
**LAKE CASCADE WATERSHED ADVISORY GROUP,** the **IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY,** and the **IDAHO ASSOCIATION OF SOIL CONSERVATION DISTRICTS** cooperatively bring you:
LAKE*A*SYST
A Program to Help You Keep Lake Cascade Clean

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# LAKE*A*SYST

A Program to Help You Keep Lake Cascade Clean

If you live in the Lake Cascade watershed you have a special responsibility to prevent pollutants from entering streams, groundwater, and the lake. Lake Cascade's water quality is currently improving, but the growth in recent years associated with urbanization threatens the gains made thus far. One action to *minimize* the input of nutrients, sediments, and toxic materials into Lake Cascade from **Stormwater Runoff** is to prevent untreated runoff from your property from entering Lake Cascade or its tributaries.

## What is Lake*A*Syst?

Lake Assessment System (Lake*A*Syst) is a voluntary program designed to help you protect Lake Cascade by reducing sediment and nutrient delivery to the lake.

**Lake*A*Syst is a 3-Step Process:**

1) Use the fact sheets to assess stormwater runoff from your property.
2) Fill out the **Action Checklist** (in the worksheet) to inventory contamination sources
3) **Take Action** to protect Lake Cascade**,** by using Best Management Practices found in Lake*A*Syst.

**DO YOU LIVE ADJACENT TO BUREAU OF RECLAMATION LAND??**

**DO NOT DO ANYTHING ON BUREAU OF RECLAMATION LAND WITHOUT CALLING THE LOCAL OFFICE AT 382-4258. IF A PROJECT ON YOUR PROPERTY WILL HAVE ANY TYPE OF IMPACT ON BUREAU OF RECLAMATION LAND, CALL 382-4258.**

# LAKE * A * SYST FACT SHEET SUMMARY PAGE

This booklet consists of four different Fact Sheet sections, each addressing a specific topic. Each section is divided into two parts: an information section and a self assessment to be filled out by the property owner. Not all sections are appropriate for each landowner, but taken individually they contain a great deal of information to assist the landowner in becoming an informed steward of the land and water.

## FACT SHEET 1: Storm Water Runoff

**Storm water runoff occurs when precipitation from rain or snowmelt flows over the ground. Storm water can pick up debris, chemicals, dirt and other pollutants and flow into a lake, stream or river.**

**Polluted storm water runoff can have many adverse affects on plants, fish, animals and people. Sediment can cloud the water and destroy aquatic habitats. Excess nutrients can cause algae blooms. Hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil and other auto fluids can poison aquatic life.**

## FACT SHEET 2: Lawn and Garden Management

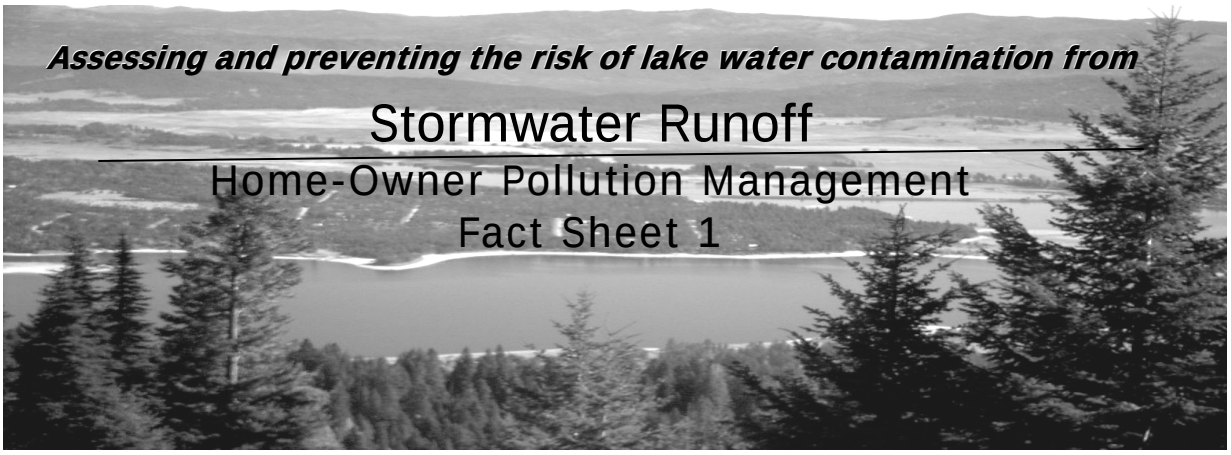
**Nutrients found in fertilizers can cause problems when they enter lakes and streams. Nitrogen and phosphorus contribute to algae growth, which depletes oxygen in the water and can suffocate fish and insects that fish eat. The proximity of some homes to the lakeshore increases the risk that these materials will enter the water and cause problems.**

## FACT SHEET 3: Landscape and New Construction

**Plants and trees help hold the soil and prevent erosion, especially on steep slopes. Anytime existing native vegetation is removed, the bare soil that is exposed can be washed into Lake Cascade. It harms the lake by causing excess sedimentation, killing aquatic bottom life, and disrupting spawning.**

## FACT SHEET 4: Access Roads and Driveway Runoff

**Many roads and driveways are constructed of compacted soil. If not properly managed, they can get rutted, allowing runoff to flow freely downhill, scouring away the soil, and carrying sediment into the lake.**




## Why is Runoff a Problem?

Stormwater runoff is any drainage event resulting from precipitation, including snowmelt. As more of the watershed is developed with impermeable surfaces such as roads, driveways, roofs and parking lots, less water can soak into the ground and is forced to "run-off". This increased water flow will have a greater force resulting in a greater ability to cause erosion that is channeled into ditches, drainageways, storm sewers, or road gullies often ending up in streams and eventually Lake Cascade.

High flows of water also increase the amount of sediment, petroleum products, pesticides, fertilizers, bacteria, and metals that flow into the Lake.

Your property alone (known as a non-point source of pollution) probably is not a significant pollutant source, but the cumulative effect of all the properties in the Watershed is a significant source of pollutant delivery into Lake Cascade. Excess amounts of pollutants such as phosphorus cause nuisance algae blooms.

### Identifying Problems Caused by Runoff

| PROBLEM | POSSIBLE CAUSE |
|---|---|
| • Is the water near shore cloudy?<br>• Is there an oily rainbow film on the water?<br>• Are there algal blooms, green scum, or abundant plant growth in the water?<br>• Are washouts, trenches, small piles of sediment, leaves, or debris found at the bottom of slopes? | • Excess sediment reaching the water<br>• Possible petroleum contamination<br>• Excess nutrients such as nitrate or phosphorus reaching the water<br>• Excessive runoff across the property |

# What Can I Do?

Many people are not aware of the concepts of stormwater runoff and that it can contribute to both surface and ground water quality degradation. **Homeowners** around Lake Cascade are principally responsible for managing stormwater runoff from their property.

Traditionally, the objective of stormwater management has been to transport runoff as quickly as possible through the drainage system in order to prevent flooding and protect lives and property. This is referred to as quantity control. Although public health and safety are still the most important goals, other objectives must now be met as well, such as preservation of water quality for *recreation and fisheries*. Today it is necessary to balance both quantity and quality goals. This balance can be achieved through the voluntary implementation of Lake*A*Syst.

**Impact of Urbanization**

The quantity or volume of stormwater runoff from the residential area around Lake Cascade depends on several factors including: (1) the intensity of a given storm event, (2) the duration of the event, (3) the amount of impervious area such as pavement, buildings and compacted soils, (4) soil type, and (5) land slope.

Urbanization around the lake increases the quantity of runoff, and therefore may have a serious impact on its quality. As shown in Figure 1 below, in a developed area where there are impervious surfaces (compacted soils, decks, rooftops, paved areas) more water runs off. Compared to an area of natural vegetation where rain-water soaks into the ground and returns to the air through evapotranspiration.

This fact sheet addresses the importance of managing stormwater runoff with *Best Management Practices (BMP's).* BMP's are actions you can take to reduce your impact on the environment.

Two areas are covered:

**Reducing Pollutants in Runoff.** Pollutants can include bare soil, pesticides, fertilizers, petroleum, lawn clippings, and pet and animal waste.

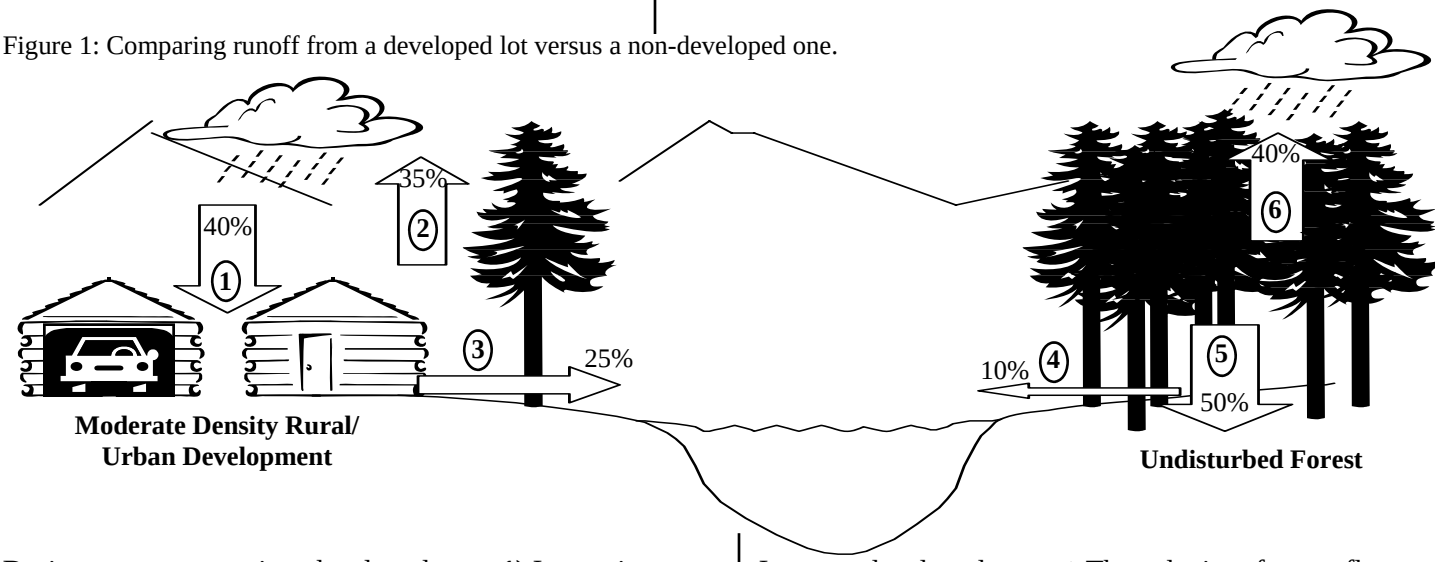
**Preventing and Minimizing Runoff.** This section describes BMP's you can adopt on your property to help protect and preserve water quality.

# Reducing Pollutants in Runoff

Stormwater is unavoidable, but its effects can be reduced by keeping harmful chemicals and materials out of the runoff. Urbanization around the Lake and within its watershed can have an adverse affect on the quality of stormwater runoff, which may have a serious impact on the lake and potentially your drinking water supply. Runoff usually consists of surface runoff from roads, driveways, and yards. These are known as *nonpoint* sources of pollution. Stormwater and snowmelt runoff collects and transports the following pollutants to surface and/or ground water:

- *Nutrients* such as phosphorus and nitrogen from fertilizers
- *Bacteria and viruses* from human and animal wastes
- *Organic chemicals* such as pesticides and petroleum products
- *Heavy metals* such as lead, copper, zinc and cadmium that are usually associated with sediments

Figure 1: Comparing runoff from a developed lot versus a non-developed one.




During a storm event in a developed area: **1)** Impervious areas decrease the amount of water allowed to soak into the ground; **2)** decreases the amount of water returned to the atmosphere through evapotranspiration; **3)** increases the amount of water running off the property, carrying pollutants.

In a non-developed area: **4)** The velocity of water flowing over the surface is kept in check by vegetation and the organic duff of the forest floor; **5)** allowing more water to soak into the ground; 6**)** more water is readily available to evapotranspirate back into the air.

- *Sediment*, which can be a composite of fine particulate matter such as silt and clay with chemically bound phosphorus, forest duff organic material, stones, sand, gravel, seed, glass, plastics, metals, and other fine residues. Sediment can smother fish eggs and degrade water quality.

**Phosphorus** often receives a good deal of attention when considering lake water quality because phosphorus affects the amount of algae growth seen in lakes.

### Pollution Prevention

Source control BMPs are nonstructural practices designed to **prevent pollutants** from entering stormwater. First, by eliminating the source of pollution and second by preventing pollutants from entering any runoff.

The first and most important source control practice is *good stewardship*. Your role as a good steward is essential in protecting and maintaining the quality of Lake Cascade. One of the easiest and most efficient ways to keep the Lake safe, clean, and inviting for fishing and recreational opportunities is to PREVENT *erosion* and *pollution* from happening. It is much easier to prevent a problem than it is to solve one. As the old saying goes: "an ounce of prevention is worth a pound of cure".

Following are some potential pollution sources that can be found on your property, and the management practices for protecting Lake Cascade:

### Hazardous Household Products

This BMP promotes efficient and safe housekeeping practices such as storage, use, and cleanup, especially when handling potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool/hot tub chemicals. The following are some common sense BMPs:

- Always use caution when handling any hazardous products. These products may contain toxic chemicals that can cause severe injury or death. When possible use **alternative products** that are less toxic.
- Change buying habits to purchase fewer products that might become hazardous household waste, and buy in quantities that can be used up.
- Store household hazardous products securely and away from children, pets, water, and sources of heat, sparks, and flames
- Store products above flood levels in basements and storage sheds.
- Store products in their original containers and keep them well labeled. Do not store chemicals in food containers.
- Read and follow use instructions, and product labels.
- Do not apply pesticides, fertilizers, and other chemicals if rain is expected within twenty-four hours.
- Use up all of the product before disposing, or give extra to friends.
- **Do not** dispose of household hazardous waste:
  - In trash
  - In storm drains or streams
  - In sink or toilet
  - On the ground
- **Do dispose** of household hazardous wastes through the Valley County Transfer site located at 240 Spink Lane (Take Spink Lane east off of Farm to Market Road, 5,5 miles north of Roseberry or 3 miles south of Lake Fork):
  - Motor oil is accepted with no charge and is recycled.
  - Car batteries will be accepted for a fee of $5 charge.
  - Latex paint is accepted if it is stabilized with sand or kitty litter and is solid. Oil based or lead paint and paint thinner is not accepted.
  - Hazardous wastes are accepted several weeks each year at a free collection site. Call the Transfer Station for dates (634-7712).
  - Refer to the Handbook of Valley County Stormwater Best Management Practices for disposal techniques (BMPs 22-26).

### Vehicle Use and Engine Maintenance

Vehicle use is a potential source of pollutants to Lake Cascade via stormwater runoff. Cars and boats contribute pollutants such as heavy metals, oil and grease and other hydrocarbons through exhaust, leaks, spills, corrosion, and wear and tear of parts. These pollutants are either deposited onto roadways and carried into receiving waters by runoff or directly into the lake from boats and watercraft.

- Purchase only those items you need in amounts you can use.
- Recycle and reuse engine maintenance products when appropriate.

- Clean up oil stains and avoid outdoor spills of antifreeze, brake fluid, and other engine fluids.
- Used oil, antifreeze, and cleaners can be taken to the Transfer Station (634-7712).
- Never dump used oil, antifreeze, or gasoline down a storm drain, in a ditch, or on the ground. These wastes contain toxic compounds which can end up in Lake Cascade.
- Routine maintenance of your vehicle assures efficient fuel consumption, clean exhaust, and leak prevention.
- Try to wash vehicles on the lawn or commercial car wash. Do not use cleaners that contain ammonia, chlorinated solvents, petroleum distillates, or lye. Buy and use only nontoxic, **phosphate free**, biodegradable cleaners.

**Lawn and Garden Care**

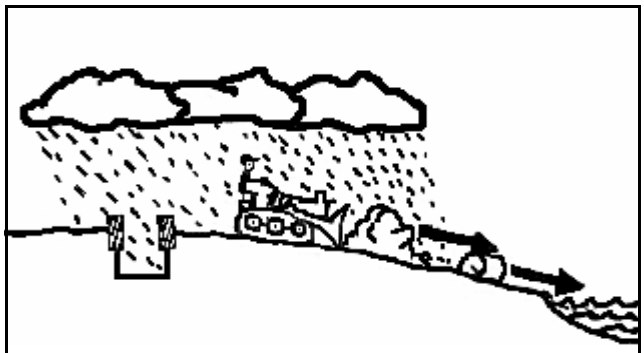
Lawn and gardens near the shore must be carefully planned and maintained to prevent possible contamination of stormwater runoff. Grass clippings, excess fertilizer and other yard wastes will wash away during storm events. Fertilizers for example may add nitrogen and phosphorus to the lake promoting algae and aquatic weed growth.

- Maximize the effectiveness of lawn fertilizers and thus minimize the quantity applied. Consider alternatives to chemical fertilizers such as organic mulch.
- Fertilizer and pesticide application within 15 feet of the Lake, streams and ditches, is **not encouraged**.
- Native vegetation should be considered as a quality alternative to cultured lawns and landscapes. Landscapes will revert to a native state if no maintenance is performed; planting native vegetation will hasten the process.
- Keep yard wastes out of nearby streams and the Lake to protect water quality.
- Burning yard waste is not an environmentally friendly alternative. Hydrocarbons and nutrients that are released contribute to water pollution as well as air pollution.
- Sweep clippings back onto the grass and compost leaves and garden wastes away from water on your property to recycle nutrients.
- Keep areas of bare soil to a minimum.

**Animal Wastes**

Animal droppings can be troublesome in two ways. First, pet and stock wastes contain nutrients that can promote the growth of algae in streams and the lake. Second, these wastes are a source of gastrointestinal diseases. The risk of stormwater contamination increases if pet wastes are allowed to accumulate in animal pen areas or left on roads or driveways where runoff can carry them to drainage ditches and into the lake.

- Reduce the chance for manure associated with dogs, cats, cattle, horses, or ducks to be washed into the nearest water body.
- If animal manure is stacked, it should be applied to land. For best results manure should be broken up with a harrow to increase the filtering capacity of vegetation and the uptake of nutrients by plants. Land application of dog or cat waste is not recommended.



**Building Construction Impacts: sedimentation and wastes enter surface waters.**

**Erosion Prevention**

If you are adding on or building a new house, landscaping, or putting in a new driveway or road you need to consider the effects of construction and other activities that remove vegetation when clearing an area and exposing bare soil. Bare soil can be easily washed into nearby water bodies.

Excessive soil suspended within runoff that washes into nearby streams buries coarse-sized channel rock that is useful for fish spawning. This suspended sediment also carries excess phosphorus into the Lake, which encourages algae growth.

- To prevent unforeseen impacts, cover bare earth with a layer of straw mulch, fabric, or bark. This covering will keep the soil in place. A good rule of thumb for hay or straw is one 50 pound bale per 500 square feet. Also, be sure to replant any bare areas immediately after new construction activities.
- If you have rainspouts and gutters, check the flow to ensure that the rainwater is spread out evenly at the point of surface discharge. Direct the discharge to a grassy area, garden, or forest floor depression, where it can soak into the ground.

**Erosion Prevention Continued**

- Stabilize exposed soil immediately after land disturbance for private road and driveway construction. Once vegetation is removed and soil exposed, the rate of erosion is greatly increased. Refer to the section below, Preventing and Minimizing Runoff, for some simple cost-effective measures that can be used to minimize erosion impact.

**Protecting the Riparian Zone of Streams and the Lake**

The riparian zone is the moist soil area next to water bodies able to maintain plants. The width of the zone varies, from a few feet for small creeks to hundreds of feet wide along lowland areas of streams or rivers. Because the riparian zone is home to many plants and animals, it is the most important area of a lake or stream environment. The thick vegetation works to reduce erosion and filter out pollutants. Overhanging branches provide shade and a source of insects and seeds. As more of the riparian zone disappears, more wildlife is affected and the stream channel becomes unstable. An unstable stream channel causes further erosion and loss of stream habitat and structure. A riparian zone at the shoreline can serve as a filter strip for pollutants in stormwater runoff.

The following are practices for protecting the riparian zone.

- For new home and lot construction, retain a high percentage of native shrubs and trees along the shoreline. As a guideline for Lake Cascade, remove no more than 20% of the native vegetation for a walkway, beach access, and home safety.
- For existing residential and business development minimize disturbance in riparian vegetation along the lake front and streams. Replace non-natives with native plants. A desired minimum vegetative buffer between lawn applications, bare soil, and the lake would be a minimum of 20 feet wide.

# Preventing and Minimizing Runoff

Planning ahead is the first and most important step in preventing or minimizing erosion due to runoff. An easy way to do this is to pretend that you are a raindrop. In looking at the landscape or any impervious surfaces, which route would you travel? Obviously, you would want to take the easiest path downhill. Keeping that in mind, note any areas that runoff would choose to travel. Walk your property during and following heavy rain storm to inspect drainage patterns and areas of erosion.

**Site Planning**

Site planning is an essential tool in preventing pollutants from being transported off-site. A general step-by-step process is recommended for those developing or redeveloping near water bodies, on steep slopes or gradients, and/or on highly erodible soils. Please check with the Valley County Planning and Zoning Department for more detailed information regarding these steps or modifications. The purpose of site planning is to reduce site runoff and erosion through planning considerations based on the conditions of your site. For more information please refer to the *Lake*A*Syst Landscape and New Construction* fact sheet.

**Long-term BMP's**

- Limit paved, compacted dirt, and covered areas that prevent water from seeping into the ground.
- Invest in permanent stabilization practices for long-term protection of your property by planting new vegetation, installing **erosion control structures**, and diverting drainage. Maintain these areas to ensure their effectiveness. Use the *Handbook of Valley County Stormwater Best Management Practices* to help you decide which structures to install for erosion control. The handbook is available for review at the Valley County Planning and Zoning office in Cascade
- Retain trees and shrubs; trees provide a natural umbrella by shedding water and can reduce runoff by as much as 50%;
- Plan and complete an annual maintenance schedule to make sure that your runoff and erosion control plan is working to protect your property
- Limit clearing and grading on slopes. Minimize cutting and filling for roads, sidewalks, and footpaths to reduce erosion and still provide access.
- Avoid damaging adjacent property with temporary erosion control methods, because water does not stop flowing at your property line.

**Drainageways**

- Use existing natural drainage systems such as a gulch or any low areas instead of digging new ditches.
- Design culverts and drainage structures to handle excessive amounts of runoff. Assistance is available from the Valley County Road Department (382-7195) or consult a professional engineer.
- Protect drainageways from sedimentation so they are able to carry storm water as intended.

**Roads, Driveways, and Walkways**

BMPs for control and management of stormwater runoff from existing public and private roads and driveways are essential for the prevention of water quality degradation of the Lake.

- Minimize semi-impervious and impervious surfaces.
- Incorporate a good gravel base into your private roads and driveways instead of only compacted dirt.
- Do not compact or pave wasted space such as corners near buildings that are not large enough for parking or driving.
- Maintain a good drainage and erosion control system for private roads and driveways: keep culverts unplugged, keep drainage ditches deep and vegetated, keep cut banks (above slope) and fill banks (below slope) from eroding by establishing vegetation.
- Locate walkways away from steeper slopes that have greater erosion potential; if you must cross a hillside, follow the contour of the slope.
- Use steps when a walkway must go directly up and down a slope, particularly near the waterfront.
- Minimize road crossings over water ways and cross at a right angle to the stream if possible.
- Sweep paved parking areas and walkways instead of washing them down with a hose, to prevent sediment, salt, and petroleum products from washing off in runoff; cover stockpiles of salt and sand with a tarp or store them in a building.
- Use vegetated roadside areas away from the lake to divert runoff and to store snow instead of impervious and semi-impervious surfaces close to the lake.
- Install water bars and open top box culverts on sloping roadways to slow and divert runoff into vegetated drainageways.
- Use paving stones instead of solid concrete for walkways; this allows water to seep around the stones instead of running off.
- Avoid creating paths straight down a slope because this causes erosion; compacted soil on footpaths also promotes excessive runoff.

**Landscaping and Construction**

- When landscaping, stage construction so that one area is stabilized before another area is disturbed.
- Avoid construction in areas with:
  - little vegetative cover; preserve existing cover
  - erodable soils (sands, or soils that appear fluffy when dry)
  - mainly bedrock with a thin covering of soil
  - steep slopes of greater than 10% (see figure 1 to picture a 10% slope)

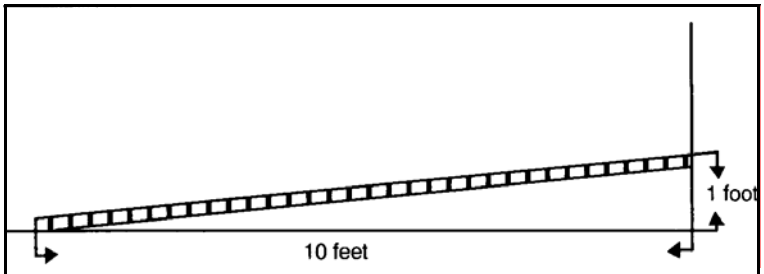
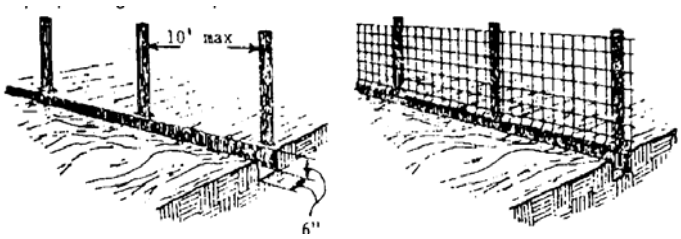



**Figure 1***: A 10% slope is represented by leaning a board against the wall with the top at 1 foot and the base set 10 feet away from the wall.*

- Control erosion during construction by using temporary methods such as: **diversions** to carry water away from the construction site to where it can be safely dispersed, or **silt fences or straw bales** to trap sediments before they enter the water; a combination of methods may be the best solution (see Figures 2 and 3 on page 7).
- Use only clean fill (free from debris and dirt) such as rock, sand, or gravel near lakes and streams.
- Use only solid concrete forms such as interlocking blocks or slabs; do not use treated timbers or railroad ties.
- Make sure utility trenches are drained of water, backfilled, seeded, and mulched.
- Inspect construction projects immediately after initial installation of erosion control measures, during construction, following any severe rainstorm, before reseeding, and when nearing the completion of construction work; temporary erosion controls should be removed; ensure that stabilization is complete and drainageways are in proper working order.

*1. Set posts and excavate a 6x6 trench upslope along the line of posts.*

*2. Staple wire fencing to the posts.*




*3. Attach the filter fabric to the wire fence and extend it into the trench.*

*4. Backfill and compact the excavated soil.*

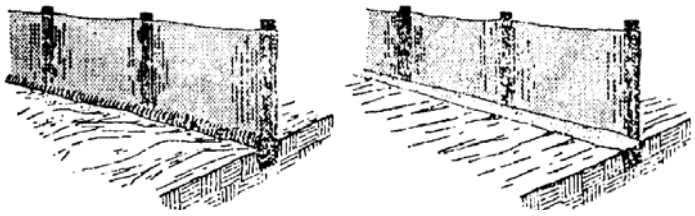
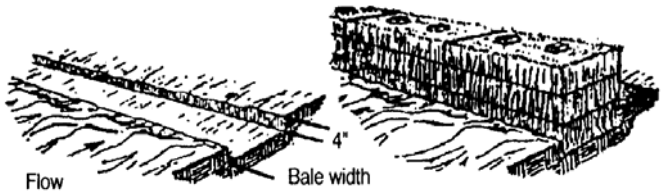


**Figure 2***: Constructing a silt fence to slow runoff and prevent erosion.*

*1. Excavate the trench.*

*2. Place and stake straw*




*3. Wedge loose straw between bales*

*4. Backfill and compact the excavated soil.*

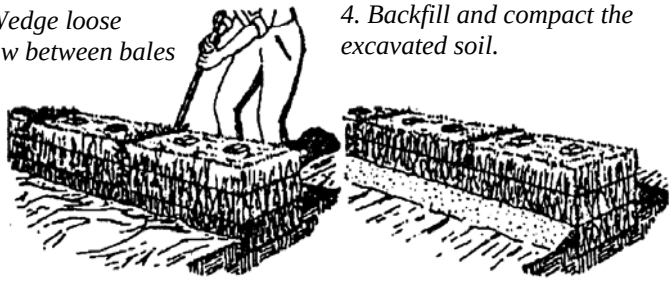


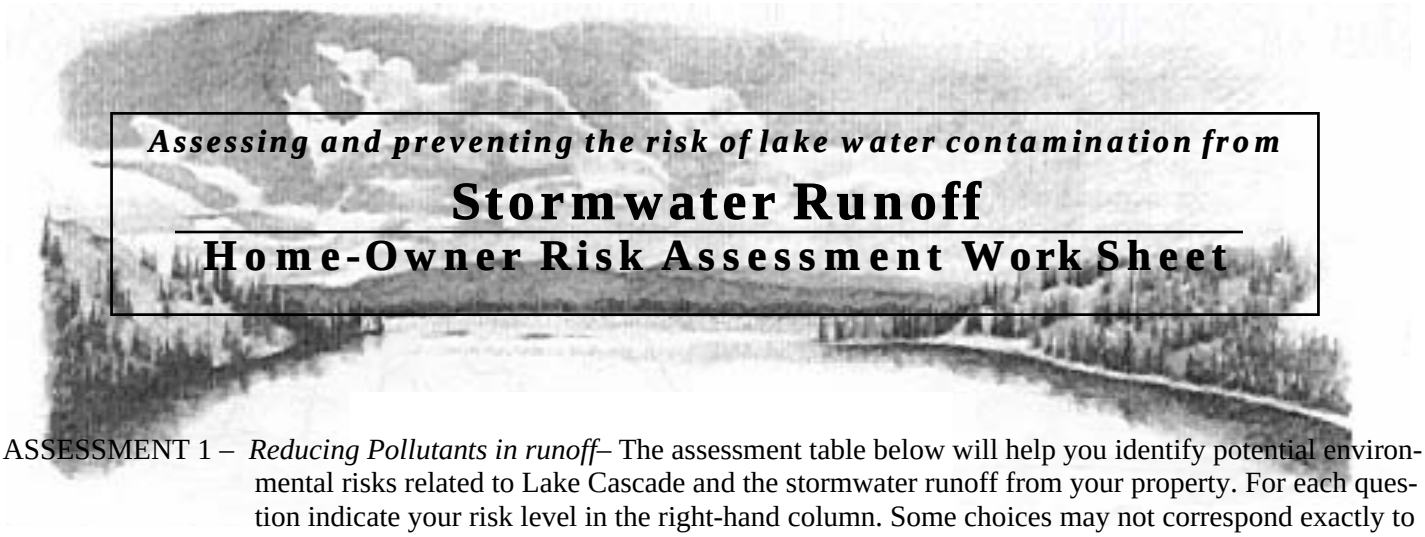
**Figure 3***: Constructing a straw bale barrier to slow runoff and prevent erosion.*

**Buildings and Runoff**

- Install rain gutters along the edge of rooftops to help carry water off of the roof and away from the building to areas where soil will not be eroded; make sure there is erosion protection where the gutters outlet onto the soil.
- Keep gutters free from debris and draining properly.
- Pave patios with flagstones or decay-resistant wood blocks instead of solid material to permit some water to seep around the stones or blocks.
- If you are building a new house or garage, and design considerations are flexible, position rooftops so they are perpendicular to the slope, instead of parallel, to slow down runoff as shown below.

*Rooofline perpendicular to slope slows down runoff*

*Roofline parallel to slope increases potential for runoff damage*



***Assessing and preventing the risk of lake water contamination from***

# Stormwater Runoff

## Home-Owner Risk Assessment Work Sheet

ASSESSMENT 1 – *Reducing Pollutants in runoff*– The assessment table below will help you identify potential environmental risks related to Lake Cascade and the stormwater runoff from your property. 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 page 11 and record your medium and high-risk practices. Your goal is to lower your risks. Use the BMP recommendations on pages 1-7 to help you decide how to best reduce pollutants in runoff.

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Automotive Wastes:** | Oil drips and fluid spills are cleaned up. Dirty car parts and other vehicle wastes are kept out of runoff. | Drips and spills are not cleaned up. Car parts and other vehicle wastes are left on unpaved areas outside. | Used oil, antifreeze, and other wastes are dumped in ditch or onto the ground. | ❒ Low<br>❒ Medium<br>❒ High |
| **Vehicle Washing:** | Vehicles washed on a lawn or gravel drive. Runoff diverted to vegetated areas. Phosphate free soap is used. | | Vehicles are washed on an impervious surface and runoff runs directly into lake or stream. Soap type unknown. | ❒ Low<br>❒ Medium<br>❒ High |
| **Storage of pesticides and other chemicals:** | Chemicals are stored in waterproof containers in a garage, shed, or basement that is protected from storm water. | Chemicals are stored in waterproof containers but within reach of storm water. | Chemicals are stored in non-waterproof containers outdoors or within reach of storm water. | ❒ Low<br>❒ Medium<br>❒ High |
| **Handling and use of pesticides, fertilizers, and other chemicals:** | Any spills are cleaned up immediately. Alternatives to chemicals used when possible. Chemicals are applied according to the label. | Chemical applications used. Spills are not cleaned up. | Spills are not cleaned up. Products are used in higher amounts than what the label recommends. | ❒ Low<br>❒ Medium<br>❒ High |
| **Pet and animal wastes:** | Buried away from gardens, wells, or ditches, wrapped and placed in the garbage for disposal. | Animal wastes are left to decompose on grass or soil. Wastes are scattered over a wide area. | Animal wastes are left on paved surfaces, concentrated in pen or yard areas, or dumped in a ditch. | ❒ Low<br>❒ Medium<br>❒ High |

ASSESSMENT 1 CONTINUED– *Reducing pollutants in runoff.*

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Grass clippings, leaves, and other yard waste:** | Grass clippings, leaves and other yard wastes are swept off paved surfaces and onto lawns away from water flow routes. Leaves and other wastes are composted. | | Leaves and other yard wastes are raked into piles near the lake and burned on-site. | ❒ Low<br>❒ Medium<br>❒ High |

ASSESSMENT 2 – *Landscaping and Site Management to Control Runoff-* for each question in the assessment table below indicate your risk level in the right-hand column. Select the answer that best matches your situation. Afterward record your medium and high-risk practices in the **Action Checklist** on page 11. Use the BMP recommendations on

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Bare soil, gardens, & construction projects** | Areas of bare soil are seeded and topped with a layer of mulch or straw. Sediment retention barriers (straw bales, soil fence) are used especially on steeper slopes until grass is established. | Soil is left bare during a construction project, but natural features slow and treat most runoff. | Soil is left bare and no natural features or sediment retention barriers are used. | ❒ Low<br>❒ Medium<br>❒ High |
| **Proximity to surface water:** | >500 feet to surface water. | 300-500 feet to surface water. | 10-300 feet to surface water. | ❒ Low<br>❒ Medium<br>❒ High |
| **Impervious areas (rooftops, paved, and concrete surfaces):** | Paved surfaces are minimized; pavers used instead. Runoff from impervious areas diverted into vegetated buffer to prevent drainage directly to the lake or stream. | Some small areas are paved for patios. | A lot of surfaces on property are impervious to water. These areas also drain water directly into the lake or a stream. | ❒ Low<br>❒ Medium<br>❒ High |
| **Ratio of total lot that is impervious:** | 0-19% | 20-40% | >40% | ❒ Low<br>❒ Medium<br>❒ High |
| **Roof Drainage:** | Downspouts and drip lines direct roof drainage onto lawn, garden, or vegetated area where water soaks into the ground. | Some downspouts and drip lines discharge water onto paved surfaces or grassy areas where water runs off. | Most or all drip lines or downspouts discharge onto paved or bare soil surfaces, or downspouts run directly to a stream entering the lake. | ❒ Low<br>❒ Medium<br>❒ High |

ASSESSMENT 2 CONTINUED– *Preventing and Minimizing Runoff Impact.*

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Landscaping and buffer strips:** | Yard is landscaped to slow the flow of stormwater and provide areas where water soaks into the ground. Buffer strips of thick vegetation are left along streams or lakeshores. | No areas are landscaped to encourage water to soak in, but yard is relatively flat and little runoff occurs. Mowed grass or spotty vegetation exists adjacent to a stream or lake. | There is no landscaping to slow the flow of stormwater, especially on steep slopes, erodible properties. Stream banks or lakeshores are eroding. | ❒ Low<br>❒ Medium<br>❒ High |
| **Sediment basin, sediment trap, or buffer strips will be used:** | In problem areas (problem areas are defined as areas adjacent to waterways, areas of highly erodible soils and/or steep slopes, and wellheads) stormwater detention ponds, buffer strips or other devices installed to slow water flow. | | No landscape changes made to slow the flow of stormwater, especially on steep erodible slopes. | ❒ Low<br>❒ Medium<br>❒ High |

To help prevent erosion, leave existing vegetation or establish a buffer strip of thick vegetation along streambanks and the lakeshore.

# ACTION CHECKLIST

Stormwater Management

| 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: June 1 |
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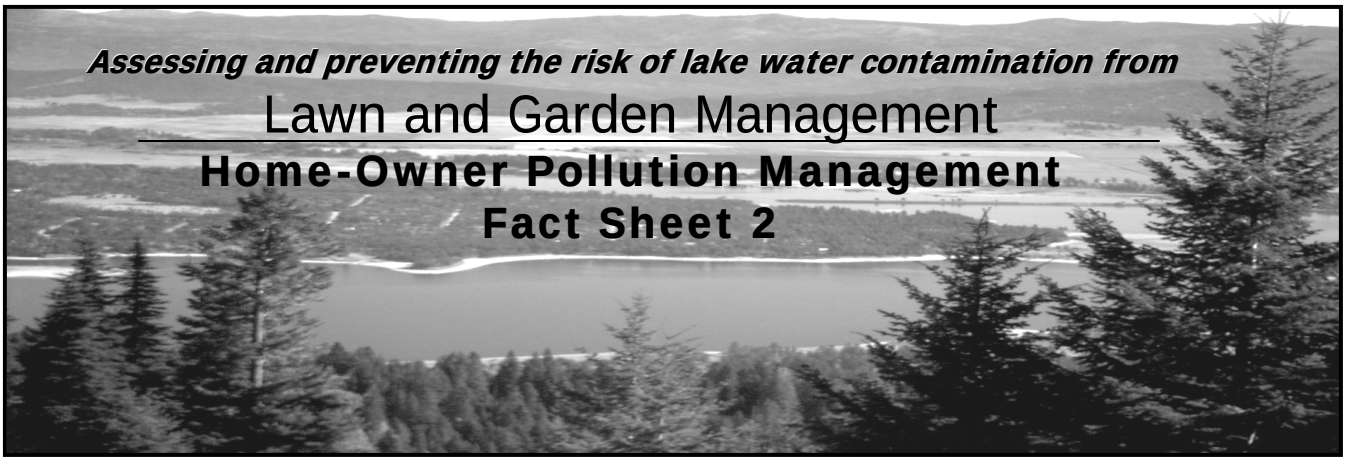
## You Can Make a Difference

An essential part of stormwater management is keeping water from leaving your property, or at least slowing its flow as much as possible. Many home sites slope towards Lake Cascade and its tributaries. You can make a difference by land-scaping your property with native shrubs and grasses to encourage water to soak into the ground.




## Why are Lawns and Gardens a Potential Problem?

Homeowners commonly over-apply fertilizer, adding much more nitrogen and phosphorus to a lawn than it will use. Over-watering can cause excess nutrients or pesticides to be either washed into the lake, or leach into the lake through shallow ground water.

Lawns and gardens near Lake Cascade or any of its tributaries must be carefully planned and maintained to prevent possible contamination of surface waters. Native vegetation should be considered as a quality alternative to cultured lawns and landscapes. Landscapes will revert to a native state if no maintenance is performed; planting native vegetation will hasten the process.

### Water Quality Concerns

- **Fertilizers–** Supply excess nutrients, especially nitrates and phosphorus, increasing aquatic plant and algae growth which can lead to reduced dissolved oxygen in bottom lake waters.
- **Pesticides–** Kill beneficial plants and insects resulting in lowered fish productivity and contaminated spawning beds. Cause chronic health problems in humans.
- **Irrigation–** Too much pushes fertilizers and pesticides into ground water, and/or, along with sediment, runoff into surface water.

# Improving Lawn and Garden Management

Before beginning any practice, stop and think about potential risks to water quality. Homeowners must be aware of potential problems caused by soil erosion, as well as pollution due to chemical amendments and organic yard waste.

Special attention should be paid if the following conditions exist:

- There are areas of exposed soil—flowerbeds, vegetable gardens, or poorly established vegetation.
- Soils with a coarse texture, such as sands or sandy loams which are common along Lake Cascade.
- The property slopes toward surface water.
- There are impervious surfaces, such as sidewalks and driveways.
- Lawn or landscape maintenance is being done close to the surface water.
- Fertilizers, pesticides, or soil amendments are being applied.
- Avoid or minimize the use of chemical fertilizers and pesticides.

**Why should homeowners be concerned about pesticide use on their lawns and gardens?**

Pesticide over use or misapplication may cause the following:

- Harm or kill beneficial insects and earthworms associated with your lawn or garden;
- Harm to humans, wildlife, and pets that come into contact with your lawn or garden;
- Result in chemical runoff, during rainfall or irrigation; damaging the aquatic ecosystem fish rely on;
- Leach through the soil directly into ground water which is used for drinking water;
- Accumulate in the soil and become toxic to the plants you are growing; and
- Create pest resistance to the applied chemicals so that they will be very difficult to control in the future.

**Why should homeowners be concerned about fertilizer use on lawns and gardens?**

- Nitrates and phosphorus, the two main ingredients in most fertilizers, can contaminate surface water;
- Nitrates from fertilizers can contaminate drinking water supplies by leaching into ground water fed wells, which at 10 parts per million is especially hazardous to pregnant women, and fatal to infants under 6 months of age, and can also be fatal to young ruminant animals.
- Cause diseases, such as necrotic ring spot in lawns.
- Make some weeds more competitive with the plants you are trying to grow.
- Causes excess aquatic weed growth.

# BMPs for Protecting Surface Waters

The most efficient BMP for protecting surface water from lawn and garden activities is to add or enhance a **vegetative filter strip** (see figure 1) between the lake and your lawncare maintenance practices. This alone will help preserve water quality by filtering rain and irrigation runoff, and by absorbing nutrients from shallow ground water. Other BMPs include:

- Rake dead leaves and brush away from the water; compost vegetation in a sturdy structure away from the shoreline.
- Never dump leaves and vegetative debris into the lake or a stream because this releases nutrients and organic acids into the water and uses up valuable oxygen needed by fish.
- Avoid burning on the beach or near shore because the remaining ash is highly alkaline and may change the pH of the lake and promote growth of undesirable plants.
- When treating diseases or insect pests, use chemicals responsibly and use only the required amount. **Note: Use of pesticides, insecticides or fertilizers within 15 feet of the high water line of Lake Cascade is not encouraged.**

## Preventing Soil Erosion

Surface waters can be contaminated by soil particles that are washed or blown into the water. In addition to the problem of sediment, soil particles can carry phosphorus, which is a harmful pollutant, into the water.

To avoid this problem (see figure 1):

- maintain a vigorously growing filter zone of grass, trees, and shrubs next to surface waters;
- minimize areas of exposed soil by maintaining native vegetation or dense turf;
- construct an earth berm near the shore to minimize the possibility of runoff; the berm, which is a small mound of earth, should run parallel to the shore to prevent runoff into surface water.

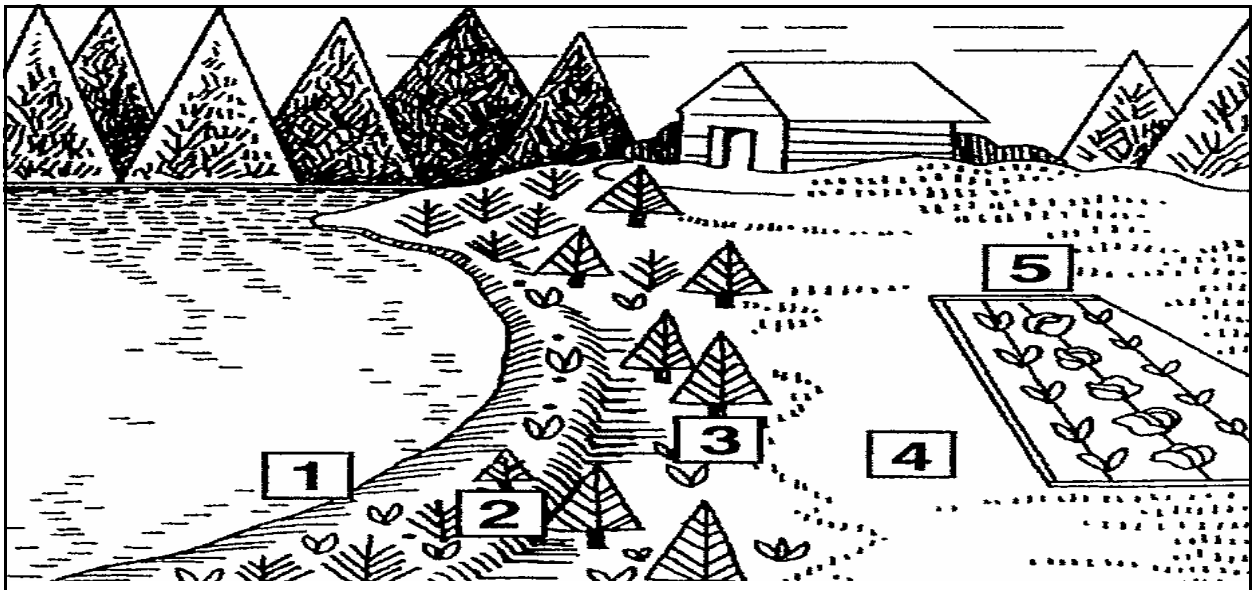



**Figure 1***: A well designed landscape plan includes ① natural vegetation along the water's edge; ② an intact ridge or added berm; ③ a natural vegetation filter strip; ④ well-established grass or ground cover; ⑤ a level flower or vegetable garden set back from the water front.*

# Best Management Practices for Lawns

A healthy good-looking lawn actually improves your living environment. On a hot day, your lawn reduces the glare of the sun, keeps surrounding areas cooler, and will attract birds and other wildlife. On windy and rainy days, your lawn protects the soil on your property from erosion. But lawns and gardens near surface waters must be carefully planned and maintained to prevent possible contamination of surface waters. Native vegetation should be considered as a quality alternative to cultured lawns and landscapes. Landscapes will revert to a native state if no maintenance is preformed; planting native vegetation will hasten the process.

**Pest Management for Lawns**

If possible, avoid the use of chemical pesticides. Consult a professional applicator or an Extension Agent from the University of Idaho Extension Service (382-7190) when making a decision. The following practices will minimize the potential contamination from pesticides:

- Properly identify whether the pest is an insect, disease, or other problem;
- Determine if there is an economic or aesthetic justification for initiating control of the pest;
- Consider control options other than the use of a chemical pesticide; **biological controls and pest-resistant plant varieties are becoming more available;**
- Use the least toxic and most readily degradable pesticide that will be effective;
- **Read the pesticide label carefully and pay special attention to safety precautions and warnings about use near water**;
- Do not apply pesticides when it is windy to avoid the possibility of drift;
- When purchasing pesticides, buy only what is needed to control the problem during the current season. For empty pesticide containers, **triple rinse** the containers and use the rinse water as part of your yard management;
- Waste pesticides and containers should be disposed of properly. Never pour excess pesticides on the ground, into surface waters, or into sanitary treatment systems; contact Valley County Extension office for the next Idaho State Department of Agriculture pesticide container recycling event.

**Fertilizer Management**

Native vegetation does not require the application of additional fertilizer. Use caution if applying fertilizers to lawns and adhere to the following guidelines:

- **Have your soil tested to determine how much fertilizer is needed to minimize the use of chemical fertilizers; soil test sample bags are available through the Valley County University of Idaho Extension Service (382-7190) .**

- Use alternative forms of fertilizer. **Grass clippings provide (a years worth) 2 pounds annual nitrogen; Compost provides 1 pound annual nitrogen; and Corn Gluten (20 pounds per 1000 square feet) provides 2 pounds annual nitrogen**. This is preferable to chemical fertilizer. However, natural amendments have the potential to damage water quality if used in excessive amounts.
- If chemical fertilizers are used, select slow-release (water insoluble) forms; see section on Soil Fertility Management for timing.
- Water your lawn after fertilizing, but do not allow excess water to run off into surface waters.
- Sweep up any fertilizer spilled on hard surfaces and reapply to the grass, never wash it off.
- Use extra caution when applying fertilizer near surface waters; do not spread fertilizer within **15 feet of surface waters** or wetlands; use a "drop" spreader and not a "cyclone" spreader to minimize the possibility of getting fertilizer directly into the water.
- Never apply fertilizers to frozen ground or snow.
- Leave a natural filter strip of grass, trees, and/or shrubs next to the shoreline; another option would be to construct a berm along the shore.

**Irrigation Management**

Use water wisely on lawns. Over-watering may cause pesticides, fertilizers, and sediment to either runoff to surface waters, or leach and contaminate the ground water you use for drinking water.

- Established lawns only need 1" to 2" of water per week.
- Water deeply in the early morning and evening to avoid evaporation.
- Avoid over-watering. Avoid this at all times, but especially after applying fertilizers and pesticides.

- Leave grass clippings on the lawn this will:

  √ shade the soil surface, reducing moisture loss;

  √ provide nitrogen, potassium and phosphorus, reducing the need for fertilizer;

  √ help decompose thatch;

  √ save time and energy by not bagging clippings.

**Establishing New Turf**

Retaining native vegetation is the recommended best management practice. But if having a lush green lawn is what you want the following practices will help you prevent pollutants from entering Lake Cascade or its tributaries.

- For maximum pollution prevention a 25 foot wide riparian vegetation buffer strip must be maintained between any management activities associated with lawn care and surface waters.
- Natural vegetation cannot be excessively removed from the riparian zone, generally a distance of 50 to 100 feet from the surface water is recommended. Removal of vegetation from slopes should be minimal. Do not remove more than 25% of vegetation.

- **If there is a bare slope and the danger of soil erosion exists add a layer of mulch to stabilize it then sod for best results.**
- Seeding is effective if runoff is not a problem and if the seedbed can be kept moist. Bluegrass seed requires three weeks to establish, and if the seedbed dries out during this time, the seedlings may die.
- When seeding, preparation of a good seedbed is necessary for success. Seed-soil contact is essential. Select seed varieties that are suitable for full sun or partial shade. An excellent mixture for around Lake Cascade is Bluegrass, Creeping Red Fescue, and Perennial Rye.

## MAINTAINING ESTABLISHED TURF

**Soil Fertility Management**

Adequate soil nitrogen is necessary for a healthy lawn. Many property owners use nitrogen fertilizer to enhance the nitrogen levels in their soil. In most cases, adding nitrogen fertilizer produces greener, thicker, faster-growing lawns and garden plants. **Nitrogen is a very mobile nutrient and attention must be paid to application rates and timing to eliminate the possibility of water contamination.**

- Do not apply more than 3 lb. of actual nitrogen per 1,000 square feet of lawn per year. If soils are sandy or grass is sparse, you will want to test your soil for best results.
- For best results split apply your fertilizer by dividing your total need by 4. Then apply once on Memorial Day, once on the Fourth of July, once on Labor day, and then again in October.
- The use of slow-release nitrogen is desirable. This may be some form of organic fertilizer or "synthetic" slow-release form.
- Never apply fertilizer to frozen ground or on snow.

- Use extreme caution when applying fertilizers near water. **Fertilizer application is not encouraged within 15 feet of Lake Cascade and its tributaries .** Never allow any fertilizer to enter surface water or wetlands.

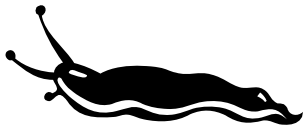
With proper management, dense turf provides a good ground cover to prevent soil erosion.

# Best Management Practices for Gardens

### Pest Management for Gardens

It is best to avoid using pesticides as both beneficial insects (ladybugs) and pests (weeds, insects, and disease) may be killed. The following pest management BMPs will help keep your garden ecosystem healthy.

- Create a garden with diversity. Plant a combination of different types of plants to create a balanced ecosystem and in general, rotate plants each year to outsmart potential pests and minimize the threat of soil borne diseases.
- Maximize conditions for healthy plant growth. Choose plants that are suited for your climate and are resistant to diseases in the area. Group plants according to water and light requirements and space them to allow ample root and top growth at maturity.
- Protect and use beneficial insects. Develop garden habitats to ensure a healthy environment for beneficial insects. Also, learn to recognize the eggs and larvae of beneficial insects so as to not harm them.
- Use the least toxic solution for your problems. Some low toxic methods to solve problems include biological controls, insect traps, or mechanical means to remove pests. Also, learn to live with a low level of plant damage.



- If you do use herbicides or pesticides, use them carefully. Identify the insect and weed pests and select the appropriate chemical. Also, buy only what you need and be sure to follow label directions.


- Use the least toxic solution for your problems. Some low toxic methods to solve problems include biological controls, insect traps, or mechanical means to remove pests. Also, learn to live with a low level of plant damage.
- If you do use herbicides or pesticides, use them carefully. Identify the insect and weed pests and select the appropriate chemical. Also, buy only what you need and be sure to follow label directions.


- Store and dispose of herbicides and pesticides properly. Store any extra in a secured area, and if you need to dispose of these chemicals, take it to your locally organized household hazardous waste collection program or go through the Idaho State Department of Agriculture Pesticide Disposal Program.

### Fertilizer Management for Gardens

Fertilizer should be added only in the amounts needed, at the appropriate time, and in a form that makes the nutrients available to plants. Nutrient management BMPs to implement in your garden includes:

- Test your soil. Test your soil for nitrogen (N), phosphorus (P), potassium (K), sulfur (S), pH, and organic matter. Soil samples should be taken to a depth of 12 inches.
- Build a healthy soil. Add organic matter, such as compost to enhance the structure, aeration, and nutrient and water holding capacity of the soil. Organic matter can also be added by growing cover crops. Also, try to supply needed nutrients using organic fertilizers, such as composted manure, cottonseed meal, bone meal, blood meal, and greensand. Most gardening shops have these types of fertilizers. If not, you can order from gardening retailers that specialize in providing organic fertilizers and pesticides.
- Apply fertilizers properly. Based on your soil test and plant needs, apply the proper rate of nutrients and apply it at the correct growth stage of the plant. Overfeeding plants can be as detrimental as underfeeding, but this risk can be reduced if organic fertilizers are used, because the nutrients are released slowly. Synthetic fertilizers are also useful, as they can provide readily needed nutrients. Be sure not to over apply.

### Irrigation water management for gardens

- Reduce the need for watering by mulching. Mulches not only slow the evaporation of water from the soil surface but also can improve a soil's water holding capacity, keep the soil cooler on hot summer days, reduce weed growth, and help prevent soil erosion. Examples of organic mulches include grass clippings, leaves, and straw. Inorganic mulches may also be used and examples are permeable sheeting and/or rock. Keep in mind that rocks can form undesirable heat sinks.

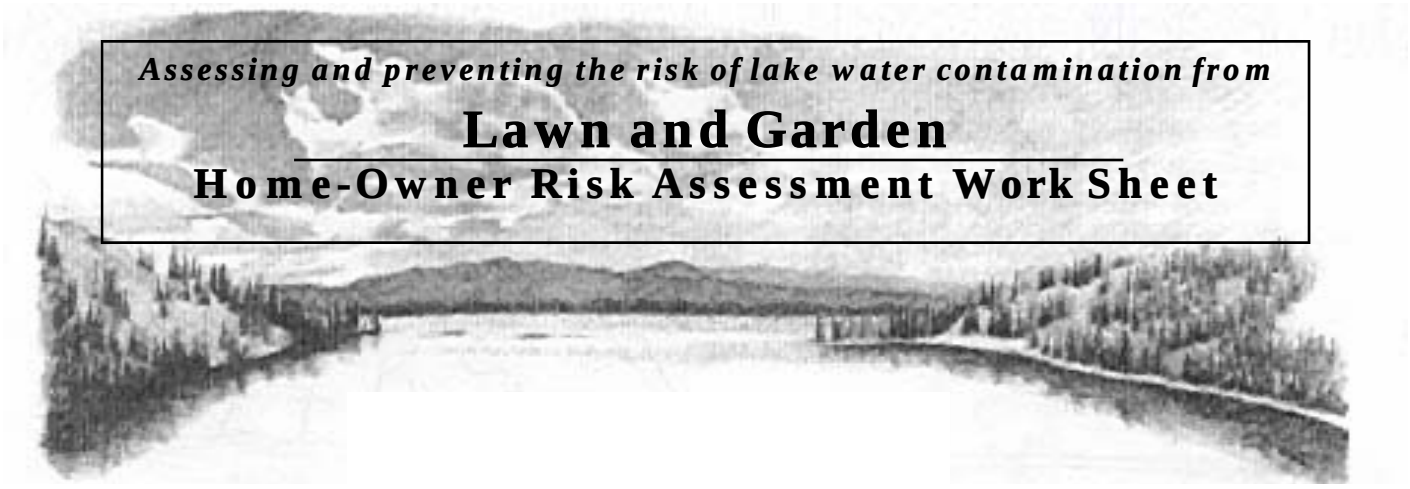
## Irrigation Water Management for Gardens

- Reduce the need for watering by improving soil structure. Each year be sure to add organic matter such as compost, grass clippings, tilled in cover crops, and other dead plant materials.
- Irrigate only when the plants need water. Check whether the soil is dry several inches below the surface. If it is dry, then water, but water slow enough so that it soaks into the root zone and does not run off the soil surface. The depth of the root zone depends on the plant, but in general this is 6 to 8 inches deep. If possible, use a drip irrigation system to conserve water.

### Location of Gardens

Flower and vegetable gardens can add to the quality of life of property owners living around Lake Cascade. Certain precautions must be taken to prevent the possibility of surface water contamination.

- Gardens should **not** be located on slopes because they can promote accelerated soil erosion and runoff. An alternative on slopes is to install a terraced garden. Dense turf or other vegetation should be established on slopes.
- To minimize the area of exposed soil, use intensive growing techniques such as intercropping, succession planting, and raised beds.



*Assessing and preventing the risk of lake water contamination from*

# Lawn and Garden

## Home-Owner Risk Assessment Work Sheet

ASSESSMENT 1 – *Lawn and Garden* – The assessment table below will help you identify potential environmental risks related to Lake Cascade and your lawn and garden maintenance practices. 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** and record your medium and high-risk practices. Your goal is to lower your risks. Use the BMP recommendations to help you decide how to best reduce pollution.

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Fertilizers:** | Soil is tested for nutrients. Fertilizer rate is used at label recommendations and applied more than 100 ft from any surface water source. | Soil is not tested. Fertilizer is used at an unknown rate, 50 to 100 feet from any surface water. | Soil is not tested. Fertilizer is applied at a higher rate than label recommendation. Fertilizer is applied 10-50 feet from the lake or its tributaries. | ❒ Low<br>❒ Medium<br>❒ High |
| **Pesticides:** | Do not use chemicals to control weeds, insects, or diseases. Encourage natural defenses (lady bugs and wasps). Use non-toxic solutions (Pull weeds). | Limited use of chemicals, spot spray mostly. | Rely on chemical control for control of pests. | ❒ Low<br>❒ Medium<br>❒ High |
| **Storage of pesticides, fertilizers, and other chemicals:** | Chemicals are stored in waterproof containers in a secure area protected from stormwater and over 100 feet away from the lake or its tributaries. | Chemicals are stored in waterproof containers but not in a secured area. | Chemicals are stored in non-waterproof containers outdoors or within reach of stormwater or in a well-house. | ❒ Low<br>❒ Medium<br>❒ High |
| **Handling and disposal of pesticides, fertilizers, and other chemicals:** | Any spills are cleaned up immediately. Disposal through a local household hazardous waste collection event or approved landfill. | | Spills are not cleaned up. Disposal of chemicals consists of burning, or dumping at an unapproved landfill or on the property. | ❒ Low<br>❒ Medium<br>❒ High |

ASSESSMENT 1 CONTINUED– *Lawn and Garden Care*. When finished turn to the **Action Checklist** and record your medium and high-risk practices. Use the BMP recommendations to help you decide how to best reduce pollution.

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Grass clippings, leaves, and other yard waste:** | Grass clippings, leaves and other yard wastes are swept off paved surfaces and onto lawns away from water flow routes. Leaves and other wastes are composted. | | Leaves and other yard wastes are raked into piles near the lake and burned on-site. | ❒ Low<br>❒ Medium<br>❒ High |
| **Bare soil, gardens, & landscaping projects:**<br><br>**Proximity to surface water:** | Areas of bare soil are seeded and topped with a layer of mulch or straw. Sediment retention barriers (straw bales, silt fence) are used especially on steeper slopes until grass is established.<br><br>>500 feet to surface water. | Soil is left bare during a construction project, but natural features slow and treat most runoff.<br><br>300-500 feet to surface water. | Soil is left bare and no natural features or sediment retention barriers are used.<br><br>10-300 feet to surface water. | ❒ Low<br>❒ Medium<br>❒ High<br><br>❒ Low<br>❒ Medium<br>❒ High |
| **Lawn type and maintenance** | Turf-grass is suited to soil type, available sunlight, and climate. Grass is pest resistant and mowed high (a mixture of blue-grass,fescue, and brome is recommended). | Turf-grass is suited to the site, and is mowed shorter than second highest setting on mower. | Grass type is not suited to available light, soil type, or climate. Grass is mowed as short as possible and growth is encouraged right up to shoreline. | ❒ Low<br>❒ Medium<br>❒ High |
| **Irrigation Management:** | Application of water based on the requirement of plants. Watering is done in the morning or evening. Plants are suitable to climate and do not need extra water. | Watering is excessive. | Heavy application of water. There is excessive water runoff. Time of watering is not adjusted according to pesticide and fertilizer applications. | ❒ Low<br>❒ Medium<br>❒ High |
| **Composting** | The compost pile is well-maintained: It is aerated regularly and contains yard waste, vegetable food scraps, and other nitrogen sources (manure). | The compost pile is poorly maintained: It is not aerated or lacks the proper mix of materials. Pet wastes are added to the pile. Is located within 50-100 feet of surface waters. | The compost pile is poorly maintained: It contains excessive high-nitrogen material and is not turned regularly. The pile is less than 50 feet from the lake or a tributary. | ❒ Low<br>❒ Medium<br>❒ High |

ASSESSMENT 2 – *Location of Application in Relation to Water Resources*. When finished turn to the **Action Checklist** and record your medium and high-risk practices. Use the BMP recommendations to help you decide how to best reduce pollution.

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Location of fertilizer application in relation to surface waters:** | Fertilizer is applied at the recommended rate more than 50 feet away from surface waters and surface runoff from post application watering does not drain into surface waters. | | Fertilizer is applied 10 to 50 feet from the lake or its tributaries and the drainage of post application watering is not considered. | ❒ Low<br>❒ Medium<br>❒ High |
| **Location of well in relation to application area:** | Application area is down gradient and over 25 ft from the well. No post application surface water reaches well area. | Application area is up gradient and over 25 feet from the well. Post application water drainage does not reach the wellhead. | Application is applied to the lawn area around the well. Post application surface water moves across wellhead area. | ❒ Low<br>❒ Medium<br>❒ High |
| **Solubility of fertilizer:** (ability to dissolve in water) | Low solubility. 2-3lbs of a non-synthetic fertilizer is split applied (4x/ year). Or, use organic fertilizer or mulch. | Moderately-high solubility. Synthetic fertilizer used. Applied at full rate each time. | High solubility. Applied at full rate 3-4x/ year. | ❒ Low<br>❒ Medium<br>❒ High |
| **Amount of fertilizer applied:** | Application rate is based on soil tests. Recommended amount is measured out when applied. | | No soil tests. Fertilizer is applied at an unknown rate. | ❒ Low<br>❒ Medium<br>❒ High |
| **Location of Pesticide application in relation to Lake Cascade and streams:** | No pesticides are applied. Or spot application is used to control noxious weeds more than 10 feet away from surface water. | Weed and feed is used on the lawn, but more than 10 feet away from surface waters. | Pesticides are used within 10 feet of the lake. | ❒ Low<br>❒ Medium<br>❒ High |
| **Relative leachability of pesticide:** **(**ability to move to the ground water) | Low | Medium | High | ❒ Low<br>❒ Medium<br>❒ High |
| **Vegetation Buffer:** | Shrubs, ground cover, and trees are planted between the lake and the lawn and garden to reduce soil erosion and uptake excess nutrients and pesticides. | A natural buffer is present along the shoreline, but the lawn is manicured as close as possible to the lake. | No natural or planted vegetation buffer is present between the lake and the lawn and garden. | ❒ Low<br>❒ Medium<br>❒ High |

# ACTION CHECKLIST

Lawn and Garden Management

| **Write all high and medium risks below.** | **What can you do to reduce the risks?** | **Set a target date for action.** |
|---|---|---|
| *Sample:* Fertilizers applied without regard to soil test. | Contact Extension Service for information on soil testing to determine application rate. | One week from today: June 1 |
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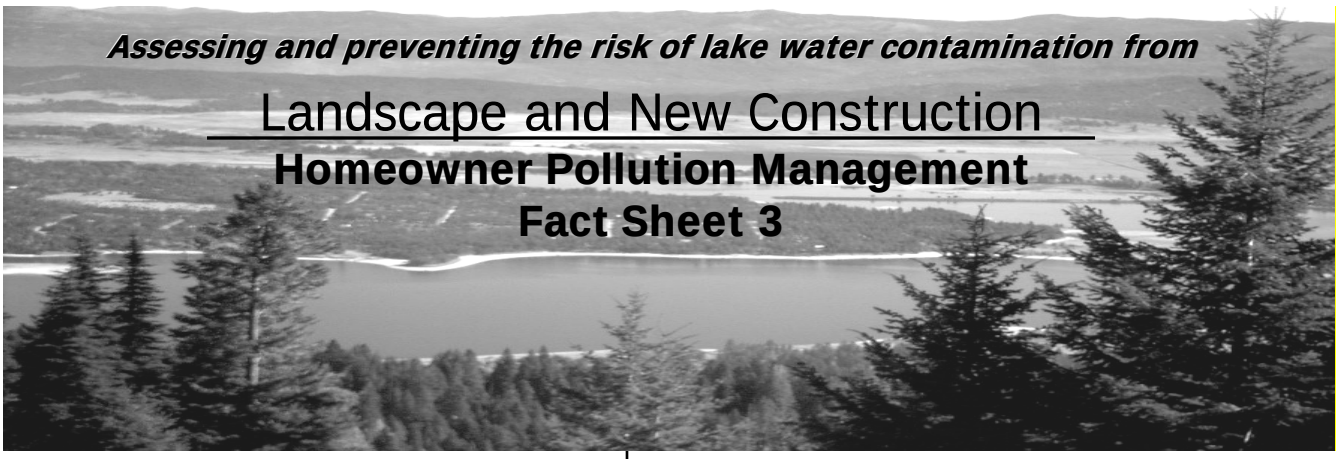
Information derived from Lake*A*Syst materials is intended only to provide general information and recommendations to property owners around Lake Cascade regarding their management practices. **All results are confidential**.



***Assessing and preventing the risk of lake water contamination from***

# Landscape and New Construction

## Homeowner Pollution Management

## Fact Sheet 3

## Best Management Practices

*Best Management Practices* (BMPs) are actions you can take to reduce your impact on the environment. This fact sheet describes BMPs you can adopt on your property to prevent water contamination, improve water quality, and enhance your lots aesthetics and value.

## Site Planning

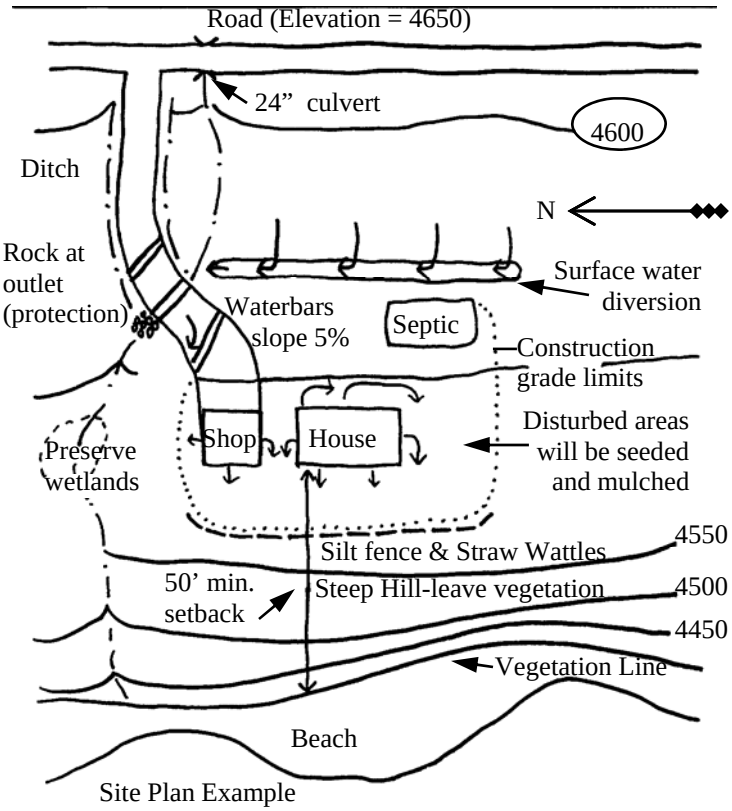
Site planning is an essential tool in preventing pollutants from being transported off-site. A general step-by-step process is recommended for those developing or redeveloping near Lake Cascade, especially on steep slopes or gradients, and highly erodible soils. The purpose of site planning is to reduce site runoff and erosion through planning considerations based on the conditions of your site.

### Developing Your Site Plan

The site plan should be based on your long-term objectives and the suitability of the land for these uses, with precautions taken to prevent soil erosion and water pollution. With these considerations in mind, your site plan will optimize the natural beauty and attributes of your property. The site plan can be a one-year, ten-year, or a twenty-five year plan, depending on your resources and time. But remember, the longer you wait, the more difficult and costly it will become to fix erosion problems.

### Importance of a Landscape Site Plan

Plants and trees help hold the soil and prevent erosion, especially on steep slopes. Any time existing vegetation is removed the bare soil that is exposed can be easily washed into Lake Cascade. Soil erosion can lead to structural damage, reduce soil fertility, and fill in road ditches. It harms Lake Cascade and basin streams by causing excess sedimentation, killing aquatic bottom life, and disrupting spawning. The sediment, with accompanying nutrients, may lead to algal blooms, and reduced aesthetic appeal. All of these potential problems are expensive to correct and more importantly, can be avoided by proper water and land-use practices.




Site Plan Example

As in the example above a site plan should include: roads, buildings, topography, shoreline, and plants.

### Layout of Your Grounds

You can manage your buildings and grounds to reduce water runoff problems in several ways. Locate driveways, walks, and yard and garden edges to follow level contours and gentle slopes. Do not lead water directly downhill. This gives it maximum speed and cutting power for erosion. Long, steep slopes have the greatest erosion potential. Consider putting small dams at intervals in ditches to slow runoff water and trap sediment. Cross-slope designs are better than up-and-down-hill ones.

## BMPs for Landscaping

- **Keep the site covered**. Any disturbances of ground cover (grass or shrubs) will expose soil. This leads to erosion and slope failure. Use hay or straw as mulch to cover disturbed areas after reseeding. A good rule of thumb is one 50-pound bale per 500 square feet. Consider working only in a small area and stabilizing that site before disturbing another.

- **Minimize disturbance to plants and trees**. Select and save trees to gain time in landscaping later. Protect trees from heavy equipment by encasing them with heavy planks tied vertically around the trunks. Large trees can be killed by heavy traffic that compacts the soil. Putting fill material too deeply over the root area can also kill trees**.**

- **Maintain a filter strip of natural vegetation along the banks of Lake Cascade and streams**. The best filter strip is mature woodland with undisturbed grass and shrub layers.

- **Establish permanent cover**. After your grounds have been graded to minimize and control runoff, the next step is to plant a permanent cover on all areas that have been disturbed. Trees and shrubs are excellent at protecting soil from rain and are practical erosion-control measures. Use native types of trees and shrubs wherever possible. They are well adapted to our climate, insects, and diseases. Native trees and shrubs also create a landscape that needs minimal maintenance and is more natural.

- **Plant trees and shrubs** to help buffer harsh winter winds and provide shade during hot summer days. Plants also serve as a living "fence" to provide privacy and excellent habitat for birds and other wildlife.




**Keep bare soils to a minimum**. *Picture 1, erosion of the soil surface from roof runoff. Picture 2, Because of the steep slope water carries sediment into the lake. Picture 3, is a perfect example of what to do by retaining existing vegetation.*

- **Use pesticides and fertilizers carefully**. Use only approved pesticides and follow label directions. Refer to the Lawn and Garden Fact sheet for more information.
- **Plan streets and roads**. Roads that follow general contours and moderate slopes offer less obstruction to natural drainage. They are also easier to stabilize and maintain. Where you have steep slopes consider putting in "water bars." These are small, raised ridges on the road surface. They help to route runoff water to road ditches, rather than allowing it to run the entire length of the slope. Properly sized culverts are also important for a well-drained roadbed. Refer to the Access Roads and Driveways fact sheet for more information.
- **Control runoff**. Rainfall and snowmelt runoff should be directed to safe drainage-ways so that water will not scour and wash away soil. Curbs of dirt, timber or other materials can be placed at the crests of steep hills or cuts to divert runoff. They collect runoff and lead it downhill to a safe outlet. Refer to the Stormwater Runoff fact sheet for more information.

  Don't forget that "hard" surfaces are impermeable to water and increase runoff. These impermeable surfaces include building roofs, roads, driveways, and patios. Minimize the amount of hard surfaces to help control excess runoff.

**To prevent runoff damage by water:**

- keep it **spread out**, moving slowly.
- **divert** it away from sensitive areas.
- direct it to **flow over erosion-resistant materials** such as dense sod, rocks, plastic sheeting, or concrete.
- **protect natural drainage ways from** filling with sediment.

# New Construction BMPs

Construction activities are one of the more common sources of non-point source pollution. If you are disturbing more than an acre of land then you may be required to obtain an EPA Construction General Permit to satisfy the requirements of the NPDES program (brochure enclosed).

The removal of site vegetation during construction exposes bare ground to precipitation. When erosion prevention measures are inadequate and sediment control is not used, large volumes of sediment can be transported off-site during storms and snowmelt. This sediment can adversely affect storm drains, streams, and lakes.

Construction site erosion prevention and sediment control are important in protecting existing and future water quality. Erosion prevention should be the first choice, using such measure as (1) timing of construction to coincide with the dry season, (2) preserving native vegetation, (3) covering stockpiles, and (4) mulching and matting. Please refer to the ***Handbook of Valley County Storm Water Best Management Practices*** for additional measures. Maintaining natural vegetation and stabilizing exposed soil surfaces helps in preventing erosion; however, this is not always possible at each construction site.

If construction cannot be postponed until the dry season, sediment control is the preferred alternative for trapping sediment on-site. The following measures are practical and cost-effective: (1) temporary berms, (2) straw bale barriers, and (3) silt fence.

Additional site planning may be necessary to protect water quality in circumstances where the construction site is near a sensitive water resource, such as a creek, stream, or Lake Cascade; along a steep slope (greater than 30 percent); within an area of porous soil; or a shallow water table. A certified professional can provide direction in developing an erosion and sediment control plan prior to development, if site conditions warrant more attention. An erosion and sediment control plan outlines each construction activity beforehand, accounting for possible impacts to sensitive ecological areas.

**Timing of Construction**

Construction work and erosion prevention applications should be scheduled so they occur under optimal conditions. Optimal conditions consist of dry, low runoff periods during the year when erosion is lowest, usually summer.

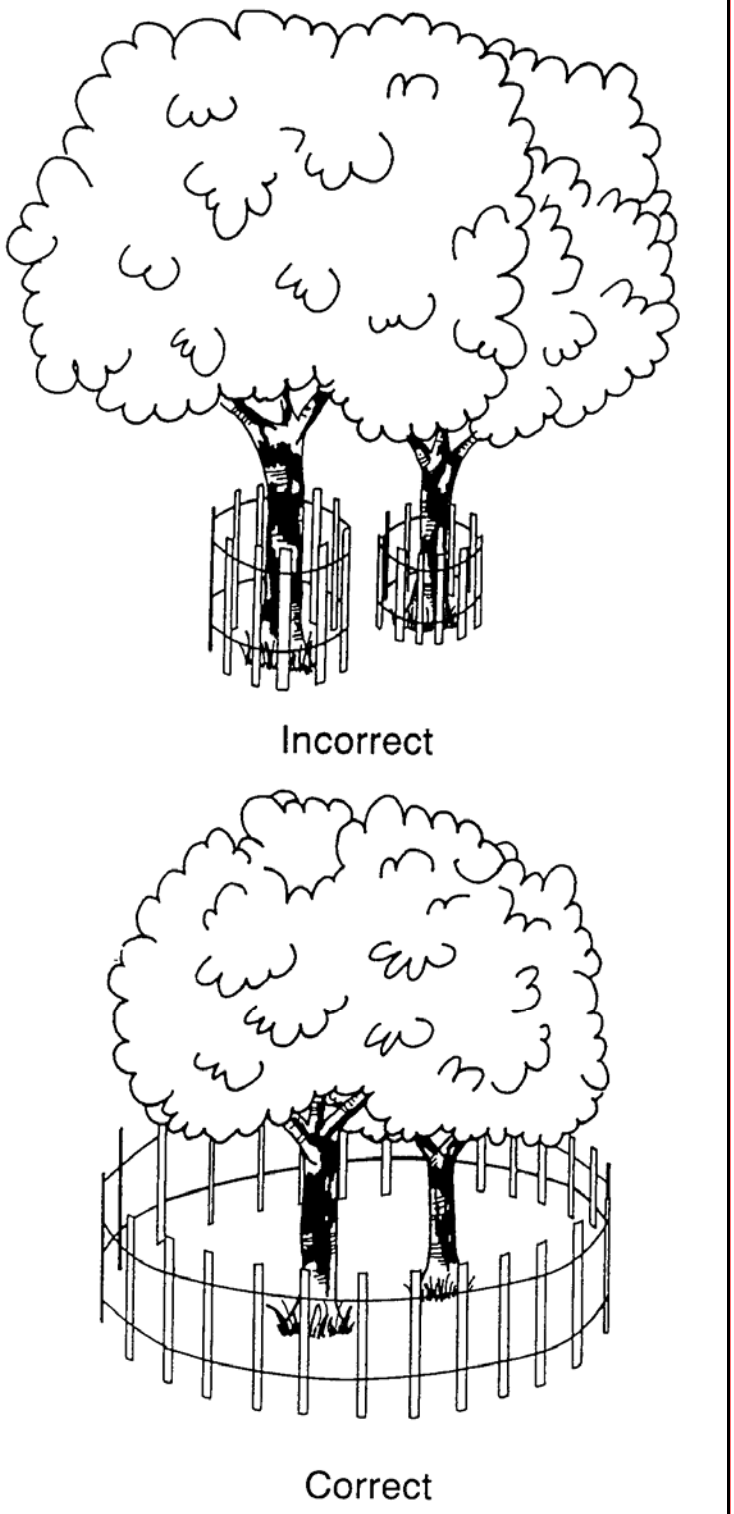
**Preserving Native Vegetation**

Minimizing disturbance or restricting construction to a specified area on the site or a right-of-way can protect existing vegetation (including trees, grasses, and other plants). By preserving natural vegetation, a natural buffer zone or a stabilized area helps prevent erosion. A desired vegetative buffer strip would be a minimum of 20 feet back into the property within which are planted indigenous grasses and plants that do not require fertilizers and artificial watering. This measure also minimizes the amount of bare soil exposed to erosive forces. Areas where preserving vegetation can be particularly beneficial are floodplains, wetlands, streambanks, steep slopes, and other areas where other structural sediment controls would be difficult to establish, install, or maintain. Preserving natural vegetation has many advantages:

- It does not require time to re-establish vegetation.
- It can handle higher quantities of storm runoff than newly seeded areas.
- It usually requires less maintenance, watering, and chemical application, than newly planted or seeded areas.
- It has greater filtering capacity because the vegetation and root structure are usually denser in preserved natural vegetation than in newly seeded or bare areas.

Successful preservation of vegetation requires good planning and site management to minimize the impact of construction activities. The areas to be preserved should be identified early during the planning stage and be clearly marked in the field before any work on-site begins. Other useful practices are as follows:

- Clearly mark any trees to be preserved, and protect roots against ground disturbance within the dripline of each marked tree (see figure at the right). The dripline marks the edge of the tree's foliage where moisture from rainfall would drop. Most of the tree's roots lie within the dripline and are vulnerable to damage.
- Consider the use of design alternatives in order to preserve natural vegetation in certain areas where it typically would be removed and where its preservation would not pose safety problems.
- Perform maintenance activities as needed to ensure that the vegetation remains healthy and aids in erosion prevention and sediment collection. Inspect the preserved vegetated areas at regular intervals to make sure they remain undisturbed and are not overwhelmed by sediment.




Barriers should be installed at the drip line of tree branches.

**Covering Soil Piles**

Short-term soil piles should be completely covered with a tarp of some kind. If the soil cannot be replaced during the same growing season in which it was stockpiled, soil piles or stockpiled soil should be seeded. The purpose of re-vegetating stockpiled soil is to reduce the potential of soil loss from erosion. Seeding will require greater maintenance during the drier summer months of July, August, and September. It may be necessary to break up the soil surface if it becomes crusted or smooth after stockpiling.

Reseed with a native grass mix. Include a nitrogen fixing species such as white clover Cover the seed with one-half to three-quarter inch of soil to improve germination. This can be done with tillage equipment, if slopes are not too steep, or by hand raking. It may be necessary to re-seed after one growing season.

**Mulching**

Mulching temporarily stabilizes soil and acts to control erosion through use of such materials as straw, grass, grass hay, compost, wood chips, or wood fibers. Mulching allows vegetation to re-establish, reduces soil crusting, reduces evaporation, and decreases fluctuations in soil temperature. Other materials can be used for mulching including erosion control fabrics or mats, wood residue, and hydromulch, or a combination of these materials. Mulches can be spread by hand or with machines. Mulching is done after seeding, unless otherwise noted. Mulch should be applied to disturbed areas within riparian zones (approximately 100 feet on each side of a perennial stream or within 100 feet of the lake) and buffer strips. mulch are described below.

Cut-and-fill slopes associated with private roads can also be mulched, reducing the chance for erosion and aiding in re-establishing vegetation. These areas should be evaluated on a case-by-case basis to determine the need for mulching. Several types of mulch are described below.

- Straw or hay mulch

  Straw or hay mulch is usually economical and is satisfactory under a variety of conditions. The disadvantages are that straw may absorb soil moisture in very dry conditions, resulting in poorer seed establishment; there is increased fire potential; the mulch may attract wildlife as a food source; and the mulch may include unwanted vegetation or weed seeds. Use enough mulch to cover all exposed soil, or 1.5 tons per acre. The mulch should be worked into the soil to avoid being blown away. Use only certified noxious weed free straw.

- Wood residue—wood chips, sawdust, and shavings

  This type of mulch can usually be purchased through local sources, and it is easy to apply and contains no weed seeds. It is more fire resistant than straw or hay, and chips are resistant to wind movement. The disadvantages include the following: heavy applications may prevent moisture from reaching soil; wood product mulch may be acidic; it may have nitrogen deficiency; it may float on or be dislodged by running water; and shavings and sawdust may be taken up by the wind. With a chip size of 0.5 inch or less, an application of 1.5 to 2 tons per acre is recommended.

- Erosion control fabric or mats

  Erosion control fabrics, such as jute, excelsior paper, plastic, or nets, are especially useful on steep slopes or areas with high winds where nets can be anchored in place. They can, however, be expensive, costing as much as 4 or 5 times more than tacked straw. Also, the labor cost of anchoring is high. Nets are less effective on rocky areas and very rough surfaces. Erosion beneath mats may be a problem if they are not properly installed. Costs may limit use to critical areas, such as stream banks, channels where runoff concentrates, and generally hot, dry sites.

**Temporary Berms**

A temporary berm is a ridge of compacted soil or sandbags that intercepts and diverts runoff from small construction areas. Temporary berms often are constructed along the top edge of fill slopes but also may be constructed across a roadway at a slight angle to the centerline. Berms are used to prevent runoff onto newly constructed slopes until permanent measures are in place. They intercept flow from the construction area and direct it to temporary slope drains or to outlets where it can be safely discharged. Since temporary berms do not provide filtration, they can only be used for minor flows.

- Soil berm

  An earth dike or soil berm should be high enough to prevent overflow and divert water to a grassy swale. Berms are normally constructed from embankment materials. Design a berm of soil with an approximate height of 1 foot with a minimum top width of approximately 2 to 2 ½ feet and side slopes of 2:1 (horizontal: vertical) or flatter.

  All soil berms should be properly located to effectively divert intercepted runoff. Runoff intercepted from disturbed areas should be diverted to

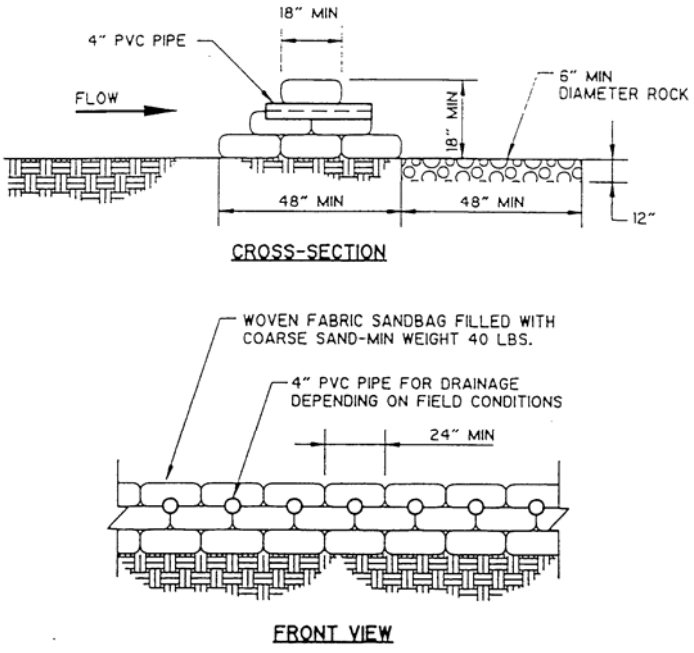
a sediment-trapping BMP such as a vegetative buffer strip, a sediment trap, a temporary or permanent grassy swale, straw bale barriers, or a silt fence. The entire width of the berm must be compacted.

- Sandbag berm

  The following dimensions are suitable for sandbag berms: height and top width are both slightly more than 1 ½ feet minimum, and bottom width between 4 ¼ to 5 feet. Each sandbag has a general length of 2 to 2 ½ feet, a width of approximately ½ foot, depth or thickness of approximately 1-1½ feet, and a weight of 90 –130 lbs.

  The sandbags should be installed to prevent flow under or between bags. When the sandbags are stacked in an interlocking fashion, it provides additional strength for resisting the force of the flowing water. However, sandbags should not be stacked more than three deep without broadening the foundation (using additional sandbags) or providing additional stability.

The sandbags should be reshaped or replaced as needed during inspection. Inspections should be made daily during wet weather. When silt reaches a depth of ½ foot behind the berm, it should be removed and disposed of at an approved site in a way that does not contribute to additional siltation. The sandbag berm should be left in place until all upstream areas are stabilized and accumulated silt has been removed. The sandbags should then be removed by hand.



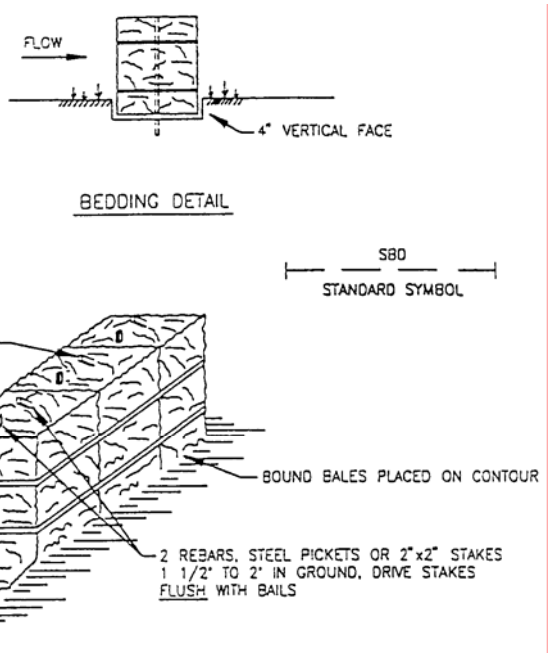

Proper sand bag berm design.

# Sediment Collection BMPs

## Straw Bale Barriers

Straw bale barriers are primarily used to intercept sediment-laden runoff from small drainage areas of disturbed soil. The purpose of a straw bale dike is to reduce runoff velocity and effect deposition of the transported sediment load. The straw bale barrier is used where there is no concentration of water in a channel or other drainage way above the barrier.

When **installed and maintained properly**, straw bale barriers remove most of the sediment transported in construction site runoff. This optimum efficiency can be achieved through careful maintenance, with special attention given to replacing rotted or broken bales. Straw bale barriers can be constructed from readily available materials and put in place to control runoff without causing major site disturbances. Installation, however, can be demanding work. Straw bale barriers should be used for no more than two to three months because they tend to rot and fall apart over time. Use only certified noxious weed free straw.



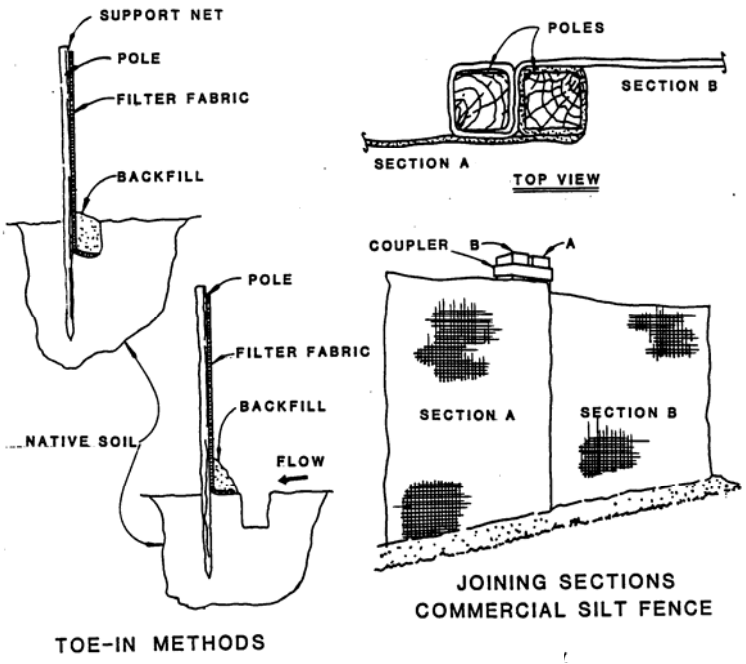

Construction Specifications:

- Bales should be placed at the toe of a slope or on the contour and in a row with ends tightly abutting the adjacent bales.
- Each bale should be embedded in the soil a minimum of 4 inches and placed so the bindings are horizontal.
- Bales shall be securely anchored in place by either two stakes or re-bars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale at an angle to force the bales together. Stakes should be driven flush with the bale.
- Inspection shall be frequent and repair replacement should be made promptly as needed.
- Bales should be removed when they have served their use-fulness so as not to block or impede storm flow or drainage.

## Silt Fence

A silt fence is a filter fabric that is entrenched or attached to supporting poles. The purpose of the silt fence is to detain sediment-laden water on-site and prevent soil loss. A common application of silt fence is along the perimeter of the lot or around a temporary soil pile area. Silt fences are also practical along streams or creek channels. However, they should not be installed within the channel itself or anywhere there is a concentrated flow. Silt fences have a design life of six months. Silt fences work best when reinforced with wire backing. Silt fences often do not withstand heavy snowloads and another BMP should be used if needed over the winter. Installation guidelines include:

- Allow an area behind the fence for the ponding and settling of runoff and sediment, respectively;
- Placing the silt fence along a level contour, to prevent the ponding of water that is greater than 1 ½ inches deep at any point. Ensure that the bottom of the silt fence is buried to the appropriate level.
- Weekly or periodic inspection of the silt fence to repair tears and remove sediment that reaches one-third the height of the fence.





## Stormwater Filters

Stormwater filters are designed to filter pollutants out from runoff. The primary removal mechanisms employed by these facilities are straining and settling, which allow capture of coarse to fine sediments and the pollutants adhered to them. Vegetated filters such as bioswales also offer limited nutrient uptake in plants as well as sorption in underlying soils. The term biofiltration has been coined to describe the more or less simultaneous process of filtration, infiltration, adsorption, and biological uptake of pollutants in stormwater that takes place when runoff flows over and through vegetated treatment facilities.

In vegetated systems, the degree to which the above mechanisms operate will vary considerably depending upon many factors, such as the depth and condition of the vegetation, the velocity of the water, the slope of the ground, and the texture of the underlying soil. However, the most important design criterion is the residence time of the stormwater in the biofilter, provided there is an adequate stand of vegetation and the underlying soil is of moderate texture. Therefore, to be effective, the biofilter must be designed so that the residence time is sufficient to permit most, if not all, of the particulates and at least some of the dissolved pollutants to be removed from the stormwater.

Stormwater filters can be used for a variety of land uses. However, they may not be suitable where the runoff contains high sediment loads over long periods, unless the facility is inspected and maintained frequently.

The following stormwater filter BMPs should be used when diverting runoff from a construction site. A detailed discription for the design and construction of these BMPs can be found in the ***Handbook of Valley County Storm Water Best Management Practices.***

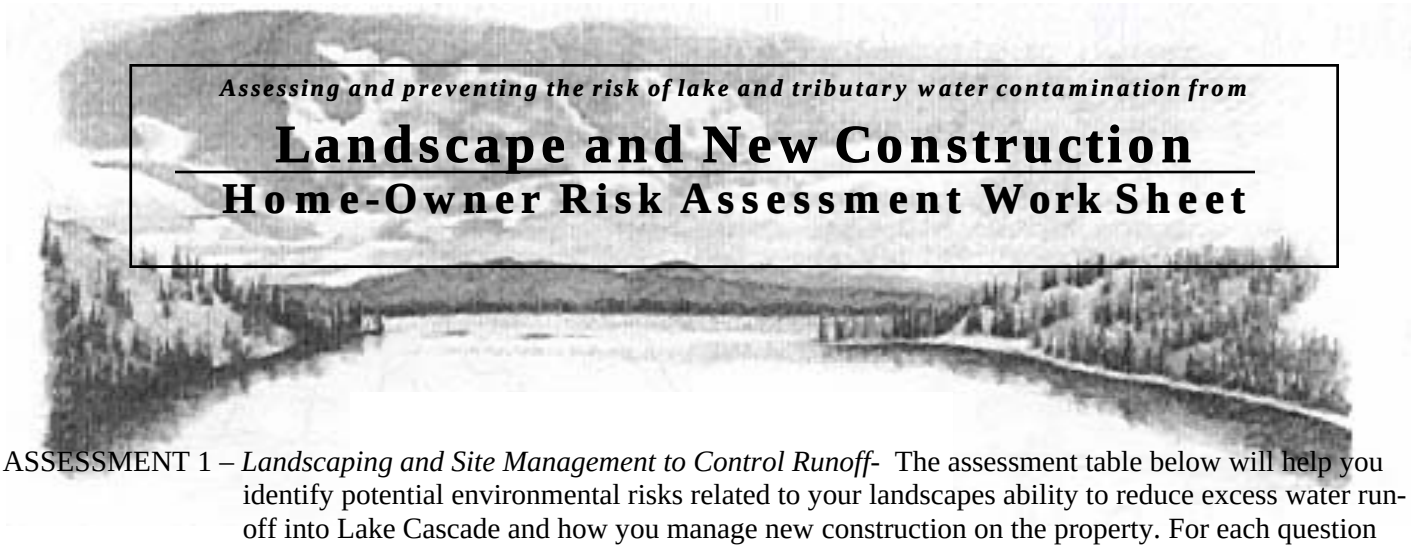
**Vegetated Swale**– Or grassed waterway is designed to provide treatment of conventional pollutants but not nutrients.

**Vegetated Filter strip**– is designed to provide runoff treatment of conventional pollutants but not nutrients. Very effective at pretreating runoff prior to a filtration BMP.

**Sand Filter**– filter stormwater runoff through a sand layer into an underdrain system which conveys the treated runoff to a detention facility.

**Compost Stormwater Filter**– mechanical filter to remove fine sediments, metals, and degrade organic compounds such as oil and grease. Needs to be used with other BMPs such as a sediment trap.

**Catchbasin Inserts**– are generally used under a storm drain grate providing water quality treatment through filtration, settling, or adsorption.



*Assessing and preventing the risk of lake and tributary water contamination from*

# Landscape and New Construction

## Home-Owner Risk Assessment Work Sheet

ASSESSMENT 1 – *Landscaping and Site Management to Control Runoff-* The assessment table below will help you identify potential environmental risks related to your landscapes ability to reduce excess water run-off into Lake Cascade and how you manage new construction on the property. 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 page 11and record your medium and high-risk practices. Your goal is to lower your risks. Use the BMP recommendations on pages 1-7 to help you decide how to best reduce pollution.

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Site Plan**: | A site plan has been developed for preventing erosion and pollutants from being transported off-site. | | No site plan has been developed for making clean water a priority. | ❒ Low<br>❒ Medium<br>❒ High |
| **Topography, slope of site from potential pollution source toward the lake or a stream:** | 0-2% slope | 3-4% slope | 5% and above | ❒ Low<br>❒ Medium<br>❒ High |
| **Retention of existing native vegetation:** | Plants and trees that help hold soil in place and prevent erosion are protected and preserved whenever landscaping or doing new construction. | Not all trees and plants are retained during construction projects. Areas that are under construction are revegetated when finished. | Preserving vegetation is not taken into consideration when constructing or landscaping. | ❒ Low<br>❒ Medium<br>❒ High |
| **Landscaping and buffer strips:** | Yard is landscaped to slow the flow of stormwater and provide areas where water soaks into the ground. Buffer strips of thick vegetation are left along streams or lakeshores. | No areas are landscaped to encourage water to soak in, but yard is relatively flat and little runoff occurs. Mowed grass or spotty vegetation exists adjacent to a stream or lake. | There is no landscaping to slow the flow of stormwater, especially on steep slopes, erodible properties. Stream banks or lakeshores are eroding. | ❒ Low<br>❒ Medium<br>❒ High |

ASSESSMENT 1 CONTINUED– *Landscaping and Site Management to Control Runoff.*

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Roads, driveways, and openings:** | All BMPs required to prevent erosion and protect water quality are identified during the design and construction of roads, trails or driveways, which is done in consultation with an engineer. BMPs are frequently inspected and maintained. | | Roads, trails and openings are bare and eroding. No effort is taken to reduce road or skid construction in a riparian area. | ❒ Low<br>❒ Medium<br>❒ High |
| **Control Runoff:** | Rainfall and snowmelt runoff is directed into areas appropriate for collecting runoff, so that water will not scour and wash away soil. | | No landscape changes made to slow the flow of stormwater, especially on steep erodible slopes. | ❒ Low<br>❒ Medium<br>❒ High |

ASSESSMENT 2 – *Other Landscaping Considerations.* When finished turn to the **Action Checklist** on page 11 and record your medium and high-risk practices. Use the BMP recommendations on pages 1-7 to help you decide how to best reduce pollution.

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Landscaping maintenance to protect property from forest fire:** | Leaf clutter, dead trees and branches, firewood, and unused old timber is taken to an approved landfill and/ or stored away from the house and other out buildings. | | Leaf clutter, dead and down trees, and old unused lumber are not stored away from buildings. | ❒ Low<br>❒ Medium<br>❒ High |

ASSESSMENT 3 – *Construction site erosion prevention*– is important in protecting existing and future water quality. Construction sites close to water bodies have a greater potential for affecting water quality. Maintaining natural vegetation and stabilizing exposed soil surfaces helps prevent erosion. When finished turn to the **Action Checklist** on page 11 and record your medium and high-risk practices. Use the BMP recommendations on pages 1-7 to help you decide how to best reduce pollution.

| | LOW RISK | MEDIUM RISK | HIGH RISK | YOUR RISK |
|---|---|---|---|---|
| **Timing of Construction:** | Construction work and erosion prevention applications are scheduled for optimal conditions; dry, low runoff periods when erosion is lowest. | Construction work is performed during the wet season, but erosion prevention BMPs are used to help reduce runoff. | Construction work is performed during the wet season and no erosion prevention BMPs are used. | ❒ Low<br>❒ Medium<br>❒ High |
| **Sediment Control:** | On construction sites close to water bodies sediment control devices like temporary berms, straw bale barriers, or silt fencing are used. And on steeper slopes (greater than 30%) additional measures are taken with professional assistance. | Construction site is protected by natural vegetation, but no man-made sediment control devices are used. | No sediment control BMPs are used during construction to keep water laden with sediment from running directly into Lake Cascade. | ❒ Low<br>❒ Medium<br>❒ High |
| **Bare soil during construction projects:** | Areas of bare soil are seeded and topped with a layer of mulch or straw. Sediment control devices (straw bales, silt fence, or berms) are used especially on steeper slopes until grass is established. | Soil is left bare during a construction project, but natural features slow and treat most runoff. | Soil is left bare and no natural features or sediment control devices are used. | ❒ Low<br>❒ Medium<br>❒ High |
| **Proximity to surface water:** | >500 feet to surface water. | 300-500 feet to surface water. | 10-300 feet to surface water. | ❒ Low<br>❒ Medium<br>❒ High |

# ACTION CHECKLIST

Landscape and New Construction

| **Write all high and medium risks below.** | **What can you do to reduce the risks?** | **Set a target date for action.** |
|---|---|---|
| *Sample:* Runoff from construction activities runs directly into a stream or the lake. | Divert water into a heavily vegetated area and place a silt fence between vegetated area and the nearest waterbody. | One week from today: June 1 |
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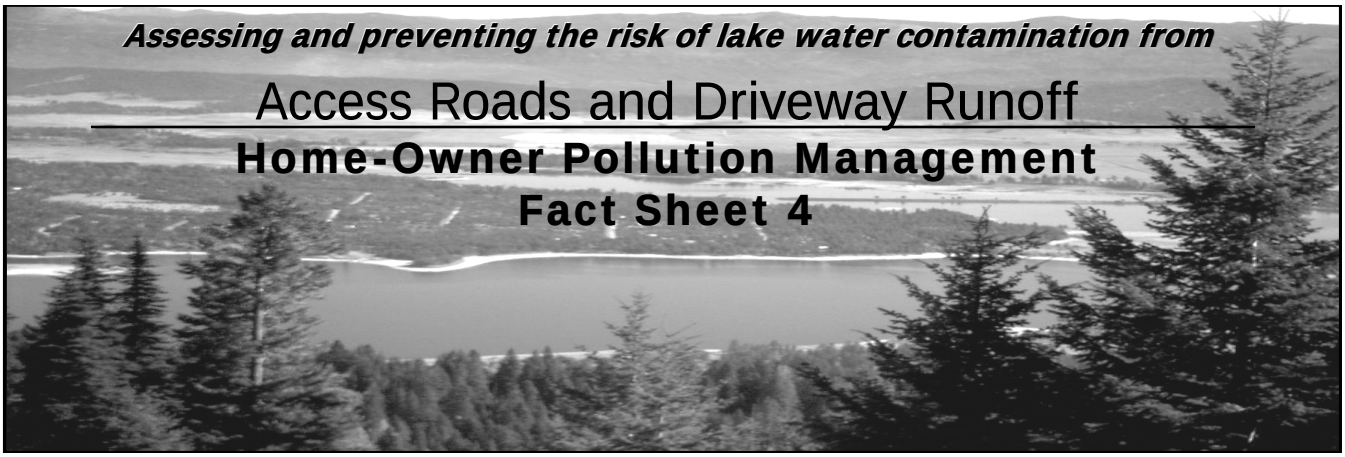
Information derived from Lake*A*Syst materials is intended only to provide general information and recommendations to property owners around Lake Cascade regarding their management practices. **All results are confidential.**




## Public and Private Residential Roads

Roads may be considered pollutant sources to Lake Cascade and its tributaries due to the amount of sediment flowing into these waterbodies during storm and snow melt runoff events.

The public roads around Lake Cascade are either maintained by the United States Forest Service, the Idaho State Department of Lands, or by the Valley County Road Department. Homeowners are responsible for maintaining their private driveways.

***How does a rut form and where does all that dirt go?***

Most roads and driveways are constructed of compacted native soils. These dirt roads, if not properly managed, can get rutted after just a single storm. If a road is constructed properly, water from a storm event does not get a chance to pick up speed and create a rut. Water runoff is slowed down by control measures and diverted into vegetated drainage areas where the dirt is captured and the water is filtered back into the ground.

On the other hand, if a road does not have any runoff control practices in place, water runs freely downhill unchecked where it picks up speed and scours away the soil creating those car eating ruts. The runoff carrying suspended sediment (dirt) then flows into either the lake or one of it's tributaries. The addition of fine sediment into water bodies increases the loading of phosphorus, which is the limiting factor of algae production (algae blooms and algae on the rocks), and can cover fish spawning beds in streams. Ruts can also form by driving on dirt roads during spring thaw or during times when the roadbed becomes soft and muddy.

The information and intent of this Fact Sheet is to **only provide general guidelines** on proper road construction as it relates to water runoff and erosion control management on private roads and driveways. The expertise of a road design engineer or contractor and an experienced heavy equipment operator are essential in designing roads. In too many cases we have seen private roads constructed by a property owner who has insufficient knowledge and experience in these areas, and consequently either no BMPs are installed, or BMPs that are installed fail in the objective of proper water runoff management. The guidelines in this Fact Sheet should help you ensure that road building on your property is done in a proper manner to minimize the impact on Lake Cascade, streams, and wildlife. We also offer several maintenance guidelines which the property owner can undertake for long-term functioning of BMPs.

Excellent references on BMPs are include *Forestry for Idaho: BMPs – Forest Stewardship Guidelines for Water Quality,* and *The Valley County Handbook of Storm Water Best Management Practices.* This information is available for you to review at the Idaho Department. of Lands office or the Planning and Zoning office at the Valley County courthouse building

# Road Construction BMPs

Many private roads and driveways have significant gullies which form each winter and spring. These gullies can serve as conduits to transport water carrying sediment directly into streams and Lake Cascade. Normally, plants and trees help hold the soil in place and prevent erosion, especially on steep slopes, but when existing vegetation is removed for road construction the bare soil that is exposed can be easily washed into Lake Cascade. Soil erosion can lead to structural damage, reduce soil fertility, and fill in road ditches. It harms Lake Cascade by causing excess sedimentation, killing aquatic bottom life, and disrupting spawning. The sediment, with accompanying nutrients, may lead to algae blooms and reduced aesthetic appeal. All of these potential problems are expensive to correct and more importantly, can be avoided by properly controlling erosion during the construction process. The following BMPs are used to control erosion during the construction process and for preventing erosion problems in the future.

**Construction BMPs:**

- Place temporary roads as far as possible away from streams, surface waters or wetlands.
- Construct roads in a manner that prevents debris, overburden, and excess materials from entering streams. Deposit excess materials outside of stream protection zones.
- Construct roads to Idaho Forest Practices Act (IFPA) standards. See 'Rules Pertaining to the Idaho Forest Pactices Act Title 38, Chapter 13 Idaho Code'. (www.idl.idaho.gov)
- Manage drainage at staging areas to prevent sediment from entering streams.
- Clear drainage ways of all debris, generated during construction or maintenance, that may interfere with drainage or impact water quality.
- When constructing road fills near streams, compact the material to settle it, reduce erosion, and reduce water entry into fill. Minimize snow, ice, frozen soil, and woody debris buried in embankments. Limited slash and debris may be windrowed along the toe of the fill to provide a filter near stream crossings.
- Construct road stream crossings or roads constricting upon a stream channel in compliance with the Stream Channel Alteration Law, Title 42, Chapter 38, Idaho Code.
- Gravel native surface roads

**Stabilize Road Slopes:**

- Where exposed material (excavation, embankment, waste piles, etc.) is erodible and may enter streams, *stabilize* it before fall or spring runoff by seeding, compacting, riprapping, benching, mulching, or other suitable means.
- Retain *outslope drainage* during or following operations and remove outside edge berms except those protecting road fills.
- Construct *cross drains and relief culverts* to prevent erosion. Minimize construction and installation time. Use rip rap, vegetation matter, down spouts, or similar devices to prevent erosion of fills. Install drainage structures on uncompleted roads **before** fall or spring runoff.
- Install a wooden *open-top box culvert* across the road grade to convey surface runoff and roadside ditch flows to the downslope side. This practice is an excellent substitute for pipe culverts on lightly used unpaved roads on steep grades of 6% or more. Make sure to clean out culverts regularly.
- Install *waterbars* for use as a temporary or permanent drainage practice on light-use, low-maintenance, unpaved roads. Waterbars should be placed above grade changes to prevent water from flowing down steeper portions of roads or skid trails.
- Construct the road with shallow, outward-sloping dips or undulations to collect surface runoff and convey it away from the road surface.
- Care should be taken to maintain trees and shrubs growing at the base of fill slopes.
- Mixing stumps and other vegetative debris into the road fill should always be avoided.
- **Design roads to balance cuts and fills or use full bench construction where stable fill construction is not possible.**

Most forest roads are built by excavating a road surface. Road design and layout on-the-ground show machine operators the proper cut slopes and indicate cut slope steepness. The bulldozer starts at the top of the cut slope, excavating and sidecasting material until the desired road grade and width is obtained. Material from cuts is often pushed or "drifted" in front of the blade to areas where fill is needed. 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 to develop strength.

**Stream Crossings**:

Any roads that include stream crossings that will affect the area below the mean high water line will require a 404 permit from the US Army Corps of Engineers and a Stream Alteration Permit form the Idaho Department of Water Resources.

For information on 404 permits contact:
The Army Corps of Engineers
Boise Regulatory Office
304 North 8th Street, Rm 140
Boise ID 83702
Phone: (208) 345-2154

For information on Stream Alteration Permits:
www.idwr.gov

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.

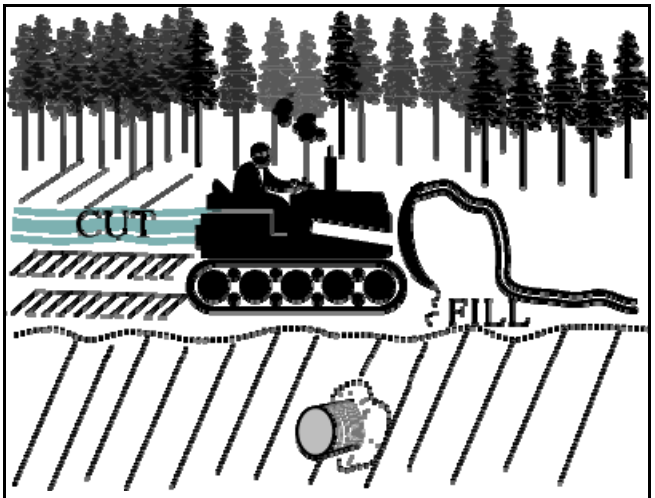
**During the process of cut-and-fill, it is critical to avoid letting sidecast or waste material enter streams or placing it on unstable areas where it might erode.**

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

*Please refer to the Handbook of Valley County Stormwater BMPs for more BMPs on controlling erosion during the construction process.*

**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 |




Forest roads are often built by excavating the road surface out of a hillside. A bulldozer starts at the top of the cut slope, excavating and sidecasting material until the desired road width is obtained.

# BMP Design and Construction

Knowing which BMP to use is half the battle the other half is designing, constructing and installing the BMP. The following guidelines were taken from the Valley County Catalog of Storm Water Best Management Practices. Please refer to this manual when doing any new construction.

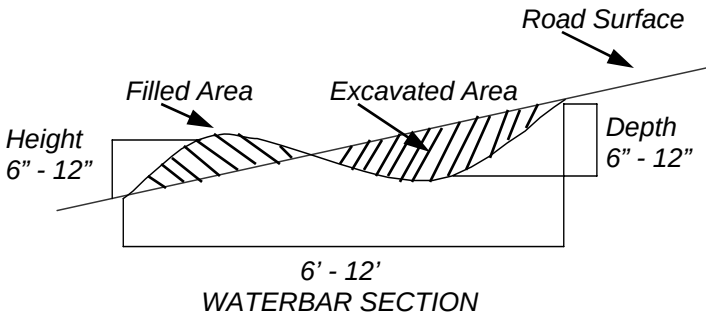
Open-Top Box Culvert: Construct a box-like frame (three-sided, open-topped) of logs; lumber; discarded guardrail; or commercial, corrugated steel. Install it flush with the road surface skewed at an angle downgrade across the roadway. The inflow end should extend 6-12 inches beyond the surface of the roadbed and should be directed onto vegetated ground or riprap or into another erosion control structure such as a sediment trap or catch basin. Install relief open-top box culverts with a minimum cross drainage grade of 2 percent.

Spacing between culverts should be in accordance with recommended cross drainage spacing in Table 1. Where recommended spacing is less than 33 ft, the road should be paved with gravel or crushed rock.

Water bar: A cut and berm built at a downward angle across the roadway, extending from the cutbank to the opposite fill shoulder. Waterbars reduce erosion by diverting storm water runoff from the road surface and directing it to a safe discharge area.

- 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.
- Berm 6-12 inches high; Cut 6-12 inches deep, skewed at angle of **30º to 40º across road.**

- A shallow trench, 12 to 18 inches below the surface of the road or trail would extend beyond both sides.
- Discharge: Runoff should be directed onto fill material with proper energy dissipation and drainage away from the fill.



*WATERBAR SECTION*

Road Crowning: Used as a drainage measure to divert surface water off the entire road surface so that water does not concentrate in any specific location.

- A rounded slope with the high point being the middle of the road with an approximate 1 to 2 percent grade from the middle outward.
- Berms on the outside of the road should be limited or removed to allow water to flow off the road surface.
- Provide sediment collection or erosion-control measures at the toe of the fill slope to prevent excessive erosion and sediment transport.

Rolling Dip: Used as a runoff diversion measure to prevent erosion of the road surface. Rolling dips are effective on long inclines to keep storm water from flowing directly down the road where it may cause gullying and other damage to the road surface and grade.

- Rolling dips are not suitable on road grades steeper than 5 percent. Road must be at least 150 feet long.
- 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.

Align the dip across the road at nearly a 90-degree angle and slope it outward 5 percent. 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 fillslope) before final grading to direct storm water discharge from the dip. Outflows should be kept free of debris to prevent ponding.

Machine maintenance on your property can result in water contamination. Dispose of used oil, filters, and parts responsibly!

## BMPs for Ditches

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 so as not to become an erosion problem itself.

Construction Guidelines:

- Locate ditches on the up slope side of the road to prevent water from flowing onto the road from uphill.
- Size ditches so they are large enough to handle runoff from the 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 parabolic-shaped or at least flat and a minimum of 2 feet wide to help slow and disperse water.
- Line ditches as soon as possible to prevent erosion and to maintain the ditch profile.
- Line ditches which have a less than 5% slope with grass in order to filter sediments.
- Line ditches which have a greater than 5% slope with 2-6 inch diameter rock.
- All ditches need an outlet; standing water 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.

## Culvert BMPs

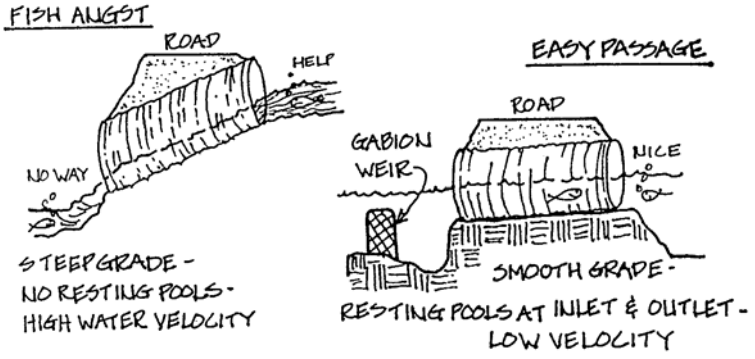
Use fish friendly culverts at stream crossings. Culvert installation should not change the conditions in the stream that existed prior to installation. Trout and other species move upstream and downstream to spawn and meet other habitat needs.

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

The following BMPs are for a fish friendly culvert.

- 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 across streams with high gradients.
- Place riprap securely at upstream culvert end to avoid dislodging that may result in lower culvert capacity, higher velocity flows and reduced inlet efficiency.

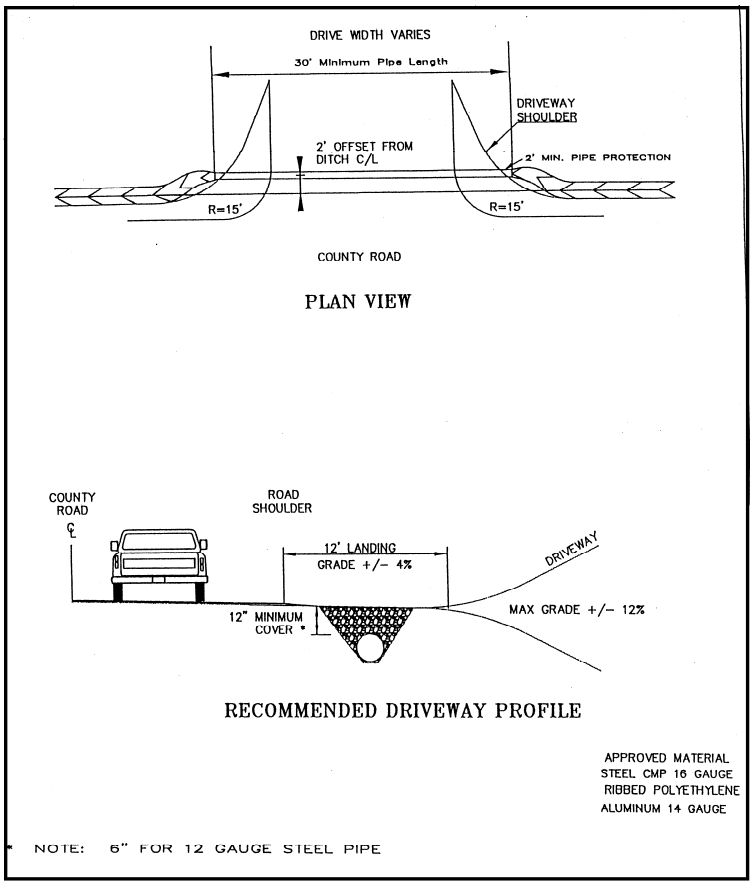



**FISH ANGST vs. EASY PASSAGE**

## Culvert Maintenance & Inspection Chart

| Problem | Cause | Solution |
|---|---|---|
| Ponded/ puddled water | Culvert bottom is too high.<br><br>Ditch grade is too flat. | Reset the pipe to match the invert to the channel bottom. Regrade 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. Also, check for excess sediment coming from an upstream source. | 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 and/or with suitable and properly compacted bedding material. |

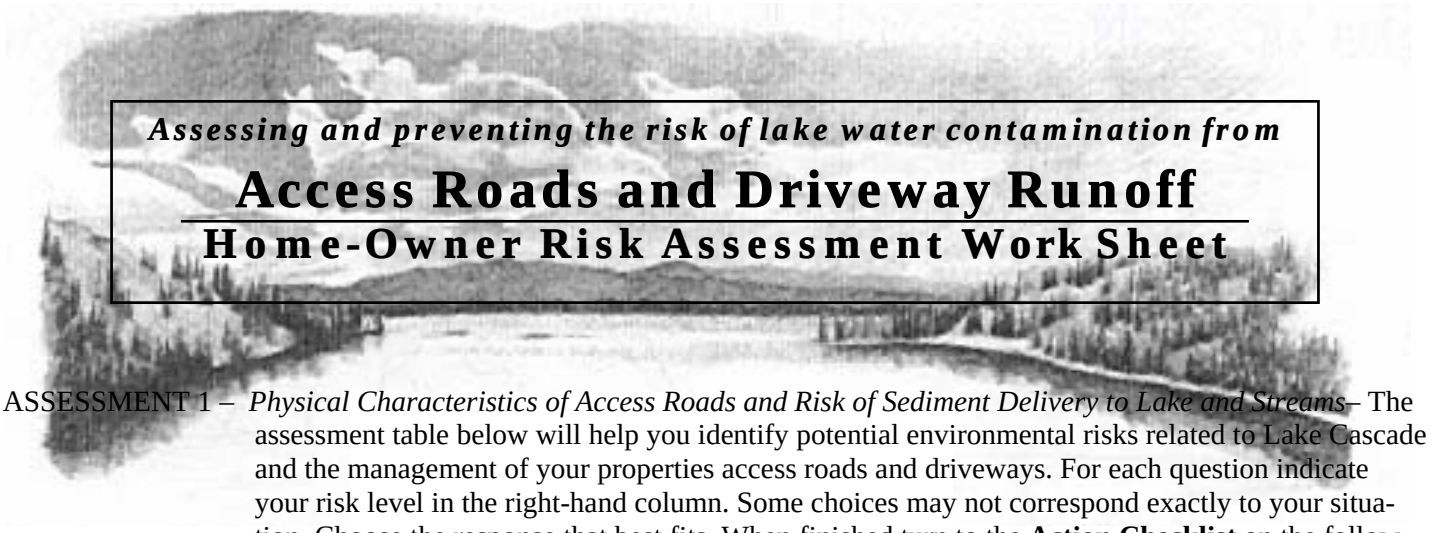
# Valley County Driveway Specifications




# BMP 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 down.

- 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.



***Assessing and preventing the risk of lake water contamination from***

# Access Roads and Driveway Runoff

## Home-Owner Risk Assessment Work Sheet

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 Lake Cascade and the management of your properties 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 following page and record your medium and high-risk practices. Your goal is to lower your risks. Use the BMP recommendations on pages 1-5 of this brochure and those found in the *Handbook of Valley County Stormwater Best Management Practices*, 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<br>❒ Medium<br>❒ 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<br>❒ Medium<br>❒ 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<br>❒ Medium<br>❒ 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<br>❒ Medium<br>❒ 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 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<br>❒ Medium<br>❒ 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: June 1 |
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Information derived from Lake*A*Syst materials is intended only to provide general information and recommendations to property owners around Lake Cascade regarding their management practices. **All results are confidential.**

# Lake*A*Syst Resources and Contact Information

**Stormwater Runoff – Fact Sheet 1**

Handbook of Valley County Stormwater Best Management Practices

- ·available for viewing at the Planning and Zoning/Building Department, Valley County Courthouse
- ·contains information regarding selecting and installing stormwater best management practices
- ·contains information regarding disposal of hazardous wastes

Valley County Transfer Station, 240 Spink Lane, 634-7712.

- ·information regarding disposal of hazardous wastes in Valley County
- ·accepts certain waste and recyclable materials

Lakeshore Disposal, McCall, 634-7176

- ·does not collect batteries or hazardous wastes

Valley County Road Department, 382-7195

- ·can assist with information regarding driveway and culvert installation

Idaho Department of Lands, 555 Deinhard Lane, McCall, ID 83638 (634-7125)

- ·can assist with information regarding culvert installation on timbered property
- ·can offer seeding suggestions on timbered property

Valley County Weed Department, 382-7199

- ·offers information regarding the disposal of pesticide and fertilizer containers

Idaho Department of Environmental Quality, 634-4900

- ·for general information on water quality and stormwater issues
- ·for assistance in locating resources

# Lake*A*Syst Resources and Contact Information

**Lawn and Garden Management – Fact Sheet 2**

Valley County University of Idaho Cooperative Extension Service, 108 W. Pine St., Cascade, 382-7190

- ·can assist with pest management and fertilizers
- ·can assist with soil testing

Valley County Weed Department, 382-7199

- ·offers information regarding the disposal of pesticide and fertilizer containers

Handbook of Valley County Stormwater Best Management Practices

- ·available for viewing at the Planning and Zoning/Building Department, Valley County Courthouse
- ·contains information regarding selecting and installing stormwater best management practices
- ·contains information regarding disposal of hazardous wastes

# Lake*A*Syst Resources and Contact Information

**Access Roads and Driveway Runoff – Fact Sheet 3**

US Forest Service, BNF - Cascade Ranger Station, 540 N Main St., Cascade, ID 83611
- ·for information on Forest Service Roads

Idaho Department of Lands, 555 Deinhard Lane, McCall, ID 83638 (634-7125)
- ·can assist with information regarding culvert installation on timbered property
- · for information regarding roads maintained by IDL

Valley County Road Department, 382-7195
- ·can assist with information regarding driveway and culvert installation
- ·for information regarding roads maintained by the County

Archer, D. & M. *Forestry for Idaho: BMPs – Forest Stewardship Guidelines for Water Quality.* University of Idaho Cooperative Extension System.

Idaho Forest Practices Act, www.idahoforests.org

Stream Channel Alteration Law, Title 42, Chapter 38, Idaho Code.

Idaho Department of Water Resources, www.idwr.gov

Handbook of Valley County Stormwater Best Management Practices
- ·available for viewing at the Planning and Zoning/Building Department, Valley County Courthouse
- ·contains information regarding selecting and installing stormwater best management practices for roads and driveways

Army Corps of Engineers
Boise Regulatory Office
304 North 8th Street, Rm 140
Boise ID 83702

# Lake*A*Syst Resources and Contact Information

**Landscape and New Construction – Fact Sheet 4**

Idaho Department of Lands, 555 Deinhard Lane, McCall, ID 83638 (634-7125)

- ·can assist with information regarding culvert installation on timbered property
- ·can offer seeding suggestions on timbered property

Valley County Building Department, Valley County Courthouse, 382-7114

- ·for information regarding set backs, subdivision infrastructure and drainage

Valley County University of Idaho Cooperative Extension Service, 108 W. Pine St., Cascade, 382-7190

- ·can assist with pest management and fertilizers
- ·can assist with soil testing

Handbook of Valley County Stormwater Best Management Practices

- ·available for viewing at the Planning and Zoning/Building Department, Valley County Courthouse
- ·contains information regarding selecting and installing stormwater best management practices for roads and driveways

NPDES Permit - http://cfpub.epa.gov/npdes