SECTION 7

Access Roads and Driveway Runoff

This fact sheet addresses the impacts improper road construction and maintenance can have on water quality and how *you* can make a difference with *Best Management Practices (BMPs)*. BMP's are actions you can take to protect our natural resources.

The ultimate goal of this information is to provide *general* guidelines on proper road construction and maintenance for private roads, to avoid negative impacts to water quality.

1. Read the facts and information in the following pages.
2. Fill out the Property Assessment worksheet in order to analyze your property's specific needs.
3. Fill out the Action worksheet, then **Take Action!**

Why are Roads an Issue?

Most roads and driveways are constructed of compacted native soils. These dirt roads, if not properly managed, can become damaged by erosion after just a single storm. If a road is not designed with runoff control practices, water runs freely downhill picking up speed and scouring away the road (soil) creating huge ruts, gullies, washouts, and flooding. As this stormwater runoff speeds its way downhill it picks up tons of soil (sediment) and other pollutants from the road. Eventually this water and all that it carries, finds its way into streams, rivers, and lakes. This can be detrimental to water quality by covering fish spawning beds, creating muddy waters, and adding excess nutrients, causing algae blooms and weed growth. The erosion of roads can also be costly to landowners, both in repair and property value.

Quality Construction … *the bottom line*

High quality expertise by road design engineers and heavy equipment operators is invaluable for the safety and longevity of roads and driveways, as well as the protection of our natural resources. Unfortunately, there are many examples of private roads constructed by an operator who has insufficient knowledge and experience in this area. As a result ruts, gullies, washouts, and flooding become expensive and dangerous problems. Having your road constructed properly is an excellent long term investment.

Water runoff can be slowed by numerous control measures and diverted into vegetated drainage areas, where the dirt it carries is captured and the water is filtered back into the ground. These control methods may include open-top box culverts, waterbars, road sloping, and rolling dips. The guidelines in this Section should help to ensure that roads on your property are built for the long term, saving time, money, and water quality.

Public Access Vs. Private Residential Roads

Many roads around the lake were once used as logging roads, but are now used for residential and recreational access. Maintenance of our public roads will depend on who owns the property and the activities taking place, such as a timber sale. Maintenance may involve the United States Forest Service, Idaho State Department of Lands, or Bonner County Road Department. Unfortunately, because there are so many public access roads, maintenance can be left unattended. If you observe a hazardous road, report it to one of these agencies and get it on the radar. Homeowners, however, are responsible for their private driveways and can use the guidelines below.

Road Design and Layout

When designing a new road, implement these Best Management Practices into your road design before beginning construction and make sure your contractor is experienced in these practices. Check with your county, state, or city regulations regarding road and driveway standards and permit requirements. They may vary depending on where your property is located.

- During road layout - avoid slopes over 8 % or road segments longer than 200 feet.
- Vary the grade as much as possible between uphill and downhill to facilitate travel and drainage.
- Place roads as far away from streams, surface waters or wetlands as possible.
- Install drainage features and structures.
- Obtain appropriate permits for stream crossings. Contact Idaho Department of Lands for more information.
- Design drainage features to intercept runoff before it reaches road stream crossings.
- Design roads to balance cut and fill.

Drainage Improvement Methods

The following guidelines were taken from the State of Idaho Catalog of Storm Water Best Management Practices and the Forest Practices Act BMP's. Please refer to these manuals before doing any new construction.

Open-Top Box Culvert:

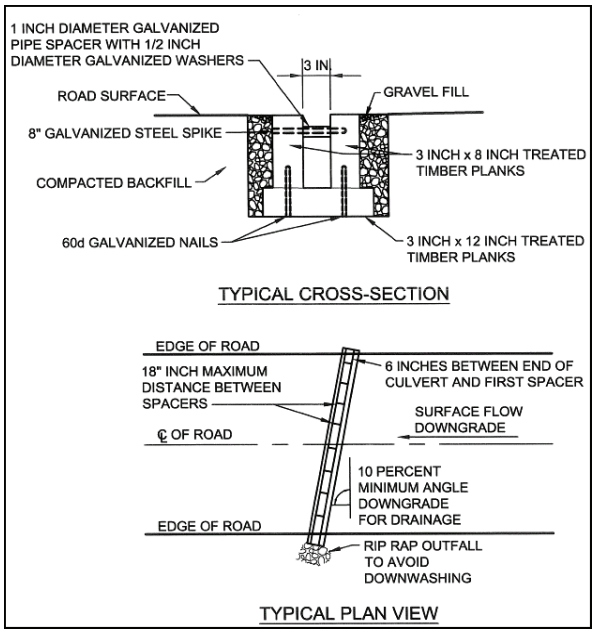
This practice is an excellent substitute for pipe culverts on lightly used unpaved roads on steep grades of 6% or more. Construct a box-like frame (three-sided, open-topped) of logs; lumber; discarded guardrail; or commercial, corrugated steel. The trough should be 3-4 inches wide and 6-8 inches deep. Install it flush with the road surface skewed at a downgrade angle across the roadway. The slope of the culvert should be a minimum of 2%. The outflow end should extend 6-12 inches beyond the surface of the roadbed and should be directed onto vegetated ground, riprap, or another erosion control structure such as a sediment trap or catch basin.

Table 1

Road Grade (percent)	Spacing Between Open-Top Culverts, (feet)
2 to 5	300 to 500
6 to 10	200 to 300
11 to 15	100 to 200
16 to 20	<100

Where recommended spacing is less than 33 ft, the road should be paved with gravel or crushed rock.

Typical Open-Top Box Culvert Detail

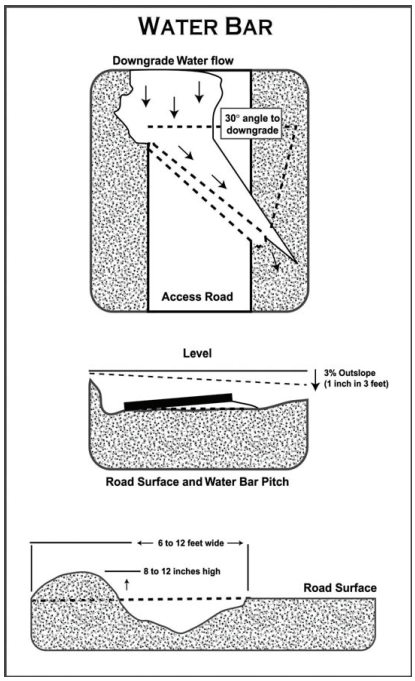


Details courtesy of DEP Pennsylvania

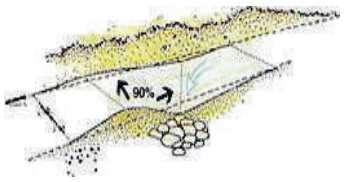
Water Bars:

A water bar is a cut and berm built at a downward angle across the roadway. It extends from the cut bank to the opposite down hill shoulder. Installation of water bars should be done in areas with minimal or no fill. Install *waterbars* for use as a temporary or permanent drainage practice on light-use, low-maintenance, unpaved roads.

- Berm 6-12 inches high; Cut 6-12 inches deep, skewed at angle of **30º to 40º across road**
- Construct low enough for traffic to pass over and angle across road to direct runoff flow off the road.
- Proper spacing between water bars can be determined from Table 1.
- Discharge should never be directed onto fill material.



Ditch Relief Culverts:



Ditch relief culverts transfer water from a ditch on the uphill side of a road, under the grade and release it into a stable area. Bedding material should be free of rock or debris that might puncture the pipe or carry water around the culvert. Cover with soil, avoiding puncture from large rocks. Compact soil at least halfway up the side to prevent water from seeping around the culvert. Install culverts at least 12" in diameter at a 30-degree downgrade angle to enhance flow. Ensure proper slope of at least 5 inches every 20 feet.

Rolling Dip:

Rolling dips are effective on long inclines with a grade of 5% or less. Rolling dips are built into the road during construction, following the natural contours of the land. Install erosion and sediment measures at the low point of the dip (drainage outfall to fill slope) before final grading to direct storm water discharge from the dip. Outflows should be kept free of debris to prevent ponding.

- Road must be at least 150 feet long.
- Align the dip across the road at nearly a 90-degree angle and slope it outward 5 percent.
- The dip should be 1 foot below the road surface. The upgrade approach to the bottom of the dip should be approximately 66 feet long. The down grade approach to the bottom of the dip should be approximately 23 feet long.

Road Sloping:

Slope entire road or segments of road at a 1-2% slope in order for water to flow off entire surface. Water should never be directed toward structures. Area where water is directed should have ample erosion control measures in place, such as, vegetation, rock, and mulch.

During Construction

The following Best Management Practices (BMP's) are used to control erosion during and after the construction process. Make sure you and your contractor are familiar with these practices.

- Construct roads in a manner that prevents debris, overburden, and excess materials from entering streams. Deposit excess materials outside of stream protection zones. See Forest Lot Management Section #8 for more information on Stream Protection Zones.
- Clear drainage ways of all debris generated during construction or maintenance that may interfere with drainage function.
- Construct drainage features to intercept runoff before it reaches road stream crossings.
- Care should be taken to maintain trees and shrubs growing at the base of fill slopes.
- When constructing road fills near streams, compact the material in lifts less than 1 foot high. Reduce water flowing over fill. Prevent snow, ice, frozen soil, and woody debris from being buried in the fill. Limited slash and debris may be windrowed along the toe of the fill to provide a filter near stream crossings.
- Construct the road with shallow, outward-sloping dips or undulations to collect surface runoff and convey it away from the road surface.
- Design roads to balance cuts and fills or use full bench construction where stable fill construction is not possible.

Cut and Fill Guidelines

During the process of cut-and-fill, it is critical to avoid letting sidecast or waste material from entering streams or placing it on unstable areas where it might erode.

Design roads to balance cuts and fills or use full bench construction where stable fill construction is not possible. While cut-and-fill construction is common for gentle terrain, full-bench roads are usually built on slopes over 65%. In full-bench construction, the entire road surface is excavated into the hill. The excavated material is pushed or hauled to an area needing fill or to a disposal area.

Minimize sediment production from borrow pits and gravel sources through proper location, development, and reclamation.

Road fill is used to cover culverts and build up flat areas. Since fill must support traffic, it needs to be spread and compacted in layers (lifts 12 inches or less) to develop strength.

Stabilize Road Slopes:

- ***Preserve Existing Vegetation***—whenever possible. Plants hold the soil in place with deep roots preventing erosion. When *any* existing vegetation is removed along slopes, the bare soil that remains is easily washed into the lake, rivers, and streams. New vegetation takes many, many years to mature.
- ***Stabilize exposed material***—excavation, embankment, waste piles, etc. are all erodible and may enter streams, ***stabilize*** **it before fall or spring runoff** by seeding, compacting, riprapping, benching, mulching, tarping or other suitable means.
- ***Retain outslope drainage*** during or following operations and remove outside edge berms except those protecting road fills.

Ditch Design

Ditches are constructed to convey water from storm runoff to an adequate outlet without causing erosion or sedimentation. A good ditch needs to be shaped and lined using the appropriate vegetative or structural material.

Ditches are efficient in the removal of runoff from the road, helping preserve the road bed and banks. Well designed ditches provide an opportunity for sediments and other pollutants to be removed from runoff water before it enters surface waters. A ditch achieves this by controlling, slowing and filtering the water through vegetation or structures. In addition, a ditch must be stable to avoid further erosion.

Construction Guidelines:

- Size ditches so they are large enough to handle runoff from the upslope drainage area.
- Design and grade ditch and bank side slopes at a maximum 2:1 slope.
- Excavate a ditch deep enough to drain the road base: 1.5 to 2 feet deep
- The ditch bottom should be a minimum of 2 feet wide to help slow and disperse water..
- Seed ditches which have a less than 5% slope with grass in order to filter sediments and stabilize soil.
- Line ditches which have a greater than 5% slope with 2-6 inch diameter rock. An alternative to rock lining is to install grade control structures such as small diameter logs or larger diameter rock.
- All ditches need an outlet; standing water saturates and weakens roads.

Cleaning and Maintenance:

- Clean ditches when they become clogged with sediments or debris to prevent overflows and washouts.
- Check ditches after major storm events for obstructions, erosion, or bank collapse.
- Re-grade ditches only when absolutely necessary and line with vegetation or stone as soon as possible.
- Deposit wastes at safe disposal sites and stabilize these sites to prevent erosion. Avoid locations where erosion will carry materials into a stream.

Routine Road Maintenance

The Best Management Practices listed previously must be regularly maintained to control erosion. Periodic inspection and maintenance will extend the life of the BMP and keep road maintenance costs low.

- Permanently mark road culverts to aid in location and clean regularly.
- Clean and repair box culverts on a regular basis. Keep water bars, and box culverts free of debris and sediment for optimum performance.
- **Avoid using roads during wet periods** if such use would likely damage the road drainage features.
- Grade road surfaces only as often as necessary to maintain a stable running surface and to retain the original surface drainage.
- Rolling dips and other outflows should be kept free of debris to prevent ponding.
- Place all excess material removed by maintenance operations in safe disposal sites and stabilize these sites to prevent erosion. Avoid locations where erosion will carry materials into a stream.

Resources:

Forestry for Idaho: BMP's - Forest Stewardship Guidelines for Water Quality.
www.idahoforests.org/bmp.htm

Stormwater Erosion Education Program (SEEP)
www.panhandleseep.org

Natural Resources Conservation Service (NRCS)
A public service providing evaluations and consultation.
1224 Washington Ave., Suite 101
Sandpoint, Idaho 83864
(208) 263-5310

Bonner County Planning Department
1500 Highway 2, Suite 208
Sandpoint, Idaho 83864
(208) 265-1458

Designing Fish Friendly Culverts

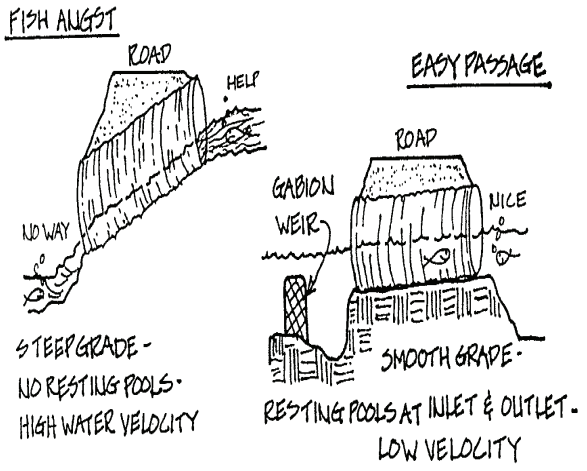
Use fish friendly culverts at stream crossings. Culvert installation should not change the conditions in the stream that existed prior to the installation. Trout and other species move upstream and downstream to spawn and meet other habitat needs.

Culverts can impede fish passage by creating the following conditions:

- ⇒ Excessive water velocities
- ⇒ Vertical barrier (fish must jump too high)
- ⇒ Inadequate water depth
- ⇒ Icing and debris problems
- ⇒ Culvert design does not accommodate the size and species of fish passing through the structure

BMPs for fish friendly culverts:

- When crossing a stream, select the culvert site so that there is no sudden increase or decrease in gradient and there is a 50-foot straight alignment of the stream channel directly above the crossing.
- Use bridges, bottomless arches or partially buried culverts in areas where fish passage is an important consideration.
- Design culverts so that water velocities passing through the pipe are equal to water velocities in the stream.
- Provide resting pools at culvert inlet and outlet for culverts installed in streams with high gradients.
- Place riprap securely at upstream culvert end to avoid dislodging that may reduce culvert capacity and create higher velocity flows.



FISH ANGST vs. EASY PASSAGE

Culvert Maintenance & Inspection Chart

Problem	Cause	Solution
Ponding /puddled water	Invert is too high. Ditch grade is too flat.	Reset the pipe to match the invert to the channel bottom. Re-grade ditch to maintain correct flow.
Dented/crushed ends	Traffic/snow plows are hitting the ends.	Fix pipe ends; use flared inlets and outlets; mark and protect.
Heavy corrosion	Water flowing through the culvert is acidic.	Install a sleeve of PVC in the existing pipe or replace the steel pipe with non-corrosive material (PVC, polyethylene, aluminum, concrete).
Piping around the outlet	Pipe is incorrectly installed, resulting in water flowing outside the pipe.	Reinstall pipe with proper bedding and compaction; install a headwall or antiseep diaphragm.
Sediment build-up	Not enough slope.	Reinstall pipe with proper bedding and compaction; install a headwall or antiseep diaphragm.
Sediment build-up	Not enough slope.	Reinstall pipe with a slope of at least 1/4 inch per foot.
Objects blocking the pipe	Debris traveling from the ditch to the culvert.	Remove blockage; install check dams upstream of the culvert.
Sagging bottom	Foundation material has settled or has low bearing capacity.	Reinstall pipe with suitable and properly compacted foundation material.
Crushed top	Not enough cover. Soil around walls not compacted. Traffic loads are too heavy.	Add cover. Reinstall pipe deeper with suitable and properly compacted bedding material.

Assessing and preventing the risk of lake water contamination from

Access Roads and Driveway Runoff

Risk Assessment Sheet 7

ASSESSMENT 1 – *Physical Characteristics of Access Roads and Risk of Sediment Delivery to Lake and Streams*– The assessment table below will help you identify potential environmental risks related to the management of your property's access roads and driveways. For each question indicate your risk level in the right-hand column. Some choices may not correspond exactly to your situation. Choose the response that best fits. When finished turn to the **Action Checklist** on the back of this page and record your medium and high-risk practices. Your goal is to lower your risks. Use the BMP recommendations in Section 7, Access Roads and Driveway Runoff, to help you decide how to best reduce pollution associated with water runoff.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Access road type, and slope of road to home:	Road paved, or road has good gravel base.	Road compacted dirt, and slope is 0-15%.	Road compacted dirt, and slope is >15%.	❒ Low ❒ Medium ❒ High
Condition of unpaved road into home:	Erosion low; no obvious gullies or road wash channels.	Some signs of erosion with loss of soil.	Erosion evident with deep gullies and wash channels.	❒ Low ❒ Medium ❒ High
Condition of road cut bank (above slope) and fill bank (below slope):	Banks are relatively flat and well vegetated, no obvious signs of erosion.	Banks are steep but well protected with vegetation with only some signs of erosion.	Banks are steep, generally bare, erosion evident with gullies and soil slumps.	❒ Low ❒ Medium ❒ High
Existence and condition of structures for water runoff management:	Drainage ditches deep and vegetated, culverts maintained, water bars or rolling dips present on steep slopes to slow runoff velocity.	Evidence that drainage ditches and culverts are not completely effective in runoff management.	Drainage ditches shallow or flat allowing road wash, culverts plugged or no culverts, road needs water bars or rolling dips.	❒ Low ❒ Medium ❒ High
Fate of water and sediment runoff from roads and road banks:	Most water flows over forested land where sediment can drop out before reaching a stream or the lake.	A good deal of water flows directly into the lake or stream; water only slightly turbid (dirty).	Most runoff water is channelized and flows directly into streams or the lake; water is turbid.	❒ Low ❒ Medium ❒ High

ACTION CHECKLIST

Access Roads and Driveway Runoff

Write all high and medium risks below.	**What can you do to reduce the risks?**	**Set a target date for action.**
Sample: Runoff from driveway runs directly into a stream or the lake.	Slow movement of water running down the driveway with culvert boxes that divert storm water into heavily vegetated areas.	One week from today: