	X					X			Y

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Travel Management Plans	Develop and implement comprehensive travel management plans to limit NPS pollution from transportation networks, and to limit disturbance of riparian areas.			X	X	X			X			X	Y
Off-Highway-Vehicle (OHV) Management	Developing, designating, and maintaining trails for OHV recreation. Trails should be designed to avoid OHV contact with surface water and riparian areas, or to limit contact to hardened crossings or bridges.			X	X							X	N
Road Crossing	Site, design and construct bridges, culverts, hardened crossings, and fords to prevent the following: disruption of stream sediments, erosion of stream banks, removal of large amounts of riparian vegetation, and excessive bridge deck runoff.	Stream Crossing (NRCS 578)		X	X	X			X			X	Y
Road Grading	Rut removal, grade control, crowning, and other techniques to prevent concentrated flow of road runoff that can lead to erosion.			X	X								Y
Road Relocation	Relocate roads outside of riparian areas and floodplains.			X	X	X			X			X	Y
Road Obliteration or Decommissioning	Removal or decommissioning of roads that have been significant sources of NPS pollution.			X	X								Y
Disturbed Soil Roughening	Roughening of disturbed soil to temporarily discourage concentrated runoff.			X	X								N
Settling Basins or Sediment Traps	Constructed pits or depressions used to trap or settle out sediment from road runoff. These structures must be periodically cleaned out in order to maintain function.	Sediment Basin (NRCS 350), Runoff Management System (NRCS 570), Water and Sediment Control Basin (NRCS 638)		X	X				X				N
<i>Mining and Industry</i>													

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Mine Tailings Removal and Storage	Removal of mine tailings and waste rock from floodplains and riparian areas, and storage of tailings and waste rock in a location where they will not come into contact with surface water or groundwater.				X		X					X	Y
Groundwater Recharge Control	Implementation of land use practices to reduce groundwater recharge of flooded mine workings, and thereby reduce acid mine drainage.						X					X	N
Clean Water Diversion	Berms, reservoirs, infiltration basins, vegetated strips, or other structures used to prevent clean runoff or precipitation from coming into contact with mine tailings or waste rock, and picking up pollutants.				X		X					X	N
Adit Closure	Permanent closure of mine adits to eliminate or reduce acid mine drainage.						X					X	Y
Industrial Site Housekeeping	Maintaining a general cleanliness and order at industrial sites to limit the opportunity for uncontrolled, offsite transport of pollutants.		X	X	X	X	X	X	X	X	X	X	N
Transportation Network BMPs	Please see " <i>Transportation</i> " section of this table.		X	X	X	X	X	X	X	X	X	X	?
Spill Prevention and Control Plan	Planning documents and training designed to speed up response and recovery time in the event of a spill of hazardous material.											X	Y
<i>Recreation</i>													
Public Boat Ramps and Fishing Access Sites	Establish and maintain a system of boat ramps and fishing access sites that allow the public adequate access to streams and lakes through riparian areas, while discouraging creation of individual user trails through riparian areas.				X	X						X	Y

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Public Trails	Establish and maintain a system of trails in and through riparian areas. Trails should be sited and constructed to prevent erosion and control runoff from the trail surface.				X								N
Remove "Unofficial" Trails	Obliterate or restrict access to trails that generate significant amounts of NPS pollution or cause excessive damage to riparian areas.				X	X							N
Waste Handling and Disposal	Provide toilets and trash cans to encourage proper waste disposal.		X	X					X	X			N
Spill Prevention and Control	Manage vehicle and equipment fuel to prevent release into surface water or groundwater.										X		?
No-wake Zones	Establish and enforce no-wake zones to protect fragile shorelines from erosion.				X								N
Off-Highway-Vehicle (OHV) Management	Developing, designating, and maintaining trails for OHV recreation. Trails should be designed to avoid OHV contact with surface water and riparian areas, or to limit contact to hardened crossings or bridges.				X						X		N
<i>Stream Restoration</i>													
Streambank stabilization, stream channel and in-stream habitat restoration	Stream restoration practices will be identified and applied on a site-specific basis. Emphasis will be given to BMPs that restore natural, self-perpetuating stream processes and cost-effective controls.	Montana intends to develop guidance on appropriate stream restoration techniques during the next 5 years.	X	X	X	X			X				Y
<i>Forestry - Please see Appendix A - 2 for Montana forestry BMPs</i>													
<i>Miscellaneous BMPs</i>													

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Wetland Restoration or Creation	Restoration, re-creation or enhancement for the purpose of addressing NPS pollution.	Wetland Restoration (NRCS 657), Wetland Creation (NRCS 658), Wetland Enhancement (NRCS 659)	X	X	X	X			X	X	X	Y
Revegetation	Planting, protecting or reestablishing permanent vegetative cover in riparian or upland areas with the goal of reducing NPS pollution. Practice may include, but is not limited to seeding, sprigging, shrub planting, fencing to protect emerging or fragile vegetation, willow lifts, sod mats, overseeding, non-native plant removal, native plant reintroduction, riparian buffer creation, and replacement of annual plants with perennial vegetation.	Field Border (NRCS 386), Hedgerow Planting (NRCS 422), Pasture and Hay Planting (NRCS 512), Range Planting (NRCS 550), Riparian Forest Buffer (NRCS 391), Riparian Herbaceous Cover (NRCS 390), Tree/Shrub Establishment (NRCS 612)	X	X	X	X			X	X	X	?
Floodplain Reestablishment	Reestablishment of a stream's floodplain or reconnection to an abandoned floodplain, with the purpose of addressing NPS pollution. Practice may also include breaching, removal, or modification of dikes, levees, road bases, or railroad grades to allow streams to access or reestablish a floodplain.		X	X	X	X						Y
Culvert Replacement or Removal	Removal or replacement of culverts to reduce NPS pollution.	Stream Crossing (NRCS 578)		X	X							Y
Dam Removal or Modification	Dam removal or modification to restore the natural hydrograph of a stream in order to facilitate natural stream processes that would reduce NPS pollution.				X	X						Y

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Educational Tours, Field Days, Trainings, Conferences, Workshops	Educational events designed to raise awareness of NPS pollution or train people on how to address NPS pollution.		X	X	X	X	X	X	X	X	X	X	N
Brochures, Newsletters, Fliers, Mailings, List-servers, Webpages, Blogs	Educational materials designed to raise awareness of NPS pollution or train people on how to address NPS pollution.		X	X	X	X	X	X	X	X	X	X	N
Media Campaigns	Television, radio, internet or other media campaigns to raise awareness of NPS pollution or train people on how to address NPS pollution.		X	X	X	X	X	X	X	X	X	X	Y
Service Learning	Hands-on training and experience in techniques to address NPS pollution.		X	X	X	X	X	X	X	X	X	X	?
Social Networking	Use of social networking to raise awareness of NPS pollution issues or train people on how to address NPS pollution.		X	X	X	X	X	X	X	X	X	X	N
Special Area Management Plan	Management plans designed to help prevent NPS pollution in sensitive or threatened landscapes or watersheds.		X	X	X	X		X	X	X			Y
Mulching	Application of organic materials to bare or highly erodible soils to prevent erosion.	Mulching (NRCS 484)		X	X								N
New Technology, Practices Not Previously Considered, Other	Other practices, not mentioned above, may be useful for reducing or preventing NPS pollution. Other practices should be evaluated and applied where appropriate.		X	X	X	X	X	X	X	X	X	X	?

A.2 FORESTRY FROM DNRC

BEST MANAGEMENT PRACTICES FOR FORESTRY IN MONTANA

January 2006

* BMPs Not Monitored During Audits

I. DEFINITIONS

1. "Hazardous or toxic material" means substances which by their nature are dangerous to handle or dispose of, or a potential environmental contaminant, and includes petroleum products, pesticides, herbicides, chemicals, and biological wastes.
2. "Stream," as defined in 77-5-302(7), MCA, means a natural water course of perceptible extent that has a generally sandy or rocky bottom or definite banks and that confines and conducts continuously or intermittently flowing water.
3. "Streamside Management Zone (SMZ)" or "zone" as defined at 77-5-302(8), MCA means "the stream, lake, or other body of water and an adjacent area of varying width where management practices that might affect wildlife habitat or water quality, fish, or other aquatic resources need to be modified." The streamside management zone encompasses a strip at least 50 feet wide on each side of a stream, lake, or other body of water, measured from the ordinary high water mark, and extends beyond the high water mark to include wetlands and areas that provide additional protection in zones with steep slopes or erosive soils.
4. "Wetlands" mean those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, swamps, bogs, and similar areas.
5. Adjacent wetlands are wetlands within or adjoining the SMZ boundary. They are regulated under the SMZ law.
6. Isolated wetlands lie within the area of operation, outside of the SMZ boundary, and are not regulated under the SMZ law.

II. STREAMSIDE MANAGEMENT

The Streamside Management Law (77-5-301 through 307 MCA) provides minimum regulatory standards for forest practices in streamside management zones (SMZ). The "Montana Guide to the Streamside Management Zone & Rules" is an excellent information source describing management opportunities and limitations within SMZs.

III. ROADS

A. Planning and Location

1. Minimize the number of roads constructed in a watershed through comprehensive road planning, recognizing intermingled ownership and foreseeable future uses. Use existing roads, unless use of such roads would cause or aggravate an erosion problem.
2. Review available information and consult with professionals as necessary to help identify erodible soils and unstable areas, and to locate appropriate road surface materials.*
3. Fit the road to the topography by locating roads on natural benches and following natural contours. Avoid long, steep road grades and narrow canyons.
4. Locate roads on stable geology, including well-drained soils and rock formations that tend to dip into the slope. Avoid slumps and slide-prone areas characterized by steep slopes, highly weathered bedrock, clay beds, concave slopes, hummocky topography, and rock layers that dip parallel to the slope. Avoid wet areas, including moisture-laden or unstable toe slopes, seeps, wetlands, wet meadows, and natural drainage channels.
5. Minimize the number of stream crossings and choose stable stream crossing sites.
6. Locate roads to provide access to suitable (relatively flat and well-drained) log landing areas to reduce soil disturbance.*

B. Design

1. Properly design roads and drainage facilities to prevent potential water quality problems from road construction.*
2. Design roads to the minimum standard necessary to accommodate anticipated use and equipment. The need for higher engineering standards can be alleviated through proper road-use management.
3. Design roads to balance cuts and fills or use full bench construction (no fill slope) where stable fill construction is not possible.*
4. Design roads to minimize disruption of natural drainage patterns. Vary road grades to reduce concentrated flow in road drainage ditches, culverts, and on fill slopes and road surfaces.

- C. **Road Drainage** Road Drainage is defined as all applied mechanisms for managing water in a non-stream crossing setting, road surface drainage, and overland flow; ditch relief, cross drains and drain dips)
1. Provide adequate drainage from the surface of all permanent and temporary roads. Use outsloped, insloped or crowned roads, and install proper drainage features. Space road drainage features so peak flow on road surfaces or in ditches will not exceed capacity.
 - a. Outsloped roads provide a means of dispersing water in a low- energy flow from the road surface. Outsloped roads are appropriate when fill slopes are stable, drainage will not flow directly into stream channels, and transportation safety can be met.
 - b. For in-sloped roads, plan ditch gradients steep enough, generally greater than 2% but less than 8%, to prevent sediment deposition and ditch erosion. The steeper gradients may be suitable for more stable soils; use the lower gradients for less stable soils.
 - c. Design and install road surface drainage features at adequate spacing to control erosion; steeper gradients require more frequent drainage features. Properly constructed drain dips can be an economical method of road surface drainage. Construct drain dips deep enough into the subgrade so that traffic will not obliterate them.
 2. Design all ephemeral draw culverts with adequate length to allow for road fill width. Minimum culvert size is 15 inch. Install culverts to prevent erosion of fill, seepage and failure as described in V.C.4 and maintain cover for culverts as described in V.C.6.
 3. Design all relief culverts with adequate length to allow for road fill width. Protect the inflow end of all relief culverts from plugging and armor if in erodible soil. When necessary construct catch basins with stable side slopes. Unless water flows from two directions, skew ditch relief culverts 20 to 30 degrees toward the inflow from the ditch to help maintain proper function.
 4. Where possible, install culverts at the gradient of the original ground slope; otherwise, armor outlets with rock or anchor downspouts to carry water safely across the fill slope.

5. Provide energy dissipaters (rock piles, slash, log chunks, etc.) where necessary to reduce erosion at outlet of drainage features. Crossdrains, culverts, water bars, dips, and other drainage structures should not discharge onto erodible soils or fill slopes without outfall protection.
6. Prevent downslope movement of sediment by using sediment catch basins, drop inlets, changes in road grade, headwalls, or recessed cut slopes.*
7. Route road drainage through adequate filtration zones or other sediment-settling structures to ensure sediment doesn't reach surface water. Install road drainage features above stream crossings to route discharge into filtration zones before entering a stream.

D. Construction (see also Section IV on stream crossings)

1. Keep slope stabilization, erosion and sediment control work current with road construction. Install drainage features as part of the construction process, ensuring that drainage structures are fully functional. Complete or stabilize road sections within same operating season.*
2. Stabilize erodible, exposed soils by seeding, compacting, riprapping, benching, mulching, or other suitable means.
3. At the toe of potentially erodible fill slopes, particularly near stream channels, pile slash in a row parallel to the road to trap sediment (example, slash filter windrow). When done concurrently with road construction, this is one method that can effectively control sediment movement, and it can also provide an economical way of disposing of roadway slash. Limit the height, width and length of "slash filter windrows" so wildlife movement is not impeded. Sediment fabric fences or other methods may be used if effective.
4. Minimize earthmoving activities when soils appear excessively wet. Do not disturb roadside vegetation more than necessary to maintain slope stability and to serve traffic needs.*
5. Construct cut and fill slopes at stable angles to prevent sloughing and other subsequent erosion.
6. Avoid incorporating potentially unstable woody debris in the fill portion of the road prism. Where possible, leave existing rooted trees or shrubs at the toe of the fill slope to stabilize the fill.

7. Consider road surfacing to minimize erosion.*
8. Place debris, overburden, and other waste materials associated with construction and maintenance activities in a location to avoid entry into streams. Include these waste areas in soil stabilization planning for the road.
9. Minimize sediment production from borrow pits and gravel sources through proper location, development and reclamation.
10. When using existing roads, reconstruct only to the extent necessary to provide adequate drainage and safety; avoid disturbing stable road surfaces. Prior to reconstruction of existing roads within the SMZ, refer to the SMZ law. Consider abandoning existing roads when their use would aggravate erosion.

E. Maintenance

1. Grade road surfaces only as often as necessary to maintain a stable running surface and adequate surface drainage.
2. Maintain erosion control features through periodic inspection and maintenance, including cleaning dips and crossdrains, repairing ditches, marking culvert inlets to aid in location, and clearing debris from culverts.
3. Avoid cutting the toe of cut slopes when grading roads, pulling ditches, or plowing snow.
4. When plowing snow, provide breaks in snow berm to allow road drainage.*
5. Haul all excess material removed by maintenance operations to safe disposal sites and stabilize these sites to prevent erosion. Avoid sidcasting in locations where erosion will carry materials into a stream.*
6. Avoid using roads during wet periods if such use would likely damage the road drainage features. Consider gates, barricades or signs to limit use of roads during spring break up or other wet periods.
7. Upon completion of seasonal operations, ensure that drainage features are fully functional. The road surface should be crowned, outsloped, insloped, or water-barred. Remove berms from the outside edge where runoff is channeled.*

8. Leave abandoned roads in a condition that provides adequate drainage without further maintenance. Close these roads to traffic; reseed and/or scarify; and, if necessary, recontour and provide water bars or drain dips.

IV. **TIMBER HARVESTING, AND SITE PREPARATION A. Harvest**

Design

1. Plan timber harvest in consideration of your management objectives and the following*:
 - a. Soils and erosion hazard identification.
 - b. Rainfall.
 - c. Topography.
 - d. Silvicultural objectives.
 - e. Critical components (aspect, water courses, landform, etc.).
 - f. Habitat types.
 - g. Potential effects on water quality and beneficial water uses.
 - h. Watershed condition and cumulative effects of multiple timber management activities on water yield and sediment production.
 - i. Wildlife habitat.
2. Use the logging system that best fits the topography, soil type, and season, while minimizing soil disturbance and economically accomplishing silvicultural objectives.
3. Use the economically feasible yarding system that will minimize road densities.*
4. Design and locate skid trails and skidding operations to minimize soil disturbance. Using designated skid trails is one means of limiting site disturbance and soil compaction. Consider the potential for erosion and possible alternative yarding systems prior to planning tractor skidding on steep or unstable slopes.*
5. Locate skid trails to avoid concentrating runoff and provide breaks in grade. Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas. Limit the grade of constructed skid trails on geologically unstable, saturated, highly erosive, or easily compacted soils to a maximum of 30%. Use mitigating measures, such as water bars and grass seeding, to reduce erosion on skid trails.

6. Minimize the size and number of landings to accommodate safe, economical operation. Avoid locating landings that require skidding across drainage bottoms.

B. Other Harvesting Activities

1. Tractor skid where compaction, displacement, and erosion will be minimized. Avoid tractor or wheeled skidding on unstable, wet, or easily compacted soils and on slopes that exceed 40% unless operation can be conducted without causing excessive erosion. Avoid skidding with the blade lowered. Suspend leading ends of logs during skidding whenever possible.
2. Avoid operation of wheeled or tracked equipment within isolated wetlands, except when the ground is frozen (see Section VI on winter logging).
3. Use directional felling or alternative skidding systems for harvest operations in isolated wetlands.*
4. For each landing, provide and maintain a drainage system to control the dispersal of water and to prevent sediment from entering streams.
5. Insure adequate drainage on skid trails to prevent erosion. On gentle slopes with slight disturbance, a light ground cover of slash, mulch or seed may be sufficient. Appropriate spacing between water bars is dependent on the soil type and slope of the skid trails. Timely implementation is important.
6. When existing vegetation is inadequate to prevent accelerated erosion, apply seed or construct water bars before the next growing season on skid trails, landings and fire trails. A light ground cover of slash or mulch will retard erosion.*

C. Slash Treatment and Site Preparation

1. Rapid reforestation of harvested areas is encouraged to reestablish protective vegetation.*
2. When treating slash, care should be taken to preserve the surface soil horizon by using appropriate techniques and equipment. Avoid use of dozers with angle blades.
3. Minimize or eliminate elongated exposure of soils up and down the slope during mechanical scarification.*

4. Scarify the soil only to the extent necessary to meet the resource management objectives. Some slash and small brush should be left to slow surface runoff, return soil nutrients, and provide shade for seedlings.
5. Carry out brush piling and scarification when soils are frozen or dry enough to minimize compaction and displacement.
6. Carry out scarification on steep slopes in a manner that minimizes erosion. Broadcast burning and/or herbicide application is preferred means for site preparation, especially on slopes greater than 40%.
7. Remove all logging machinery debris to proper disposal site.*
8. Limit water quality impacts of prescribed fire by constructing water bars in firelines; not placing slash in drainage features and avoiding intense fires unless needed to meet silvicultural goals. Avoid slash piles in the SMZ when using existing roads for landings.

V. STREAM CROSSINGS

A. Legal Requirements

1. Under the Natural Streambed and Land Preservation Act of 1975 (the "310 law"), any activity that would result in physical alteration or modification of a perennial stream, its bed or immediate banks must be approved in advance by the supervisors of the local conservation district. Permanent or temporary stream crossing structures, fords, riprapping or other bank stabilization measures, and culvert installations on perennial streams are some of the forestry-related projects subject to 310 permits.

Before beginning such a project, the operator must submit a permit application to the conservation district indicating the location, description, and project plans. The evaluation generally includes on-site review, and the permitting process may take up to 60 days.

2. Stream-crossing projects initiated by federal, state or local agencies are subject to approval under the "124 permit" process (administered by the Department of Fish, Wildlife and Parks), rather than the 310 permit.
3. A short-term exemption (3a authorization) from water quality standards is necessary unless waived by the Department of Fish, Wildlife and Parks as a condition of a 310 or 124 permit. Contact the

Department of Environmental Quality in Helena at 444-2406 for additional information.

B. Design Considerations (Note: 310 permit required for perennial streams)

1. Cross streams at right angles to the main channel if practical. Adjust the road grade to avoid the concentration of road drainage to stream crossings. Direct drainage flows away from the stream crossing site or into an adequate filter.
2. Avoid unimproved stream crossings. Depending on location, culverts, bridges and stable/reinforced fords may be used.

C. Installation of Stream Crossings (Note: 310 permit required for perennial streams)

1. Minimize stream channel disturbances and related sediment problems during construction of road and installation of stream crossing structures. Do not place erodible material into stream channels. Remove stockpiled material from high water zones. Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance. Time construction activities to protect fisheries and water quality.
2. Design stream-crossings for adequate passage of fish (if present) with minimum impact on water quality. When using culverts to cross small streams, install those culverts to conform to the natural stream bed and slope on all perennial streams and on intermittent streams that support fish or that provides seasonal fish passage. Ensure fish movement is not impeded. Place culverts slightly below normal stream grade to avoid outfall barriers.
3. Do not alter stream channels upstream from culverts, unless necessary to protect fill or to prevent culvert blockage. On stream crossings, design for, at a minimum, the 25-year frequency runoff. Consider oversized pipe when debris loading may pose problems. Ensure sizing provides adequate length to allow for depth of road fill.
4. Install stream-crossing culverts to prevent erosion of fill. Compact the fill material to prevent seepage and failure. Armor the inlet and/or outlet with rock or other suitable material where feasible.
5. Consider dewatering stream crossing sites during culvert installation.*
6. Maintain a 1-foot minimum cover for stream-crossing culverts 15 to 36 inches in diameter, and a cover of one-third diameter for larger

culverts, to prevent crushing by traffic.

7. Use culverts with a minimum diameter of 15 inches for permanent stream crossings.*

D. Existing Stream Crossing

1. Ensure stream crossing culverts have adequate length to allow for road fill width and are maintained to preserve their hydrologic capacity. To prevent erosion of fill, provide or maintain armoring at inlet and/or outlet with rock or other suitable material where feasible. Maintain fill over culvert as described in V.C. 6.

VI. Winter Logging

A. General

1. Consider snow-road construction and winter harvesting in isolated wetlands and other areas with high water tables or soil erosion and compaction hazards.*
2. Conduct winter logging operations when the ground is frozen or snow cover is adequate (generally more than one foot) to prevent rutting or displacement of soil. Be prepared to suspend operations if conditions change rapidly, and when the erosion hazard becomes high.*
3. Consult with operators experienced in winter logging techniques.*

B. Road Construction and Harvesting Considerations

1. For road systems across areas of poor bearing capacity, consider hauling only during frozen periods. During cold weather, plow any snow cover off of the roadway to facilitate deep freezing of the road grade prior to hauling.*
2. Before logging, mark existing culvert locations. During and after logging, make sure that all culverts and ditches are open and functional.*
3. Use compacted snow for road beds in unroaded, wet or sensitive sites. Construct snow roads for single-entry harvests or for temporary roads.*
4. In wet, unfrozen soil areas, use tractors or skidders to compact the snow for skid road locations only when adequate snow depth exists.

Avoid steeper areas where frozen skid trails may be subject to erosion the next spring.*

5. Return the following summer and build erosion barriers on any trails that are steep enough to erode.*

VII. HAZARDOUS SUBSTANCES A.

General

1. Know and comply with regulations governing the storage, handling, application (including licensing of applicators), and disposal of hazardous substances. Follow all label instructions.
2. Develop a contingency plan for hazardous substance spills, including cleanup procedures and notification of the State Department of Environmental Quality.*

B. Pesticides and Herbicides

1. Use an integrated approach to weed and pest control, including manual, biological, mechanical, preventive and chemical means.*
2. To enhance effectiveness and prevent transport into streams, apply chemicals during appropriate weather conditions (generally calm and dry) and during the optimum time for control of the target pest or weed.*

A.3 LOCAL GOVERNMENT RIPARIAN SETBACKS AND LAND USE PLANNING ORDINANCES

Riparian Setbacks and Land Use Planning in		Compiled by: MT Audubon, P.O. Box 595, Helena, MT 59624; 406-443-3949; website:								
List of Adopted Local Government Regulations and										
Date Updated: July 31, 2009		NOTE: This chart is sorted by Type of Regulation (Flood plain, Subdivision , Zoning, etc.)								
Local Government	Purpose of Regulation	Size of Setback or Other Stream Protection Measure	Restrictions Apply	Specific Exceptions	Setback measures	Area Covered: Streams,	Reference	Vegetation Requirements	Additional Requirements/NOTES	How to Obtain
Type of Regulation: Development Permit Ordinance										
Beaverhead County	Protect water quality, flood plain, riparian resources,	Examine all new buildings proposed within 500 feet of Big Hole River; minimum setback is 150 feet.	New buildings		Ordinary high water mark	Big Hole River only	Ordinance No. 2005-1, Big Hole River Conservation Development Standards &	Indicates that development should be outside flood plain	NOTE: Ordinance also adopted in Madison County; zoning regulations adopted in Butte-	Use this link: http://www.beaverheadcounty.org/html/land_use_and_planning_department
Madison County	Protect water quality, flood plain, riparian resources,	Examine all new buildings proposed within 500 feet of Big Hole River; minimum setback is 150 feet.	New buildings		Ordinary high water mark	Big Hole River only	Ordinance No. 1- 2004, Big Hole River Conservation Development Standards &	Indicates that development should be outside flood plain	NOTE: Ordinance also adopted in Beaverhead County; zoning regulations adopted in Butte-	Use this link: http://madison.mt.gov/departments/plan/publications/planpub.asp
Type of Regulation: Flood Plain Regulations										
Missoula County	Protection from flooding	Prohibits new levees. Maintenance of an existing levee is allowed in three situations: if the levee is publicly maintained; if relocating, elevating, or flood-proofing the structures protected by the levee is not feasible; or if a streamside levee is to be reconstructed away from the stream bank.	New bank stabilization structures used in streams			All river and streams with delineated 100 year floodplains	Flood plain Regulations: Chapter V: Specific Standards, 5.02.B.	Prohibits large-scale clearing of native vegetation within 50 feet of a stream or river	“Softer” bank stabilization techniques, including logs and other woody debris, may be allowed after review by administrators.	Use this link: http://www.co.missoula.mt.us/opgweb/floodplain/floodplain.htm

<p>Ravalli County</p> <p>Date: Floodway policy adopted March 17, 1999</p>	<p>Protection from flooding</p>	<p>The setback prohibits buildings in the 100-year flood plain (floodway fringe and the floodway). The setback appears under 4-6 (c) of the regulations: anything</p>	<p>Buildings and associated structures</p>			<p>All rivers and streams with delineated 100- year floodplains</p>	<p>Flood plain Regulations, Development Standards, Section 4-6 and Table 4-6</p>	<p>None</p>		<p>Use this link: http://www.ravalliacounty.mt.gov/Planning/Land.htm</p>
<p>Type of Regulation: Growth Policy</p>										
<p>Jefferson County</p> <p>Date: Riparian policy adopted June 18, 2003</p>		<p>"Promote investigation on stream setbacks..." "Require all construction to be setback from streams" "Recommend wetland</p>				<p>Streams and wetlands</p>	<p>2003 Growth Policy, Water Quality, Page 10 - 11.</p>		<p>NOTE: Growth Policies are non-regulatory but local regulations should comply with the Growth Policy.</p>	<p>Use this link: http://www.jeffco.mt.gov/courty/planning.html</p>