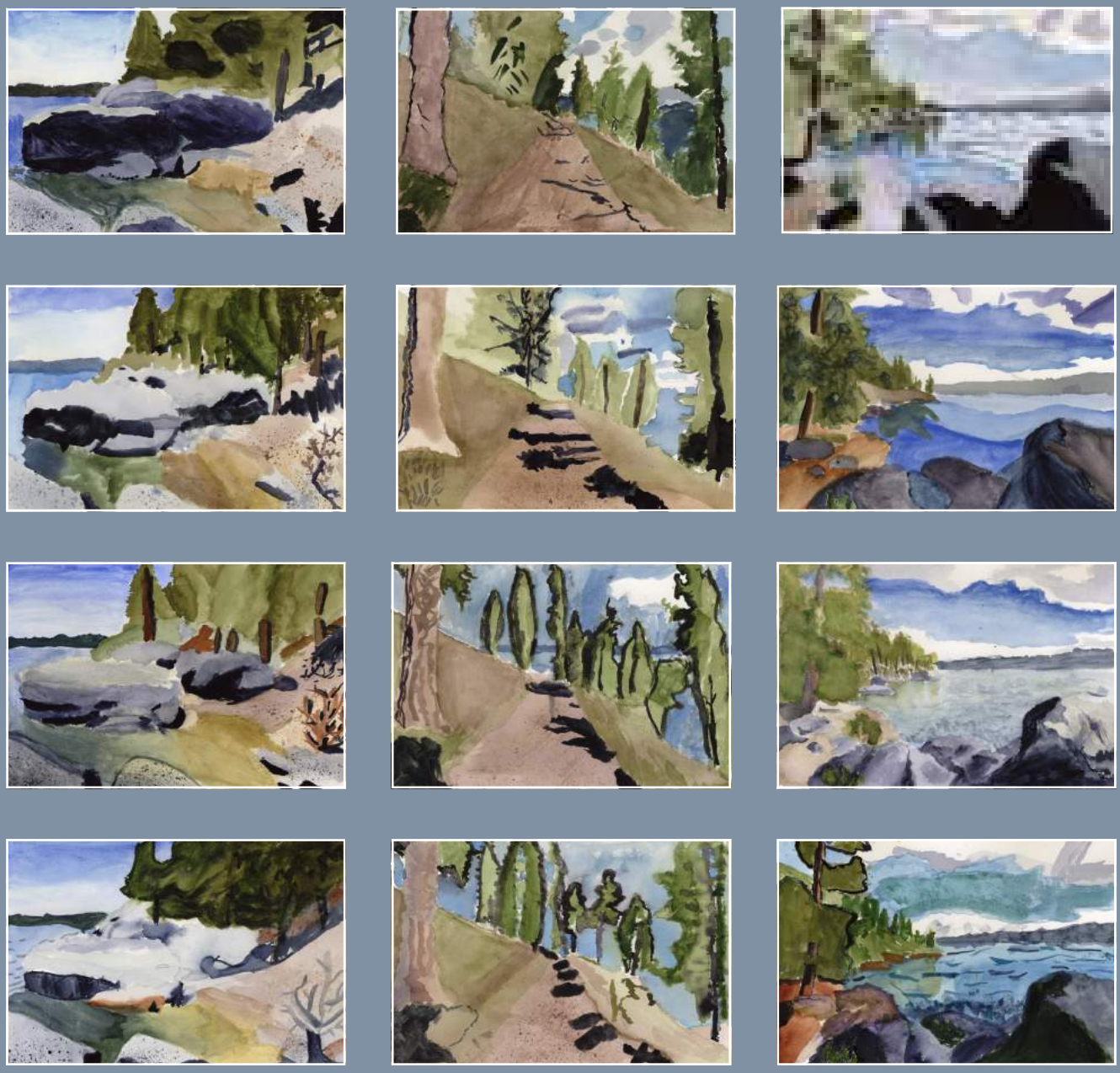

Coeur d'Alene Lake Management Plan

Lake·A·Syst

A Landowner's Guide to Protecting Water Quality

A special thanks to Sorensen Magnet School for allowing us to use these students' artwork on the cover:

Tubbs Hill in Three Views: The Story Behind the Project

In May 2011, the 2nd and 3rd grade classes at Sorensen Magnet School spent a full day on Tubbs Hill. They rotated between four stations, learning about native plants, native animals, conservation, and nature drawing, The next day, local artist Jessica L. Bryant (who also taught the drawing segment) came to the school for an artist-in-residence project. She worked with twelve 2nd and 3rd graders, three from each class, to paint landscapes of Tubbs Hill. The kids worked from Jessica's photography of three different views from Tubbs Hill. They worked together in groups of four, all painting the same view. Jessica focused on teaching value and color, helping the students learn to really see what they were looking at. The finished paintings were used to generate a compilation poster showing all 12 pieces. The paintings are arranged by class. The top two rows are the 2nd grade classes; the bottom two rows are the 3rd grade classes. They had just two hours of painting time together spread over two days. The kids showed remarkable focus and dedication to their artwork, and the results are spectacular!

Posters are for sale through Sorensen for $15 each.

Coeur d'Alene Basin

Lake·A·Syst

A Landowner's Guide to Protecting Water Quality



Sponsored by

The Coeur d'Alene Lake Management Plan
State of Idaho, Department of Environmental Quality
and the
Coeur d'Alene Tribe

Molly McMahon, Editor
Idaho Association of Soil Conservation Districts
March 2013

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Acknowledgements

The initial Lake*A*Syst program in north Idaho was developed for Priest Lake in 2000 by Glen Rothrock of the Idaho Department of Environmental Quality (IDEQ) and Lance Holloway of the Idaho Association of Soil Conservation Districts (IASCD). The program was sponsored under the IDEQ Priest Lake Management Plan. In 2005, a Pend Oreille program was developed by Gary Parker, Lake*A*Syst Coordinator with the Bonner Soil and Water Conservation District. In 2008, a Hauser Lake program was initiated by the Hauser Lake Watershed Coalition and Kootenai Shoshone Soil and Water Conservation District. In 2009, the Lake*A*Syst material was updated for Priest Lake by Molly McCahon, Lake*A*Syst Coordinator with the Bonner Soil and Water Conservation District.

Development of the north Idaho Lake*A*Syst program included important contributions from government agency representatives, private organizations, and many community members. Contributing groups included: the U.S. Department of Agriculture - Forest Service, Natural Resources Conservation Service, Panhandle Lakes Resource Conservation and Development Council, IDEQ, Idaho Department of Lands, Idaho Department of Fish and Game, Idaho State Department of Agriculture, University of Idaho Extension, Panhandle Health District, Pend Oreille Basin Commission, Bonner County, Kootenai County, Bonner Soil and Water Conservation District, Kootenai-Shoshone Soil and Water Conservation District, IASCD, City of Hauser, Hauser Lake Watershed Coalition, Tri-State Water Quality Council, Lake Pend Oreille Nearshore Total Maximum Daily Load Committee, and involved citizens from the communities of Priest Lake, Pend Oreille Lake, and Hauser Lake.

The Lake*A*Syst program for the Coeur d'Alene Lake Basin was developed according to the Coeur d'Alene Lake Management Plan (LMP), a water quality plan finalized in 2009 and jointly implemented by the Coeur d'Alene Tribe and IDEQ. LMP staff contracted through the Bonner Soil and Water Conservation District to have Molly McCahon (an employee of IASCD) customize and update existing Lake*A*Syst materials for the Coeur d'Alene Lake Basin. We gratefully acknowledge Molly for her excellent work and experience in developing the materials that comprise this manual for home and land owners in the basin. Thank you, Molly, for your patience with the uncountable comments and editing suggestions that came your way by LMP staff members.

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Front Cover Design: Watercolor prints from students of Sorensen Elementary School, Coeur d'Alene
Back Cover Design: Coeur d'Alene Tribe GIS Department

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Introduction to Lake*A*Syst

Lake*A*Syst is an assessment program designed to assist shoreline property owners in making well-informed decisions about property management. Although the information in this manual is tailored to property owners along Coeur d'Alene Lake and surrounding streams and rivers, much of the information is applicable to anyone concerned with protecting our water resources: business owners, foresters, ranchers, decision-makers, and other community members. Water quality is a shared responsibility. While ***point source pollution*** is addressed through federal and state regulations, we rely on our entire community to address ***nonpoint source pollution*** that continues to have enormous impacts on our nation's waters.

This manual consists of 11 sections, each addressing a specific topic. Each section is divided into two parts: an information section and an assessment section for you to fill out. Not every section will be applicable to your situation, but taken individually, they contain a great deal of information to assist you in becoming an informed steward of the land and water. Each section includes a Resource Directory of professionals from local, state, federal, and non-profit organizations. Most of these agencies exist to assist landowners, and many provide on-site assistance. We encourage you to use these resources, in addition to other organizations and companies you may be familiar with, to help guide your land management decisions.

How to use this manual:

1. Read the facts and information at the beginning of each section. Terms in bold italics are defined in the glossary.
2. Consider how the best management practices (BMPs) described can be implemented on your property.
3. Use the risk assessment worksheet(s) at the end of each section to analyze your property's specific needs.
4. Use the action worksheet at the end of each section to make a plan to reduce your risks.
5. Refer to the resource directory in each section for assistance on implementing your plan. Appendix B provides a compilation of the resource directories.

Thank you for doing your part to protect our valuable natural resources.

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Section 9 - Aquatic Invasive Species (cont.)

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SECTION 1
STORMWATER RUNOFF MANAGEMENT

This fact sheet addresses the impacts stormwater runoff has on water quality and how *you* can make a difference with ***Best Management Practices*** *(BMPs)*. BMPs are actions you can take to protect our natural resources. **The ultimate goal of this information is to minimize the negative impacts of stormwater runoff to lakes, rivers, and streams.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheets (p. 1-9) in order to analyze your property's specific needs.
3. Fill out the action worksheet (p. 1-11), then **take action!**

Why is Stormwater Runoff a Problem?

Stormwater runoff is the flow of water from rain or melting snow that does not soak into the ground due to ***impervious*** surfaces. Under natural forested conditions, stormwater is absorbed into the ground, but as an area becomes developed or altered with structures, roads, and driveways, less water is absorbed into the soil. Not only does this disrupt the entire water cycle, it increases the amount of water that needs to be diverted (Figure 1-1).

Increased runoff is generally channeled into ditches, storm sewers, and road gullies, which often lead to lakes, rivers, and streams. Runoff picks up and carries ***pollutants*** such as fertilizers, pesticides, petroleum, ***heavy metals***, and hazardous waste products. The movement of these materials into surface water creates a number of problems, including excess aquatic plant and ***algae*** growth; low ***dissolved oxygen*** (used up by decaying plants); negative impacts to fish, wildlife, and recreation; degraded spawning beds; and murky water. Runoff that is not diverted flows overland and unmanaged, creates problems such as drinking well contamination, flooding, and erosion (Figure 1-2).

Figure 1-1. *Improperly placed sediment controls allow polluted stormwater runoff into storm drain which flows directly to surface water.*

Our Responsibility

Our region is widely known for its world class fishing, immense beauty, and good water quality, which make it a popular destination for people worldwide. However, increased waterfront development raises concerns about how to maintain the good water quality we currently enjoy. If you live on the waterfront you have a special responsibility and opportunity to prevent water pollution. **One important action to take on your property is the control of stormwater runoff.** Homeowners are responsible for stormwater retention or discharge from their property. Your property alone is probably not a significant source of pollution, but the cumulative effect of numerous properties can have a substantial impact on water quality.

Figure 1-2. *May 2008 photo taken by EPA of flood plume at mouth of Coeur d'Alene River. Flood events carry thousands of tons of sediment and polluted runoff into Coeur d'Alene Lake.*

Minimizing Stormwater Runoff

Traditionally, the objective of stormwater management has been to transport runoff as quickly as possible through the drainage system to prevent flooding and protect lives and property. Years of research now shows how contaminated stormwater negatively affects public health and wildlife habitat. New practices encourage decreasing runoff rather than merely diverting it.

Reducing the amount of impervious surface on your property and directing runoff into an area where water can infiltrate are the best ways to minimize runoff. Ideally, stormwater should move slowly and absorb into the ground. Impervious surfaces are hardened surfaces that don't allow water to pass through. These surfaces include roofs, sidewalks, carports, roads, driveways, and patios (Figure 1-3). As you look around your property for stormwater problems, remember that you may not see the impacts created by stormwater coming off your property. Water from your land may quickly run off your driveway, along the curb, into a clogged culvert, and flood a road two miles down. In other words, everyone needs to do their part. If you reduce stormwater coming off your property, the entire drainage system will have less water to manage.

Consider stormwater and how it affects your property; walk your property during a heavy rainstorm, and watch where the water drains. Look for areas of ***erosion***, potential flooding and water draining directly to surface water.

If you have an existing house and landscape, review the BMPs outlined in this section to address any stormwater runoff issues discovered while evaluating your property.

If you are in the development phase, a general step-by-step process is recommended for property located near waterbodies, on steep slopes or gradients, and on land with highly erodible soils. Begin with a quality site plan for pre-construction, construction, and post-construction. Use BMPs, and routinely practice pollution prevention. For more information on site planning and stormwater management, read Section 6, New Construction. Numerous online and community resources are available (see Resource Directory, p. 1-8).

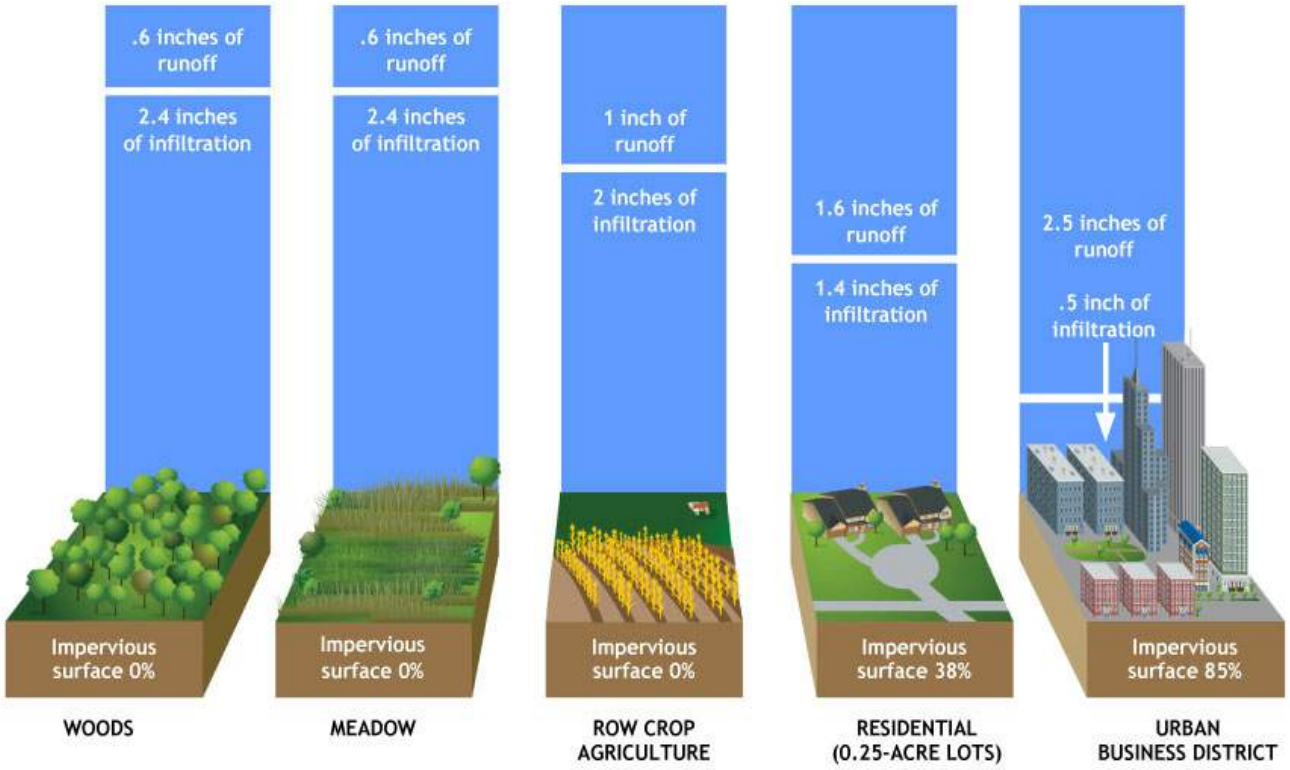

Figure 1-3. *Percentage of impervious surface related to infiltration rates following a 3-inch rain storm.*

Buildings and Landscapes

For buildings and landscapes, use the following BMPs:

- Limit paving, compacted dirt and covered areas.
- Use permeable pavers, flagstones, river rock or planted ground covers on patios, walkways and areas around buildings (Figure 1-4).
- Limit clearing and grading on slopes.
- Minimize cut and fill for roads, sidewalks, and footpaths to reduce erosion and still provide access.
- Preserve existing vegetation. Only disturb areas that are absolutely necessary for structures and access.
- Do not compact or pave wasted space such as corners near buildings that are not large enough for parking or driving.
- Use steps when a walkway must go directly up and down a slope, particularly near the shoreline.

Figure 1-4. *Decorative permeable pavers.*

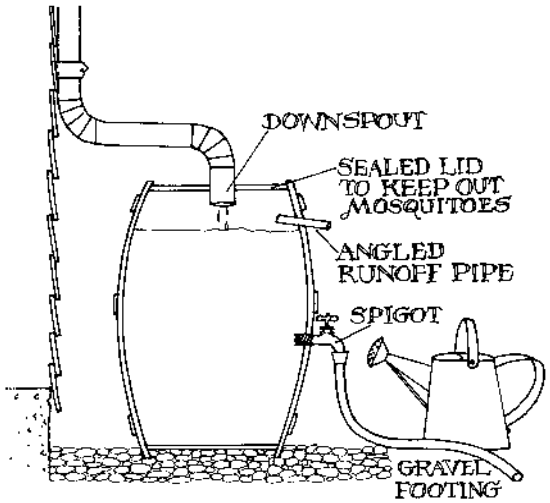

Figure 1-5. *Rain barrel installed below rain spout.*

- Install a rainwater catchment system to collect and reuse water for irrigation. In this region, a 2,000 square foot (ft²) roof could easily generate over 41,000 gallons of water a year (Figure 1-5).
- Install rain gutters and keep them free of debris. Place a rain garden below a downspout instead of concrete (Figure 1-6).
- Use native plants in your landscape, especially as a buffer around surface water. Native plants are very low maintenance.
- If you are building a new house or garage, consider positioning rooftops so they are perpendicular to the slope.
- To reduce erosion, avoid creating walking paths straight down slopes. Compacted soil on footpaths also promotes excessive runoff.

Figure 1-6. *A rain garden installed below a downspout.*

Roads, Driveways, and Ditches

- Keep culverts unplugged (Figure 1-7); keep drainage ditches deep and vegetated or rock-filled (Figure 1-8); and keep cut banks (above slope), and fill banks (below slope) from eroding by establishing vegetation.
- Minimize semi-impervious and impervious surfaces. Use permeable alternatives wherever possible (Figure 1-9).
- Incorporate a good gravel base into your private roads and driveways rather than compacted dirt.
- Locate driveways and all walkways away from slopes because steeper slopes have greater erosion potential; if you must cross a hillside, follow the contour of the slope.
- Minimize road crossings over waterways 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, sand, or soil with a tarp or store them in a building.
- Use roadside areas covered with grass for runoff and snow storage instead of impervious and semi-impervious surfaces.
- Install water bars, rolling dips, trench drains, or other diversion methods on sloping roads and driveways to slow and divert runoff (Figure 1-10). For diversion techniques, see Section 7, Access Roads and Driveway Runoff.
- Use existing natural drainage systems such as valleys or other low areas instead of digging new ditches.
- Design culverts and drainage structures to handle excessive amounts of runoff. Assistance is available from numerous public agencies (see Resource Directory, p. 1-8).

Figure 1-7. *The result of an undersized/ clogged ditch.*

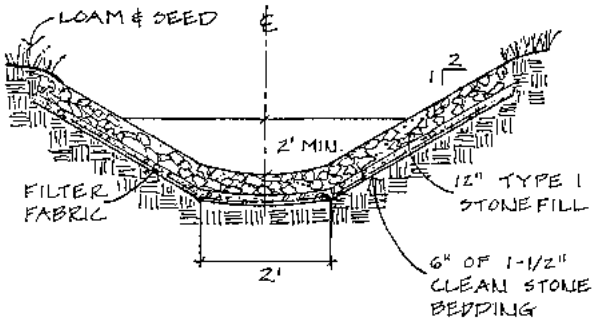

Figure 1-8. *Recommended ditch design.*

Figure 1-9. *Permeable pavers on driveway allow stormwater to infiltrate.*

Figure 1-10. *Decorative trench drain in driveway directs runoff to vegetative landscaping for infiltration.*

Reducing Pollutants in Runoff

Stormwater is unavoidable, but its impacts can be reduced by keeping harmful chemicals and unwanted materials out of runoff. Pollution prevention is the easiest way to keep the Coeur d'Alene Basin safe, clean, and inviting. Sources for concern are bare soils, roads, driveways, and yards. Stormwater and snowmelt collect and transport the following pollutants to surface and/or ground water**:**

Nutrients - Phosphorus and/or nitrogen from fertilizers, detergents, or animal wastes.

Bacteria and viruses - Human and animal wastes.

Litter - Glass, plastics, etc.

Organic chemicals - Pesticides and petroleum.

Heavy metals - Lead, copper, zinc, arsenic, and cadmium that are usually associated with sediments.

Sediment - Combination of silt/clay with chemically bound phosphorus, forest duff, stones, sand, gravel, seed, metals, and other fine residues.

Why is Phosphorus a Problem?

Phosphorus can negatively impact lake water quality because it is a ***limiting nutrient*** to plants. Additions of phosphorus above natural levels can accelerate algae and other aquatic plant growth (***eutrophication***), which depletes dissolved oxygen (Figure 1-11). When this plant material breaks down, it uses the dissolved oxygen in water. Overall phosphorus concentrations in Coeur d'Alene Lake are low, but in areas of dense residential development along the shoreline, phosphorus concentrations can be higher than in undeveloped areas.

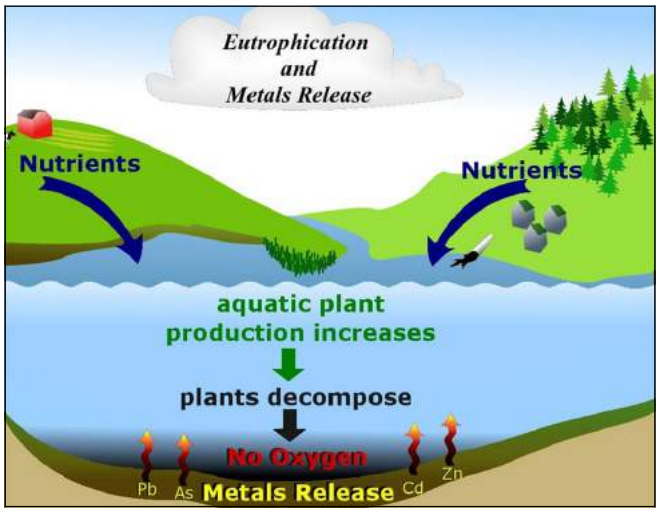

Figure 1-11. *Eutrophication and metals release diagram.*

Lawn and Garden Care

Lawns and gardens near the shore must be carefully planned and maintained to prevent possible contamination to stormwater runoff. Grass clippings, excess fertilizer, and other yard wastes will wash away during storm events. Excess fertilizer will add ***nitrogen*** and ***phosphorus*** to lakes, rivers, and streams promoting algae and aquatic weed growth (see Section 2, Lawn and Garden Management).

- Avoid applying fertilizers and pesticides at least 25 feet from lakes, rivers, and streams.
- Don't fertilize if you don't need to. Get a soil test kit to determine whether you need fertilizer. This could save you money.
- Choose a fertilizer with little to no phosphorus. Turf rarely needs additional phosphorus. Check phosphorus levels in your soil.
- Native vegetation is a quality alternative to cultured lawns and landscapes. Native plants do not need additional fertilizers or water; they take care of themselves.

Animal Wastes

Animal droppings can be troublesome in two ways. First, pet and livestock wastes contain nutrients that can promote the growth of algae in lakes, rivers, and streams. Second, wastes can be a source of disease. The risk of stormwater contamination increases if pet wastes are allowed to accumulate in animal pen areas or left on lawns, roads, or driveways where runoff can carry them to surface water. Reduce the risk of contamination by manure associated with dogs, cats, cattle, horses, or waterfowl by disposing of it upland.

- If animal manure is stacked, it should not be located within 150 feet of a water body. Always divert runoff from manure stacks toward a vegetated area for filtration. Covering manure piles is a great solution to prevent manure runoff.
- Apply stacked manure, once it is fully composted, to make effective use of fertilizers.
- Don't let dog waste accumulate in one central area. Either give pets lots of space away from water or routinely pick up waste and put it in the trash.
- Keep livestock fenced out of lakes, rivers, and streams.
- Waterfowl prefer to be able to walk in and out of the water but dislike plants higher than 18". Allowing plants to grow on the shore may reduce nuisance geese and ducks and their waste.

Protecting and Creating Vegetative Buffers

Riparian zones are heavily vegetated areas surrounding water bodies (Figure 1-12). The width of these areas can vary, but the natural function is to stabilize soil, filter pollutants, and provide fish and wildlife habitat. These areas provide homes to many plants and animals and are key components of lake, river, and stream environments. The thick vegetation reduces erosion and filters out pollutants. Overhanging branches provide shade and a source of insects and seeds. Riparian zones and ***vegetative buffers*** are quickly disappearing due to development along the shorelines (see Section 8, Riparian, Pasture, and Forest Management).

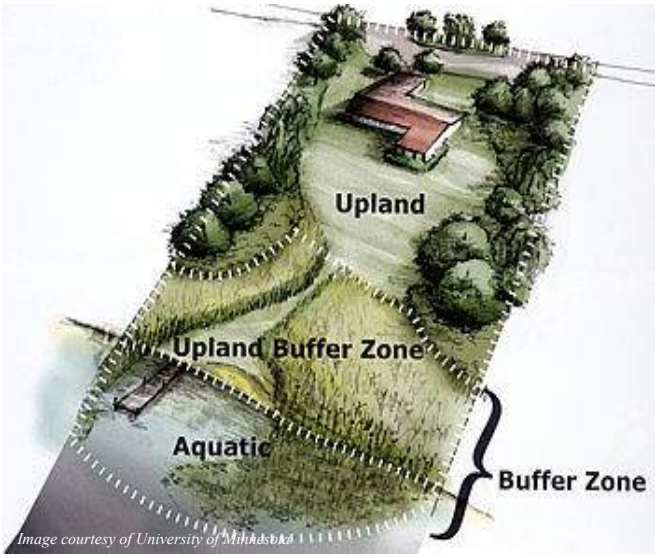

Figure 1-12. *A vegetative buffer between water and upland land use protects water quality.*

- For new home and lot construction, retain a high percentage of native shrubs and trees along the shoreline. As a guideline, remove no more than 20% of the native vegetation for a walkway, beach access, and home safety (Figure 1-12).
- For existing residential and business development, minimize disturbance in riparian zones along lakes, rivers, and streams. Leave native plants where possible and choose species that require little maintenance. Check your county's site disturbance ordinance for guidelines (see Resource Directory, p. 1-8).
- Contact local nurseries, University of Idaho Extension/Master Gardeners, or the Native Plant Society for recommendations on native plant design in vegetative buffers (see Resource Directory, p. 1-8).
- Keep cattle and horses out of riparian zones. Large animals trample riparian vegetation and stream banks causing erosion.

Use Caution with Hazardous Household Products

Use safe housekeeping practices when storing, handling, and disposing of potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, pharmaceuticals, fluorescent lights, and swimming pool and hot tub chemicals (see Section 5, Hazardous Materials).

- When possible use alternative products that are non-toxic and environmentally friendly.
- *Do not* dispose of household hazardous waste:
  - –In the trash
  - –Down storm drains
  - –In creeks, streams, rivers, or lakes
  - –Down sinks and toilets

- Unused household hazardous wastes can be disposed of properly at recycling/transfer stations in Kootenai County and Spokane County (see Resource Directory, p. 1-8).
- Change buying habits: purchase fewer products, and buy in appropriate quantities.
- Store products above flood levels of basements and storage sheds and off ground level.
- Read and follow instructions on product labels.
- Store products in their original containers, and keep them well labeled.

Vehicle Use and Engine Maintenance

Cars and boats are a major source of 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 deposited on roadways and carried into receiving waters by stormwater runoff (Figure 1-13; see also Section 5, Household Hazardous Wastes).

- Don't spill. Use drip pans and draining boards to capture oils and solvents, then depose of properly.
- Use rags and dry absorbent materials like kitty litter and baking soda to clean up spills, leaks, and drips.
- Clean up oil stains and avoid outdoor spills of antifreeze, brake fluid, and other engine fluids.
- Recycle unused fluids. Used oil, antifreeze, and cleaners can be taken to county recycling/transfer stations (see Resource Directory, p. 1-8).
- Never dump used oil, antifreeze, or gasoline down a storm drain, in a ditch, or on the ground. These wastes contain toxic compounds that can end up in the lake and in drinking water.
- Wash vehicles on the lawn or at a 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.
- Routine maintenance of your vehicle and boat helps prevent oil leaks and ensures efficient fuel consumption and clean exhaust.

Figure 1-13. *Vehicle oil going down storm drain.*

Erosion and Sedimentation Prevention

If you are building a new house or structure, landscaping, or putting in a new driveway or road, consider the effects of construction and other activities on nearby surface water. Bare soil is easily washed into nearby water. Excess soil in suspension, washes into nearby streams and buries coarse-sized channel sediment that is necessary for fish spawning. Sediment also carries excess phosphorus into surface water. For more erosion prevention methods, read Section 6, New Construction.

- Preserve existing vegetation whenever possible. Once vegetation is removed and soil is exposed, the rate of erosion is greatly increased.
- Cover bare soil immediately with layer of straw or other organic material (for hay or straw, use one 50 pound bale per 500 ft²). This covering will help keep soil in place (Figure 1-14).
- Replant disturbed areas as soon as possible.
- When landscaping or building, stage construction so that one area is stabilized before another area is disturbed.
- If you have rainspouts and gutters, direct the discharge to a grassy area, garden, or forest swale, where it can soak into the ground.
- Avoid damaging adjacent property.
- Design culverts and drainage structures to handle excessive amounts of runoff.
- Protect storm sewers from sedimentation so they can carry stormwater as intended.
- Inspect construction projects continually for potential erosion issues. Inspect area immediately after installing erosion control measures, following any severe rainstorm, before reseeding, and when nearing the completion of construction work.

Figure 1-14. *Straw mulch covering bare soil to prevent erosion.*

Resource Directory
Stormwater Runoff Management

Kootenai County
Community Development
(Planning and Building)
451 Government Way
Coeur d'Alene, ID 83814
(208) 446-1000

Solid Waste and Hazardous Materials
Transfer Stations
(208) 446-1430
www.kcgov.us/departments/solidwaste

Ramsey Transfer Station
3650 Ramsey Road
Coeur d'Alene, ID 83815

Post Falls Transfer Station
15580 W. Prairie Avenue
Post Falls, ID 83854

Kootenai-Shoshone
Soil and Water Conservation District
7830 Meadowlark Way, Suite C-1
Coeur d'Alene, ID 83815
(208) 762-4939 ext. 101

Benewah Soil and Water Conservation District
900 E Street
PO Box 488
Plummer, ID 83851
(208) 686-1699

City of Coeur d'Alene Stormwater Utility
710 E. Mullan Avenue
Coeur d'Alene, ID 83814-3958
(208) 769-2233

Lakes Highway District
11341 N. Ramsey Road
Hayden Lake, ID 83835
(208) 772-7527

Idaho Department of Environmental Quality
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Coeur d'Alene Tribe -
Lake Management Department
Coeur d'Alene Office
424 Sherman Avenue, Suite 306
Coeur d'Alene, ID 83814
(208) 667-5772

Plummer Office
850 A Street
PO Box 408
Plummer, ID 83851
(208) 686-5302

University of Idaho Extension
Master Gardeners and Plant Clinic
Kootenai County Extension
1808 N. 3rd Street
Coeur d'Alene, ID 83814
(208) 446-1680

Benewah County Extension
701 College Avenue, Suite LL2
St. Maries, ID 83861
(208) 245-2422

Coeur d'Alene Reservation Extension
402 Anne Antelope
Plummer, ID 83851
(208) 686-1716

Other Resources

Center for Watershed Protection
www.cwp.org

Stormwater Manager's Resource Center
www.stormwatercenter.net

Kinnikinnick Native Plant Society, Inc.
www.nativeplantsociety.org

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

Stormwater
Journal for Surface Water Professionals
www.stormwater.org

Risk Assessment Worksheets
Stormwater Management Runoff

Assessment Worksheet 1 - Reducing Pollutants in Runoff

Use this assessment worksheet to identify potential environmental risks. 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, go to the Stormwater Runoff Management Action Worksheet on page 1-11 and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section to help you determine the best solution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Automotive wastes	I clean up all drips and spills, and recycle oil and fluids. I keep dirty car parts and other vehicle wastes out of runoff.	I don't clean up drips and spills. I leave car parts and other vehicle wastes on the ground.	I dump used oil, antifreeze, and other wastes in a ditch or onto the ground.	☐ Low ☐ Medium ☐ High
Vehicle washing	I wash my vehicles on a lawn or gravel drive with phosphate-free soap. I make sure that runoff is diverted to vegetated areas.	I wash my vehicles at a commercial car wash, but I don't know if the operation uses BMPs.	I wash my vehicles on an impervious surface and my runoff runs directly into a lake or stream. I don't pay attention to what kind of soap I use.	☐ Low ☐ Medium ☐ High
Storing pesticides and other chemicals	I store my chemicals in waterproof containers in a garage, shed, or basement that is protected from stormwater.	My chemicals are stored in waterproof containers but within reach of stormwater.	My chemicals are stored in non-waterproof containers outdoors or within reach of stormwater.	☐ Low ☐ Medium ☐ High
Handling and using pesticides, fertilizers, and other chemicals	I immediately clean up any spills. I use alternatives to chemicals whenever I can, and apply the chemicals I do use according to the label instructions.	I use chemical applications according to label instructions, but I don't clean up spills.	I don't clean up spills, and I use products in higher amounts than what the label recommends.	☐ Low ☐ Medium ☐ High
Pet and animal wastes	I bury animal wastes away from gardens, wells, or ditches; or I put them in the garbage.	I leave animal wastes to decompose on grass or soil, but the wastes are scattered over a wide area.	I leave animal wastes on paved surfaces; or my pet wastes are concentrated in pen or yard areas; or I dump them in a ditch.	☐ Low ☐ Medium ☐ High

Assessment Worksheet 2 - Minimizing Runoff

Use this assessment worksheet to identify potential environmental risks. 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, go to the Stormwater Runoff Management Action Worksheet on page 1-11 and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section to help you determine the best solution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Bare soil, gardens, and construction projects	I seed any areas of bare soil and top them with a layer of mulch. I use sediment retention barriers (straw wattles and silt fences) until vegetation is established.	I leave soil bare during construction, but I use natural features and vegetation to slow most runoff.	My soil is left bare. No natural features or sediment retention barriers are used to slow runoff.	☐ Low ☐ Medium ☐ High
Impervious areas (rooftops, paved sidewalks, driveways, and roads)	My landscape plan minimizes paved surfaces; pavers are used instead. I use vegetated buffers to divert runoff from impervious surface areas to prevent drainage directly to surface water.	I have some small areas of my land paved for patios.	A lot of surfaces on my property are impervious to water. These areas also drain water directly into a lake, river, or stream.	☐ Low ☐ Medium ☐ High
Roof drainage	The downspouts on my home direct roof drainage onto my lawn, a rain garden, or a vegetated area.	Some of my home's downspouts discharge water onto paved surfaces.	Most or all of the downspouts on my home discharge onto paved or bare soil surfaces.	☐ Low ☐ Medium ☐ High
Landscaping and vegetative buffers	My yard is landscaped to slow the flow of stormwater and to provide areas where water soaks into the ground. I have left a thick vegetative buffer along the shoreline.	My yard is relatively flat with landscaping that allows water to soak in. I have some mowed grass or spotty vegetation adjacent to my shoreline.	I have no landscaping to slow the flow of stormwater. Steep slopes and shoreline on my property are eroding.	☐ Low ☐ Medium ☐ High
Septic system	I divert stormwater runoff away from my drainfield.	Some stormwater runoff flows over my septic drainfield but only a small amount.	Stormwater runoff runs toward my septic drainfield and saturates the ground.	☐ Low ☐ Medium ☐ High

Action Worksheet
Stormwater Runoff Management

Write all high and medium risks below.	What can you do to reduce the risks?	Set a target date for action.
Sample: Stormwater drains off my driveway toward a steep slope located adjacent to shoreline.	Install water bar or trench drain to redirect water away from slope and into vegetated area.	Next week

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SECTION 2
LAWN AND GARDEN MANAGEMENT

This fact sheet addresses the impacts lawn and garden management can have on water quality and how *you* can make a difference with ***Best Management Practices (BMPs).*** BMPs are actions you can take to protect our natural resources. **The ultimate goal of this information is to minimize negative impacts to water quality.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheets (p. 2-9) in order to analyze your property's specific needs.
3. Fill out the action worksheet (p. 2-11), then **take action!**

Why are Lawns and Gardens a Potential Problem?

Lawn and gardening activities on the shoreline often involve fertilizing, weed and pest control, and soil disturbance. Soluble ***nutrients*** found in fertilizers are beneficial to yards and gardens but can cause problems when they enter surface water such as lakes, rivers, and streams. ***Nitrogen*** and ***phosphorus*** contribute to ***aquatic plant*** and ***algae*** growth, which depletes oxygen in the water, impedes water recreation, and is aesthetically unappealing (Figure 2-1). Lawn and garden pesticides can have a negative impact on the health of humans, fish, and wildlife, if used incorrectly. Keep in mind that many shoreline landowners and managers use surface water for drinking and irrigation.

Soil eroding into the lake impacts the clarity of water and carries fertilizers and pesticides. The proximity of many homes to the lakeshore increases the risk that these materials will enter the water and cause problems. Conscientious homeowners can help maintain high water quality for everyone to enjoy. Refer to your county's site disturbance ordinance to find out local building setback limits (see Resource Directory, p. 2-8).

Figure 2-1. *An algae bloom impacts clarity of water and is aesthetically unappealing.*

Courtesy of the Washington State Water Quality Consortium

Pay Special Attention if:

- There are areas of bare and exposed erodible soil on shoreline, flowerbeds, lawns, vegetable gardens, etc.
- The property slopes toward surface water.
- There are ***impervious*** surfaces close to surface water.
- Lawn or landscape maintenance is being done close to surface water.
- Fertilizers, pesticides, or soil amendments are being applied.

Vegetative Buffers

The most effective and efficient action you can take to protect surface water from lawn and garden activities is to add or preserve a native ***vegetative buffer*** or ***riparian zone*** along the shoreline (Figures 2-2 & 2-3). A buffer between surface water and your land activities should consist of native or beneficial plants that have deep root systems, do not need additional water, and do not require fertilizer application. The lack of a vegetative buffer is one of the most significant causes of excessive nutrient runoff into lakes, rivers, and streams, as well as property loss due to soil ***erosion***.

Create a diverse buffer using native grasses, trees, and shrubs along at least 50% of your shoreline. For maximum pollution prevention, buffers should extend at least 25 feet from the water's edge to any management activities associated with lawn and garden care. For more information on plant selection and design, read Section 8, Riparian, Pasture, and Forest Management and consult the Resource Directory on page 2-8.

Figure 2-2. *A healthy vegetative buffer protects surface water and adds beauty to your landscape.*

Figure 2-3. *The property on the left leaves sloping bare soil/sand exposed to* ***stormwater****. The property on the right is attractive with abundant plants and access.*

Easy Care Lawns

Lawns can be an attractive part of your landscape. In fact, a well-maintained lawn or lawn alternative adds value to your property and helps to tie together your home and other landscape plants (Figures 2-4 & 2-5). Healthy vegetation actually improves your living environment. On a hot day, greenery reduces the glare of the sun, keeps surrounding areas cooler, and attracts birds and other wildlife.

However, lawns should never be maintained all the way to the water's edge. This will only accelerate erosion due to the shallow roots of turf grass. In most cases, a vegetated buffer should be integrated into the shoreline's landscape design. With proper management, dense turf provides a good ground cover to prevent soil erosion but should not be used as a long-term solution within 25 feet of the high water mark. Traditional lawn management activities like mowing, fertilizing, and herbicides are harmful to water quality. Use the BMPs that follow to reduce contaminants from entering surface water.

Figure 2-4. *Creeping thyme replaces traditional lawn. This plant is drought tolerant and doesn't require fertilizer or mowing.*

Figure 2-5. *Native grasses don't require water, fertilizer or mowing.*

Fertilizer Management for Lawns

Consider the following BMPs for lawns:

- Have your soil tested to determine how much fertilizer is actually needed (Figure 2-6). Soil tests are available at the University of Idaho Extension office, Natural Resources Conservation Service (NRCS), or local hardware stores.
- Whether it is organic or chemical, too much fertilizer is never a good idea. If chemical fertilizers are used, select slow-release (water insoluble) forms. For proper application, follow the instructions on the fertilizer bag.
- Choose fertilizers with low phosphorus levels. A healthy turf grass growing in our region generally doesn't need excess phosphorus.
- Nitrogen moves quickly through the soil to groundwater, so pay close attention to application rates.
- If you use a professional lawn care service, familiarize yourself with the type of pesticides and fertilizers being used and how they are applied. In some cases they may unnecessarily include a "weed and feed" product at every application.
- Mulching mowers recycle grass clippings and can eliminate the need for one fertilizer application per year.
- Water your lawn sparingly after fertilizing. This prevents excess water and fertilizers from running into surface waters.
- Choosing native grasses will decrease your need to fertilize and water, giving you more time to play!
- Always sweep up any fertilizer spills from hard surfaces and reapply to the grass. Never wash it off.
- Do not spread fertilizer within *at least* 25 feet of surface waters or ***wetlands***.

Figure 2-6. *A soil test kit can help you determine the levels of phosphorus, nitrogen, potassium and pH of the soil on your property.*

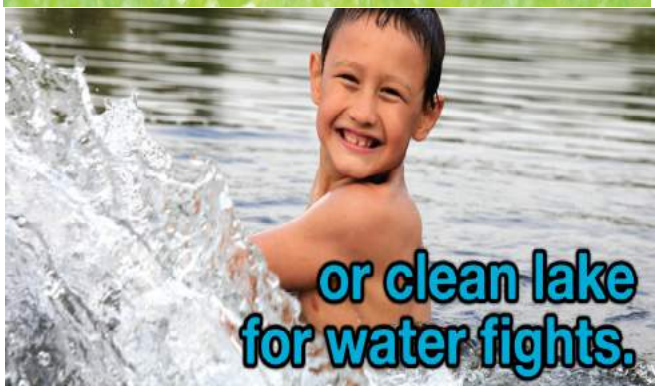
Improper Use of Fertilizers:

- Contaminates surface water with excess nutrients such as nitrogen and phosphorus.
- Contaminates drinking water from groundwater wells with ***nitrate***, which is hazardous, especially to pregnant women, infants, and small children.
- Contributes to severe fungal diseases on plants.
- Makes some weeds more competitive with the plants you are trying to grow.

Improper Application of Pesticides:

- Harms or kills beneficial insects and earthworms associated with your lawn or garden.
- Harms wildlife and pets that come into contact with your lawn or garden.
- Results in chemical runoff, during rainfall or irrigation, into streams, rivers, lakes, and ***stormwater*** drains.
- Leaches through the soil directly into groundwater that is used for drinking water.
- Creates pest resistance to the applied chemicals, making them more difficult to control in the future.

Courtesy of OurWaterWebs.org



Pest Management for Lawns

If possible, avoid the use of chemical pesticides and herbicides. Consult a professional from University of Idaho Extension to determine if using pesticides is justified (see Resource Directory, p. 2-8).

The following practices will minimize the potential of contamination from pesticides:

- Properly identify the problem. Most plant problems are caused by environmental conditions or human activities, not insects and diseases.
- Determine if there is an economic or aesthetic justification for initiating pest control.
- Consider control options other than using a chemical pesticide; biological controls and pest-resistant plant varieties are becoming readily available.
- Use the least toxic and most degradable product.
- 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 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 reapply the rinse water to the areas already treated. Empty containers should be disposed of properly at your local transfer station. Never pour excess pesticides on the ground, into surface waters, or into sanitary treatment systems.
- When controlling diseases, insects, and weeds use chemicals responsibly and use only the required amount.

Irrigation Management: Water Wisely

Over-watering may cause pesticides, fertilizers, and sediment to run off to surface waters, or leach through soil and contaminate the ground water you use for drinking.

- Established lawns only need 1-2 inches of water per week. A tuna can is a useful measuring tool.
- Install an irrigation system. Set system for early mornings or evenings. Make sure system is working correctly and that water is not being wasted on sidewalks, walkways and driveways (Figure 2-7).
- Drip systems use water efficiently and reduce the risk of erosion by watering individual plants rather than the entire soil surface. Consider installing in vegetable gardens and gardens with new plantings (Figure 2-8).
- Water deeply in the early morning or evening to avoid evaporation during the hot days.
- Avoid overwatering at all times, but especially after applying fertilizers and pesticides.
- Leave grass clippings on the lawn to shade the soil surface, retain moisture, and provide nitrogen, potassium, and phosphorus reducing the need for fertilizer.

Figure 2-7. *An improperly functioning sprinkler wastes water on street.*

Figure 2-8. *A drip system watering an individual plant.*

Garden Wisely

Flower and vegetable gardens can add to the quality of life, but certain precautions must be taken to prevent the possibility of surface water contamination.

Your garden is a complex ecosystem of plants, animals, insects, birds, fungi, worms, and microorganisms such as bacteria. A healthy garden ecosystem has a balance between producers, consumers, and decomposers. If an imbalance occurs, symptoms such as plant disease or an increase of damaging pests may result. This imbalance can be caused by improper applications of pesticides, fertilizers, and water or by removing organic matter, such as leaves, from the garden. By using gardening BMPs, the potential for gardening problems and the need for chemical controls are reduced. By reducing chemical use, the risk of contaminating the surface water and your drinking water is also reduced.

Location, Location, Location

When planning a garden spot, ensure that BMPs are implemented:

- Unless your garden is made up of densely growing, low maintenance native plants, your garden should be located at least 200 feet from surface water and drain away from surface water.
- If your garden is located on a slope draining toward surface water, apply fertilizers and pesticides sparingly and only when absolutely necessary. Mulch all bare soil to prevent erosion.
- Terraced gardens on slopes can help slow water and provide long-term erosion prevention. Dense berries, shrubs, groundcovers and native grasses also provide excellent erosion prevention on slopes.
- Gardens should never be located on septic system drainfields or mounds.

Figure 2-9. *A beneficial ladybug eating the dreaded aphid.*

Pest Management in the Garden

The following pest BMPs will help keep your garden ecosystem healthy:

- Avoid using pesticides.
- Create a garden with diversity. Plant a combination of different plant types to create a balanced ecosystem, and if possible, 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.
- Use and protect beneficial insects (Figure 2-9). Develop garden habitats to ensure a healthy environment for beneficial insects. 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. Learn to live with a low level of plant damage.
- If you do use herbicides or pesticides, use them carefully. Identify problem insects and weeds, and select the appropriate chemical. Buy only what you need, and 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 them to your local household hazardous waste collection program or go through the Idaho State Department of Agriculture Pesticide Disposal Program (see Resource Directory, p. 2-8).

Fertilizer Management in the Garden

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 include the following:

- 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 content, and water-holding capacity of the soil. Organic matter can also be added by growing a green manure cover crop, such as clover. 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, or 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, correctly applied, may also provide needed nutrients.

Irrigation Management in the Garden

To ensure that your plants stay healthy, efficient watering is essential:

- 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, such as permeable landscape fabric and/or rock.

- 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 slowly 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.

- Reduce the need for watering by improving soil structure. Each year, add organic matter such as compost, grass clippings, tilled in cover crops (green manure), and other dead plant materials.

- Drip systems use water efficiently by watering individual plants rather than the entire soil surface. Consider installing drip systems in vegetable gardens and gardens with new plantings.

Proper Debris Disposal

Avoid burning on the beach or near shore because the remaining ash results in an immediate release of nitrogen and phosphorus, leading to algae and aquatic weed growth. This growth is of special concern with the tremendous expansion of ***aquatic invasive species***. Burning trade or construction waste is prohibited per the "Rules for the Control of Air Pollution in Idaho" (***IDAPA*** 58.01.01.600-617). Burning of debris requires a local fire district permit.

If you must burn on the shore, burn in a metal or stone container that can be easily emptied of ash. Never leave ashes on the shore to be washed away, and **never dump ashes into the lake!**

Never dump leaves and vegetative debris into the lake or a stream. This releases nutrients and organic acids into the water and uses up valuable oxygen needed by fish. Rake leaves and brush away from the water (unless they are used as mulch); compost vegetation in a sturdy structure away from the shoreline or burn at least 100 feet from water.

Soil Stabilization

Surface waters are contaminated by soil particles (***sediment***) that are washed or blown into the water. Sediment makes water cloudy, covers spawning beds, and carries phosphorus. Unlike nitrogen, which moves quickly through the soil, phosphorus attaches itself to the soil particle and holds on tight. When soil is washed into water the phosphorus may dissolve and become available to plants, which makes aquatic invasive species and algae grow. Read Section 6, New Construction for detailed information on erosion control. Refer to your county's site disturbance ordinance to become aware of setback limits (see Resource Directory, p. 2-8).

Figure 2-11. *Property loss and sediment loading due to shoreline erosion. A healthy vegetative buffer instead of turf could help prevent this.*

Soil Protection Measures

Follow these BMPs to reduce soil erosion on your property:

- Maintain a vigorously growing vegetative buffer of grass, trees, and shrubs with deep root systems to protect your property from shoreline erosion (Figures 2-10, 2-11 and 2-12).
- Cover all areas of bare exposed soil with vegetation as soon as possible. If in a pinch, temporarily cover areas with mulch, such as straw, leaves, or wood mulch (Figure 2-13).
- Steep slopes should have dense vegetation with deep root systems or terracing. This vegetation will slow stormwater runoff and retain soil. Steep turf lawns are not recommended.

Figure 2-12. *Native plants like this Douglas Spirea bring beauty to your garden and help stabilize soil.*

Figure 2-10. *Native vegetation on this river bank helps keep the shoreline stable and attractive.*

Figure 2-13. *This comparison shows how effective mulch, within an erosion control blanket, is at preventing erosion.*

Resource Directory
Lawn and Garden Management

Kootenai County

Noxious Weed Control Department
10905 N. Ramsey Road
Hayden, ID 83835
(208) 446 -1290

Solid Waste and Hazardous Materials Transfer Stations
(208) 446-1430
www.kcgov.us/departments/solidwaste

Ramsey Transfer Station
3650 Ramsey Road
Coeur d'Alene, ID 83815

Post Falls Transfer Station
15580 W. Prairie Avenue
Post Falls, ID 83854

Community Development (Planning and Building)
451 Government Way
Coeur d'Alene, ID 83814
(208) 446-1070
www.kcgov.us/departments/planning

Idaho Native Plant Society (Calypso Chapter)
www.idahonativeplants.org

Idaho Native Plant Expert
Idaho Panhandle National Forest
(208) 765-7417
www.fs.fed.us/ipnf

University of Idaho Extension Master Gardeners and Plant Clinic
www.uidaho.edu/extension

Kootenai/Shoshone County Extension
1808 N. 3rd Street
Coeur d'Alene, ID 83814
(208) 446-1680

Benewah County Extension
701 College Avenue, Suite LL2
St. Maries, ID 83861
(208) 245-2422

Coeur d'Alene Reservation Extension
402 Anne Antelope
Plummer, ID 83851
(208) 686-1716

Idaho State Department of Agriculture Pesticide Disposal Program
(208) 332-8628
www.agri.idaho.gov

Suggested Reading

Deep-Planting Techniques to Establish Riparian Vegetation in Arid and Semi-Arid Regions
Dreesen, D.R. and G.A. Fenchel. 2010. *Native Plants Journal*. 11(1)

Forest Nursery Notes
U.S. Department of Agriculture Forest Service. USFS Reforestation, Nurseries, and Genetic Resources.
www.rngr.net/publications/fnn

Landscaping with Native Plants in the Idaho Panhandle
Kinnikinnick Native Plant Society. 2011.
www.nativeplantsociety.org/

Northern Idaho Fertilizer Guide: Northern Idaho Lawns
Mahler R.L. and V.J. Parker-Clark. 1998. University of Idaho Extension, Moscow, ID. Publication CIS 911.
www.cals.uidaho.edu/edcomm/pdf/CIS/CIS0911.pdf

The Practical Streambank Bioengineering Guide
Bentrup, G. and J.C. Hoag. 1998. U.S. Department of Agriculture Natural Resources Conservation Service. Washington, DC: USDA-NRCS.
www.plant-materials.nrcs.usda.gov/pubs/idpmcpu116.pdf

Rodale's Ultimate Encyclopedia of Organic Gardening
Bradley F.M., B.W. Ellis, and E. Phillips, eds. 2009. New York, NY: Rodale, Inc.

Weed Control in Lawns
University of Idaho Extension. 1991. Moscow, ID. Publication no. 334.
www.cals.uidaho.edu/edcomm/detail.asp?IDnum=1137

Risk Assessment Worksheet
Lawn and Garden Management

Assessment Worksheet 1 - Lawn and Garden Management

The assessment worksheet below will help you identify potential environmental risks related to 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, go to the Lawn and Garden Management Action Worksheet on page 2-11 and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section to help you decide how to best reduce pollution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Fertilizers	I test my soil for nutrients and use the recommended fertilizer rate. I do not apply fertilizer within 100 feet of any surface water.	I have not tested my soil. I am not sure how much fertilizer I need, and I apply it within 50 to 100 feet of surface water.	I have not tested my soil, and I apply fertilizer at a higher rate than the label recommendation and within 10-20 feet from the lake or its tributaries.	☐ Low ☐ Medium ☐ High
Pesticides	I do not use chemicals to control weeds, insects, or diseases. I encourage natural defenses (lady bugs and wasps) and use non-toxic solutions (pull weeds).	I employ limited use of chemicals, and mostly spot spray.	I rely on chemical control for pests.	☐ Low ☐ Medium ☐ High
Storing pesticides, fertilizers, and other chemicals	I store chemicals in waterproof containers in a secure area protected from stormwater and over 100 feet away from the lake or its tributaries.	I store chemicals in waterproof containers but not in a secured area.	I store chemicals in non-waterproof containers outdoors or within reach of stormwater.	☐ Low ☐ Medium ☐ High
Handling and disposing of pesticides, fertilizers, and other chemicals	I clean up all spills immediately and dispose excess materials through a local household hazardous waste collection event or approved landfill.	I clean up spills and dispose of wastes in my garbage.	I don't clean up spills. I dispose of chemicals by burning or dumping them at an unapproved landfill or on my property.	☐ Low ☐ Medium ☐ High
Vegetation buffer	I have planted shrubs, ground cover, and trees between the lake and the lawn and garden to reduce soil erosion and uptake excess nutrients and pesticides.	I have a natural buffer along my shoreline, but my lawn is manicured as close as possible to the lake.	I don't have any natural or planted vegetation buffer between the lake and my lawn and garden.	☐ Low ☐ Medium ☐ High

Assessment Worksheet 1 continued - Lawn and Garden Management

When finished, turn to the Lawn and Garden Management Action Worksheet on page 2-11 and record your medium and high-risk practices.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Grass clippings, leaves, and other yard waste	My grass clippings, leaves and other yard wastes are swept off paved surfaces and onto my lawn away from water flows. I compost leaves and other wastes.	I sweep my grass clippings and leaves into the street where they may be washed down the storm drain.	I rake leaves and other yard wastes into piles near the lake and burn them on site.	☐ Low ☐ Medium ☐ High
Bare soil, gardens, and landscaping projects **Proximity to surface water**	I seed areas of bare soil and top them with a layer of mulch or straw. I use sediment retention barriers (straw wattles, silt fence) on steeper slopes until I can get grass established. >200 feet to surface water.	I leave soil bare during construction projects, but natural features slow and treat most runoff. <200 feet to surface water.	My soil is left bare. No natural features or sediment retention barriers slow runoff. <100 feet to surface water.	☐ Low ☐ Medium ☐ High
Lawn type and maintenance	My turfgrass is located at least 100 feet from surface water.	My turfgrass is located 25 feet from surface water.	My turfgrass grows right up to the shoreline, and I regularly use fertilizer and chemical pest control.	☐ Low ☐ Medium ☐ High
Irrigation management	I water in the morning or evening. I use plants that are suitable to the climate and that do not need extra water.	I don't measure my watering.	I water heavily, and water runoff is excessive. I do not time watering according to pesticide and fertilizer applications.	☐ Low ☐ Medium ☐ High
Composting	Debris from my property is composted at least 100 feet from surface water.	I do not compost, but I do burn debris at least 100 feet from surface water.	My compost pile is located <50 feet from surface water. I put pet waste on my compost pile.	☐ Low ☐ Medium ☐ High

Action Worksheet
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 UI Extension for information on soil testing to determine application rate.	One week from today.

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SECTION 3
SAFE DRINKING WATER

This fact sheet addresses the importance of protecting your drinking water sources from contamination and how *you* can make a difference with ***Best Management Practices*** *(BMPs)*. BMPs are actions you can take to protect our natural resources. **The ultimate goal of this information is to prevent drinking water contamination.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheets (p. 3-8) in order to analyze your property's specific needs.
3. Fill out the action worksheet (p. 3-11), then **take action!**

Is Your Drinking Water Safe?

Most people take a safe drinking water supply for granted. We assume the water coming out of the faucet is safe. Unfortunately, this assumption is not always correct. Households located near surface water should have their private water supply tested regularly to confirm it is safe to drink. If your water is treated by a municipal water treatment plant, it is still important to protect surface and groundwater to prevent the risk of contamination.

The most obvious concern with an unsafe drinking water supply is the health risk to your family and guests. Contamination from ***wastewater***, a septic system, or an outhouse is a potential source of bacteria, viruses, and parasites that can cause gastrointestinal problems or transmit contagious diseases. Wastewater also contains high levels of ***nitrate*** that can present a serious health risk to infants.

Drinking water wells should be tested annually, especially if you own an infrequently-used vacation home or draw from shallow groundwater. Additionally, many vacation dwellings use surface water for the household water supply. Surface water presents a different set of risks; information on safety considerations and testing for surface water is available from the Panhandle Health District (PHD) or Idaho Department of Environmental Quality (IDEQ).

Property and resale values are other reasons to make sure your water supply is clean. During property transfers, most lenders will not provide financing for the purchase of property without a well test that meets the U.S. Environmental Protection Agency's Primary Drinking Water Standards for several contaminants.

Drinking Water Sources

Public water systems are community systems that have at least 15 service connections or regularly serve an average of 25 individuals for at least 60 days per year. These public systems are regulated by IDEQ following the "Idaho Rules for Public Drinking Water Systems" (***IDAPA*** 58.01.08) established through the federal Safe Drinking Water Act. Public systems are governed by a community board of directors and have a licensed system operator. Typically, water is from drilled wells, but sometimes the drinking source is from surface water. Testing for contaminants is done on a regular basis and includes a wide array of compounds.

Non-community public water systems are regulated by PHD with required water testing and include facilities such as restaurants, motels, schools, and office buildings.

Non-public (private) water systems serve fewer than 25 people and have fewer than 15 service connections. Water is typically from drilled wells. Private systems do not have a regulating agency and do not rely on a water provider to ensure that water is safe to drink. Ensuring a safe private water supply is the responsibility of the individual home owner or the owners of a small cluster of homes serviced by the well.

Surface water is extracted from the lake or streams into individual homes and cabins. This water is not recommended for drinking unless treated.

Protect Your Drinking Water

If your home is served by a source other than a public water system, either by an individual well or extraction from surface waters, then **it is your responsibility to provide a safe drinking water supply**.

Surface Water

IDEQ does not recommend using surface water as a drinking water supply unless it is treated, but a significant number of homes and cabins do extract water from the lake or nearby streams for household use. Besides bacteria, surface waters can also contain single-cell protozoa, Giardia and Cryptosporidium, whose cysts are intestinal parasites and are considered a waterborne disease. The cysts reside in the digestive tract of mammals and are transmitted through the fecal-water-oral route. Ingestion of the cysts by humans can lead to severe intestinal disorders.

Use of surface water for drinking should go through a two-step treatment process. The water should be filtered to 1 micrometer (µm or micron) to remove most of Giardia and Cryptosporidium cysts. Water should then be disinfected to kill bacteria and viruses. Water can be disinfected by boiling, using chlorine, or with ultra-violet light. Contact PHD or IDEQ for more information on using surface water for drinking (see Resource Directory, p. 3-7).

If surface water is left untreated, Giardia protozoa may contaminate a water supply.

New Wells

New wells are good investments for the future. Getting the most from such an investment means locating the well away from contamination sources and working to maintain the quality of the well. Simple BMPs include the following:

- Use a licensed well contractor for installing new wells or sealing unused wells.
- Prior to drilling, make sure groundwater is not already contaminated.
- When planning development on your lot, leave enough room for future expansion to avoid crowding the well. Let your well contractor know your future plans.
- Follow at least the required minimum distances from potential contamination sources that are set by PHD and local ordinances when locating your new well (Figure 3-1).

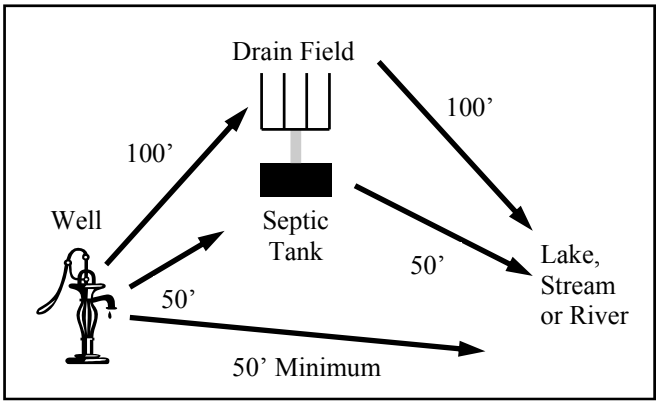

Figure 3-1. *Panhandle Health District minimum separation distance requirements between drinking water wells and possible sources of contamination.*

Well Location

Whether a well taps water just below the ground surface or hundreds of feet deep, its location at the ground surface is a crucial safety factor. A well down-slope from a leaking fuel tank or a failing septic system runs a greater risk of contamination than a well on the uphill side of these pollution sources. **The general rule for protecting the water supply is to keep a well up-slope and far from potential sources of contamination.** When determining the proper well location, consider soil type, slope, surface drainage, groundwater flow, and potential contaminants. PHD, IDEQ, and the Idaho Department of Water Resources (IDWR) are all available to assist you with proper well location.

Separation Distances

IDWR "Well Construction Standard Rules" (IDAPA 37.03.09) require that constructed wells must meet all site and distance requirements set forth by PHD and IDEQ. IDAPA 37.03.09 requires a minimum distance of 100 feet from a septic drainfield to a well (Figure 3-1). This separation distance allows for natural protection provided by the soil. Soil type will ultimately determine a safe distance. For more information contact PHD (see Resource Directory, p. 3-7).

Any condition likely to cause groundwater contamination should be improved, even if your well is far away from the potential source. Whether or not drinking water is affected, groundwater and surface water contamination is a violation of Idaho law. Consider all possible contamination sources on adjacent property.

No specific distance will guarantee that the well will not be affected. Keep in mind that separation distances listed by the state are minimums. You may want to choose greater separation distances, depending on factors at your well site.

Well Construction and Safety

Proper well design reduces the risk of contamination by sealing the well from anything that might enter it from the surface (Figure 3-2). Poor design can allow a well to become contaminated by letting rain or snowmelt reach groundwater without filtering through the soil. All surface runoff should be diverted away from the well (Figure 3-3). Wells located in pits, or constructed without grout or a sanitary well seal, can allow surface water to carry bacteria, pesticides, fertilizer, or petroleum into your drinking water supply.

Casing Safety

The well driller installs a steel pipe (casing) during construction to prevent collapse of the borehole. All openings in the casing should be sealed, and if water pipes exit through the side of the casing, they must do so through an approved fitting called a ***pitless adapter.***

The space between the casing and the sides of the borehole provides a direct channel for surface water and contaminants to reach groundwater. To seal off that channel, the driller fills the space with grout (cement or a type of clay called bentonite). The grout seal should extend a minimum depth of 18 feet from the ground's surface, and possibly deeper, depending on your local hydrogeology. The ground surface needs to slope away from the well in all directions to ensure that surface water will flow away from the well (Figure 3-3).

Inspect the condition of the well casing for holes or cracks at the surface, or look down inside the casing with a light or mirror. If the casing can be moved by pushing against it, you have a problem with your well casing's ability to keep out contaminants.

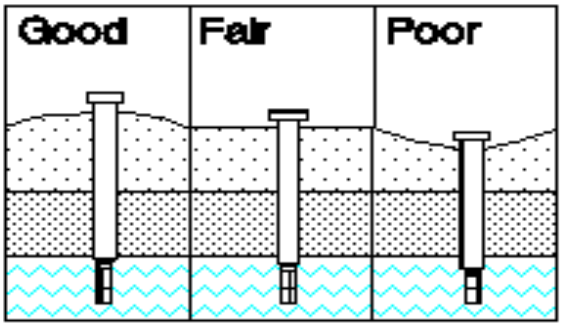

Figure 3-3. *Comparison of well placements at ground surface. With proper placement, ground surface will slope away from well.*

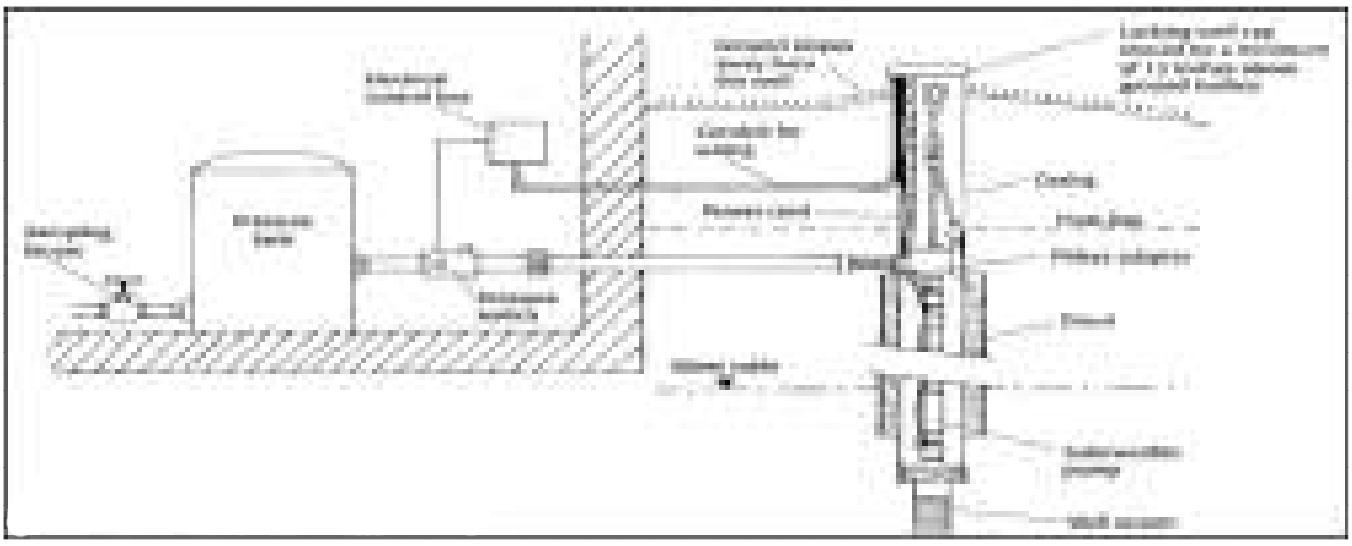

Figure 3-2. *A properly constructed well.*

Check the condition of the well casing by listening for water draining down into the well (pump should not be running). If you hear water, either the casing has a crack or hole, or the casing does not extend down to the water level in the well. Both situations could put your drinking water safety at risk.

To prevent contaminants from getting down inside the well casing, the driller installs a tight fitting, vermin-proof well cap to prevent easy removal by children or entry of insects or surface water. Well regulations require a vermin-proof seal for all private wells (not all wells have caps; some may have pumping equipment attached at the surface). The cap should be firmly installed, with a screened vent incorporated into it so that air can enter the well. If your well has a vent, be sure that it faces the ground, is tightly connected to the well cap, and is properly screened to keep insects out. Check the well cap to see that it's in place and tightly secured. Electrical wires entering the well should be in an approved conduit.

Idaho wells are required to have a durable, watertight casing that extends to a minimum depth based on local hydrogeology and in compliance with IDAPA 37.03.09. This ensures that water is filtered through soil and geologic materials before entering the well. Since most contamination comes from the surface, grouting and casing the well deeper can provide greater protection. The casing should exceed the minimum casing depth.

IDAPA 37.03.09 requires that at least 12 inches of casing pipe extend above the final grade of the land to prevent surface water from running down the casing, or through the seal and into the well. Siting a well in an area subject to flooding is strongly discouraged. Check with IDWR for regulations concerning casing construction and minimum specifications (see Resource Directory, p. 3-7).

Well Age

If you have an older well, have it inspected by a licensed well driller. Older well pumps are more likely to leak lubricating oils, which can contaminate the groundwater. Well construction information may be available from the previous owner or the well construction report (well log). IDWR has copies of well logs on file and online.

Additionally, older wells are more likely to have a thinner casing that has corroded through. Even wells that are 30-40 years old with modern casings are subject to corrosion.

Backflow Prevention and Cross Connections

Anti-backflow devices should be placed on all faucets with hose connections (Figure 3-4). Air gaps should be maintained between hoses or faucets and the water level during all activities. Otherwise, contaminated water from laundry tubs, sinks, washing machines, pressure washers, outside hydrants, livestock tanks, and hot tubs can flow back through the plumbing contaminating your water supply. Water supplies with cross-connections (connections between two otherwise separate pipe systems, such as potable and non-potable) also put your drinking water at risk.

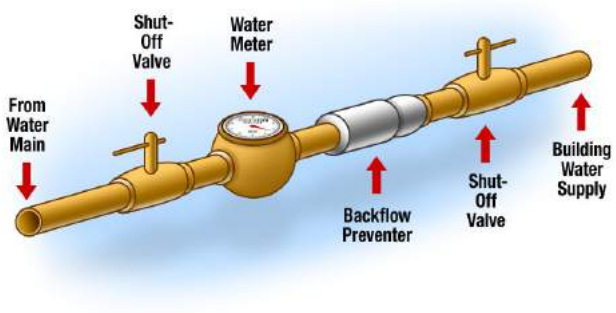

Figure 3-4. *Schematic drawing of a typical backflow prevention device.*

Home Water-Treatment Systems

If you are a waterfront homeowner responsible for the safety of your drinking water, use caution when choosing from the multitude of available home water-treatment systems. Two of the most common home water treatment systems are granular activated carbon and membrane filtration. Make sure any treatment unit is certified by the National Sanitation Foundation (NSF). Home systems can be expensive, and you may be sold a system that treats water for compounds that are not a concern in your watershed. Conversely, your system may not treat a compound that may be of specific concern. If you are drinking surface water, make sure your system is NSF-certified for cyst reduction. For specific concerns in your area, contact PHD or IDEQ (see Resource Directory, p. 3-7).

Well Maintenance

You wouldn't let a car or tractor run too long without an oil change, and likewise, your well deserves the same attention. Good maintenance means testing the water every year, keeping the well area clean and accessible, keeping potential contaminants as far away as possible, and annually having a qualified well driller check the well mechanics.

- Locate your well on ground higher than contamination sources, such as fuel tanks, livestock lots, septic systems, and pesticide mixing areas.
- Establish a *well protection zone*. Keep hazardous wastes such as paints, fertilizers, pesticides, oil and gasoline far away from your well. Keep livestock operations at least 50 feet from your well.
- Build soil up around well so that all surface water drains away.
- Avoid areas that are prone to flooding.
- Avoid diverting surface drainage to well areas where it may seep into your drinking water.
- Make the well accessible for pump repair, cleaning, testing, and inspections.
- Disinfect the well and plumbing system following maintenance on the well or pump and after appliances or plumbing fixtures are repaired or replaced.
- Maintain septic systems properly, and pump septic tanks regularly (see Section 4, Household Wastewater Treatment).
- Immediately replace or repair wells in which the casing is no longer watertight because of damage or corrosion.
- If you have an older well, have it inspected by a licensed well driller. Older wells are more likely to leak lubricating oils and become corroded.
- Keep your well records in a safe place.
- Test the water annually for nitrate and ***coliform*** bacteria.
- Test your water anytime a change in taste, odor, or color is noticed. For assistance contact PHD or IDEQ (see Resource Directory, p. 3-7).

Unused Wells

Many rural homesteads have unused wells. It is not uncommon to visit a homestead and find three or four wells, with only one or two currently in use. No one knows how many of these wells are in Idaho, although estimates are in the thousands.

If not properly filled and sealed, these wells can provide a direct conduit for surface water carrying contaminants to enter groundwater without filtering through soil, or they can allow contaminant movement from one aquifer to another. In addition to these wells being a threat to groundwater, large open wells pose safety hazards for people and animals. The landowner, under IDAPA 37.03.09, is responsible for properly abandoning wells and test holes.

Locating Unused Wells

Old well locations may not be obvious. Pipes sticking out of the ground around the homestead or under an old windmill are the most common places for finding unused wells. A depression in the ground may indicate an old well. Also, wells were often drilled in basements of houses, under front steps, or near old cisterns.

Proper Well Abandonment

IDWR administers the laws regulating well abandonment (see Resource Directory, p. 3-7). Well drillers and landowners are required to follow these laws so that the potential for aquifer contamination can be reduced. Knowledge of the geology of the well site and special equipment is often required to remove old pumps and piping and to properly install sealing material inside the well. Use of inappropriate materials and methods can lead to well settling, collapse, and continued groundwater contamination. Costs for well abandonment will vary with the well depth, diameter, and area geology.

You may perform proper well abandonment work on your own land, or an Idaho-licensed well driller can also be hired to close these wells. Regardless of who does the work, the minimum regulatory requirements must be met. Local well drillers can be helpful given their experience with well construction materials, and typically they have a working knowledge of the geology of the well site.

Water Testing

Keep an eye on ***water quality*** in existing wells by testing them annually. Wells should be tested immediately after construction and then at least once annually for nitrate and coliform bacteria. Well testing is particularly important for shallow wells, dug wells, sand-point wells, and wells that have shown contamination.

The water should also be tested:

- Before using a well that has not been used for a long time.
- When family or guests experience recurring or unexplained stomach illness.
- If there are individuals who may be at increased risk like infants and pregnant or nursing women.
- If your neighbors find a particular contaminant in their water.
- If you note a change in water taste, odor, color, or clarity.
- If you have a spill or back siphon of chemicals or petroleum products near your well or on your homestead.
- When there has been a significant change in land use in the area.
- If the presence of an old landfill has been discovered nearby.

What Do I Test For?

A good initial set of tests for a private well includes hardness, pH, conductivity, corrosivity, chloride, nitrate, coliform bacteria, and sometimes lead, arsenic, zinc, copper, and other metal contaminants.

Nitrate occurs naturally in many watersheds. Nitrate levels above the federal drinking water limit of 10 milligrams per liter (mg/L or parts per million) should not be consumed by infants under one year of age or pregnant women. High nitrate in groundwater often stems from agricultural activities such as fertilizing and manure from animal feed lots.

Lead in drinking water can be a health concern particularly for children and pregnant women. The lead level should not exceed 15 micrograms per liter (µg/L or parts per billion). Sample for lead if you have lead pipes or copper joints with lead solder, or if you draw from surface water. Soft or acidic water can accelerate lead leaching from the plumbing system.

Annually test for total coliform bacteria, which is the standard bacteriological test conducted on drinking water supplies. Total coliform bacteria are a group of closely related bacteria genera, where some species are found in fecal matter, and some species are found in soil and plant material. The presence of total coliforms is an indicator of system vulnerability. If your drinking water sample shows the presence of total coliforms, many laboratories will automatically test for the presence of fecal coliforms. Presence of fecal coliforms indicates fecal contamination of the water source, either through an animal source or from septic systems. **If fecal coliforms are present, the water does not meet drinking water standards**. Certain bacteria and viruses from fecal sources are pathogens that, when ingested, can cause intestinal disorders and diseases (e.g., hepatitis). A short-term fix for coliform contamination is boiling water; a long-term solution is disinfecting the supply (chlorination or ultraviolet light).

Laboratory tests for other possible contaminants can be expensive so you will probably not have them done unless you suspect a specific problem. For example, you may want to test for volatile organic chemicals (VOCs) if a nearby spill or deposit of oil, petroleum, or solvent has occurred.

A high concentration of iron in groundwater will cause stained porcelain and may be unpleasant to taste, but it is not harmful.

Follow the laboratory's instructions for water sampling to ensure accurate results. Use only the container provided, and return the samples promptly. Bacteria sample bottles are sterile and must be returned to the lab within a short, specified time limit. Request that drinking water methods be used to test your water. Contact PHD or IDEQ for assistance in interpreting test results (see Resource Directory, p. 3-7).

If your property is within the Institutional Controls Program (ICP) Boundary, it may be under the Basin Property Remediation Program. IDEQ contractors can sample private well water at the tap for lead and arsenic. Refer to the ICP boundary website to see if you qualify, or contact the IDEQ office in Kellogg at (208) 783-5781 (also see Section 11, Heavy Metals).

Call PHD or IDEQ
to learn more about having your drinking water tested
(see Resource Directory page 3-7)

Resource Directory
Safe Drinking Water

Panhandle Health District 1 (PHD)

Kootenai County, Environmental Health
8500 N. Atlas Road
Hayden, ID 83825
(208) 415-5200

Kellogg Office
114 W. Riverside Avenue
Kellogg, ID 83837
(208) 783-0707

Institutional Controls Program (ICP)
114 Riverside Avenue
Kellogg, ID 83837
(208) 0707
www.phd1.idaho.gov/institutional/institutionalindex.cfm

Idaho Department of Environmental Quality (IDEQ)

Coeur d'Alene Regional Office, Drinking Water
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Kellogg Superfund Office
1005 W. McKinley Avenue
Kellogg, ID 83837
(208) 783-5781

Idaho Department of Water Resources (IDWR)
Coeur d'Alene Regional Office
7600 N. Mineral Drive, Suite 100
Coeur d'Alene, ID 83815
(208) 762-2800

Other Resources

Well Construction Standards Rules
IDAPA 37.03.09
http://adminrules.idaho.gov/rules/current/37/0309.pdf

U.S. Environmental Protection Agency (USEPA)
www.epa.gov/safewater/

Risk Assessment Worksheets
Safe Drinking Water

Assessment Worksheet 1 - Drinking Water Well Location

The assessment worksheet below will help you identify potential environmental risks related to your drinking water. 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 Safe Drinking Water Action Worksheet on page 3-11 and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section to help you decide how to best reduce your risks.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Position of well in relation to contamination sources	My well is upslope from all potential pollutant sources. No surface water runoff reaches the well. I divert surface water from the well area.	My well is level with, or downhill from, potential pollution sources. Some surface water runoff may reach the well.	My well is downhill from pollution sources or in a depression. Surface water runoff reaches the well.	☐ Low ☐ Medium ☐ High
Separation distances between well and pollution sources (suggested minimum separation distance is 100 feet)	Distances from potential pollution sources for my well meet or exceed all minimum requirements.	Some but not all distances from potential pollution sources for my well meet minimum requirements.	Distances from most or all potential pollution sources for my well do not meet minimum requirements.	☐ Low ☐ Medium ☐ High
Soil type	My soil type is primarily Class C soil, which is fine-textured, like clay loams or silty clay.	My soil type is primarily Class B soil, which is medium-textured, like silt or loam.	My soil type is primarily Class A soil, and is coarse-textured, like sand, sandy loam, or gravel.	☐ Low ☐ Medium ☐ High

Assessment Worksheet 2 - Well Construction and Maintenance

Use the worksheet below to rate your risks related to well construction and maintenance.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Well age	My well was constructed since Idaho well guidelines were enacted in 1987. I have it inspected annually.	My well is about 20 years old and is inspected every 2 or 3 years.	My well was installed over 50 years ago, and I don't remember the last time it was inspected.	☐ Low ☐ Medium ☐ High
Casing height above land surface	The casing extends 12 or more inches above the surface. If the area floods, the casing is above flood levels.	The casing is at the surface or up to 12 inches above the surface.	My well has no casing present. My well is hand-dug. The pump is at or below ground surface.	☐ Low ☐ Medium ☐ High
Condition of casing and well cap	No holes or cracks are visible. The cap is tightly attached. A screened vent faces the ground. There is no space around the pitless adapter.	My casing is showing visible stress fractures. The cap is loose, and no screen is present.	My casing has visible holes or cracks. The cap is loose or missing. I can hear or see running water. Sunken ground around the casing is evident.	☐ Low ☐ Medium ☐ High
Casing depth and surface seal (see well log for this information)	The casing extends below water level in well and is more than 18 feet below surface. At least 18 feet of surface seal is in place, or into the confining layer above the aquifer in which the well is completed.	My surface seal is less than required depth.	There is no surface seal.	☐ Low ☐ Medium ☐ High
Backflow protection	I have installed anti-backflow devices (such as check valves). There are no cross-connections between water supplies.		I have no anti-backflow devices. An air gap is not maintained. There are cross-connections between water supplies.	☐ Low ☐ Medium ☐ High
Water testing	My water is tested annually, and records indicate consistent, satisfactory water quality. Bacteria, nitrate, and other tests meet standards.	I test my water regularly. Bacteria, nitrate, and other tests do not meet standards some of the time, but I monitor them closely.	I do not have my water tested. Water taste, clarity, and smell change throughout the seasons.	☐ Low ☐ Medium ☐ High
Unused wells	There are no unused wells on my property, or there are unused wells that are properly sealed.	There are old wells on my property, but they are maintained to keep out contaminants.	There are unused, unsealed wells on my property, near the lake or drinking water well.	☐ Low ☐ Medium ☐ High

Assessment Worksheet 3 - Drinking Water Source and Conveyance System

Use the worksheet below to rate your risks related to drinking water sources from the lake and its tributaries. *IDEQ does not recommend drinking from lakes or any other surface water source without an approved treatment process.*

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Drinking water source	My water comes from a deep groundwater source (over 20 feet deep), with a properly constructed drilled well.	My water comes from shallow groundwater source (under 20 feet) and a hand-dug or driven-point well.	My water comes from the lake or another surface water source (streams, creeks, ponds). My pump and pipe extend into the water.	☐ Low ☐ Medium ☐ High
Separation distances from surface water to pollution sources (suggested minimum separation distance is 100 feet)	The distance of my water source from potential pollution sources meets or exceeds all minimum requirements.	There are some potential pollution sources for my surface water drinking source that do not meet minimum separation requirements.	The distances from most or all potential pollution sources to my drinking water source do not meet state minimum requirements.	☐ Low ☐ Medium ☐ High
Home water-treatment system for surface water	I use a two-step treatment system. My water is fine-filtered through a membrane filter certified by the NSF for Giardia and Cryptosporidium cysts. My water is disinfected by boiling, using chlorine, or by ultraviolet light.	I use a granular-activated carbon filter (generally a good filter, but water should be disinfected).	I have no treatment, system, or I use a screen wrapped around the end of the pipe.	☐ Low ☐ Medium ☐ High
Water testing	I test my water annually. My records indicate consistent, satisfactory water quality. Bacteria, nitrate, and other tests meet standards.	I have tested my water once in the last 5 years. Bacteria, nitrate, and other tests do not meet standards some of the time, but I am monitoring it closely.	I do not have my water tested. My water's taste, clarity, and smell change throughout the seasons.	☐ Low ☐ Medium ☐ High

Action Worksheet
Safe Drinking Water

Write all high and medium risks below.	What can you do to reduce the risks?	Set a target date for action.
Sample: Water hasn't been tested for 5 years. Does not taste like it used to.	Contact IDEQ or PHD for information on water testing.	One week from today.

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SECTION 4
HOUSEHOLD WASTEWATER TREATMENT

This fact sheet addresses the impacts household wastewater treatment can have on water quality and how *you* can make a difference with ***Best Management Practices*** *(BMPs)*. BMPs are actions you can take to protect our natural resources. **The ultimate goal of this information is to prevent water contamination from household wastewater.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheets (p. 4-9) in order to analyze your individual situation.
3. Fill out the action worksheet (p. 4-12), then **take action!**

Introduction to Septic Systems

On-site ***wastewater*** treatment systems, commonly known as septic systems, treat sewage and wastewater from your household including showers, baths, sinks, and washing machines. All sewage and wastewater should flow into your septic tank, as they may contain diseases which can become human or environmental health concerns.

Conventional septic systems are the most common form of on-site wastewater treatment and, where soil conditions are suitable, the most desirable on-site system to use. Since the septic tank and drainfield are completely covered with soil, the system is not visible and odor is nonexistent as long as wastewater does not surface.

A septic system has two parts: the sewage tank and the soil treatment system (absorption/drainfield) (Figure 4-1). The most common sewage tank type is a septic tank that receives raw sewage from the household. Three layers form in the tank: solids settle to the bottom, and a layer of scum or grease floats on the surface of a liquid layer (Figure 4-2). As raw sewage is added to the tank, an equal amount of liquid flows out into the soil treatment system. Anaerobic bacteria within the tank begin breaking down raw sewage. The primary treatment of wastewater occurs in the soil, beneath the drainfield absorption area. This area is usually a series of trenches (laterals), each containing a distribution pipe embedded in drainfield gravel or rock. The effluent flows out through holes in the pipe, then down through the drainfield gravel or rock, and into the soil. The soil filters out remaining solids and pathogens (disease-producing microorganisms), and dissolved substances degrade as the wastewater slowly percolates through the soil to groundwater. These biological processes only work in soil that is not saturated with water.

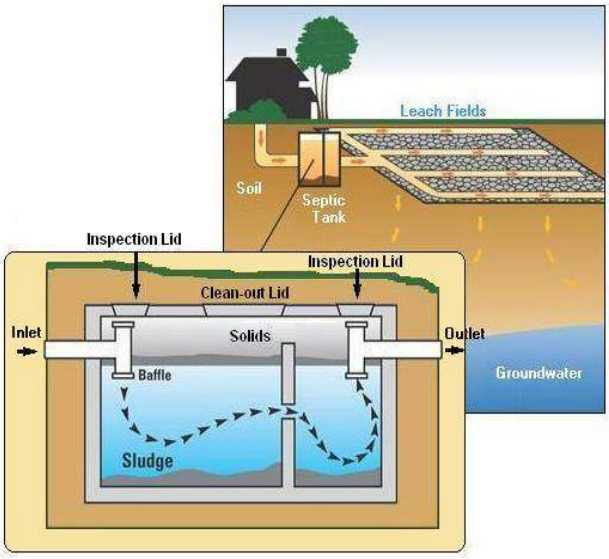


Figure 4-1. *Typical on-site household wastewater treatment and disposal system.*

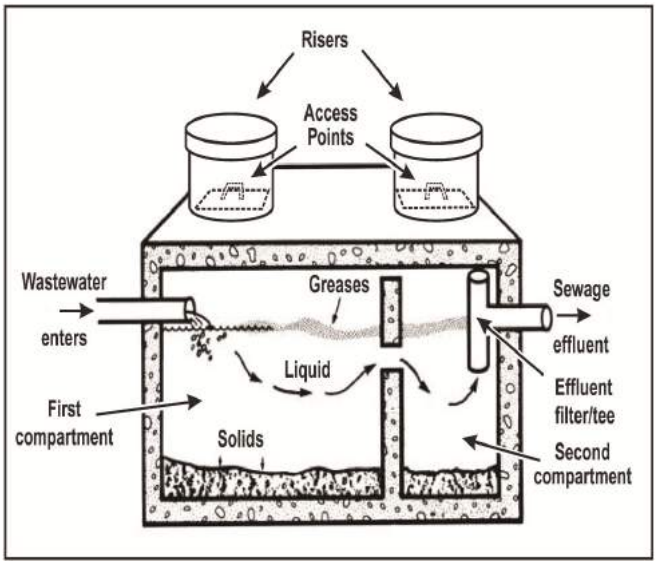


Figure 4-2. *Conventional septic tank.*

A special zone, called the biomat, forms in the upper 1 to 6 inches of the soil below the trench. This biomat zone is an important piece of the system that helps remove many of the germs and chemical pollutants. If too many solids accumulate in the septic tank, they can flow into the trenches and create a biomat that becomes too thick (Figure 4-3). When this happens, the biomat completely clogs the soil and does not allow the sewage effluent to flow out of the trench.

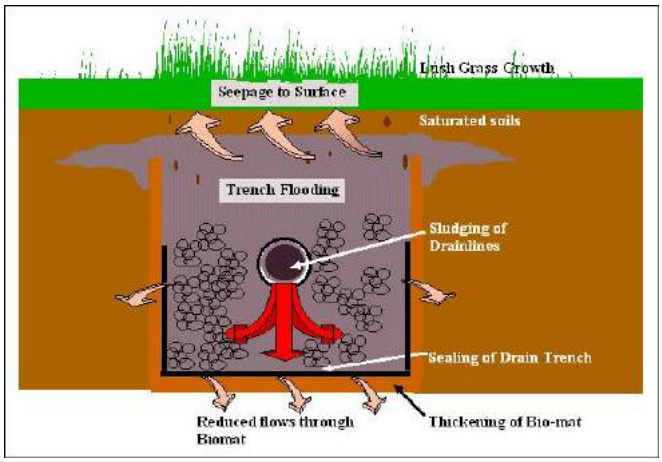


Figure 4-3. *Biomat thickening.*

Alternative Treatment Systems

Many types of wastewater treatment systems are available. A licensed Environmental Health Specialist (EHS) from Panhandle Health District (PHD) must evaluate the site to determine the system that is best suited to your site and needs. If PHD determines your property is suitable for an alternative treatment system, consider these options:

A **capping fill trench** is a standard drainfield trench constructed so that its bottom is between 3 inches and 2 feet into the natural soil. A selected fill material caps the trench to provide cover.

A **gravelless trench system** is a standard trench design except that the drain rock is replaced by either a large diameter, nylon fabric-wrapped plastic pipe or a plastic-domed chamber. Gravelless-domed chamber systems are awarded a 25% reduction in size if arranged in trenches.

Sand mounds are elevated pressure beds built with a mound of medium sand that treats effluent before percolating through the soil. **Specific soil requirements must be approved before these systems are used.** Contact PHD for more information (see Resource Directory, p. 4-7). Never install these systems in flood ways, areas with large trees and boulders, or in concave slopes, slope bases, or depressions.

Wastewater Treatment Systems within the Coeur d'Alene Lake Basin

- **Community Wastewater Treatment Plants (WWTP):** Either the entire wastewater stream from a household (including raw sewage), or just the effluent from septic tanks, is piped to a WWTP. Effluent from a WWTP may be discharged to a stream or river in which case a permit from the U.S. Environmental Protection Agency (EPA) is required. You may get a monthly or annual bill for this service.
- **Community Sewage Lagoons:** Typically, effluent from septic tanks is pumped (or gravity fed) to constructed lagoons for storage and treatment. Sometimes raw sewage is pumped to the lagoons. During the period from April to September, some systems apply lagoon water by sprinklers to land with crops for nutrient (nitrogen and phosphorus) uptake. Lagoon systems are regulated by the Idaho Department of Environmental Quality (IDEQ) and require an IDEQ permit.
- **Large Soil Absorption Systems (LSAS):** These are community systems where effluent from septic tanks is fed to an underground absorption/ drainfield system. A system is designated as LSAS when it receives more than 2,500 gallons per day (gpd) of wastewater (10 or more homes connected). These systems require a PHD permit with IDEQ engineering review. There are system requirements for maintenance, reporting, and alternating or reserve drainfields.
- **Community Drainfield Systems:** These typically service 3 to 9 homes with effluent flow less than 2,500 gallons per day (gpd). These systems require a PHD permit.
- **Individual On-Site Wastewater Treatment:** These systems are typically a septic tank with tank effluent going to an underground absorption/ drainfield system. Since the mid-1970s, these systems have required a PHD permit with soil percolation tests and specified separation distances to groundwater, surface water, and drinking water wells (Figure 4-5 on page 4-4). Prior to the mid-1970s, a PHD permit was not required, and older homes have been found to have drainfields very close to surface waters with minimal opportunity for soil treatment of the wastewater.

Why Worry About Wastewater?

If your home is near the waterfront, it is particularly important to have a properly functioning septic system. Surface water contaminated with septic waste is extremely hazardous to human health, wildlife, and our natural resources. Many septic systems are either old, unmaintained, or located too close to lakes, rivers, and streams.

Waste water contaminants include the following**:**

- **Bacteria and viruses** can cause disease in humans. These microorganisms are usually removed by settling or through treatment/filtration in the soil. Many die from aging or the adverse conditions in the soil absorption system.
- **Suspended solids** are composed of particles that are more dense (sludge) or less dense (scum) than water. Most can be separated from liquid waste by allowing enough time in a relatively calm septic tank. Grease and fats are also considered suspended solids. Soil absorption fields can be quickly clogged by wastewater high in suspended solids.
- **Organic chemicals** include cleaning solvents, paints, pesticides, and fuels that usually are not degraded or removed through treatment and can pass along with the wastewater into the water supply.
- **Inorganic chemicals** include lead from corroded piping, pesticides (herbicides, insecticides, fungicides, and rodenticides), and preservatives. These chemicals may seriously compromise your on-site treatment system. Household on-site systems are generally designed to degrade only biological contaminants. Inorganic chemicals introduced into your on-site system may harm the microorganisms that break down household wastes.
- ***Nutrients*****,** such as ***Nitrogen*** from human wastes, and ***phosphorus*** from detergents and some chemical water conditioners are notable contaminants. ***Nitrate***-nitrogen is a common ground-water contaminant. Phosphorous can also contaminate surface water.

Failed septic system on a playground.

Health and Environmental Risks

Bacteria, viruses, and parasites in wastewater may spread hepatitis, dysentery, and other diseases. These disease-causing organisms, called pathogens, may make nearshore water unsafe for recreation. Flies and mosquitoes that are attracted to and breed in wet areas where wastewater reaches the surface may also spread disease.

High nitrate levels in groundwater, which is where our drinking water comes from, can result from inadequately treated wastewater. Excessive nitrate levels in drinking water can result in serious health problems for infants.

Synthetic cleaning products or other chemicals used around the house, which end up in the septic system, can be toxic to humans, pets, and wildlife.

Inadequate treatment can also allow excess nutrients to reach your lake or stream, promoting algae or weed growth. Algal blooms and abundant aquatic plants make the lake unpleasant for swimming and boating, and they also affect water quality for fish and wildlife habitat. As plants die, settle to the bottom, and decompose, they use up oxygen that fish need to survive.

A properly designed, constructed, and maintained system can effectively treat wastewater for many years. The following BMPs will help you prevent water contamination.

Installing a Septic System

Idaho has standards for septic systems. Before purchasing undeveloped property, evaluate whether it is septic-compatible. You don't want to be the unlucky person who invests in land only to find out the property cannot sustain a septic system. Call PHD for a site evaluation.

Once it has been determined that your property can sustain a septic system, you will need to identify the best possible location. Determining locations for septic and water wells should always be done before designing buildings or compacting soil. **Systems must be installed to meet all local codes and setbacks.** If the system fails to meet legal requirements, it may need to be replaced. Moreover, if your system is improperly located, designed, or constructed, contaminants may reach your well or surface water.

An individual soil absorption system is required to be at least 100 feet from any water supply, 20 feet from the foundation of the house, and 5 feet from property lines (Figures 4-4 and 4-5). However, separation distances of greater than 200 feet to water supplies are highly recommended because they provide greater protection to your drinking water supply.

Soil absorption systems are not suitable on some sites because of slow soil permeability, shallow depth to restrictive soil layer or bedrock, shallow water table depth, or other factors. Deep, well-drained, well-developed, medium-textured soils (such as silt loam and loam) are more desirable for soil absorption systems. Coarse, sandy soils allow effluent to flow too quickly downward to groundwater and do not provide adequate time for solids and pathogens to filter from the liquid. Unsaturated soils allow air movement, which helps keep the soil profile aerobic (oxygenated).

New Construction and Additions

When remodeling your home or cabin, expand the capability of your septic system to meet the new demands that will be placed on it. Preserve enough undeveloped space on your property for future expansion or replacement of the septic system. This expansion area must be left undeveloped.

Septic tank size is based on the number of bedrooms in the house. For one- to four-bedroom homes, the minimum septic tank size is 1,000 gallons. Each additional bedroom requires 250 gallons in additional volume. Appropriately-sized tanks have enough space for sludge to accumulate for an average of three years without needing solids removal.

PHD will identify the following site conditions:

- Depth to the highest known groundwater table or to bedrock
- Soil types and conditions
- Slope
- Setback requirements from wells, surface water, buildings, and property lines
- Septic system compatibility

	Building Sewer (feet)	Septic Tank (feet)	Drainfield or Absorption Bed (feet)
Well or suction line	Public: 100 Private: 50	Public: 100 Private: 50	100
Water pressure line	10	Public: 25 Private: 10	25
Water body	—	50	100-300
Dwelling foundation	—	5	Basement: 20 Slab or crawl -space: 10
Property line	—	5	5

Figure 4-4. *Minimum horizontal separation distances (measured in feet). *Distance measured to high water mark. Exact distance depends on soil type.*

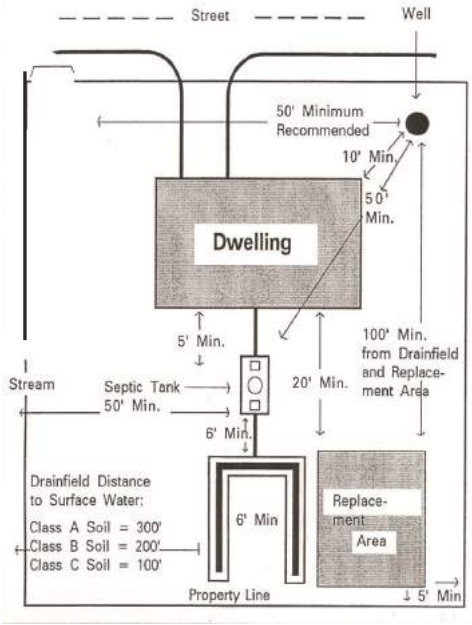


Figure 4-5. *Sample plot plan.*

Maintaining Septic Systems

For an on-site system to function over a long period of time, it needs to be properly designed, installed, and maintained. When all site-specific criteria have been met, the system will minimally impact surface or groundwater.

- Be cautious about adding chemical or biological additives to your system. Most researchers think additives provide little or no benefit. Remember that no additive can fix a system that has failed due to neglect and overloading.
- Have your septic system inspected annually to measure sludge and scum levels.
- Pump septic tanks every three to five years or whenever recommended by the licensed professional during annual inspections. Garbage disposal use, tank size, number of days the septic system is used, and the number of people using it will greatly affect when your tank needs to be pumped (Figure 4-6).
- Keep a grass cover over the absorption field, which will help use some of the nutrients available and aid in evapotranspiration.
- Never plant a vegetable garden over an absorption field. Microbes from the effluent may travel through the soil and contaminate the crop, especially root crops.
- Do not allow trees to grow over the system. Roots from the trees can cause damage to lines, as well as plug them.
- Safety around septic tanks should not be overlooked. The space within a septic system contains gases that are toxic when inhaled. Never go into or lean into a septic tank. Fatalities can occur from unsafe acts during septic tank maintenance and repair.
- Do not drive over an absorption field. Compaction from vehicles or equipment will cause settling, shifting, or breakage of lateral lines. This damage can lead to wastewater surfacing and create a health hazard.

When Do I Pump the Tank?

Pump the tank before it reaches 40% full of scum and sludge. When the tank is filled beyond this point, sewage has less time to settle and solids can pass through to the absorption field causing premature failure. Septic system maintenance needs to be done by a licensed professional who can determine if the tank needs to be pumped.

When the tank is pumped, have all components of the system checked: the baffles, potential tank leaks, and any needed repairs. Keep a record book on the system, and record all maintenance procedures.

Pumping frequency depends on the capacity of the septic tank, the flow of wastewater (related to the number of people in the household and water-use habits), and the volume of solids in the wastewater (more solids if a garbage disposal is used).

Tank Size (gallons)	Number of People Using the System					
	1	2	4	6	8	
900	11	5	2	1	<1	No. of yrs
1,000	12	6	3	2	1	
1,250	16	8	3	2	1	
1,500	19	9	4	3	2	

Figure 4-6. *Estimated tank pumping frequency in years.*

Septic System Failure

Signs your septic system may be failing include the following:

- Sewage is backed up in your drains or toilets; it may be a black liquid with a bad odor.
- Slow toilet flushing. If all toilets in your home are not fully flushing, this is likely a septic issue versus a plumbing problem.
- Wet areas or water seeping near a drainfield. The drainfield could be saturated if the weather has been continually rainy and cold. An odor may be present (Figure 4-7).
- Excessive growth of aquatic weeds or algae in the lake near your home. Incomplete treatment of nutrient-rich water seeping from your system promotes this growth.
- Unpleasant odors around your house. This may result from improper venting or a failing system.
- Bacteria or nitrates are found in your drinking water. This indicates a serious water contamination problem that may come from your own or a neighbor's failing system.
- Biodegradable dye flushed through the system shows up in nearby surface waters.

Call a professional to evaluate whether your septic system is the cause of these issues. If you determine septic failure to be the cause, follow the steps in Figure 4-8. According to the "Individual/ Subsurface Sewage Disposal Rules" (***IDAPA*** 58.01.03), "the owner of any failing system shall obtain a PHD permit and cause the failing system's repair."

Main Causes of Septic System Failure:

- Infrequent septic tank pumping.
- Overuse of water, especially from leaky faucets or continuously running toilets.
- Improper construction.
- Overuse of garbage disposals.
- Damage from excavation or from vehicles driving over system.
- Undersized septic tanks and drainfields.
- Tree and plant roots.

Figure 4-7. *Follow the guidelines for a failed system to protect human and environmental health.*

If Your System Fails, Take Immediate Action!

- Call PHD to help you evaluate the situation. If failure occurs on the weekend, and PHD is not available, go to the next step.
- Look for a septic specialist in the phone book or online.
- Rent a Port-a-Potty, and stop using water.
- Fence off the area to minimize contact with wastewater (for humans, pets, and wildlife).
- Don't use additives. Additives are of no benefit and may harm the system.
- Do not pipe sewage into ground or surface water. It is illegal.
- Do not pipe sewage into a sinkhole or drainage well because it can potentially pollute groundwater.
- If wastewater is surfacing near or above your drainfield, don't cover it with more soil. This does not fix the problem.

Figure 4-8. *It is imperative that you follow the guidelines above in order to protect human and environmental health.*

Conserve Water!

Reducing the amount of wastewater entering the system is important because lower flow (volume) equals better treatment, longer system life, and less chance of overflow. Excess flow is a principal reason for system failure (wastewater surfacing or backing up in house). Lower flow improves treatment by increasing the time waste spends in the septic tank, thus providing more time for solids to separate, settle, and decompose. Lower flow also means improved aeration and increased soil contact, providing better treatment in a soil absorption field. Every gallon you save in your house is a gallon that doesn't have to be absorbed by your drainfield.

Consider these tips for conserving water:

- Shorten shower times and choose showers over baths to minimize wasted water.
- Identify and repair leaking pipes, sticking float valves in toilets, and dripping faucets to reduce water waste. A dripping faucet can waste 15-20 gallons per day.
- Know where the water shut-off valve is in your home.
- Keep a container of drinking water in the refrigerator rather than running water until it's cold. While waiting for hot water at the sink, fill a container of cold water for use later.
- Wash only full loads in the dishwasher. Scrape, soak, or use the pre-wash cycle on your dishwasher rather than rinsing your dishes.
- Plug up the sink or use a washpan if washing dishes by hand.
- Wash only full loads of clothes, and use front-loading washers and suds-savers to save water. To avoid overloading your system, spread washing over the week instead of washing several loads on one day.
- Install low-flow aerators in all of your faucets.
- If you have an older toilet, convert it to a low-flow toilet with a displacement device.
- Replace older appliances and fixtures with newer, energy efficient models. Look for the WaterSense and Energy Star logos (Figure 4-9).

Items That Don't Go Down the Drain

Common sense is your best management practice to minimize the amount of contaminants going into wastewater. If you have to think twice about flushing or pouring something down the drain, *don't do it.* Remember, what goes down the drain doesn't just disappear, it ends up in our water.

- **Do not use the toilet as a wastebasket.** Don't flush facial tissue, baby wipes, diapers, tampons, medications, or any kind of plastic down the drain.
- **Eliminate the use of garbage disposals.** Ground-up garbage does not decompose easily, causes rapid buildup of solids in the tank, and may clog the drainfield's distribution pipes and soil pores. When building or remodeling, don't install a garbage disposal.
- **Toxic substances** such as household chemicals, cleaners, degreasers, acids, oils, paints, disinfectants, and pesticides, should never be put down the drain.
- **Use liquid laundry detergent, and use it sparingly.** Liquid is less likely to have fillers that may damage the septic system. Use phosphate-free detergents.

	Older Models	Newer Models	Most Efficient
Showerhead gallons per minute	5.5	2.5	2.0
Toilet gallons per flush	5	1.6	1.3
Dishwasher gallons per cycle	11-15	6-10	2.2-4.3
Washing machine gallons per wash	Top loading 40	Front loading 20-25	Front loading 10-15

Figure 4-9. *Replace older appliances and fixtures with newer, energy efficient models. Look for the WaterSense and Energy Star logos.*

Resource Directory
Household Wastewater Treatment

Panhandle Health District (PHD)
Kootenai County, Environmental Health
8500 N. Atlas Road
Hayden, ID 83835
(208) 415-5200

Idaho Department of Environmental Quality (IDEQ)
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Other Resources

Individual/Subsurface Sewage Disposal Rules
IDAPA 58.01.03
http://adminrules.idaho.gov/rules/current/58/0103.pdf

City of Coeur d'Alene
Phosphorous Laundry Detergent Ban
Chapter 13.28 - City Ordinance 2267 §1, 1990.
Prohibits the sale and distribution of laundry-cleaning products containing phosphorus in the City in order to reduce the introduction of phosphorus into public wastewater and into the Spokane River.

Web Soil Survey
U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) - soil information, maps, and data.
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

EnergyStar
www.energystar.gov

WaterSense
www.epa.gov/watersense

Risk Assessment Worksheets
Household Wastewater Treatment

Assessment Worksheet 1 - Septic System Design and Location

The assessment worksheet below will help you identify potential environmental risks related to your drinking water and the treatment of your home's wastewater. 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 Household Wastewater Treatment Action Worksheet on page 4-12 and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section to help you decide how to best reduce pollution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Capacity of system	My tank is designed to handle more wastewater than is required, based on the size of my home.	My capacity just meets load requirements, but I watch out for factors indicating system overload. I use water conservation measures.	I've added bathrooms, bedrooms, or water-using appliances without reexamining the capacity of my wastewater system.	☐ Low ☐ Medium ☐ High
Drainfield	My drainfield is over 100 feet from my well. Depending on soil type, the drainfield is between 100-300 feet from any surface water source.	My drainfield is 100 feet away from my well and surface waters.	My drainfield is less than 100 feet from the lake or a drinking water well.	☐ Low ☐ Medium ☐ High
Tank	My tank is more than 50 feet from wells and surface waters.		My tank is less than 50 feet from wells or surface waters.	☐ Low ☐ Medium ☐ High
Soil type	My soil is fine-textured like clay loams or silty clay.	My soil is made up of medium to fine sands, loamy sands, or silt loam.	My soil is coarse-textured like sand, sandy loam, or gravel.	☐ Low ☐ Medium ☐ High
Safety devices	An alarm is installed on the pumping chamber or lift station to indicate that the tank is full or power has been cut off to the pump.		No alarm is installed to indicate tank overflow or that power has been cut off to the pump.	☐ Low ☐ Medium ☐ High

Assessment Worksheet 2 - On-Site System Maintenance

Use the worksheet below to rate your risks related to maintaining the septic system. When finished, turn to the Household Wastewater Treatment Action Worksheet on page 4-12 and record your medium and high-risk practices.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Age of system or holding tank	My system is 5 years old or less.	My system is between 6 and 20 years old.	My system is more than 20 years old.	☐ Low ☐ Medium ☐ High
Type of tank	I have a cement tank.	I have a steel or fiberglass tank.	I have a cesspool.	☐ Low ☐ Medium ☐ High
Condition of tank	My tank and baffles are inspected for cracks; repairs are made promptly.		I do not know the condition of my tank and baffles.	☐ Low ☐ Medium ☐ High
Tank pumping	My septic tank is pumped on a regular basis as determined by an annual inspection. The holding tanks are pumped as needed.	My septic tank has been pumped, but the date is unknown.	My septic tank has never been pumped. The holding tank overflows or leaks.	☐ Low ☐ Medium ☐ High
Drainfield protection	I keep vehicles and other heavy objects or activities away from the drainfield area.	Occasionally, the drainfield is compacted by heavy objects or activities.	I allow vehicles, livestock, heavy objects, or other disturbances in my drainfield area.	☐ Low ☐ Medium ☐ High
Diverting surface water	I divert all surface runoff away from the drainfield area.	Some surface water flows into the drainfield area.	All runoff from land, rooftops, and driveways flows into my drainfield.	☐ Low ☐ Medium ☐ High
Plantings over the drainfield	I have grass or other shallow-rooted plantings over my drainfield.		I have trees, shrubs, or vegetables growing on or near my drainfield.	☐ Low ☐ Medium ☐ High
Signs of trouble	My household drains flow freely. No sewage odors inside or outside are evident. My soil over the drainfield is firm and dry and my well water tests negative for ***coliform*** bacteria.	My household drains run slowly. Soil over the drainfield is sometimes wet.	My household drains back up. Sewage odors can be noticed in the house or yard. The soil is wet or spongy in the drainfield area. My well water tests positive for coliform bacteria.	☐ Low ☐ Medium ☐ High

Assessment Worksheet 3 - Septic or Sewage System Inputs

Use the worksheet below to rate your risks relating to system inputs. When finished, turn to the Household Wastewater Treatment Action Worksheet on page 4-12 and record your medium and high-risk practices.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Solids	I do not use a garbage disposal. I do not dispose of bulky items (disposable diapers, sanitary napkins) in the toilet.	I sometimes use a garbage disposal.	I almost always use a garbage disposal, and sometimes dispose of bulky items in the toilet.	☐ Low ☐ Medium ☐ High
Dissolved solids (household chemicals)	I use household chemicals carefully (paints, cleaning products). I never pour solvents, fuels, or other hazardous chemicals down the drain. I do not use a water softener.	I sometimes pour diluted household chemicals down the drain.	I frequently pour diluted household chemicals down the drain.	☐ Low ☐ Medium ☐ High
Floatable solids	I do not dispose of cooking grease or oils into my septic system. I wipe off oil and grease from cooking utensils before washing.	I routinely dispose of grease or oils into my septic system and have made no attempt to reduce their disposal.	I always dispose of cooking grease or oils in my household septic system.	☐ Low ☐ Medium ☐ High
Water use	I use water conservatively and maintain my water fixtures regularly.		I do not use any water conservation measures. I have no water-conserving fixtures. Some of my fixtures are leaking.	☐ Low ☐ Medium ☐ High

Action Worksheet
Household Wastewater Treatment

Write all high and medium risks below.	What can you do to reduce the risks?	Set a target date for action.
Sample: Toilets frequently back up.	Have septic system inspected by licensed inspector.	Today

SECTION 5
HOUSEHOLD HAZARDOUS WASTES

This fact sheet addresses the negative impacts of improper hazardous waste management on water quality and how *you* can make a difference with ***Best Management Practices*** *(BMPs)*. BMPs are actions you can take to protect our natural resources. **The ultimate goal of this information is to prevent hazardous waste spills.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheets (p. 5-8) in order to analyze your individual situation.
3. Fill out the action worksheet (p. 5-10), then **take action!**

Why are Hazardous Household Products a Problem?

Many common household products contain ingredients that are corrosive, toxic, or flammable. When used improperly or disposed of improperly, these products can become personal health and safety concerns and have the potential to contaminate soil, drinking water, lakes, streams, and rivers. At times, small (and sometimes large) unusable amounts of hazardous materials are spilled, buried, or dumped onto residential properties.

Use Caution with These Products:

Home cleaning supplies—drain cleaners, oven cleaners, laundry and stain removers, bleach, lye, some bathroom cleaners, floor wax stripper, and polishes.

Home maintenance products—oil-based paints, lead-based paint, paint thinner, wood stains, wood preservatives, paint stripper, some adhesives and glues, degreasers, mothballs, lead solder, and fluorescent lights.

Vehicle-related products—antifreeze, oil, gasoline, cleaning solvents, brake fluid, grease, rust removers, oil filters, transmission fluid, and old auto parts.

Batteries—lead-acid car batteries, and flashlight batteries that contain mercury or cadmium.

Hobby and recreational supplies—photo developer chemicals, marine paints containing pesticides and/or mercury, swimming pool and hot tub chemicals, strong acids/bases, and chemistry sets.

Read The Label...Then Choose Wisely!

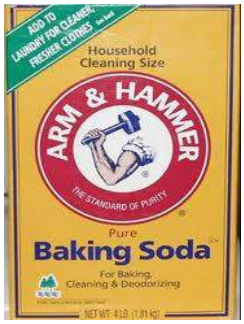
Reading product labels is the best way to get information about the product. Information on the product label can help you decide whether the product is right for the job you want to do and if it can be used safely in your situation, your home, and near your family. Before you purchase or use a product, read the label.

Labels provide information about product ingredients, how to store and use them safely, and hazards associated with the product. Labels on hazardous products contain the ***signal words***—caution, warning, or danger—which indicate how hazardous the product is to humans (see Resource Directory, p. 5-7). Labels give some indication of the potential problems to the environment.

Alternative Products Do the Job

Many alternatives are available to replace some common hazardous household products and pesticides.

Cleaning Agents



- Baking soda is a non-abrasive scouring powder.
- Use vinegar and warm water for windows and smooth surfaces.
- Rub toothpaste on wood to remove water stains.
- Avoid aerosol products because mist particles can enter the blood stream; use pump or spray bottles.
- Open drains with metal snake or plunger. Keep drains clear with rinses of ½ cup baking soda, followed by ½ cup vinegar, let sit, and then add 2 quarts boiling water.
- Clean upholstery or carpet stains immediately with cold water or club soda.
- In general, choose soap or detergent-based cleaners when possible. Avoid non-water-soluble and corrosive cleaners when others offer an effective substitute.

Paints, Solvents, Strippers, and Adhesives

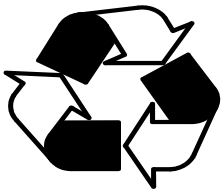
- Use latex or water-based paints whenever possible. These don't require thinners or solvents.
- Use sandpaper, a scraper, or heat gun for small jobs instead of a paint stripper. Avoid strippers and other products containing methylene chloride.
- For wood preservatives, use a water-sealing coating. If treated wood is needed, choose pressure treated.

Batteries

- Choose rechargeable batteries, and low or mercury -free batteries when possible.

Pesticides

Before you choose a pesticide, exhaust other options for managing a pest, weed, or fungus. A host of alternatives to insecticides and herbicides to control outdoor pests are available (see Section 2, Lawn and Garden Management).



***R*educe** ***R*euse** ***R*ecycle**

- Use up hazardous products before disposing.
- Don't purchase more products than you need.
- Give leftover products to a friend, neighbor, or family member who can use them.
- Try non-toxic alternatives.
- Use old paint as a primer.
- Allow used paint thinner to sit in a sealed jar until paint particles settle; pour off clear liquid, and use again.
- Don't buy several products if one can do the job.
- Don't burn empty hazardous product containers.

Product Disposal

Hazardous products eventually pose a disposal dilemma. Disposal should be your last option, as it is wasteful and, if not done properly, can be unsafe for you and the environment. Find out where you can dispose of your products safely (see Resource Directory, p. 5-7).

Burying is a Bad Idea

The ultimate goal is to prevent wastes from entering soil and water. Burying wastes is high risk.

Pesticides (Including Herbicides)

Many people don't pay enough attention to managing pesticides. U.S. Environmental Protection Agency (EPA) studies provide disturbing information about how pesticides are used, stored, and thrown away. Studies of common household practices show that people fail to recognize the danger that pesticides pose to child safety, human health, or the environment when managed improperly.

To dispose empty pesticide containers, triple rinse the containers, and use the rinse water as part of your yard and garden management. Triple-rinsed containers can be placed in your household garbage.

Burning Can Be A Health Issue

Although burning has been used in many rural areas for decades, local and state laws are becoming more restrictive. Some residents use burn barrels to get rid of many household wastes. A noxious mix of chemicals can be released into the air and can be hazardous to breathe. Eventually, most byproducts from burning are removed from the air by rain or snow and are deposited on land or water. The ash residue from burning may contain heavy metals and other toxins, and if this ash is dumped on your property, it can contaminate soil and water.

Byproducts of Open Burning

Smoke, particles, or ash from burning waste may contain some of the following pollutants:

- *Arsenic* and *cadmium* from some wood preservatives or pesticides.
- *Benzene* and other solvents from paint or varnish strippers.
- *Cadmium* from nickel-cadmium batteries and plastics such as polyvinyl chloride (PVC).
- *Chromium* from some paints.
- *Dioxin* from byproducts formed when chlorine containing products such as plastics are burned.
- *Formaldehyde* from some particle board and fabric treatments.
- *Lead* from some paint on old boards, batteries, and PVC plastics (lead is used as a stabilizer in PVC).
- *Mercury* from some batteries, paints, plastics, thermometers, thermostats, and fluorescent lights.
- *Sulfuric acid* from some chemicals, dyes and pigments, rayon, and film.
- *Toxic organics* from burning plastics.

Batteries

In Idaho it is illegal to dispose of vehicle batteries in the garbage. Most battery retailers and transfer stations will accept your old battery for recycling. If your battery leaks, clean it with baking soda.

Paints

Many of us buy too much paint. Municipalities that collect leftover hazardous household products report that paints make up about half of the material that people bring in and are a costly disposal expense.

- Paints can become unusable if they go through freeze and thaw cycles. Store paints where they won't freeze.
- Use up completely, or give leftover paint to a friend, or a theater or nonprofit group. Air dry empty containers and dispose of cans with lids off in the garbage.
- For leftover water-based paints, take the lid off and let the liquid evaporate in well-ventilated area. When dry, the can with its hardened contents can be discarded in the garbage. For leftover paints that are oil-based, or contain mercury, lead, or pesticides, the cans should be deposited at a hazardous waste drop off site.

Safe Storage

When storing household products, the primary concerns are child safety, indoor air quality, and environmental pollution. If you can smell a household product while it is in storage, the product lid may be loose or ventilation may be inadequate to protect your health.

Separate corrosives like acids or lye from each other and other hazardous products to prevent dangerous chemical reactions. Reactions occur when corrosives leak from their containers and drip or flow to other products. Corrosive materials are often stored where equipment and appliances are located. Be aware that these materials can corrode heating systems, hot water heaters, and other equipment and appliances. Routinely check areas where you store household products (under the kitchen sink, in the basement or garage, in an outside shed) to make sure that containers are closed tightly and not leaking, and the sides of containers are not bulging.

- Keep out of reach of children and pets, preferably in a locked, secure area.
- Store corrosive materials in their original container.
- Clearly label and date containers without labels.
- Keep containers tightly sealed and dry.
- Keep products in a well-ventilated area and away from sources of ignition.
- Store batteries and flammable chemicals in shade away from direct sunlight.
- Store products at least 200 feet from a well or water.
- Don't store products in your well pump house.
- Store chemicals in an outside shed or basement.
- Store products on shelves above any flood waters.

Petroleum Storage

It is important to carefully store gasoline, heating oil, and other fuels and lubricants on your property. Most homes own at least one fuel-burning device such as a lawn mower or an outboard marine engine, and likely keep fuel in portable containers that hold 1 to 5 gallons. Purchase and store minimum amounts of fuel for short periods. Buy only quantities that you need for a month or so.

Fuels are hazardous, and if improperly managed, they can pollute the water you drink (Figure 5-1). It is critical to prevent spills and leaks. Petroleum fuels contain a number of potentially toxic compounds including common solvents such as benzene, toluene and xylene, and additives such as ethylene dibromide. Benzene, a human carcinogen, has a groundwater standard much like that of many pesticides at 5 parts per billion. One gallon of gasoline containing 1% benzene can contaminate about 2 million gallons of groundwater.

Contamination can come from unexpected sources. Unknown or forgotten underground storage tanks (USTs) have come back to haunt property owners. Contaminated soil and water can rob your property of its value, trigger environmental liability and costly cleanups, and drive away lenders and property buyers. Vapors from fuel can ignite fires or collect underground and explode.

Do not fill your boat tank or portable outboard tank with gas cans near or over the water. Plan ahead. Make sure the collar on the gas can nozzle has a washer and is tight so gas doesn't spill from the collar. Even if you are not near surface water, spilling on the ground can contaminate groundwater.

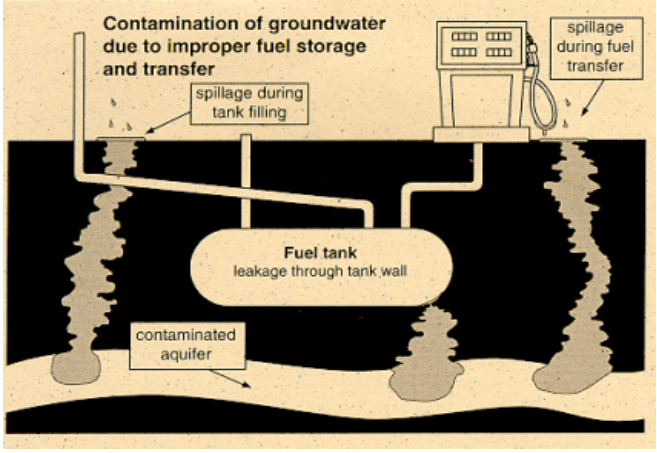


Figure 5-1. *Example drawing of how fuel contamination occurs.*

Quick Tips

- Don't pop the air vent plug on the gas can until the nozzle is in the tank filler tube.
- Don't fuel if the boat or dock is bobbing. Use a fuel bib to fill boat tank.
- If you do spill, have an oil/gas absorbent bib available to quickly soak up the spill.
- Use only self-venting Underwriter's Laboratory (UL)-approved or original containers to store fuel. Storing fuel in an unapproved container, such as a glass jar or plastic jug, is dangerous.
- In your garage or shed, store fuel containers so that they cannot become flooded, but not too high on shelves where they get hot. Periodically check for leaks.
- Don't top off your gas tank, as this leads to nozzle malfunction and fuel spills.

Storage Tanks—Above-ground, Underground, and Basement

This section on tanks is meant only to be a general information guide. For petroleum storage tanks, seek a professional company, government agency, or a fire marshal on safety, installing a new tank, making improvements to an existing tank, removing a tank, spills, and contamination.

It is vital to know about fuel storage tanks on your property, including tanks that are currently in use and those that are abandoned. As a tank owner, you have many responsibilities and must keep up with increasingly strict laws.

Federally Regulated Tanks

Federal law regulates USTs of 1,100 gallon-capacity or more and used for commercial purposes.

- Federally regulated USTs must be registered with IDEQ within 30 days of bringing the tank into use. Federal law requires that existing and new regulated USTs, and all related piping, must have corrosion protection, if they are to remain in use.
- Above-ground tanks and their installation are affected by a mosaic of local, state and federal regulations.

Unregulated Tanks

Tanks not covered by federal regulations are farm and residential USTs less than 1,100 gallons, any tank less than 110 gallons, and USTs or above-ground tanks storing heating oil burned on the premises.

Most USTs for petroleum storage by individual shoreline households and farms are less than 1,100 gallons and are considered non-regulated by federal law. Idaho "***Water Quality Standards"*** (***IDAPA*** 58.01.02) require that petroleum storage and disposal in the immediate vicinity of state waters (including groundwater) must have adequate measures and controls to ensure that stored materials will not enter public waters.

Tank Location

When locating tanks, consider the following BMPs:

- All petroleum storage tanks should be located at *least* 50 feet from a drinking water well according to state regulations, but the greater the distance the better (100 - 400 feet) (Figure 5-2). Tanks are safer when located downslope from wells. The 50-foot minimum also applies to the distance from streams, wetlands, ponds, and other surface water.
- Certain conditions accelerate the corrosion potential of USTs and piping. These conditions include high water tables, clay soils, or soils with an acid pH.

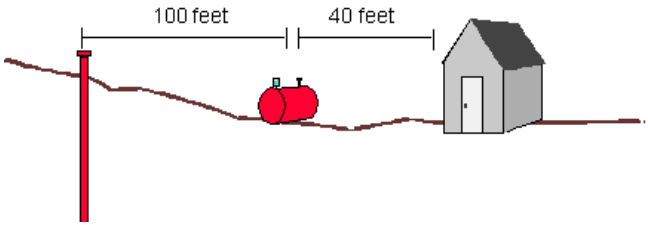


Figure 5-2. *Diagram showing petroleum storage with a 100 –foot separation from drinking water well.*

Tank Management

Is your UST old and possibly leaking? Buried tanks over 15 years old have a much higher chance of leaking. Even newer tanks and piping can leak if they were incorrectly installed. Most older tanks do not have corrosion protection. It is expensive to put corrosion protection on existing tanks, but corrosion is the primary reason for leaks, which is money out of your pocket. In some cases it may be more cost-effective to replace unprotected tanks.

Detecting Leaks

- Measure and record the amount of fuel in the tank each month, and record the gallons of fuel extracted and delivered.
- Is there an unexplained oil-like substance on streams or wet places near the tank?
- Is nearby soil stained with petroleum?
- Does your drinking water taste like fuel?
- Does fuel flow unevenly or does the suction pump rattle?
- Are your pipes, hose, or fittings corroded? Piping should be made of cathodically-protected steel, coated to prevent corrosion.

Notify the fire department, police, and IDEQ in case of a leak.

Spill Protection

Over-filling is the most common and most avoidable reason for spills.

- Never walk away while filling a container or your vehicle.
- Automatic shutoff devices are available to prevent spills.
- Use a fill-level indicator.
- Use secondary containment, such as a double-walled tank or a structure consisting of a concrete curb on a pad to contain a leak or spill.
- Use a double-walled hose.

Support and Protect Above-Ground Tanks

Tanks should be installed on a solid, stable base that resists being moved by changes in soil moisture and frost-heaving. Protect your tank from vehicles. If the tank is not enclosed in a structure, install posts or other barriers around it (Figure 5-3).

Figure 5-3. *Fuel tank protected from traffic by cement posts.*

Controlling Road Dust

Fugitive dust from the numerous gravel and dirt roads around lakes, rivers, and streams is considered by some residents to be an aesthetic problem, a nuisance, and, for some folks, a health problem.

A common solution to control road dust is to apply oil onto the surface. The use of oil formulated for application as a dust suppressant is legal. However, if dust -control oil reaches surface water, it is considered a hazardous and/or deleterious material according IDAPA 58.01.02. If adequate measures and controls are not taken to prevent environmental damage, applicators may face enforcement action. Also, oil can leave residues and deposits on your car, which can be difficult to remove.

Oil applied to unpaved road.

Application Guidelines

The State of Idaho and the federal government have regulations that prohibit the use of waste or used oil on road surfaces.

- Waste oils contain contaminants such as heavy metals and cannot be used on roads.
- Do not oil immediately before forecasted rain events.
- Make sure the applicator does not over-apply the oil, leaving puddles of oil that contaminate storm-water.
- Instead of applying oil over hard, compacted dirt, apply after a road grading when the oil can be worked into the loosened soil.
- Do not apply oil over stream crossings such as culverts and bridges.

Oil needs to be applied properly so that it does not run off during a rain storm.

Oil Alternatives

Before using oil to control road dust, consider the following alternatives:

- One solution currently used by the U.S. Forest Service is calcium chloride or magnesium chloride, in liquid or flakes. Grading and wetting the roadbed in conjunction with application improves effectiveness. Dust control results have been favorable. One concern is the migration of chloride with storm runoff. Potential for salt damage to plants is another concern. These products are not recommended near drinking water.
- Another dust control product is calcium lignosulfonate, which is more environmentally compatible; however, local availability is currently limited.
- Live with the dust.

Application of liquid calcium chloride.

Resource Directory
Household Hazardous Wastes

Hazardous Waste Drop-Off Sites and Recycling Centers

The following sites will accept residential quantities of household hazardous products, used oil, antifreeze, and batteries. Generally, no single container greater than 5 gallons will be accepted.

Each transfer station has different policies on what materials they will accept, and some centers have restricted drop-off policies. The Kootenai County Ramsey Transfer Station accepts hazardous waste only from homes in Kootenai County. Call the transfer station you plan to use, or visit their web site. All centers accept recyclable materials during operating hours.

Kootenai County Solid Waste and Hazardous Materials Transfer Stations
(208) 446-1430
www.kcgov.us/departments/solidwaste

Ramsey Transfer Station
3650 N. Ramsey Road
Coeur d'Alene, ID 83815
Accepts household waste on Wednesday and Saturday.

Post Falls Transfer Station
15580 W. Prairie Avenue
Post Falls, ID 83854
Accepts household waste on Friday and Saturday.

Shoshone County Transfer Station
52619 Silver Valley Road
Kellogg, ID
(208) 784-5190
www.shoshonecounty.org

Benewah County Transfer Station
75 Landfill Road
St. Maries, ID 83861
(208) 245-1694

Spokane Regional Solid Waste System
(509) 625-6580
www.solidwaste.org

North County
N. 22123 Elk-Chattaroy Road
Colbert, WA 99005

Valley Recycling
3941 N. Sullivan Road
Spokane Valley, WA 99216

Waste to Energy Facility
2900 S. Geiger Boulevard
Spokane, WA 99224

Idaho Department of Environmental Quality
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Coeur d'Alene Tribe -
Lake Management Department
Coeur d'Alene Office
424 Sherman Avenue, Suite 306
Coeur d'Alene, ID 83814
(208) 667-5772

Other Resources:

National Pesticide Information Center
*(*800) 858-7378
www.npic.orstedu

National Response Center
(800) 424-8802
www.nrc.uscg.mil

Report any excessive spills by first calling your local fire department and then the National Response Center. By law, the party responsible for the spill must ensure efforts towards capture and containment of the spill.

Risk Assessment Worksheets
Household Hazardous Wastes

Assessment Worksheet 1 - Product Purchase, Selection, and Use

The assessment worksheet below will help you identify potential environmental risks related to your use of hazardous products around the house. 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 Household Hazardous Wastes Action Worksheet on page 5-10, and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations in this section to help you decide how to best reduce pollution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Product selection	I always read labels, understand signal words, and respect the health or environmental hazards that labels describe. I use less hazardous products when possible.	I don't read labels or don't understand what they mean, but I use a "common sense" approach to safety.	I never read labels. I purchase products without considering what the product is made of or how it will be used.	☐ Low ☐ Medium ☐ High
Quantities purchased	I buy only what is needed for a specific job. I use up most of the product during the season of purchase. I dispose of excess products at a county waste drop-off site.	I buy excess product, but I have safe and accessible storage.	I buy more than is needed, then purchase additional products without checking on current supplies.	☐ Low ☐ Medium ☐ High
Safety precautions	I follow label instructions and take recommended precautions against exposure, like wearing protective clothing (gloves and safety goggles). I never mix products.	I occasionally read the label. I take precautions based on my knowledge of the product. I occasionally mix products for specific cleaning tasks, but refer to label first.	I never follow label instructions and take no precautions—even when recommended. If one product doesn't work, I add another without checking safety precautions.	☐ Low ☐ Medium ☐ High
Toxic alternatives	I use alternatives to toxic materials whenever I can.		I don't use alternatives.	☐ Low ☐ Medium ☐ High
Pesticides	I use non-chemical pest control. I choose pest control products according to the label and properly store, handle, and dispose of them.	When solving pest problems, I do not practice prevention or explore non-chemical options.	I do not handle pesticides as directed on the label. Pesticides are applied near my well, or at the edge of surface water.	☐ Low ☐ Medium ☐ High

Assessment Worksheet 2 - Product Disposal

When finished, turn to the Household Hazardous Wastes Action Worksheet on page 5-10 and record your medium and high-risk practices.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Recycling hazardous product containers	I triple-rinse empty yard and garden pesticide containers and include rinse water in yard and garden management. I recycle containers.	I generally leave my empty containers in the garage because I don't know what to do with them.	I burn hazardous materials, releasing metals, acids, and chlorine compounds. I spread materials from the burn barrel over my property.	☐ Low ☐ Medium ☐ High
Batteries	I recycle batteries, or take them to a county hazardous waste drop-off site. I trade-in my used car or boat battery at an auto or tire store.	I dispose of used batteries in a county landfill.	Used batteries are stored or buried on my property near a well or waterway. Small batteries (e.g. flashlight) are burned with my trash.	☐ Low ☐ Medium ☐ High
Paint and solvents	I share leftovers. Unused products containing mercury, pesticides, or hazardous solvents are taken to a county waste drop-off site.	I allow liquids to evaporate away. Sludge or leftover products are placed in normal trash flow, which goes to a county landfill.	I dump leftover products on the ground near a well or waterway.	☐ Low ☐ Medium ☐ High
Drips and spills	I contain spills on paved area with absorbent material (kitty litter), and then dispose of it at a landfill.	I don't bother containing drips and spills; occasionally I flush them onto my property.	I don't do anything to contain drips and spills. I frequently flush them onto my property, where they can infiltrate into groundwater.	☐ Low ☐ Medium ☐ High
Pesticides	I don't use pesticides.	I use pesticides for weeds in my lawn, but I follow the label and don't apply within 25 feet of surface water.	I spray right up to the water's edge. I didn't realize this could be harmful.	☐ Low ☐ Medium ☐ High
Antifreeze, Gasoline, and motor oil	I take left over or unused antifreeze to the county dump or an automotive shop. I burn used oil for heat in an approved space heater.	Containers with leftover product are stored in my garage on a raised platform.	I pour extra oil, antifreeze, and fuel in the ditch next to the road.	☐ Low ☐ Medium ☐ High

Action Worksheet
Household Hazardous Waste

Write all high and medium risks below.	What can you do to reduce the risks?	Set a target date for action.
Sample: I have containers that don't have labels, and I don't know what is in them.	Take all containers to the Kootenai County Transfer Station, and limit my overall use of hazardous materials.	One week from today.

SECTION 6
NEW CONSTRUCTION

This fact sheet addresses the impacts new construction activities can have on water quality and how *you* can make a difference with ***Best Management Practices (BMPs)***. BMPs are actions you can take to protect our natural resources. **The ultimate goal of this information is to prevent negative impacts to water quality.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheets (p. 6-10) in order to analyze your individual situation.
3. Fill out the action worksheet (p. 6-12), then **take action!**

Why is New Construction a Concern?

The U.S. Environmental Protection Agency (EPA) has identified construction activities as one of the most common sources of water ***pollution***. The process of constructing a new home, structure, or landscaping will inevitably require soil and plant disturbance, hardscape installation, wastewater system installation, and/or the use of hazardous materials. If not done correctly, these land use activities can have many negative effects on water quality. Concerns include:

- ***Nutrients*** from fertilizers and ***sediments***
- ***Stormwater runoff pollutants***
- ***Wastewater*** system failures
- Building too close to the shoreline
- Loss of ***riparian*** habitat
- ***Erosion***

Nutrients from Fertilizers and Sediments

The ***nitrogen*** and ***phosphorus*** found in soil and fertilizers contribute to ***aquatic plant*** and ***algae*** growth. The proximity of many new construction and landscape projects to the lakeshore increases the risk that these materials will enter the water and cause problems. When there is an excess of aquatic vegetation, oxygen in the water can be depleted causing negative impacts to water quality, recreation, and aesthetics (Figure 6-1).

Figure 6-1. *Waterfront with abundant aquatic vegetation.*

Stormwater Runoff

Stormwater runoff is the flow of water from rain, irrigation or melting snow that does not soak into the ground. Under natural, forested conditions, much of the water is absorbed into the ground. As an area becomes developed or altered with structures, roads, and driveways, less water seeps into the soil, increasing the amount of water coming off the site. Increased runoff also increases erosion due to the volume and velocity of water moving across land. Pollutants such as sediment, fertilizers, pesticides, heavy metals, and hazardous waste products become a greater concern (Figure 6.2). Detailed information on stormwater runoff is provided in Section 1, Stormwater Runoff Management.

Figure 6-2. *Improper erosion/sediment controls allow sediment to enter surface water.*

Wastewater Treatment Failures

If your home is near the waterfront it is critical to have a properly functioning septic system. Surface water contaminated with septic waste is extremely hazardous to the health of humans, wildlife, and our natural resources. Many septic systems are either old, unmaintained, or located too close to lakes, rivers, and streams. A properly designed, constructed, and maintained system can effectively treat wastewater for many years. See Section 4, Household Wastewater Treatment for detailed information on this subject.

Building Too Close to the Shoreline

The primary concerns with building too close to lakes, rivers, and streams are loss of riparian habitat, pollution from stormwater runoff, erosion, wastewater spills, and property damage due to flooding. When lawns, driveways, parking lots, garages, and roads are located very close to the water, the runoff from rain and irrigation will take pollutants from these hard surfaces and quickly send them into nearby water (Figure 6-3). Common pollutants include lawn fertilizers and pesticides, sediment, oils, grease, metals, dirt, salts, and other toxic materials.

Allowing a building setback of at least 40 feet is recommended (Figure 6-4). This setback protects the existing shoreline vegetation, which holds the soil and serves as wildlife habitat. Vegetation protects your valuable property from flooding, filters potential pollutants, and decreases chances of property loss due to erosion. Refer to your county's planning website for specific land-use ordinances and requirements.

Figure 6-3. *This building project does not provide an adequate setback from surface water.*

Figure 6-4. *An adequate building setback with preserved native vegetation protects property and water quality.*

Riparian Habitat Loss

The plants growing along the shoreline are referred to as riparian habitat or ***vegetative buffers*** (Figure 6-5). These buffers are one of the features that make this area so beautiful. The vegetation is home to a variety of wildlife, which also contributes to the scenery we enjoy here.

When shoreline vegetation is removed, it decreases the aesthetic beauty of the area, displaces wildlife, increases water temperature, and increases the chance for erosion (Figure 6-6). **The most effective and efficient action you can take to protect surface water from landscaping and new construction activities is to preserve or add a native vegetative buffer along the shoreline.** This buffer will help prevent soil erosion and property loss and absorb nutrients and chemicals from shoreline land-use practices.

Figure 6-5. *An example of preserved shoreline vegetation that still allows for access and views.*

Figure 6-6. *This project removed existing vegetation near the shoreline and exposed bare soil to stormwater and wind.*

Erosion

Any time existing native vegetation is removed to make room for structures or landscaping, bare soil is exposed and easily washed into surface water. Excess soil (sediment) in the water promotes algal blooms and aquatic plant growth, covers spawning beds, and muddies the water. Erosion also leads to structural damage and property loss. All of these potential problems are expensive and difficult to correct but easy to avoid.

Erosion Versus Sedimentation

Erosion occurs when soil is dislodged due to rain drop impact and stormwater. ***Sedimentation*** occurs when this eroded soil is deposited elsewhere (Figure 6-7). **The goal is to prevent erosion so sedimentation does not occur.** It is far more efficient to prevent erosion than to manage sedimentation.

BMPs for erosion prevention include pre-construction site planning, preserving vegetation, avoiding long steep slopes, mulching or roughing bare soil, timing construction, and hiring a professional trained in erosion prevention. BMPs that help protect surface water from sedimentation include silt fences, fiber rolls or straw wattles, inlet protection, and sediment basins. BMPs for both erosion and sedimentation are continuously being improved, and abundant information is available online for homeowners looking for site specific solutions.

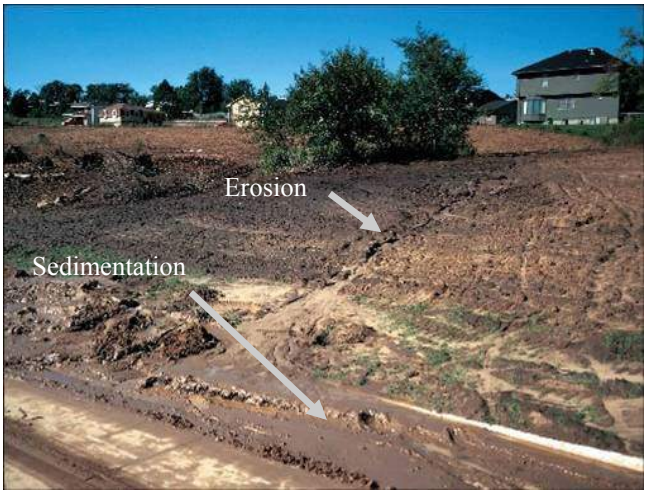


Figure 6-7. *Image showing the difference between erosion and sedimentation.*

Pre-construction Site Planning

Site planning is the first and most essential tool in protecting your property and preventing pollution. Planning ahead will save you time and money in the long run. Begin with a site assessment that includes existing vegetation, soil type, bedrock location, slope gradient, sun exposure, and existing drainage structures. Make a simple map that documents all these features. Draw a rough map that includes the location of future structures and features.

Planning and Design

- Structures should be at least 40 feet from surface water.
- Septic drainfield will need to be 100-300 feet from surface water.
- Drinking well should be at least 100 feet from your drainfield and septic tank.
- Driveways, walks, and yard edges should follow level contours and a slope gradient of 10% or less.
- Consider permeable (water can penetrate) materials for driveways, walkways, parking lots, and patios. See Section 1, Stormwater Runoff Management, for more information on permeable pavers.
- All water draining off hard surfaces should lead away from surface water and into a stabilized area with vegetation, mulch, or rock.
- Water should not be allowed to flow directly downhill, which gives the water maximum speed and cutting power for erosion.
- Only remove vegetation for access and building foundations.
- Confirm that your design or building professional is trained in erosion and sediment control and has the same goals for proper land use management as you.
- Time construction activities in the dry season. In our area, the recommended time frame is between May 1 through October 1.
- Preserve cultural resources. If you discover or suspect you may have a cultural resource on your property (e.g., arrowheads, pottery, historic cabin, etc.) notify the Idaho State Historical Society or the Tribal Historic Preservation Office.

During Construction

Erosion prevention is the first step in preventing costly stormwater damage. Measures such as timing of construction, preserving existing vegetation, clearing limits, mulching, erosion control blankets, and slope roughening are effective at preventing erosion and preserving valuable top soil.

Timing is Everything

Construction work and erosion prevention measures should be scheduled during dry, low-runoff periods when erosion is lowest. May 1 through October 1 is the recommended construction window. If your construction project is very large, consider phasing the project so small areas are cleared at a time.

Preserve Existing Vegetation

Preserving existing vegetation is the least expensive and most effective erosion control practice there is. Save as many trees and shrubs as possible; it will save time, money, and top soil. You paid for them with the purchase of your property, and these plants have tremendous value both aesthetically and environmentally. Also, young plants purchased at a nursery will take many years to mature.

The vegetation on your shoreline should be kept in place. It acts like a filter to keep the water clear, and it doesn't cost you a thing. Keep at least 25 feet of vegetation (not lawn) between the water's edge and land disturbance (see Section 2, Lawn and Garden Management).

Establish and Mark Clearing Limits

Identify the areas of vegetation to be preserved early in the planning stage, and clearly mark these areas before any on-site work begins. This can be done with orange fencing or similar material. Communicating with all construction crew members regarding clearing limits and the overall site plan is crucial. Put measures in place to protect trees and shrubs and their roots from heavy equipment.

Mulching – Keep All Bare Soil Covered!

Mulch is an immediate, effective, and inexpensive means of controlling erosion and dust. Use organic or natural materials such as straw, wood chips, forest duff, erosion control blankets, or hydromulching to cover all disturbed areas (Figures 6-8 & 6-9). Mulches can be spread by hand or with machines. Consistent coverage is important, so ensure that the soil is not visible through the mulch. Once installed, inspect regularly, and repair as needed. Consider working only in a small area and stabilizing that site before disturbing another area. Mulching allows vegetation to re-establish, reduces soil crusting, reduces evaporation, and decreases fluctuations in soil temperature. If you plan to seed the site for permanent stabilization, apply mulch after seeding.

Temporary soil stockpiles from construction activity should be completely covered with a tarp, mulch, or seed to prevent piles from eroding. If the soil stockpile will not be used within the construction window, it should be seeded. The purpose of re-vegetating stockpiled soil is to reduce the potential of soil loss from erosion during the wet season. ***Cut-and-fill slopes*** associated with private roads can also be mulched, reducing the chance for road damage, lack of access, and water pollution. Cut-and-fill areas should be evaluated on a case-by-case basis to determine the most effective form of stabilization.

Figure 6-8. *Bare soil mulched with straw.*

Figure 6-9. *This development preserved vegetation, mulched bare soil with straw, and graveled the road.*

Erosion Control Blankets

Erosion control blankets come in many different fabrics and are rolled over the soil surface to protect valuable top soil from erosion. They are useful because they stay in place, where loose mulches may blow away or become dislodged. Erosion control blankets are also useful in establishing vegetation. Proper installation is crucial to success (Figures 6-10 & 6-11).

Installation Guidelines

- Smooth soil surface.
- Anchor blanket to the top of the slope in a 6-inch trench.
- Backfill and tamp anchored ends.
- Roll blanket from top to bottom.
- Do not stretch blankets.
- Overlap sides at least 4 inches.
- Overlap uphill/downhill edges by 3 feet.
- Securely staple per instructions on blankets.

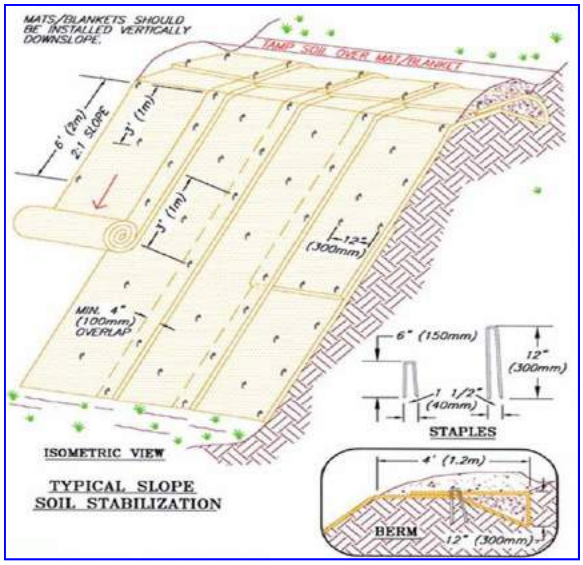


Figure 6-10. *Proper erosion control blanket installation.*

Figure 6-11. *Erosion control blanket installation on shoreline slope.*

Hydromulching

Hydromulching is a technique where wood fiber, grass, hay, or straw are applied with water and tackifier (a glue-like substance). Hydromulch can cover a large area quickly. For effective erosion protection, make sure the slope is roughened before mulch application. Inspect regularly for consistent coverage, and repair as needed.

Hydroseeding

Hydroseeding is typically a mix of seed, water, fertilizer, and tackifier, although all of these components can be customized. Any number of seed mixtures are available, including native grasses and wildflowers. It is essential that the slope is roughened and irrigation is available for successful seed germination. If irrigation is unavailable to the site during the hottest months, hydromulch or another form of mulch would be a more effective option.

Slope Roughening

A roughened surface is an easy and inexpensive way to slow the speed of runoff, encourage vegetation growth, increase water infiltration, and trap sediment. Groves, furrows, or depressions are made by driving a crawler tractor up and down the slope or using a front end loader with disks, harrows, or teeth across the slope (Figure 6-12). The main objective is to create ruts across the slope to intercept water as it runs downhill.

Figure 6-12. *Slope roughening with grooves perpendicular to the slope.*

Sediment Control - Sedimentation

As a precaution, it is a good idea to install sediment controls in case erosion controls were inadequate or not properly installed. However, do not to use sediment controls in place of erosion control (Figure 6-13). Sediment controls are not designed to hold back large amounts of soil or water. They are designed to catch what little sediment might come off a site. Remember, erosion has already been prevented upland. Several techniques are available for sediment control: silt fences, fiber rolls or straw wattles, vegetated buffers, swales, inlet protection, and sediment basins.

Figure 6-13. *A situation where erosion prevention was inadequate, resulting in this silt fence trying to hold back too much weight. This fence blew out moments after the picture was taken.*

Swale and Inlet Protection

Most swales and inlets lead to surface water. It is important to keep sediment and other pollutants out of these systems, not only to protect water quality but to prevent flooding caused by clogged systems. Many site-specific tools are available for this type of protection (Figure 6-14).

Figure 6-14. *Weighted fiber roll (top left), fiber drop inlet (top right), "witch hat" drop inlet protection (right).*

Fiber Rolls

A fiber roll or straw wattle consists of straw or similar material bound into a biodegradable tubular plastic. Wattles are used to interrupt slope or shorten slope length. They trap and filter sediments, and they release water as ***sheet flow,*** which prevents erosion. Wattles are placed across a slope in direct contact with soil and staked in a shallow trench.

Sediment must be removed behind the roll when it reaches ½ the height of the roll and must be inspected before storms and during rain events. Fiber rolls are biodegradable and can be left in place once the site is stabilized.

Installation Guidelines

- Install on contour perpendicular to flow (Figure 6-15).
- Place in a 3-4 inch trench.
- Stake ends, and stake along the roll 4 feet on center or staggered along sides.
- Overlap ends (Figure 6-16).
- Place at intervals downslope at 10 foot spacing.
- Turn final ends uphill in a smiley face to prevent water and soil from going around the roll (Figure 6-17).

Figure 6-15. *Fiber rolls installed perpendicular to flow.*

Figure 6-16. *Overlapped ends.*

Figure 6-17. *Turn ends uphill, and place roll in trench.*

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 for a 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 are temporary. They need to be removed once a site has been stabilized.** They have a life of approximately six months. Silt fences that are not removed are aesthetically unappealing, disrupt wildlife corridors, and become a pollutant.

Installation Guidelines:

- Install on a level contour with ends turned uphill in a smiley face configuration (Figure 6-18).
- Key fabric into a 6 x 6 inch trench (Figure 6-19). Otherwise, sediment and water will flow right under the silt fence, defeating the purpose.
- Place stakes 6-10 feet apart.
- When connecting several fences, wrap ends together to prevent a gap where water and soil can sneak through (Figure 6-20).
- Allow an area in front of the fence for ponding and settling of runoff and sediment, as well as equipment access to remove sediment that accumulates.
- Conduct weekly or periodic inspection of the silt fence to repair tears and remove sediment that reaches ⅓ the height of the fence (Figure 6-21).

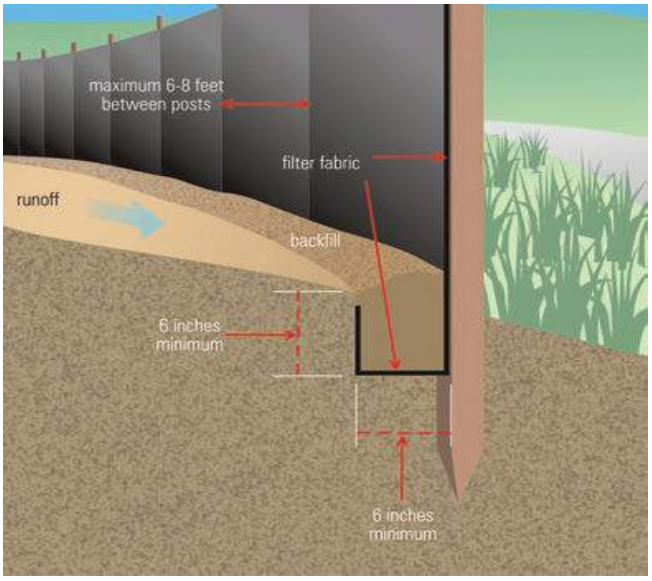


Figure 6-19. *Filter fabric embedded into 6" x 6" trench. Posts installed 6-10 feet apart.*

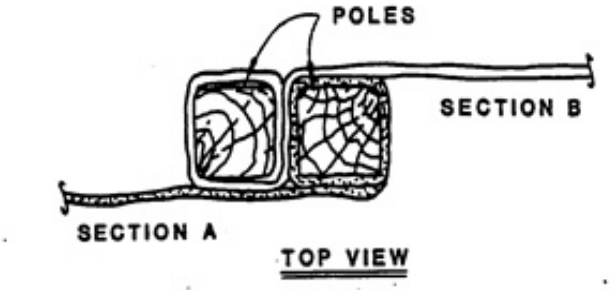


Figure 6-20. *End joints are rolled together to form a tight seal preventing water from moving through.*

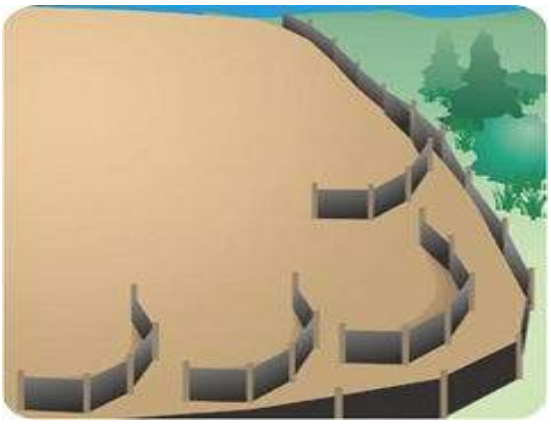


Figure 6-18. *Ends turned up into "smiley face," and room is left in front of fence to remove sediment.*

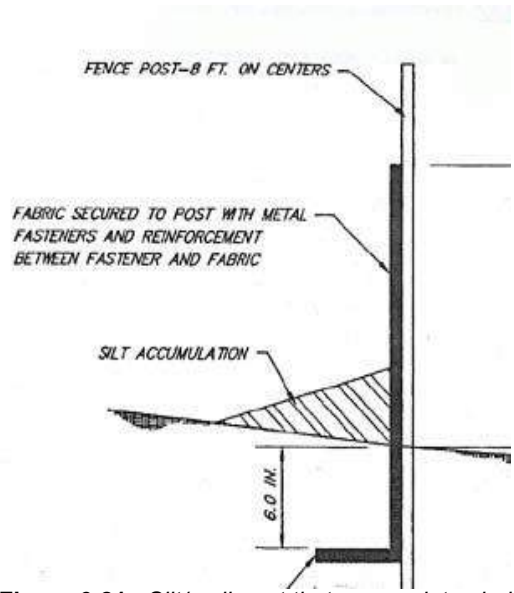


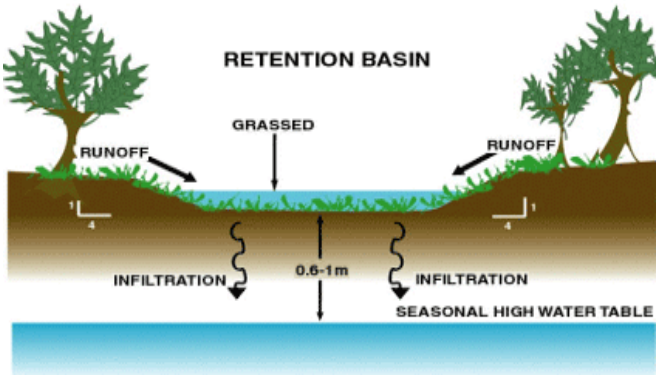
Figure 6-21. *Silt/sediment that accumulates behind the fence needs to be removed when it is ⅓ the height of the fence.*

Sediment Traps and Basins

Sediment basins are essentially large depressions designed to collect large amounts of stormwater run-off to let sediment settle out. Many types of sediment basins and traps are available. **Contact a design professional for site specific requirements.** Basins should be installed before land disturbance begins, and they should be stabilized with vegetation so the basin itself doesn't become a source of sediment.

Sediment basin/trap.

Sediment basin/trap.



General design guideline for a sediment retention basin.

Grass Infiltration Systems (Grassy Swales)

Grass infiltration systems are typically smaller than a sediment trap or basin, and are usually used as on-site treatment for residential areas or parking lots. The purpose for these grassy swales is to remove pollutants from stormwater prior to infiltrating into the groundwater. They act as a bio-filtration system for treating runoff. Grassy swales often have gradually sloping sides and can easily be mowed as part of routine lawn maintenance. They are an aesthetically pleasing solution for small lots. Grass infiltration systems can replace curbs, gutters, and storm drains.

Curb inlet allows street stormwater to flow into grass infiltration system.

A grassy swale in a residential neighborhood treats runoff from driveways, roads, and roofs.

Resource Directory
New Construction

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

Kootenai County Community Development (Planning and Building)
451 Government Way
Coeur d'Alene, ID 83814
(208) 446-1070
www.kcgov.us/departments/building

Idaho Department of Environmental Quality (IDEQ)
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Coeur d'Alene Tribe - Lake Management Department
Plummer Office
850 A Street
PO Box 408
Plummer, ID 83851
(208) 686-5302

Suggested Reading:

Forestry for Idaho Best Management Practices - Forest Stewardship Guidelines for Water Quality.
Idaho Forest Products Commission

An excellent color pamphlet with many photographs displaying and explaining proper and improper uses of forest practice BMPs, along with forest ecology and water quality concepts.
www.idahoforests.org/bmp.htm

Catalog of Storm Water Best Management Practices for Idaho Cities and Counties.
Idaho Department of Environmental Quality. 2005. Boise, ID: DEQ.

A comprehensive landowner and contractors BMP guide for the control and treatment of stormwater, erosion, and sedimentation. It is best to use a professional when designing and installing BMPs.
www.deq.idaho.gov/media/622263-Stormwater.pdf

Risk Assessment Worksheets
New Construction

Assessment Worksheet 1 - Construction Concerns

The assessment worksheet below will help you identify potential environmental risks related to how you manage new construction on 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 New Construction Action Worksheet on page 6-12, and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section to help you decide how to best reduce pollution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Building setbacks	My house and garage are over 75 feet from the lake, and our lot has a gentle slope with native vegetation.	My house is 40 feet from the lake, but there is a thick vegetative buffer.	My house was designed to be 25 feet from the water so we could be as close as possible.	☐ Low ☐ Medium ☐ High
Nutrient loading	My landscape is all native and doesn't require any maintenance.	My soil is tested annually and fertilizer is only applied once a year when needed.	My landscape has a steep slope made up of plants that are fertilized often.	☐ Low ☐ Medium ☐ High
Riparian habitat	I have kept all the plants that were growing along the shore to keep the water and fish cool and to prevent erosion.		I have removed all of the native vegetation along the shoreline so I could install a lawn.	☐ Low ☐ Medium ☐ High
Stormwater runoff control	My stormwater is diverted into a vegetated swale that is located 100 feet from surface water. A vegetative buffer runs along my shoreline.	I have a vegetative buffer on my shoreline, but I have a sloping lawn above that is fertilized regularly.	I have a steep paved driveway that runs straight down to lake. Oil is visibly running toward the lake.	☐ Low ☐ Medium ☐ High
Wastewater/septic	My septic tank is 100 feet upland from surface water and is inspected annually. The septic drainfield is 100-300 feet from surface water based on soil type.	My septic tank is old and 50 feet from surface water, but it is inspected annually and is functioning properly.	My house was built on a steep slope with a septic tank installed about 25 feet from surface water. It is an old system that has not been inspected in years. The drainfield is less than 100 feet from surface water.	☐ Low ☐ Medium ☐ High

Assessment Worksheet 2 - Erosion and Sediment Control

When finished, turn to the New Construction Action Worksheet on page 6-12 and record your medium and high-risk practices. The goal is to lower your risks.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Site plan	I had a site plan developed by a professional trained in erosion prevention.		I haven't had a site plan developed for making clean water a priority.	☐ Low ☐ Medium ☐ High
Slope of site adjacent to lake or a stream	0-2% slope	3-4% slope	5% and above	☐ Low ☐ Medium ☐ High
Timing of construction	I schedule construction work and erosion prevention applications for optimal conditions: dry, low-runoff periods when erosion is lowest.	Though construction work is performed during the wet season, I use erosion-prevention BMPs to help reduce runoff.	Construction work is performed during the wet season, and no erosion-prevention BMPs are used.	☐ Low ☐ Medium ☐ High
Erosion control	I keep existing vegetation, except around the building foundation and access areas. I make sure areas of bare soil are seeded and topped with a layer of mulch or straw.	Soil on my lot is left bare during a construction project, but natural features slow and treat most runoff.	My entire lot was cleared for my new home. Bare soil is exposed.	☐ Low ☐ Medium ☐ High
Sediment control	I make sure that erosion controls are implemented and are inspected regularly. A silt fence has been installed as secondary protection for sedimentation.	My construction site is protected by natural vegetation, but no man-made sediment control devices are being used.	My construction site was cleared, and to save money, no erosion or sediment controls have been installed.	☐ Low ☐ Medium ☐ High

Action Worksheet
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.	Cover all bare soil with mulch immediately, slow concentrated runoff with fiber rolls, and install a silt fence above surface water.	Today

SECTION 7
ACCESS ROADS AND DRIVEWAY RUNOFF

This fact sheet addresses the impacts improper road construction and maintenance can have on water quality and how *you* can make a difference with ***Best Management Practices (BMPs).*** BMPs are actions you can take to protect our natural resources. **The ultimate goal of this information is to provide general guidelines on proper road construction and maintenance for private roads to avoid negative impacts to water quality.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheet (p. 7-13) in order to analyze your property's specific needs.
3. Fill out the action worksheet (p. 7-14), then **take action!**

Why are Roads an Issue?

Most private roads and driveways are constructed of compacted native soils. These dirt roads, if not properly managed, can become damaged by ***erosion*** after just a single storm. If a road is designed without runoff control practices, water runs freely downhill, picking up speed, and scouring away the road. This runoff creates huge ruts, gullies, washouts, and flooding. As ***stormwater*** runoff speeds its way downhill, it picks up tons of soil (***sediment***) and other ***pollutants*** from the road. Eventually, this polluted water finds its way into streams, rivers, and lakes. The polluted water can be detrimental to water quality by covering fish spawning beds, creating muddy waters, adding excess ***nutrients***, and causing ***algae*** blooms and ***aquatic plant*** growth. Road erosion can also be costly to landowners, both in repair and property value.

Quality Construction - The Bottom Line

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

Water runoff can be slowed by numerous control measures and diverted into vegetated drainage areas, where the dirt it carries is captured, and the water is filtered back into the ground. These drainage control methods may include open-top box culverts, water bars, road sloping, and rolling dips. Constructing your road properly is an excellent long-term investment.

Public Access Versus Private Residential Roads

Many roads around the state were once used as logging roads. They were often constructed without much consideration to alignment or grade, due to their short-term use and controlled access. Unfortunately, these same roads are now used for continuous residential access without changing the grading and drainage (Figure 7-1). Today this discrepancy is the cause of increased erosion and is often a source of sedimentation into surface water.

Maintenance of our public roads depends on who owns the property and the activities taking place, such as a timber sale. Maintenance may involve the U.S. Forest Service, Idaho Department of Lands (IDL), local highway district, or county or city road departments. Unfortunately, because there are so many public access roads, maintenance can be left unattended. If you observe a hazardous road, report it to one of these agencies. Homeowners, however, are responsible for private driveways and roads. Opportunities for design improvements on existing roads often exist. Each road and site is unique and should be evaluated on the ground by a private engineer or other professionals from agencies like the Natural Resources Conservation Service (NRCS) or IDL. The following guidelines are designed to provide property owners with a basic understanding of access road and driveway maintenance.

Figure 7-1. *Improper grading and drainage creates ruts and gullies in roads, increasing erosion and sedimentation.*

Road Design and Layout

When designing a new road, implement these BMPs into your road design before beginning construction, and make sure your contractor is experienced in these practices. Check with your county, state, or city regulations regarding road and driveway standards and permit requirements. Requirements may vary depending on where your property is located (see Resource Directory, p. 7-12).

- During road layout, avoid slopes over 8% and road segments longer than 200 feet.
- Vary the grade as much as possible between uphill and downhill to facilitate travel and drainage.
- Place roads as far away from surface waters or wetlands as possible.
- Incorporate drainage features and structures.
- Obtain appropriate permits for stream crossings. Contact Idaho Department of Water Resources (IDWR) for more information (see Resource Directory p. 7-12).
- Design drainage features to intercept runoff before it reaches road-stream crossings.
- Design ***cuts and fills*** with stable slopes based on rock type (Table 7-1).
- Design roads to balance cuts and fills (Figure 7-2).
- Preserve existing trees, shrubs and grasses at the base of fill slopes.
- Plan to stabilize exposed soil by seeding, benching, mulching, or other suitable means. **Stabilize before fall or spring runoff!**

Cut and Fill Guidelines

During the process of cut and fill, it is critical to avoid letting side-cast or waste material from entering streams or placing it on unstable areas where it might erode. Make sure that organic material such as tree limbs, stumps, logs and even ground cover such as sod are not incorporated into road fill. Over time, these materials will deteriorate, leaving voids that can cause severe drainage and erosion problems.

Design roads to balance cuts and fills whenever possible (Figure 7-2). Use full bench construction on slopes over 55% where stable fill construction is not possible (Figure 7-3). In full-bench construction, the entire road surface is excavated into the hill and excavated material is pushed or hauled to an area needing fill or to a disposal area.

Minimize sediment production from borrow pits and gravel sources through proper location, development, and reclamation. Road fill is used to cover culverts and build up flat areas. Since road fill must support traffic, it needs to be spread and compacted in layers (lifts 12 inches or less) to develop strength.

Soil/Rock Condition	Slope Ratio (Hor:Vert)
Most rock	¼:1 to ½:1
Very well cemented soils	¼:1 to ½:1
Most in-place soils	¾:1 to 1:1
Very fractured rock	1:1 to 1 ½:1
Loose coarse granular soils	1 ½:1
Heavy clay soils	2:1 to 3:1
Soft clay rich zones or wet seepage areas	2:1 to 3:1
Fills of most soils	1 ½:1 to 2:1
Fills of hard, angular rock	1 1/3:1
Low cuts and fills (<2-3 m. high)	2:1 or flatter (for revegetation)

Table 7-1. *Common stable slope ratios for cuts and fills.*

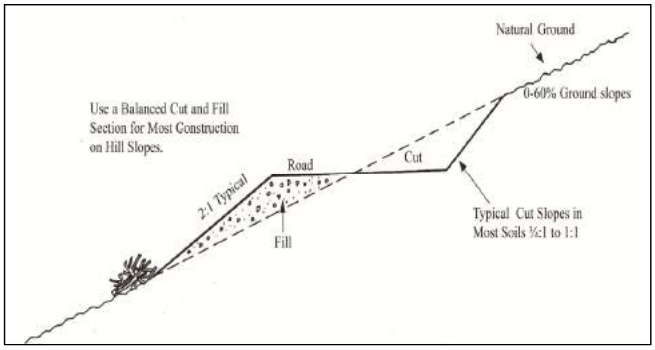


Figure 7-2. *Balance cut and fill.*

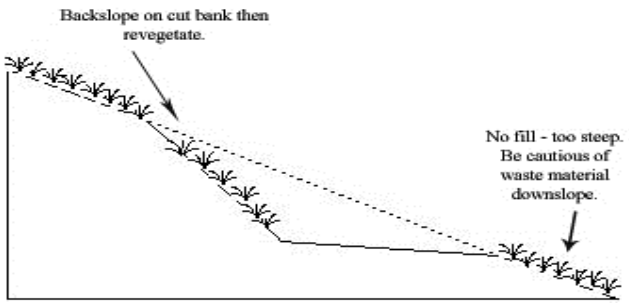


Figure 7-3. *Full bench cut and fill.*

During Construction

The following BMPs are used to control erosion during and after the construction process. Make sure your contractor and you are familiar with these practices (Figure 7-4).

Construct roads in a manner that prevents sediment, debris, and excess materials from entering streams. Deposit excess materials outside of stream protection zones (see Section 8, Riparian, Forest and Pasture Management, for more information on stream protection zones).

- Clear drainage ways of all debris generated during construction.
- Construct drainage features to intercept runoff before it reaches road-stream crossings.
- Protect trees and shrubs growing at the base of fill slopes.
- When constructing road fills near streams, compact the material in lifts less than 1 foot high. Reduce water flowing over fill. Prevent snow, ice, frozen soil, and woody debris from being buried in the fill. Limited slash and debris may be windrowed along the toe of the fill to provide a filter near stream crossings.
- Cover all bare soil with mulch, seed, or rock (Figure 7-5). For more information on erosion control, see Section 6, New Construction.
- Construct the road with shallow, outward-sloping dips to collect surface runoff and convey it away from the road surface (Figure 7-6).
- During construction and maintenance, do not create a gravel or snow berm on the outside shoulder. This berm will eliminate all opportunities for runoff on the road surface to escape.
- Permanently mark road culverts to aid in location. If not correctly marked, snow plows are likely to crush culverts (Figure 7-7).

Figure 7-4. *Poor placement of erosion control BMPs may result in sediments entering streams.*

Figure 7-5. *Exposed soil has been mulched.*

Figure 7-6. *Road constructed with outward sloping rolling dips.*

Figure 7-7. *Crushed culvert cross drain.*

Drainage Improvement Methods

Road location, construction, and drainage can cause negative impacts to water quality, cause erosion, and increase road costs. Drainage issues include roadway surface drainage, ditch water, culvert design, and natural stream crossings. The BMPs below, provided by numerous agencies and professionals, do not substitute for a technical guide. Contact a design professional for more information (see Resource Directory, p. 7-12).

Open-Top Box Culvert

Figure 7-8. *Open-top box installation.*

The open-top box culvert is an acceptable substitute for pipe culverts for lightly-used unpaved roads on steep grades of 6% or more. Construct a box-like frame (three-sided open-topped) using cedar or treated planks (Figure 7-8 and Figure 7-9). The trough should be 3-4 inches wide and 6-8 inches deep. Install the trough flush with the road surface, skewed at a downgrade angle across the roadway. The slope of the culvert should be a minimum of 2%. The outflow end should extend 6-12 inches beyond the surface of the roadbed and should be directed onto vegetated ground, riprap, or another erosion control structure, such as a sediment trap or catch basin. Maintenance is critical. When these structures fill with too much runoff sediment, they become ineffective. Proper spacing for open-top culverts is outlined in Table 7-2.

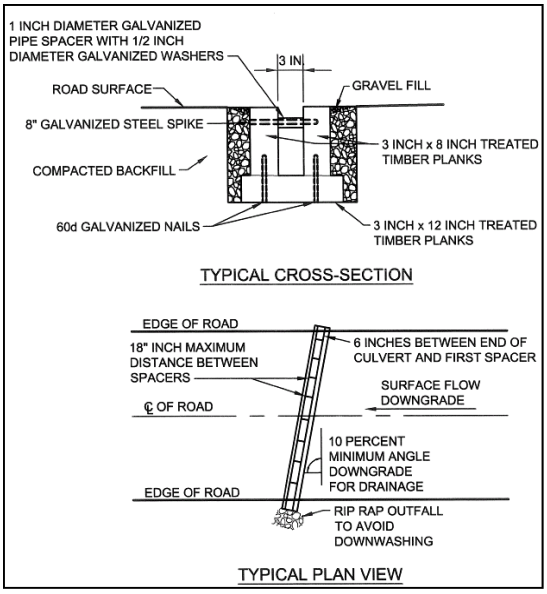


Figure 7-9. *Open box culvert detail.*

Rolling Dip

Rolling dips are most effective on long inclines with a grade of 5% or less (Figure 7-10). They are ideal on low volume roads with low to moderate speeds. Rolling dips usually cost less, require less maintenance, and are less likely to plug and fail than culvert pipes. Construct rolling dips perpendicular to the road, with a 3% -5% outslope (Figure 7-12). Stabilize soil at the low point of the dip (drainage outfall to fill slope) before final grading to direct surface water discharge from the dip. Outflows should be kept free of debris to prevent ponding. In soft soils, armor the mound and dip with gravel or rock, as well as the outlet of the dip.

- Road must be at least 150 feet long.
- Align the dip across the road centerline at nearly a 90° angle, and slope it outward 3% -5 %.
- Dip should be 1 foot below the road surface.
- For spacing recommendations, see Table 7-2.

Road Grade (percent)	Spacing Between Open-Top Culverts and Rolling Dips (feet)
2 to 5	300 to 500
6 to 10	200 to 300
11 to 15	100 to 200
16 to 20	<100
>20	Consider seasonal traffic restrictions

Table 7-2. *Recommended open-top culvert spacing and rolling dip spacing (in feet).*

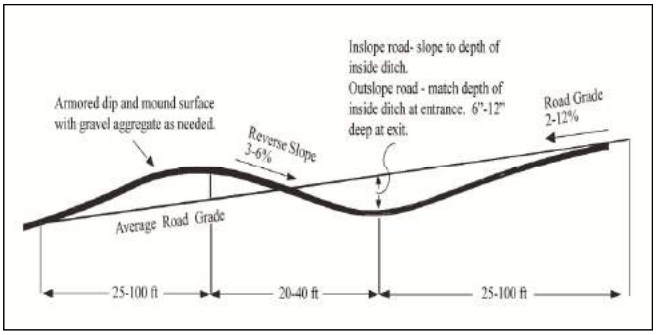


Figure 7-10. *Rolling dip cross section.*

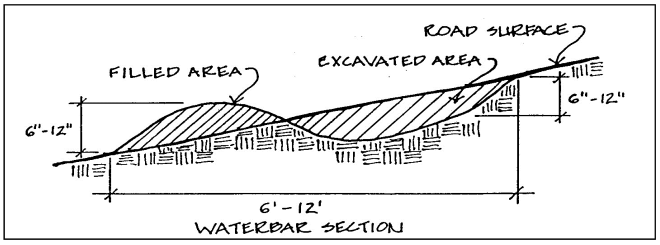


Figure 7-11. *Water bar cross section.*

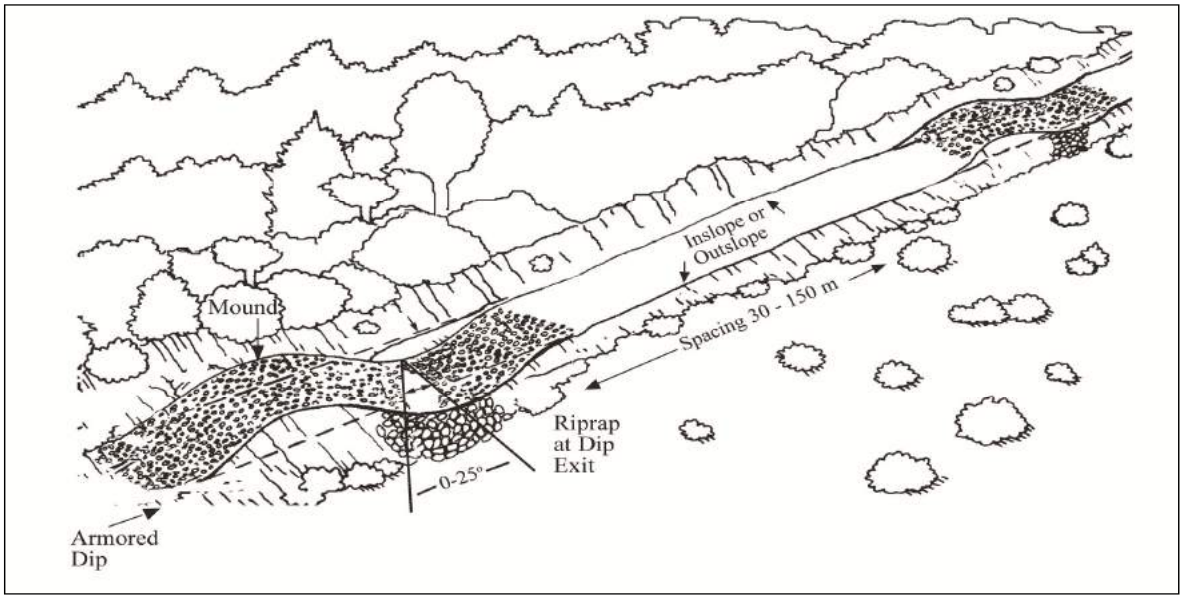


Figure 7-12. *Rolling dip and road sloping perspective.*

Water Bars

A water bar is a cut and berm built at a downward angle across the roadway extending from the cut bank to the opposite downhill shoulder (Figure 7-11). Water bars should be installed in minimal or no-fill areas. Install water bars for use on light-use, low-maintenance, unpaved roads. Ensure that reverse drainage from the crest of the water bar directs drainage back to the excavated area to keep uphill runoff from flowing through the water bar and continuing down the road surface.

- Berms should be a minimum of 6-12 inches high, cut 6-12 inches deep, and skewed at an angle of 30º to 40º across road.
- Construct the berm low enough for traffic to pass over, and angle it across road to direct runoff flow off the road.
- See Table 7-3 for proper water-bar spacing.
- Discharge should never be directed onto fill material.

Road/Driveway Grade (%)	Low to Nonerosive Soils[a] (feet)	Erosive Soils[b] (feet)
0–5	250	130
6–10	200	100
11–5	150	65
16–20	115	50
21–30	100	40

a. Low erosion soils = coarse rocky soils, gravel, and some clay
b. High erosion soils = fine, friable soils, silt, fine sands

Table 7-3. *Recommended water bar spacing (in feet).*

Road Sloping

Road sloping involves sloping the entire road or segments of road at a 3% -5% slope so water can flow off the entire surface. This can be done with insloping, outsloping, or crowning (Figure 7-13). Water should never be directed toward structures. The area where water is directed should have ample erosion control measures in place, such as vegetation, rock, and mulch.

Insloped roads direct water toward a drainage ditch, providing control of road surface water. Because water accumulates, a system of ditches, cross-drains and extra road width for the ditch is needed.

Outsloped roads avoid the need for an inside ditch. Outsloping is effective at dispersing water, minimizing the need for wide roads, and decreasing the need for other diversion practices. Outsloped roads may require roadway surface and fill slope stabilization. Outsloping should be avoided on grades 10% and greater.

Crowned roads are appropriate for high-standard, two-lane roads on gentle grades. They also require a system of ditches and cross drains. Crowned roads are difficult to maintain on narrow rural roads.

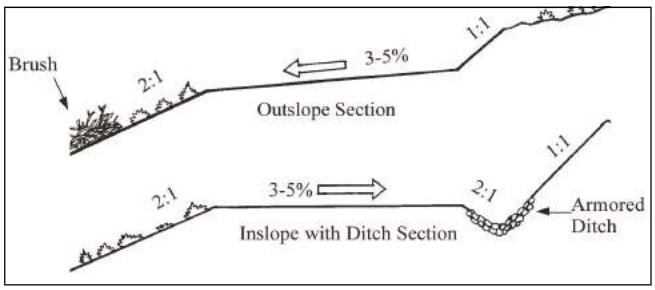


Figure 7-13. *Road sloping.*

Ditch Relief Culverts and Culvert Cross Drains for Runoff Management

Ditch relief culverts are used for runoff management by transferring ditch water to the opposite side of the road and releasing it into a stable area (Figures 7-14 and 7-15). These culverts are the most commonly used practice for road surface drainage. Below are some general guidelines to follow.

- Bedding material should be free of rock and debris that might puncture the pipe or carry water around the culvert.
- Cover the culvert with soil, avoiding puncture from large rocks.
- Compact soil at least halfway up the side of the culvert to prevent water from seeping around it.
- Install culverts at least 12 inches in diameter at a 30° downgrade angle to enhance flow (Figure 7-14). Ensure proper slope of at least 5 inches every 20 feet.
- Protect cross-drain inlets and outlets with rock (riprap 6-18 inches in diameter), brush, or logging slash to dissipate energy and prevent erosion. Locate the outlet of cross drains on stable, non-erosive soils, rock, or in vegetated areas. Refer to culvert outlet armoring (Figure 7-16).

For more information, see "Culvert Design for Stream Crossings and Fish Passage" (p. 7-8).

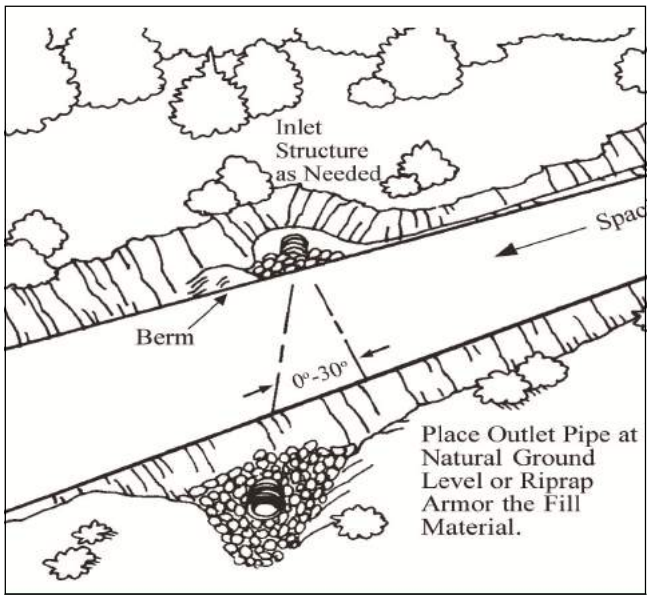


Figure 7-14. *Ditch and culvert cross drain.*

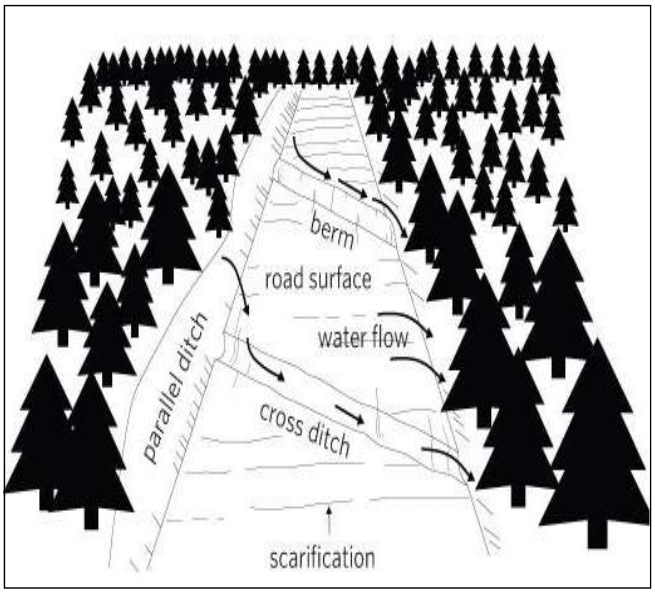


Figure 7-15. *Bird's eye view of ditch relief measures.*

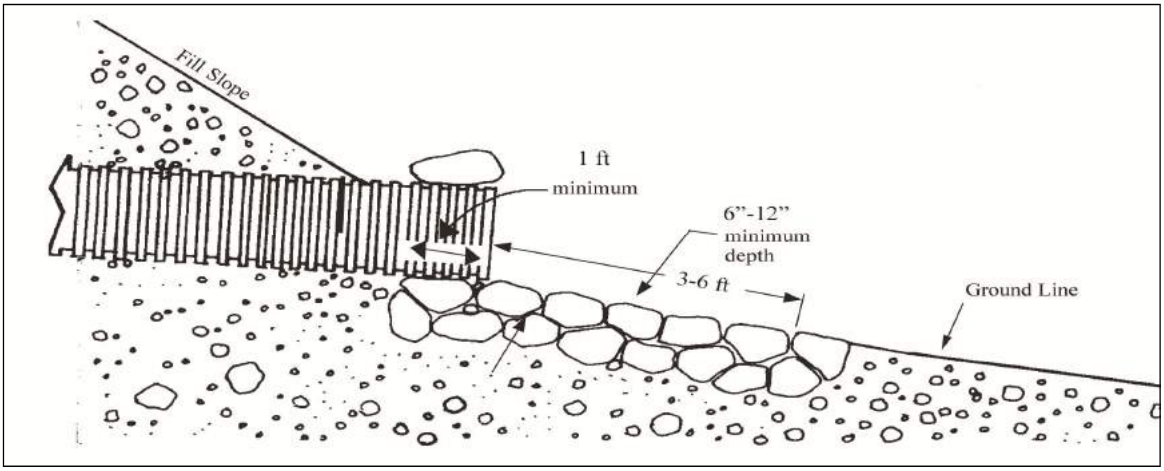


Figure 7-16. *Culvert outlet armoring.*

Ditch Design

Ditches are constructed to transport stormwater 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 efficiently remove runoff from the road and help 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, such as check dams (Figures 7-17 and 7-18). A ditch must be stable to avoid further erosion.

General Construction Guidelines

Follow these BMPs during construction:

- Size ditches so they are large enough to handle runoff from the upslope drainage area.
- Design and grade ditch and bank-side slopes at a maximum 2:1 slope (Figure 7-19).
- Excavate a ditch deep enough to drain the road base: 1.5 to 2 feet deep (Figure 7-19).
- Where possible, the ditch bottom should be a minimum of 2 feet wide to help slow and disperse water (Figure 7-19).
- Seed ditches that have less than a 5% slope with grass to filter sediments and stabilize soil.
- Line ditches that have a 5% slope or greater with 2-6 inch diameter rock, or install check dams.
- All ditches need an outlet; standing water saturates and weakens roads.

Cleaning and Maintenance

Follow these BMPs for ditches:

- Clean ditches when they become clogged with sediment or debris to prevent overflows and washouts (Figure 7-20).
- Check ditches after major storm events for obstructions, erosion, or bank collapse.
- Re-grade ditches only when absolutely necessary and line with vegetation or stone as soon as possible.
- Deposit wastes at safe disposal sites, and stabilize these sites to prevent erosion. Avoid locations where erosion will carry materials into a stream or back into the ditch.

Figure 7-17. *Straw/fiber wattles used as check dams in ditch to slow runoff.*

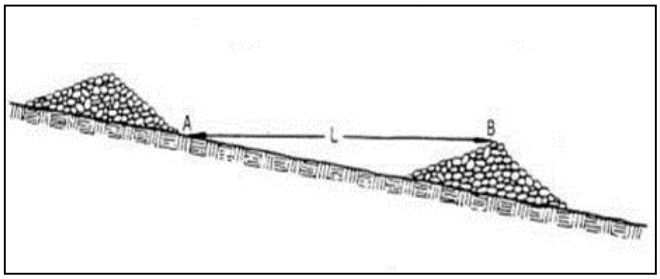


Figure 7-18. *The height of the lower check dam (B) is at the same height as the bottom of the upper one (A).*

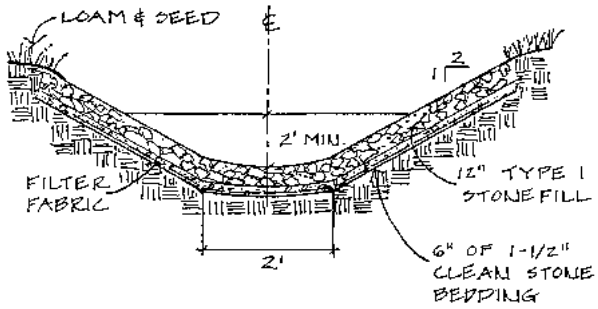


Figure 7-19. *Recommended ditch design.*

Figure 7-20. *The result of an undersized/ clogged ditch.*

Culvert Design for Stream Crossings and Fish Passage

The construction of stream crossings has the greatest potential to cause immediate sediment pollution. Proper design, installation, and maintenance of stream crossing structures can protect both roadways and fish. Ensure that all culvert installations on ***Class I streams*** allow for fish passage.

Stream Crossings

The ***Stream Channel Protection Act*** of 1971 *(*Idaho Code 42-38*)* requires that a permit be obtained from IDWR for any alterations within the beds and banks of continuously flowing natural streams in Idaho.

- Make every effort to avoid stream crossings.
- Cross streams where the stream bottom is stable and banks have low-gradient slopes (Figure 7-21).
- Cross streams at right angles, directly in line with stream (Figure 7-23).
- Build and maintain structures to protect the stream bottoms and banks.
- Only conduct construction activities when stream flows and expectancy of rain are low. Ideally, the entire process, from beginning to end, should be completed before the next rain event.
- If necessary, stabilize road and trail approaches to stream crossings with aggregate or other suitable material.

Water bars, broad-based dips, and open-top culverts should never be used to cross streams. These methods are used to improve drainage (see "Drainage Improve Methods," pp.7-4 and 7-5).

Figure 7-21. *Fish -friendly arch culvert over a low-gradient stream.*

General Culvert Installation Guidelines

Follow these guidelines for culvert installations:

- Divert all existing or potential stream flows while the culvert is being installed. This diversion will reduce or avoid sedimentation below the installation site.
- Minimize equipment use in the stream bed.
- Complete downstream work first, such as energy -dissipating devices and large rock riprap.
- Place culvert inlets on the same level as the stream bottom or slightly below.
- Cover the top of culverts with fill to a depth of 1/3 the pipe diameter or at least 12 inches, whichever is greater, to prevent crushing (Figure 7-22).
- Compact and armor backfill material at the inlet to prevent water from seeping around culvert.
- Culvert should extend at least 1 foot past fill material and be level with the stream bottom.

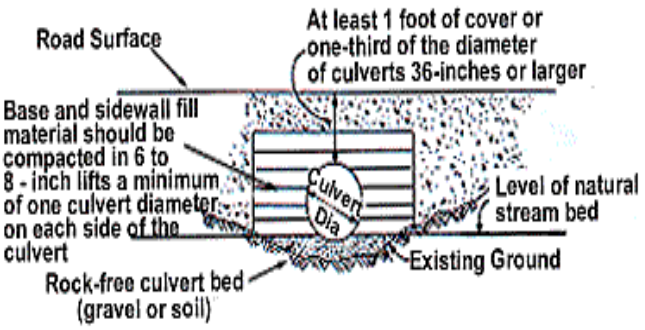


Figure 7-22. *General installation guidelines for culverts at stream crossings.*

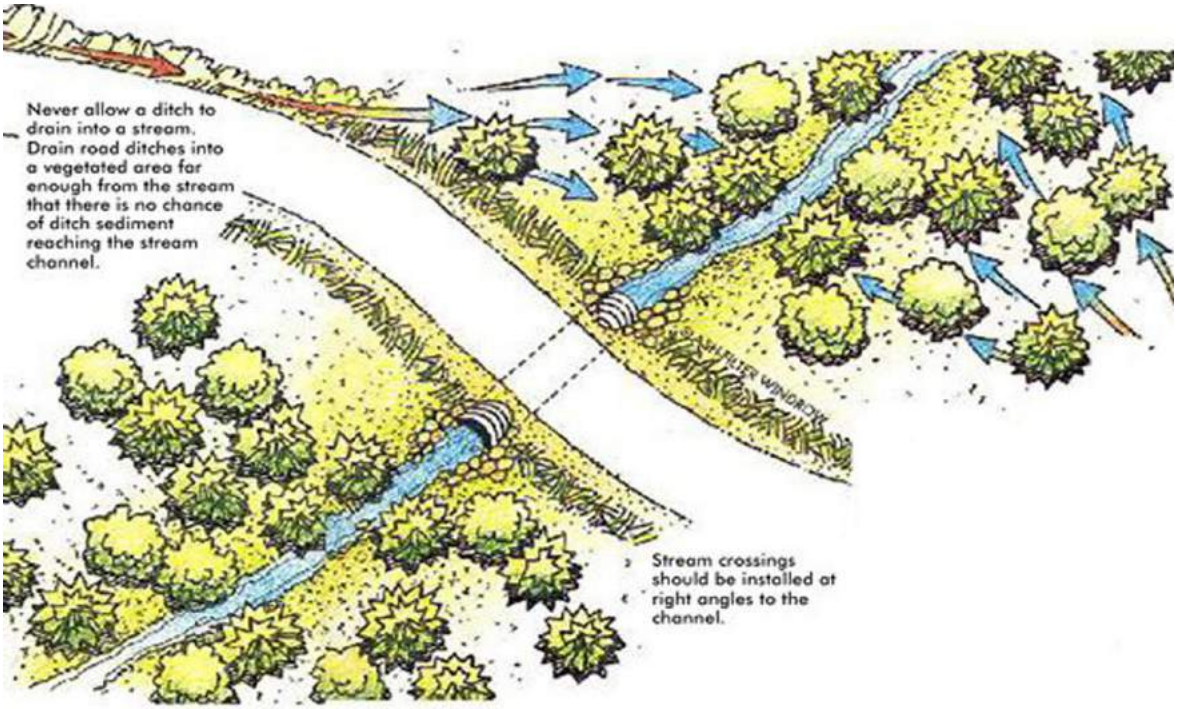


Figure 7-23. *Culvert aligned at a right angle to stream and ditch water directed to vegetated and stabilized area.*

Risks of Culvert Washouts at Stream Crossings

The risk of culvert failure is high unless it is properly designed and maintained. For most crossings, failure is due to upland erosion, clogged culverts, or undersized culverts. When a washout occurs it is inevitable that sediment will enter the stream. However, keeping sediment pollution to a minimum is necessary. Ensure that road design and construction will accommodate excess flow or runoff events that exceed the standard culvert design (Figure 7-24). These considerations are always site specific and can save your culvert while preventing excessive erosion on the road surface and surrounding landscape. Consult an engineer or professional from the NRCS or IDL.

High risk culverts include the following:

- Culverts that become plugged where there is no overflow structure (Figure 7-25).
- Undersized culverts.
- A long, steady road grade above the stream crossing.

Simple solutions include the following:

- Keep fills over culverts to a recommended depth (Figure 7-22).
- Consider a bridge instead of a culvert (Figure 7-27).
- Create an armored overflow protection dip (Figure 7-24).
- Design stream crossings to handle 50-year peak flows.

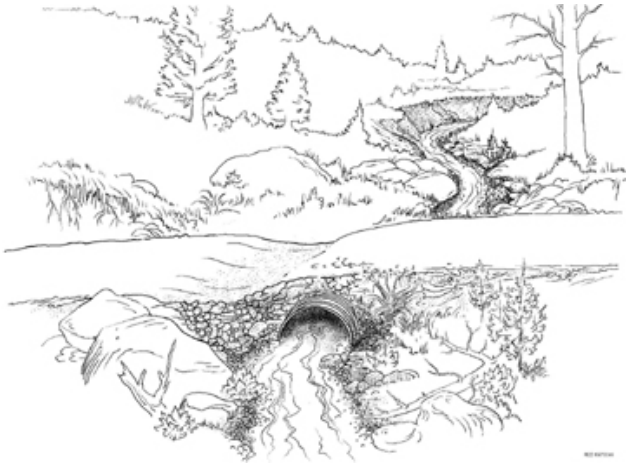


Figure 7-24. *This sketch shows an armored overflow dip designed to reduce loss of road fill in the event of culvert failure.*

Figure 7-25. *Culvert clogged with sediment.*

Fish-Friendly Culverts

Fish-friendly culverts at stream crossings are essential where trout and other species move upstream and downstream to spawn and meet habitat needs. The information provided in this section is not meant as a technical guide. See Resource Directory, p. 7-12, for local natural resource and design professionals.

Culverts can impede fish passage when:

- Water velocities are too powerful for fish to move through.
- Vertical barriers are too high for fish.
- Inadequate water depth prevents fish from being adequately submerged.
- Ice and debris caught in culvert prevent passage or trap fish inside.
- Overall culvert design does not accommodate the size and species of fish present in stream.

Courtesy of Oregon Watershed Assessment Manual

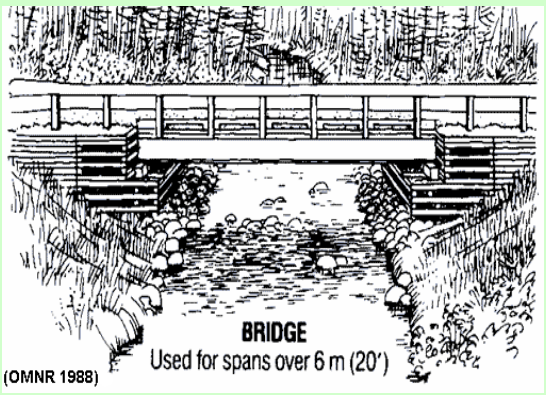


Figure 7-26. *A bridge is an alternative to a culvert.*

Culvert Design Recommendations

- Use bridges, bottomless arches, or partially buried culverts in areas where fish passage is an important consideration (Figures 7-26 and 7-27).
- Make sure there is no sudden increase or decrease in gradient (Figure 7-28). Place culverts on natural stream bed grade or slightly below.
- Design culverts so that water velocities passing through the pipe are equal to water velocities in the stream.
- Cross streams are right angles, directly in line with stream (Figure 7-23).
- Provide resting pools at culvert inlets and outlets on streams with high gradients. Fish need a place to rest before they make the journey through a culvert.
- Place riprap securely at culvert inlet to prevent loose material around inlet from clogging the culvert.

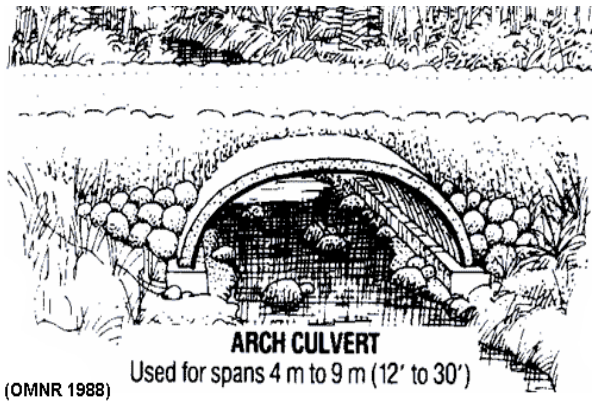


Figure 7-27. *Arch culvert as alternative to whole pipe.*

Figure 7-28. *This culvert is too high. It creates a vertical barrier for fish and scours the outlet.*

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

Routine Road Maintenance

BMPs need to be regularly inspected and maintained to extend the life of BMPs and keep road maintenance costs low.

- Permanently mark road culverts to aid in locating them. If culverts are not correctly marked, snow plows are likely to crush them.
- In the winter when snow berms block runoff from draining off the road, cut channels into snow berms to release runoff from the road surface.
- Clean and repair 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. Such use would likely damage the road drainage features.
- Grade road surfaces only as often as necessary to maintain a stable running surface and to retain the original surface drainage.
- Rolling dips and other outflows should be kept free of debris to prevent ponding.
- Place all excess material removed by maintenance operations in safe disposal sites, and stabilize these sites to prevent erosion. Avoid locations where erosion will carry materials into a stream.

Resource Directory
Access Roads and Driveway Runoff

Kootenai County

Kootenai-Shoshone
Soil and Water Conservation District
7830 Meadowlark Way, Suite C-1
Coeur d'Alene, ID 83815
(208) 762-4939 ext. 101

Eastside Highway District
6095 E. Mullan Trail Road
Coeur d'Alene, ID 83814
(208) 765-4714

Lakes Highway District
11341 N. Ramsey Road
Hayden, ID 83835
(208) 772-7527

Worley Highway District
6887 W. Kidd Island Road
Coeur d'Alene, ID 83814
(208) 664-0483

Benewah County

Benewah Soil and Water Conservation District
900 E Street
PO Box 408
Plummer, ID 83851
(208) 686-1699

Benewah County Public Works
701 W. College Avenue
St. Maries, ID 83861
(208) 245-4122

Plummer Gateway Highway District
866 D Street
Plummer, ID 83851
(208) 686-1410

Shoshone County

Shoshone County Public Works
700 Bank Street, Suite 35
Wallace, ID 83873
(208) 753-5475

Tribal

Coeur d'Alene Tribe-
Lake Management Department
424 Sherman Ave, Suite 306
Coeur d'Alene, ID 83814
(208) 667-5772

State

Idaho Department of Lands (IDL)
3258 W. Industrial Loop
Coeur d'Alene, ID 83815
(208) 769-1577

Idaho Department of Water Resources (IDWR)
7600 N Mineral Drive, Suite 100
Coeur d'Alene, ID 83815
(208)762-2800

Idaho Department of Fish & Game (IDFG)
2750 Kathleen Avenue
Coeur d'Alene, ID 83815
(208) 769-1414

Idaho Department of Environmental Quality (IDEQ)
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Federal

Natural Resources Conservation Service (NRCS)
7830 Meadowlark Way, Suite C
Coeur d'Alene, ID 83815
(208) 762-4939
or
900 E Street
Plummer, ID 83851
(208) 686-1260

Other Resources

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

Forestry for Idaho Best Management Practices - Forest Stewardship Guidelines for Water Quality.
Idaho Forest Products Commission
www.idahoforests.org/bmp.htm

Catalog of Storm Water Best Management Practices for Idaho Cities and Counties.
Idaho Department of Environmental Quality. 2005.
www.deq.idaho.gov/media/622263-Stormwater.pdf

Low Volume Road Engineering - Best Management Practices Field Guide
Keller, G. and J. Sherar. 2003. U.S. Agency for International Development. Washington, DC.
http://pdf.usaid.gov/pdf_docs/PNADB595.pdf

Risk Assessment Worksheet
Access Roads and Driveway Runoff

Assessment Worksheet 1 - Condition of Access Roads and Driveways

The assessment worksheet below will help you identify potential environmental risks related to the management of your property's access roads and driveways. For each question indicate your risk level in the right-hand column. Some choices may not correspond exactly to your situation. Choose the response that best fits. When finished, turn to the Access Roads and Driveway Runoff Action Worksheet on page 7-14 and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section 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	I have a paved road; or my road has a good gravel base.	My road is compacted dirt, and its slope is 0% -15%.	My road is compacted dirt, and the slope is >15%.	☐ Low ☐ Medium ☐ High
Condition of unpaved road into home	Little erosion is on my road, with no obvious gullies or road wash channels.	My road has some signs of erosion with loss of soil.	Obvious erosion is evident on my road, with deep gullies and wash channels.	☐ Low ☐ Medium ☐ High
Condition of road cut bank (above slope) and fill bank (below slope)	The banks of my road are relatively flat and well vegetated, with no obvious signs of erosion.	My road banks are steep but well protected with vegetation and only some signs of erosion.	My road banks are steep and generally bare. Erosion is evident with gullies and soil slumps.	☐ Low ☐ Medium ☐ High
Condition or existence of structures for water runoff management	My drainage ditches are deep and vegetated. I maintain my culverts. I use water bars or rolling dips on steep slopes to slow runoff velocity.	My drainage ditches and culverts show evidence that they are not completely effective in runoff management.	My drainage ditches are shallow or flat allowing road wash; my culverts are plugged or there are no culverts. My road needs water bars or rolling dips.	☐ Low ☐ Medium ☐ High
Where does stormwater runoff from roads and road banks end up?	Most of my stormwater flows over forested land where sediment can drop out before reaching any surface water.	A good deal of my stormwater flows directly into surface water; the water is only slightly turbid (dirty).	Most of my stormwater runoff is channelized and flows directly into streams or the lake; the water is turbid.	☐ Low ☐ Medium ☐ High

Action Worksheet
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 my 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.

SECTION 8
RIPARIAN, PASTURE, AND FOREST MANAGEMENT

This fact sheet addresses the impacts that riparian, pasture, and forestry management can have on water quality and how *you* can make a difference with ***Best Management Practices (BMPs).*** BMPs are actions you can take to protect our natural resources. **The goal of this information is to minimize negative impacts on water quality.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheets (p. 8-14) in order to analyze your property's specific needs.
3. Fill out the action worksheet (p. 8-17), then **take action!**

Do Riparian, Pasture, and Forested Areas Need Protection?

In recent years, migration from city-living to homes on small acreages has occurred. Conservation and pollution prevention measures can be implemented on pastures, forests, and ***riparian areas*** up to 20 acres in size. The need for these measures has been clearly demonstrated in ***watersheds*** throughout the state.

Most small farm owners and managers are aware of and concerned about protecting water quality in local watersheds. In fact, when determining how to use their land, the water source and quality are always a priority for the landowner. While it is well known that improper management can lead to ***pollutants*** such as ***sediment, nutrients,*** and bacteria entering streams, what is not well understood by property owners is *how* to manage these issues.

The following BMPs are recommended by local soil and water conservation districts, Idaho Department of Environmental Quality (IDEQ), the Coeur d'Alene Tribe, Idaho Department of Lands (IDL), University of Idaho Extension, and Natural Resources Conservation Service (NRCS).

Figure 8-1. *Riparian vegetative buffer protecting surface water from adjacent agriculture activities.*

Riparian Management

Riparian areas are areas of land adjacent to creeks, streams, wetlands, lakes, and rivers (Figures 8-1 to 8-3). Other terms commonly used include riparian zones, riparian habitat, ***wetlands***, ***stream protection zone***, and ***vegetative buffers***. Regardless of the terminology, riparian areas are extremely important for maintaining good water quality.

Riparian areas are strongly influenced by the presence of water and contain plants adapted to seasonally wet conditions. These areas serve as natural buffers between ***uplands*** and adjacent water bodies (Figure 8-1). This natural buffer of vegetation serves as a filter for sediment, nutrients, pathogens, and metals before they reach surface water. Plants within riparian areas keep water cool by providing shade, stabilize soils with strong roots, reduce bank erosion, and reduce the risk of flooding by *slowly* releasing ***stormwater runoff*** from uplands into stream channels.

Riparian areas are commonly impacted by human activities such as urban development, agriculture, and timber harvest. These land use activities inherently carry a high risk for water pollution and commonly involve removing riparian vegetation. Whether you are using your land for forest management, pasture and grazing, small farm operations, or recreation, preserving riparian areas or vegetative buffers on your property is essential for maintaining clean water.

Figure 8-2. *A healthy riparian area.*

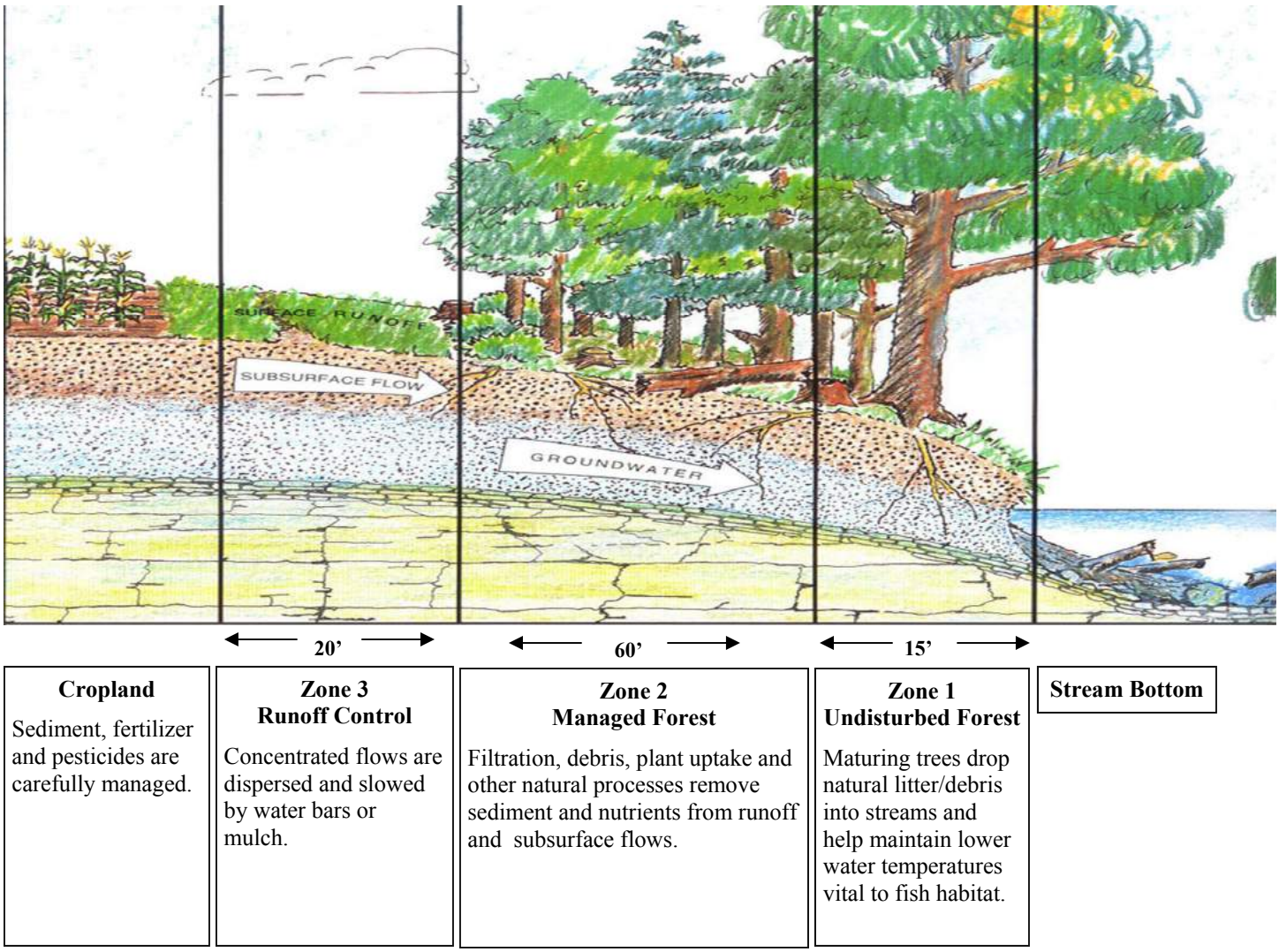


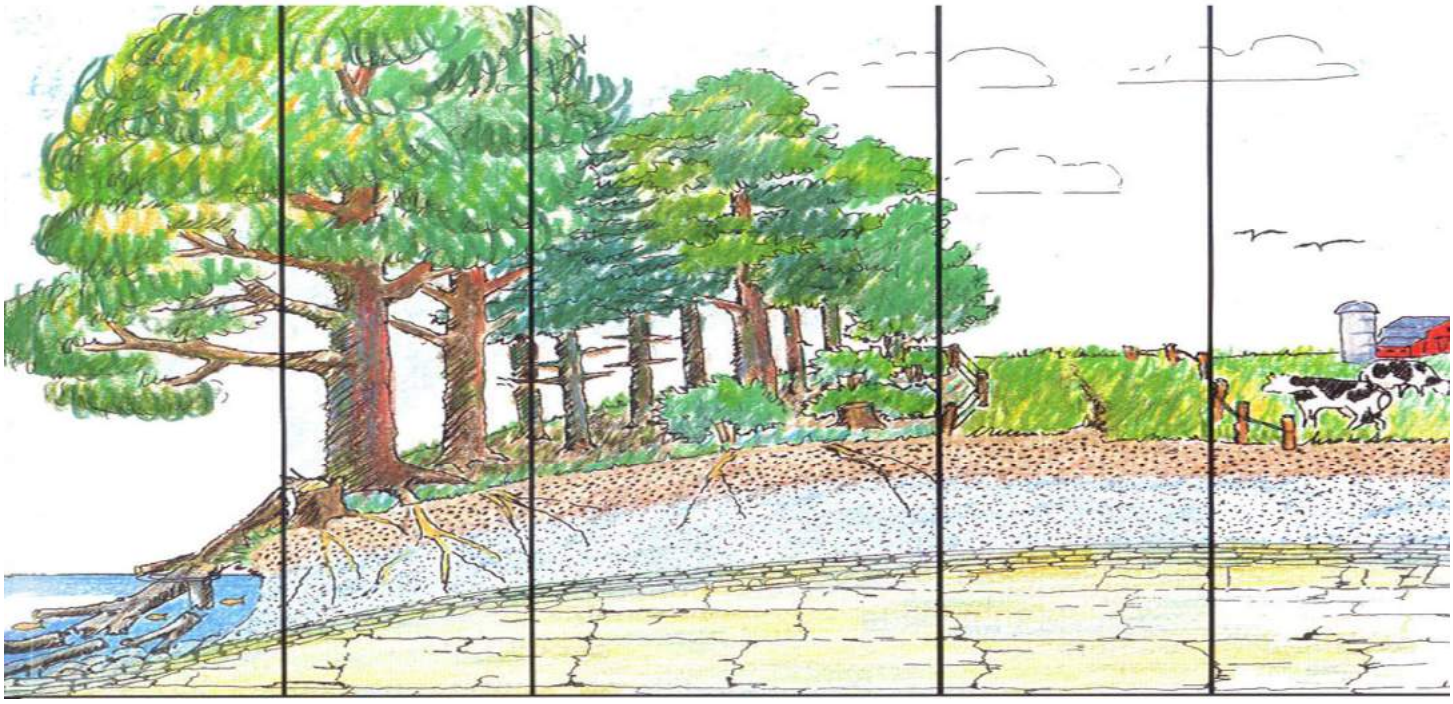
Figure 8-3. *The vegetation nearest to streams and lakes becomes increasingly important in filtering pollutants (e.g., sediment, nutrients, etc.) and stabilizing soil.*

Healthy Riparian Areas

- Diverse vegetation and root systems protect and stabilize stream banks; stream is shaded.
- Elevated water table and saturated zone increase subsurface water storage.
- Increased summer stream flows.
- Cooler water in summer and reduced icing in winter.
- Good habitat for wildlife, fish, and other aquatic organisms.

Degraded Riparian Areas

- Little vegetation to protect and stabilize stream banks and provide shade.
- Lowered water table and saturated zone reduce subsurface water storage.
- Reduction or elimination of summer stream flows.
- Warmer water in summer and increased icing in winter.
- Poor habitat for wildlife, fish, and other aquatic organisms.



15'	60'	20'	
Stream Bottom	**Zone 1** **Undisturbed Forest** Tree removal is generally not recommended in this zone.	**Zone 2** **Managed Forest** Periodic harvesting is necessary in Zone 2 in order to give neighboring trees an opportunity for vigorous growth; maintaining adequate nutrient uptake.	**Zone 3** **Runoff Control** Controlled grazing or haying is acceptable if runoff diversions are in place and Zones 1 and 2 are managed correctly.	**Pasture** Watering facilities and livestock are kept out of the Riparian Zone.

Stream Protection Zone

Stream Protection Zone (SPZ) is a designation in the ***Idaho Forest Practices Act*** (IFPA) that mandates a 75-foot minimum distance from ***Class I*** streams (both sides) and lakes that must be protected because of their importance to fish and wildlife habitat and water quality. The SPZ for a ***Class II*** stream is 30 feet. The IFPA specifically applies to lot owners who harvest timber commercially; however, anyone harvesting timber near a water body should maintain an adequate SPZ. To determine whether you have a Class I or II water body, contact IDL (see Resource Directory, p. 8-12).

Most municipalities have specific regulations or ordinances addressing land disturbance in riparian areas. These ordinances vary depending on location, and you are encouraged to contact your local municipality before removing waterfront vegetation.

Everyday Riparian Protection

Practice riparian protection on your property:

- Maintain a healthy vegetative strip.
- Leave wetlands undisturbed.
- Restrict livestock from riparian areas and surface water.
- Never dump slash or debris into surface water. This releases excess nutrients and uses up valuable oxygen needed by fish.
- Avoid burning on the shoreline. The remaining ash is highly alkaline and may change the pH of surface water and promote algae growth.
- When treating diseases or pests, use chemicals responsibly, and use only the required amount.
- **Using fertilizers within 25 feet of lakes, rivers, and streams is strongly discouraged.**

General Planting Guide for Riparian Areas and Vegetative Buffers

Figure 8-4. *Use a variety of trees, shrubs, ground-covers, and grasses when creating a vegetative buffer.*

Vegetative buffers may include aquatic plants in shallow water, moisture-loving plants along the shore, and upland plants in dry soils. If your water-front property has a riparian area or vegetative buffer that has been disturbed or is nonexistent, bringing back a healthy shoreline is relatively easy. While most restoration projects are not difficult, consulting a design professional is highly recommended. Many site-specific conditions need to be considered in shoreline restoration, such as water velocity, slope, soil type, and plant selection. Below are some general guidelines for establishing a vegetative/riparian buffer. University of Idaho Extension is an excellent resource and has numerous publications available (see Resource Directory, pp. 8-12 and 8-13).

- Use native species; they are hardier, more resistant to disease and pests, and provide natural habitat for wildlife.
- Include a variety of trees, shrubs, ground-covers, and grasses, and emphasize diversity of species, heights, and ages. Look around your property or neighboring property to determine the type of plants currently thriving in the area (Figure 8-4 and Figure 8-5).
- Plant in the spring or fall, which will provide new plantings with enough rainfall to become established without supplemental irrigation.
- Ensure sediment and erosion control measures are in place. Cover all bare soil with mulch, even when you are planting.

SUGGESTED SPECIES FOR NORTH IDAHO

Red osier dogwood

DECIDUOUS TREES

Quaking aspen *(Populus tremuloides)*

Black cottonwood *(Populus trichocarpa)*

Western paper birch *(Betula papyrifera)*

Rocky Mountain maple *(Acer glabrum)*

Red alder *(Alnus rubra)*

CONIFERS

Western white pine *(Pinus monticola)*

Lodgepole pine *(Pinus contorta)*

Ponderosa pine *(Pinus ponderosa)*

Grand fir *(Abies grandis)*

Douglas fir *(Pseudotsuga menziesii)*

Subalpine fir *(Abies lasiocarpa)*

Englemann spruce *(Picea engelmannii)*

Western larch *(Larix occidentalis)*

Western red cedar *(Thuja plicata)*

Western hemlock *(Tsuga heterophylla)*

SHRUBS

Alder *(Alnus sp.)*

Douglas spirea *(Spiraea douglasii)*

Elderberry (*Sambucus sp.)*

Serviceberry *(Amelanchier alnifolia)*

Redosier dogwood *(Cornus stolonifera)*

Chokecherry *(Prunus virginiana)*

Willow *(Salix sp.)*

Dwarf rose *(Rosa gymnocarpa)*

Shiny leaf spirea *(Spiraea betulifolia)*

Western mountain ash *(Sorbus sitchensis)*

Snowberry *(Symphoricarpos albus)*

Thimbleberry *(Rubus parviflorus)*

Mountain lover *(Pachistima myrsinites)*

Oceanspray *(Holodiscus discolor)*

Tall Oregon grape *(Mahonia aquifolium)*

GROUNDCOVERS

Kinnikinnick *(Arctostaphylos uva-ursi)*

Creeping Oregon grape *(Mahonia repens)*

Rosy pussytoes *(Antennaria rosea)*

Wild strawberry *(Fragaria virginiana)*

British Columbia wildginger *(Asarum caudatum)*

SEDGES AND RUSHES

Hardstem bulrush *(Scirpus acutus)*

Small-flowered bulrush *(Scirpus microcarpus)*

Softstem bulrush *(Schoenoplectus tabernaemontani)*

Common cattail *(Typha latifolia)*

PERENNIALS

Lupine *(Lupinus sp.)*

Aster *(Aster laevis)*

GRASSES

Idaho fescue *(Festuca idahoensis)*

Bluebunch wheatgrass *(Agropyron spicatum)*

Mountain brome *(Bromus marginatus)*

Lupine

Mountain ash

Kinnikinnick

Figure 8-5. *Examples of plants that thrive in Idaho.*

Pasture Management

Using proper grazing management strategies and improving pasture and riparian areas benefits the landowner as well as ***water quality***, fish, and wildlife. Most of the practices mentioned below result in some type of improvement in forage or water table levels, which translates into improved productivity over the long term.

Overgrazing and grazing when soils are too wet are the two most common causes of water runoff and erosion. Both of these situations cause soil compaction, which limits the amount of water allowed to infiltrate. The lack of infiltration into the soil decreases plant health and increases runoff.

Grazing in wet soils often takes place on pasturelands used as winter and spring feeding areas, on pastures grazed in early spring while soils are still wet, and on pastures grazed during or too soon after irrigation. A pasture is overgrazed when animals are allowed to feed on over 50% of plant mass. As a result, plants do not have the ability to properly regenerate themselves for the following year.

Impacts to Surface Water (Lakes and Rivers)

Most research shows that improper grazing leads to increased bacteria, nutrient, and sediment concentrations in surface water. For example, fecal coliform bacteria in streams may be a direct result of domestic animal density and access to streams.

Of the nutrients that could impact streams, ***nitrogen*** and ***phosphorus*** are the most concerning. Phosphorus binds to soil and is a potential pollutant any time soil erosion rates are high. Pastures receiving fertilizer increase the risk for nutrients to enter streams, especially in areas where the riparian area has been disturbed.

Simple Rule of Thumb

Collect manure when plants are NOT growing.
Apply when plants ARE growing.

Improper grazing can also eliminate woody vegetation resulting in decreased shade and a potential increase in stream temperatures. Streams become wide and shallow, with elevated water temperatures that have a negative effect on cold water insects and fish. Channel stability is reduced and becomes more susceptible to erosion during high flows. Stream incising (channel deepening) or channelization of riparian areas lowers the water table and causes additional erosion.

Tips For a Successful Grazing Program:

- Corral livestock and feed hay until the pasture grasses are 6" to 8" high in the spring and the pasture soils have dried sufficiently to minimize compaction.
- Eliminate continuous season-long grazing. Consider a high-intensity, short-duration grazing system or a pasture rotation system.
- Move livestock when 50% of the plant mass has been removed (3" to 4" of plant height remains). Do not graze until grasses have re-grown to at least 6" in height. This may take a month or so.
- Subdivide large pastures into smaller ones, and develop and maintain a pasture rotation system.
- During winter months, continue a rotation system. Feed in dry or frozen pastures to distribute manure, and feed evenly. If this is not possible, hold and feed livestock in a corral.
- Horses do not need round-the-clock access to feed as nutritional needs can be met with only a few hours of grazing on good pasture each day.
- Provide a water source for each pasture. Water sources should be located away from any riparian zone. If possible, do not allow livestock access to rivers, streams, or lakes.
- On irrigated pastures, irrigate immediately following grazing to stimulate plant regrowth. Do not graze on wet soils.
- Be aware when soil erosion and off-site sediment delivery are occurring, and change associated practices to eliminate the problem.
- Minimize the risk of both surface and groundwater contamination by preventing soil, fertilizers, and animal feces from entering waterways.

For a grazing plan specific to your property, refer to USDA NRCS. See Resource Directory, p. 8-12.

Graze Riparian Areas with Caution!

While most riparian areas need to be completely restricted from grazing, some areas may be grazed with caution. Animal grazing in riparian areas can result in loss of streamside vegetation, erosion due to trampling of stream banks and channels, and water pollution by animal feces. **In just a few days, livestock can remove an entire year's shrub growth. Avoid grazing riparian plants shorter than three inches.**

Stream bank compaction can also occur, contributing to poor plant root development and a decrease in the soil's infiltration rate. Grazing in riparian areas should only be used as a tool to improve plant health. Graze herds quickly on grassy areas to aerate soil and reduce the duff layer.

Grazing Solutions

Best: Use fencing and upland watering systems to restrict livestock from riparian areas (Figure 8-6). This prevents destruction to the riparian ecosystem and allows riparian plants to thrive. If the water or riparian area was previously degraded, significant improvements are often seen in only two to three growing seasons.

Good: If riparian grazing is necessary, use fencing that will allow *controlled* grazing of the riparian area. Avoid grazing the riparian area until stream banks are stable and well vegetated, and then graze only in the late spring for short periods. Avoid early spring grazing because stream banks are saturated and vulnerable to trampling. Avoid summer and fall grazing because this is when livestock tend to overgraze shrubs, especially willows.

Figure 8-6. *Fencing and upland watering systems keep livestock out of surface water.*

Impacts to Groundwater (Wells)

Grazing can impact the quality, quantity, and timing of shallow groundwater. Often, the flow of perennial and intermittent springs and streams depends on shallow groundwater. Poor grazing management practices often lead to slower soil infiltration rates. This means that more water will run off your land, and less water will be available for plant growth and groundwater recharge. The results are decreased plant cover and bare soil exposed to raindrop impact and other soil compaction. Changes in the water cycle can cause a shift in plant species to less desirable grasses and an increase in noxious weeds. Changes in the water cycle can also have an impact on the quality and quantity of residential drinking water.

It Pays to Protect!

- Strong vegetative roots reduce the likelihood of costly damages caused by flooding and stream bank repair. The loss of valuable land to bank erosion is permanent.
- Healthy riparian areas help maintain a high water table and saturated zone, which increases subsurface water storage. This promotes deep root growth, healthy pasture grass, and lessens the threat of invasive weeds.
- Streambank vegetation reduces stream channel icing in winter and shades water in summer heat.

Small farm owners concerned with water quality and increased pasture productivity should seek technical assistance. To develop and implement a plan to improve forage production, riparian areas, and animal watering options, see the Resource Directory, p. 8-12.

Forest Management

For property owners with forest land adjacent to lakes, rivers, and streams, healthy forest management will require an understanding of a number of activities. These include: site preparation, timber harvesting, planting, thinning, prescribed fire, insect and disease treatment, and preservation and enhancement of vegetation along waterways for wildlife habitat, and water quality.

In Idaho, family forest ownership is twice the acreage owned by industrial timber companies. The application of BMPs on these private lands is just as important as on industrial, state, and federal lands. State and federal audits are routinely conducted on various harvested lands to determine whether BMPs are being applied and how effective they are at protecting water quality. Common problems include inadequate SPZs, inadequate stream crossings, inadequate road surface drainage, and ditches and culverts that don't work.

If you are hiring a professional logging contractor, use this section, along with other suggested reference materials, to determine whether proper BMPs are being applied on your harvested land. An excellent publication is the **Forestry for Idaho Best Management Practices - Forest Stewardship Guidelines for Water Quality** (see Resource Directory, p. 8– 13).

Develop a Management Plan

A landowner should develop a management plan *before* beginning any forest management activities. This plan should make clean water a priority while at the same time meet the landowner's objectives. The management plan should include area maps, road planning and design, SPZs, harvesting operations, and site preparation.

To obtain assistance in preparing a management plan, contact the agencies or professionals in the Resource Directory that are noted with an asterisk (*).

Stream Protection Zone

The SPZ is a mandated 75-foot protected area adjacent to a Class I stream, lake, or other water body. This distance should be extended in areas where slopes are steep and soils are unstable. The mandate was put in place as a result of problems identified within SPZs that included constructed roads and skid trails, inadequate drainage near streams, logging slash left in streams, excessive equipment operation, and improper use of broadcast or pile burning.

Keeping SPZs intact prevents erosion, provides wildlife habitat, shades surface water, allows for water infiltration, and doesn't cost a thing. Once vegetation has been removed, you are left with disturbed ground which readily erodes, attracts noxious weeds, and requires costly maintenance and replanting.

Mapping

As an important part of the management plan, aerial maps show existing site conditions including: property boundaries, all surface water (lakes, rivers, and streams), the direction water flows onto and across the property, existing roads and trails, culverts, existing vegetation, ***critical habitat, impervious areas*** (roofs, driveways, and decks), soil types, and slopes.

Once existing conditions have been documented, create a map showing planned harvesting operations. This map should include temporary roads, erosion and sediment controls, clearing limits, preserved vegetation, changes in drainage patterns, and all BMPs (Figure 8-7).

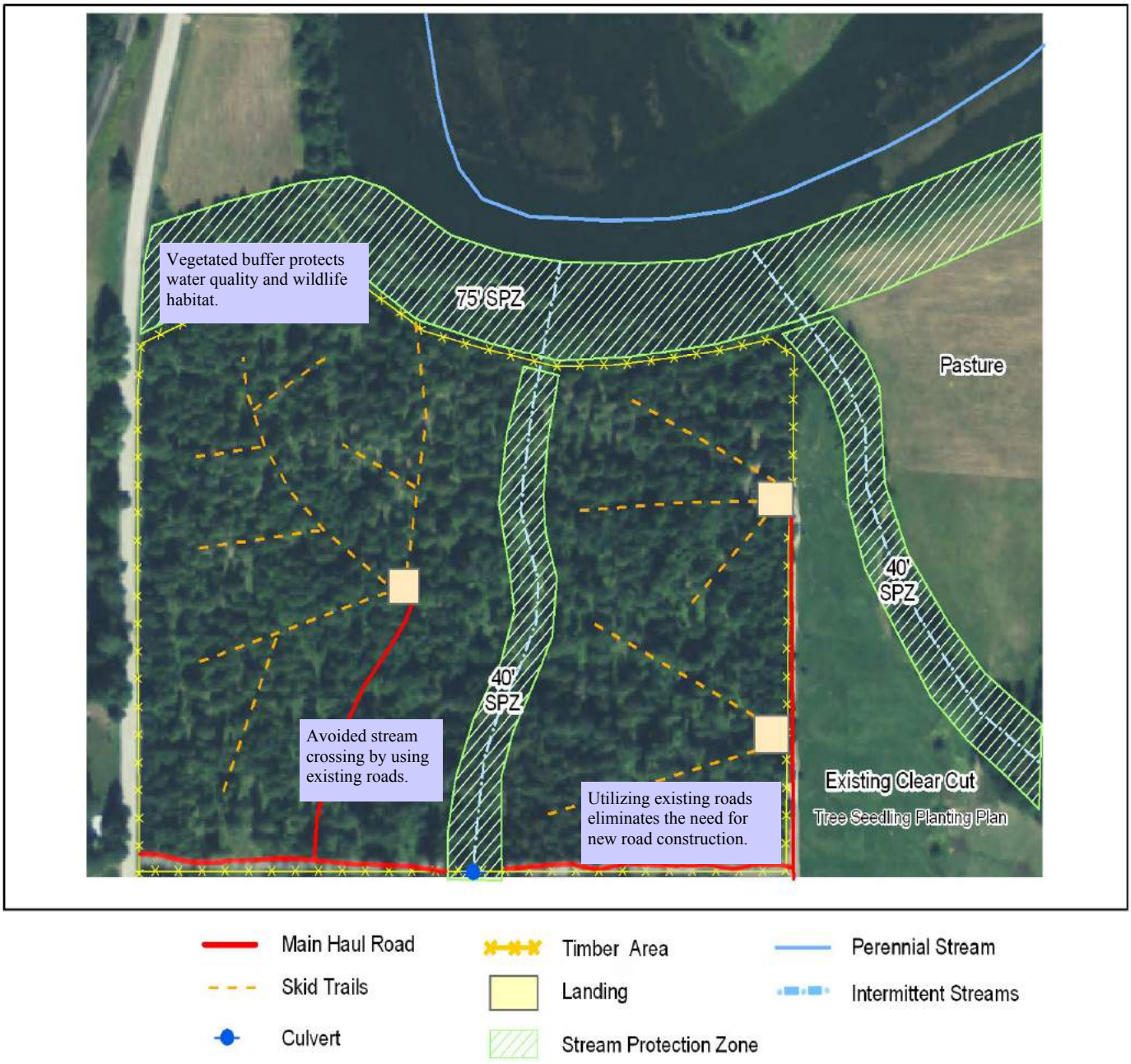


Figure 8-7. *An example forest and pasture management map produced by NRCS.*

Forest Road Design and Management

Erosion that occurs during forest road construction and throughout the life of the road has a great potential to degrade surface water. An important first step is to **determine how the roads will be used now *and* in the future.**

To minimize the impact of road construction, new roads should be built to comply with IFPA's plan and design guidelines and the ***Tribal Forest Management Plan*** (where applicable). For detailed information on road design, see Section 7, Access Roads and Driveway Runoff. Consult a professional for proper road design and construction.

Basic Forest Road BMPs

- Use existing roads whenever possible—review aerial photographs and soil surveys to help locate them.
- Locate and design new roads to minimize downhill water movement (Figure 8-8).
- Use appropriate erosion and sediment controls such as silt fencing and mulch, where soil has been disturbed or where the potential for erosion exists (see Section 6, New Construction, for details). Seed all exposed soils upon completing construction.
- Stream crossing construction must be in compliance with the *Idaho Stream Channel Protection Act* (see Section 7, Access Roads and Driveway Runoff for details). A permit must be obtained from the Idaho Department of Water Resources (see Resource Directory, p. 8-12) for *any* alterations within the beds and banks of continuously flowing natural streams in Idaho (Figure 8-9).
- Avoid crossing open water or wetlands.
- Avoid driving through open water. Skidding through streams is not permitted.
- Use properly sized culverts or bridges where necessary. Remove any temporary culverts or bridges after the road has been abandoned.
- Design roads for maximum cross drainage using water diversion structures (e.g., rolling dips and water bars) to minimize down-road flow.
- Always route drainage through a vegetative filter strip so sediment can be removed before water reaches a surface water body (Table 8-1).
- Regularly inspect and maintain drainage structures.
- Close all temporary roads after use to prevent unwanted use by off-road vehicles that could be detrimental to the site. Apply grass seed to bare ground (Figure 8-10).

Figure 8-8. *A well-designed forest road.*

Figure 8-9. *Temporary stream crossing.*

Figure 8-10. *Road closure.*

Slope of land between management activity and water body (percent)	Recommended width of filter strip (slope distance in feet)
0 – 10	75
11 – 20	76 – 85
21 – 40	86 – 110
41 – 70	111 – 150

* Distance is measured to the edge of soil disturbance, or in the case of fills, from the bottom of the fill slope.

Table 8-1. *Guide for forest lot management, showing recommended filter strip widths.*

Harvesting

Timber harvesting is an integral part of forest management. Harvesting temporarily disturbs the environment in the immediate area and should therefore follow a plan that incorporates water quality protection in all operations:

- Time the harvest to be compatible with soils, topography, and weather conditions. Soil disturbance is generally greatest under wet conditions and least under frozen conditions.
- Install water diversion structures.
- Implement sediment and erosion control practices (see Section 6, New Construction).
- Locate landings (areas where harvested trees are skidded to be processed for hauling) away from low, poorly drained areas and outside of SPZs and riparian areas.
- Follow road BMPs when designing and laying out skid trails.
- Try to minimize soil disturbance and compaction wherever possible by keeping heavy equipment on an efficient system of roads and designated skid trials. Leave rub trees along skid trails. These are the last harvest trees to be removed and will protect residual trees during skidding operations.

Forest Practices Requiring IDL Notification

- Timber harvesting and related road construction.
- Road construction and reconstruction located away from harvesting area but associated with harvesting operation.
- Application of insecticides, herbicides, rodenticides, and fertilizers for forest management purposes.
- Management of slash resulting from harvest, management or improvement of forest tree species.
- Conversion of harvested forest land to another use.
- Reforestation.
- The use of prescribed fire.

Site Preparation and Reforestation

Site preparation provides a healthy environment for reforestation following a harvesting operation or unmanaged forest lot. Ultimately, better light, nutrients, and moisture need to exist to make conditions favorable for germination, survival, and growth. These conditions can be accomplished through manual, mechanical, or chemical operations, and include the following:

- Reduce competition by unwanted vegetation to increase the survival rate of the desired trees.
- Remove slash and logging debris if the site has been harvested or unmanaged.
- Prepare or modify the soil.

Manual

Manual site preparation is the best method in small areas or near water.

Mechanical

Mechanical site preparation is usually done by a contractor with specialized equipment.

- Carry out operations when soils are frozen or dry enough to minimize compaction. Avoid operation during periods of saturated soil.
- Be sure that slash piles do not interfere with natural drainage patterns.
- Consider shearing and raking under frozen conditions to minimize soil incorporation into slash piles.
- Follow land contours to promote soil stability.
- Use patch or row scarification (clearing) where terrain or soil type calls for minimum soil disturbance.
- Low slash and small brush should be left on the forest floor to slow surface runoff, replenish soil nutrients, and provide shade to seedlings.

Chemical

Use an integrated approach to weed and pest management. **When applying pesticides and herbicides, prevent them from entering surface waters.**

- Treatment within SPZ shall be done by hand and applied only to specific targets.
- Leave a 25-foot buffer along surface water.
- For aerial application, leave a 100-foot buffer and do not spray in SPZ.
- Always refer to chemical label instructions.

Consult UI Extension or your county weed department for proper herbicide guidelines.

Resource Directory
Riparian, Pasture, and Forest Management

Federal

Natural Resources Conservation Service (NRCS)
***Grazing Plans**
7830 Meadowlark Way, Suite C-1
Coeur d'Alene, ID 83815
(208) 762-4939

or

900 E Street
Plummer, ID 83851
(208) 686-1260

State and Tribal

Coeur d'Alene Tribe -
Natural Resources Department
***Forest Management Plans**
PO Box 408
Plummer, ID 83851
(208) 686-1315

Coeur d'Alene Tribe -
Lake Management Department
Coeur d'Alene Office
424 Sherman, Suite 306
Coeur d'Alene, ID 83814
(208) 667-5772

Idaho Department of Environmental Quality (IDEQ)
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Idaho Department of Lands (IDL)
***Forest Management Plans**
Coeur d'Alene/Mica Supervisory Area
3258 W. Industrial Loop
Coeur d'Alene, ID 83815
(208) 769-1577

or

St. Joe Supervisory Area
1806 Main Avenue
St. Maries, ID 83861
(208) 245-4551

or

Cataldo Supervisory Area
80 Hilltop Overpass Road
Kingston, ID 83839
(208) 682-4611

Benewah County

University of Idaho Extension
Benewah County
701 W. College Avenue, Suite LL2
St. Maries, ID 83861
(208) 245-2422

University of Idaho Extension
Coeur d'Alene Reservation
402 Anne Antelope
PO Box 289
Plummer, ID 83851
(208) 686-1716

Benewah Soil and Water Conservation District
900 E Street
Plummer, ID 83851
(208) 686-1699

Kootenai County

University of Idaho Extension
Kootenai County
1808 N. 3rd Street
Coeur d'Alene, ID 83814
(208) 446-1680

Kootenai-Shoshone
Soil and Water Conservation District
7830 Meadowlark Way, Suite C-1
Coeur d'Alene, ID 83815
(208) 762-4939 ext. 101

Private Forestry Consultants

***Forest Management Plans**
Look in the telephone directory under Forest Management. Each county assessor's office has a list. University of Idaho Extension maintains a list online at:
www.uidaho.edu/extension/forestry/resources

Suggested Reading

Catalog of Storm Water Best Management Practices for Idaho Cities and Counties.
Idaho Department of Environmental Quality. 2005.

You may examine this useful catalog at IDL, Kootenai County Community Development, or the IDEQ office in Coeur d'Alene.
Find it online at:
www.deq.idaho.gov/media/622263-Stormwater.pdf

Forestry for Idaho Best Management Practices - Forest Stewardship Guidelines for Water Quality.
Idaho Forest Products Commission.

An excellent color pamphlet with many photographs displaying and explaining proper and improper uses of forest practice BMPs, along with forest ecology and water quality concepts. Look for this at your IDL offices or find it online at:
www.idahoforests.org/bmp.htm

Grass Seeding Forest Roads, Skid Trails, and Landings in the Inland Northwest.
Brooks, R., A. McFarland and C. Schnepf. 2011. Pacific Northwest Extension, University of Idaho. Moscow, ID. PNW 628.
www.cals.uidaho.edu/edComm/pdf/PNW/PNW628.pdf

Logging Selectively: A Practical Pocket Guide to Partial Timber Harvesting.
Schnepf, C. 2000. Pacific Northwest Extension, University of Idaho. Moscow, ID. PNW 534.
www.cals.uidaho.edu/edComm/detail.asp?IDnum=667

Low-Volume Roads Engineering, Best Management Practices Field Guide - Chapter 7, Drainage of Low-Volume Roads.
Keller, G. and J. Sherar.2003. Washington DC: U.S. Forest Service.
http://pdf.usaid.gov/pdf_docs/PNADB95.pdf

Management Planning for the Family Forest Owner.
University of Idaho Extension. 2007. Moscow, ID. CIS 1141.
www.cals.uidaho.edu/edComm/pdf/CIS/CIS1141.pdf

Managing Organic Debris for Forest Health: Reconciling Fire Hazard, Bark Beetles, Wildlife, and Forest Nutrition Needs.
University of Idaho Extension. Moscow, ID. PNW 609
www.cals.uidaho.edu/edComm/pdf/PNW/PNW0609.pdf

Plant Your Seedlings Right.
Dumroese, R.K., D.L. Wenney and Y.C. Barkley. 2001. University of Idaho, College of Natural Resources, Forest Research Nursery. Moscow, ID. CIS 528
http://seedlings.uidaho.com/default.asp?PageID=38

A Stewardship Handbook for Family Forest Owners.
National Association of State Foresters. 2009.
www.stateforesters.org/stewardship_handbook

Valuable Websites

Division I Soil and Water Conservation Districts
www.northidahoswcds.org

Idaho Forest Products Commission
www.idahoforests.org/bmp.htm

Idaho Department of Lands State Forester Forum
www.idl.idaho.gov/bureau/ForestAssist/state_forester_forum.htm

Plants Gone Wild
Plants of the Wild—native plant newsletter.
http://plantsofthewild.com/Newsletter.html

University of Idaho Extension
www.extension.org – search under "small farms"

www.uidaho.edu/extension/forestry

Risk Assessment Worksheets
Riparian, Pasture, and Forest Management

Assessment Worksheet 1 - Riparian Management

The assessment worksheet below will help you identify potential environmental risks related to riparian health. 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 Riparian, Pasture, and Forest Management Action Worksheet on page 8-17 and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section to help you decide how to best reduce pollution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Streambank condition	More than 90% of the stream banks on my property are stable with plant cover or large rocks. I see little to no active erosion.	70% - 90% of my stream banks are stable with plant cover or large rocks. I have seen some active erosion.	Less than 70% of my stream banks are stable with plant cover or large rocks. I see active erosion on my stream banks.	☐ Low ☐ Medium ☐ High
Roads, driveways, and skid trails	I have identified BMPs required to prevent erosion and protect water quality during design and construction, and I have consulted an engineer. I frequently inspect and maintain BMPs.		I have made no effort to implement water-quality BMPs along roadways on my property.	☐ Low ☐ Medium ☐ High
Streamside vegetation (riparian)	The stream on my property is well-shaded with trees and/or shrubs.	I have trees and/or shrubs providing some shade.	The stream on my property has little or no shade from trees and/or shrubs.	☐ Low ☐ Medium ☐ High
Stream crossings	I avoid stream crossings unless absolutely necessary. I have BMPs installed for all temporary and permanent culverts, bridges, and fords. I use engineering services for designing water-friendly stream crossings.		I don't use BMPs. Stream crossings on my property are eroding or bare. I don't maintain culverts, bridges, and fords.	☐ Low ☐ Medium ☐ High

Assessment Worksheet 2 - Pasture Management

Use the worksheet below to rate your risks relating to pasture management. When finished, turn to the Riparian, Pasture, and Forest Management Action Worksheet on page 8-17 and record your medium and high-risk practices.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Manure management	I collect manure in the fall and spread it in the spring to optimize plant growth and reduce nutrient runoff.		I do not collect the manure from my pasture, and runoff is directed towards surface water.	☐ Low ☐ Medium ☐ High
Pasture rotation	I maintain a regular rotation for my livestock and move them before the vegetation is overgrazed.	I rotate my livestock between pastures, but some areas show evidence of overgrazing.	My livestock graze in the same pasture year-round.	☐ Low ☐ Medium ☐ High
Livestock access to surface water and riparian zones	My livestock have watering systems for fresh water. Riparian areas and surface water are fenced off.	My livestock have limited access to the riparian areas and only during the late spring.	My livestock roam freely in the stream and graze on adjacent plants.	☐ Low ☐ Medium ☐ High

Assessment Worksheet 3 - Forest Management

Use the worksheet below to rate your risks relating to forest management. When finished, turn to the Riparian, Pasture, and Forest management Action Worksheet on page 8-17 and record your medium and high-risk practices.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Management plan	I have an up-to-date written BMP management plan for timber harvesting, site preparation, stream protection, road maintenance, and forest management.	I have a written plan, but it has not been updated in the last 5 years.	I do not have a management plan that makes clean water a priority.	☐ Low ☐ Medium ☐ High
Timber harvesting	I plan and conduct timber harvests using BMPs to protect water quality and meet the sunlight and site requirements of tree species. I have timber harvests monitored by a professional forester.	Timber harvests on my property are planned and conducted using BMPs without the assistance of a professional forester or other natural resources professional.	I do not use BMPs. I do not hire a professional forester to plan and implement timber harvests, nor do I oversee the harvests myself.	☐ Low ☐ Medium ☐ High
Using BMPs	I carefully select forestry BMPs to protect water quality during all of my forest management activities. BMPs are included in my written forest management plan.	I include BMPs on an as-needed basis where I think they are necessary, but I don't include them in my written plan.	I don't consider BMPs during forest management activities.	☐ Low ☐ Medium ☐ High
Stream Protection Zones (SPZ)	I have the SPZs on my property identified and marked. I adhere to the Idaho Forest Practices Act rule of a 75-foot width for a Class I water body.		No SPZs on my property have been delineated. I make no efforts to reduce harvesting impact on streams.	☐ Low ☐ Medium ☐ High

Action Worksheet
Riparian, Pasture, and Forest Management

Write all high and medium risks below.	What can you do to reduce the risks?	Set a target date for action.
Sample: I don't have any type of plan to manage forested lot.	Contact a natural resources professional for on-site consultation to develop a plan.	One week from today.

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SECTION 9
AQUATIC INVASIVE SPECIES

This fact sheet addresses the impacts of aquatic invasive species on water quality and how *you* can make a difference with ***Best Management Practices*** *(BMPs).* BMPs are actions you can take to protect our natural resources. **The ultimate goal of this information is to prevent, detect, and control aquatic invasive species in and near our waterways while minimizing negative impacts to water quality.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheet (p. 9-24) in order to analyze your property's individual needs.
3. Fill out the action worksheet (p. 9-25), then **take action!**

What Are Aquatic Invasive Species?

Aquatic invasive species (AIS) grow, reproduce, and spread rapidly in water environments. They are animals, plants, and other organisms (microbes) that are not native to the area and have the potential to cause harm to the economy, human health, our natural resources, and ultimately our quality of life. AIS succeed due to favorable environmental conditions and a lack of natural predators, competitors, and diseases. AIS are also referred to as "nuisance" and "exotic" species, and are one of the most significant threats to our water resources today.

Why Are They Here?

Although there are a number of sources for the introduction of AIS, such as wind, water, and animals, most invasive species are introduced by humans. It is important to recognize this is a global issue, as well as a local one. The invasion begins across the world via imported fruits and vegetables, ship ballast waters, vehicles, shipping containers, exotic pet and aquarium trade, and human travel (Figures 9-1 and 9-2).

Figure 9-1 and Figure 9-2. *Ships and decorative ponds are potential pathways for AIS introduction.*

Once these non-native species arrive in North America, they spread in many different ways. Some species have deliberately been introduced, such as garden ornamentals, range forage plants for cattle, and animals and insects used for biological control. Most often they are introduced unintentionally through numerous pathways: travelers, pets and animals, recreational boats and vessels, and the trade of ornamentals (Figures 9-3 to 9-5).

While the majority of introduced species are not harmful to the economy or the environment, a small percentage are very damaging and need to be eradicated as soon as they are detected.

Why Do We Care?

Invasive species are a form of biological pollution; they can be detrimental to the economy, human health, and natural resources. They spread easily in today's global network of commerce and are difficult and costly to control. Invasive species can impede industries, damage habitat, threaten agriculture, and reduce our quality of life.

Introduced species outcompete native plants and animals and alter important ecosystem functions such as food webs, habitat, fire, and flooding. Invasive species also hybridize with native species, causing complex environmental changes.

The introduction of AIS to the United States has been rapidly increasing and causing widespread damage. The impacts are vast and include the loss of native plant and animal communities; reduced property values; impaired drinking water; severely degraded recreational uses (swimming, boating, and fishing); increased flooding; and enormous ongoing prevention and control costs.

What Can You Do?

The following BMPs can be used to help combat AIS. It is simple to apply BMPs, and the satisfaction that comes from protecting our lakes and streams is priceless.

The health of our aquatic ecosystems requires a very specific biological balance to be sustained. Methods used to manage AIS need to address this balance fully before being applied. Read this section and contact the professionals listed in the Resource Directory (p. 9-23) before attempting to control any aquatic plant or animal on your own.

Figure 9-3. *Eurasian watermilfoil on prop.*

Figure 9-4. *Trailer and boat with attached weeds.*

Figure 9-5. *Dreissena (Quagga mussel)-infested boat prop.*

AIS Currently in Idaho Waters

Lakes, Rivers, and Streams

*Eurasian watermilfoil
Myriophyllum spicatum (p. 9-8)
Curlyleaf pondweed
Potamogeton crispus (p. 9-9)
Brazilian elodea
Egeria densa (p. 9-10)
Parrotfeather milfoil
Myriophyllum aquaticum (p. 9-12)
Yellow floating heart
Nymphoides peltata (p. 9-13)
*Crayfish
Procambarus and *Orconectes* sp. (p. 9-20)
Asian clam
Corbicula fluminea (p. 9-21)
*Didymo/rock snot
Didymosphenia geminata (p. 9-22)

Wetlands and Riparian Zones

*Common reed
Phragmites australis (p. 9-14)
Flowering rush
Butomus umbellatus (p. 9-15)
*Purple loosestrife
Lythrum salicaria (p. 9-16)
*Yellow flag iris
Iris pseudacorus (p. 9-17)

Most Unwanted or in Nearby States

Hydrilla
Hydrilla verticillata (p. 9-11)
Quagga and zebra mussels
Dreissena sp. (pp. 9-18 and 9-19)

*Currently in Benewah, Kootenai, and/or Shoshone Counties

Call 1-877-336-8676
Idaho State Department of Agriculture
to schedule a free boat inspection
www.invasivespecies.idaho.gov

Prevention

Idaho currently has aggressive state-wide prevention efforts in place; however, active participation by all water users is key to addressing this important issue. Because human actions are the primary means of invasive species introduction, it is our responsibility to work towards positive solutions. Prevention is far less expensive than control, so let's work to keep them out!

Clean Everything

Anything that gets wet needs to be cleaned. This includes boats, trailers, inflatable rafts, life jackets, flippers, waders (especially felt), and fishing rods.

Non-absorbent items

- Detergent—soak or spray all surfaces for at least one minute in 5% dishwashing detergent (2 cups detergent with water added to make 2.5 gallons).
- Bleach—soak or spray all surfaces for at least one minute in 2% household bleach (1 cup of bleach with water added to make 3 gallons).
- Hot water—soak for at least one minute in very hot water kept above 140 °F (hotter than most tap water) or for at least 20 minutes in hot water kept above 113 °F (uncomfortable to touch).

Absorbent items require longer soaking times to allow thorough saturation. For example, felt-soled waders require the following:

- Hot water—soak for at least 40 minutes in hot water kept above 113 °F.
- Hot water plus detergent—soak for 30 minutes in hot water kept above 113 °F containing 5% dishwashing detergent.
- Freezing any item until solid is likely to kill most organisms.

Drying is effective in ensuring organisms are dead.

- Items must be completely dry to the touch, inside and out, then left dry for at least another 48 hours before use.
- For mussels, it is recommended that the item dry for 30 days after leaving a waterbody with a known infestation. Didymo and quagga/zebra mussels can survive for months in moist conditions.

Do Not Release

Do not release plants, animals, or fish into a waterbody unless they originally came from that particular waterbody. If your family no longer wants your aquarium and aquatic pets**,** do not dump any of the plants, animals, or water into nearby water, storm drains, or toilets. Give them away, take them back to the pet store, or bury them away from storm drains or water bodies.

Bait

The use of live bait is unlawful in Idaho, with the exception of crayfish caught in the same waterbody that is being fished or used. **Do not dump bait or bait water.**

Ornamental Garden Plants

Many plants on Idaho's noxious weed list are sold online and in some cases at local nurseries. Become familiar with invasive plants by using this section, your local weed department, or the Idaho State Department of Agriculture (see Resource Directory, p. 9-23).

Talk About It

Tell your neighbors and friends what you have learned. **Spread the word—not the weed!** Talking about this pressing issue will greatly increase the chances for protecting our lakes. The process of informing the public by local, state, tribal, and federal agencies is expensive, time consuming, and sometimes intrusive, especially when folks are trying to relax and enjoy the lake during the beautiful summer months. Telling one person can sometimes be enough!

Expect to be Inspected

In Idaho, boaters are required by law to remove harmful plants and animals from boats and trailers. Boat inspections are now mandatory in Idaho for all traveling watercraft. All boats are considered contaminated until inspected. Look for your nearest boat inspection station. The time spent thoroughly cleaning your boat is well worth the luxury of a beautiful day on a healthy lake. For more information on Idaho's current efforts, visit *www.invasivespecies.idaho.gov*.

Clean

- Remove all visible plants and debris.
- Thoroughly wash everything, including crevices and other hidden areas (see "Clean Everything," p. 9-3).
- Rinse, scrub, or pressure wash away from storm drains, ditches, or waterways.

Drain

- Completely drain your boat before leaving the area, including wells, ballast, and engine cooling water.
- Rinse or flush under flooring, at inflation chamber joints or other areas that can trap mud and debris.

Dry

Allow time for your boat to completely dry before launching in other waters. If you have been in a known zebra and/or quagga mussel-infested waterbody, it is recommended your boat dry for 30 days.

Dispose

Dispose of plant matter and debris by bagging and placing it in the trash, away from storm drains, ditches, and waterways. If you find something suspicious, place it in a sealed container with water, and call Idaho State Department of Agriculture (see Resource Directory, p. 9-23).

Early Detection, Rapid Response

Catching AIS early and controlling them before they cause significant damage or spread to other water bodies provides the best (and sometimes only) hope of eradication. Under the Idaho Invasive Species Act of 2008, the state has determined, "Prevention, early detection, rapid response, and eradication are the most effective and least costly strategies against invasive species because they combat new invasions before they expand beyond feasible control." The suggestions below offer help on how you can be part of the solution.

Know What to Look For

Know what you are looking for and look often! Most plants and animals are not invasive; they are beneficial and necessary to fish habitat and biodiversity. Learn how to differentiate invasive species from native species. This section includes identification pages for plants and animals of concern. Numerous online resources are available for AIS.

The vast majority of new infestations are found near boat ramps and along the nearshore (0-11 feet). Regularly survey these areas for new infestations. If you find something suspicious, collect a sample, write down the exact location, and call one of the agencies listed in the Resource Directory, p. 9-23.

Form Volunteer Monitoring Groups

Waterfront residents have a unique opportunity and responsibility to be knowledgeable on potential threats to water quality. Volunteer monitoring is an excellent means of early detection and a great opportunity to get involved (Figure 9-6).

Volunteer groups can be trained by local professionals to identify aquatic plants and animals, monitor for new infestations, report findings, take water samples, and educate their neighbors. If a group like this does not exist in your area, create one of your own. Call the Coeur d'Alene Tribe, Idaho Department of Environmental Quality (IDEQ), or University of Idaho Extension, to let them know your group is interested in volunteering (see Resource Directory, p. 9-23).

Figure 9-6. *A community weed monitoring group.*

Idaho Laws and Efforts

Idaho Eurasian Watermilfoil Program, 2006
This program was created to eradicate Eurasian watermilfoil. The ability to facilitate this specialized program required hiring aquatic plant specialists in the Idaho State Department of Agriculture (ISDA), the cooperation of numerous local, state, tribal, and federal agencies, and millions of dollars. To continue the efforts put in place, future control methods need to be addressed, and participation by all water users is vital.

Idaho Invasive Species Act, 2008 (Idaho Code 22-19)
This law includes provisions that allow the state to determine what is invasive, to set up mandatory inspection and decontamination stations for boats, and to set up a $5 million emergency response fund. This law, under Idaho Code 22 is administered by ISDA.

Idaho Invasive Species Fund, 2009 (Idaho State Department of Agriculture)
This legislation provides funding programs to prevent the introduction of AIS in Idaho. This law requires all vessels, both motorized and non-motorized to purchase and display the *Invasive Species Fund* sticker to legally launch and operate in Idaho. Stickers can be purchased through Idaho Department of Parks and Recreation.

National Laws and Efforts

Lacey Act, 1900
This act prohibits trade in wildlife, fish, and plants that have been illegally taken, possessed, transported or sold.

National Invasive Species Act, 1990
This law has been the nation's chief protection against new aquatic invaders, especially those that arrive in ballast water. It was passed in response to the invasion of the zebra mussel and other species that have damaged the Great Lakes.

Get involved!

The quality of our water is well worth it!

Control Methods

A variety of techniques are used for controlling AIS. Often they are combined in what professionals call integrated pest management (IPM). Determining what control methods to use varies based on the type of species, degree of infestation, location, cost, recognized scientific research, lake management approaches, and established polices and permitting. Because AIS management is a very specialized field, always contact a professional before attempting to control AIS yourself. The information here is not a "how to" guide but is meant to provide the public with a *basic* understanding of control methods. For detailed information on aquatic plant management see Resource Directory, p. 9-23.

Manual Control

Manual controls include bottom barriers, water drawdown, hand pulling, raking, digging, and cutting (Figure 9-7).

Advantages

- Easy to use around docks and swimming areas.
- Equipment is inexpensive.
- Hand pulling allows the flexibility to remove undesirable plants while leaving native ones.

Disadvantages

- Plants often re-colonize the cleared area and treatment may need to be repeated throughout growing season.
- Labor intensive, so not practical for large areas or thick weed beds.
- It is difficult to contain and collect all plant fragments. Many aquatic plants re-grow from fragments.
- Some plants, like flowering rush, have massive rhizomes and are difficult to dig by hand.
- Pulling and raking stirs up the sediment and makes it difficult to see remaining plants.
- Hand-pulling and raking disturbs bottom-dwelling animals, can break plant parts off, and can be labor intensive.

Figure 9-7. *Hand removal.*

Bottom Barriers (Benthic Barriers)

Barriers cover the plants and lake bottom like a blanket (Figure 9-8). They compress plants, reducing the amount of light they receive, stifling growth. Studies have been conducted to determine the most effective and least destructive (to native aquatic life) time frame for barriers to stay down.

The Idaho Department of Lands (IDL) created specific guidelines for the barrier design and the time frame for leaving them in the lake bed. These guidelines make barriers easy to manage, ensuring they don't stay on the bottom of the lake becoming trash. Also, leaving barriers in for too long allows sediment to build up on top. This buildup is a problem because plants re-grow in the sediment, and the weight of the sediment makes removing the barrier difficult. Barrier installation is easiest in spring when aquatic plant growth is low. IDL requires a permit for the installation of bottom barriers. Within waters or submerged lands of the Coeur d'Alene Reservation, permission is required from the Coeur d'Alene Tribe's Lake Management Department (see Resource Directory, p. 9-23).

Figure 9-8. *Diver installing a 10' x 10' bottom barrier.*

Water Level Drawdown

Lowering the water level of a lake or reservoir can have a dramatic impact on aquatic plants growing near the shore. Plants exposed to air, due to water drawdown, are susceptible to freezing temperatures in the winter months. If exposed before a thick layer of snow accumulates, a high mortality rate often results. However, some AIS (such as flowering rush) are suspected to do best in exposed and disturbed areas created by drawdown. What might be helpful in controlling some AIS could very well make others worse. Drawdowns can also have other negative impacts to the ecosystem, such as increased erosion and changes in available fish and wildlife habitat.

Biological Control

Biological controls are predators or competitors of invasive species. Use of biological controls can involve importing exotic predators/competitors to help control exotic species, or using predators/competitors native to the area. The need for biological control methods has increased due to concerns surrounding the environment and health. It is a priority for scientists to consider the wider implications of introducing a foreign species. As a result, the decision process for this control method can often be time consuming. Several studies have been conducted on the use of native watermilfoil weevils *(Euhrychiopsis lecontei)* for controlling Eurasian watermilfoil (Figure 9-9). For more information on weevil projects see the Resource Directory, p. 9-23.

Mechanical Control

Mechanical controls include cutting boats, rotovators, and dredging. Under some circumstances, mechanical controls can be more beneficial than other methods of control. They are generally restricted to small areas such as bridges, flood control structures, marinas, and swimming areas.

Advantages

- Immediate clearing of vegetation in small areas.
- Plant material is removed. It is not left to decompose in water, using valuable oxygen.

Disadvantages

- High equipment cost.
- Labor intensive.
- Slow and inefficient (generally a couple of acres a day).
- Rapid re-growth (requires frequent repeated treatments).
- Native plants are removed, and aquatic life can be destroyed.
- Plant fragments created.
- Soil disruption.
- Increased water ***turbidity*** (muddy/cloudy).
- Problems with disposal of removed plant material.

Figure 9-9. *Milfoil weevil (Euhrychiopsis lecontei).*

Chemical Control

Aquatic herbicides are chemicals used to treat infestations that are too dense and vast to be affected by other control methods. Because chemical control can have negative environmental and health implications, preventing dense infestations that require chemical treatment is the highest priority in aquatic plant management.

Basic Aquatic Herbicide Information

Aquatic herbicides are sprayed directly onto floating or emergent plants, or are applied to the water in either a liquid or pellet form. Factors such as water flow, water temperature, type of chemical, and plant species are very important to consider. The U.S. Environmental Protection Agency (EPA) regulates and approves what aquatic herbicides are safe to use. The ISDA regulates what aquatic herbicides can be used in Idaho. It is illegal to apply aquatic herbicides not registered in Idaho. It is illegal to apply aquatic herbicides against label instructions.

Contact a Professional!

Always contact a plant professional before trying to control aquatic weeds on your own. Actions you take can have a detrimental impact on your health, your neighbors health, and water quality. Many waterfront residents draw their drinking and irrigation water from lakes and streams. Diversity in aquatic plant life is vast. What works on one plant may not work on another. *Don't take this specialized science into your own hands*. Your local weed supervisor is available to help with your aquatic weed concerns (see Resource Directory, p. 9-23).

Eurasian Watermilfoil

Myriophyllum spicatum

Eurasian watermilfoil is a non-native aquatic plant that was once commonly sold as an aquarium plant. As its name suggests, Eurasian watermilfoil originated in Europe and Asia. The plant probably arrived in the United States in the 1940s and quickly spread to all but a few states. It is suspected that this incredibly invasive aquatic plant was introduced into the Coeur d'Alene Basin from boat trailers travelling from other parts of the Columbia River Basin. *Even a tiny fragment* of the plant is enough to establish a colony that can quickly out-compete the beneficial native aquatic plants. Because it is widely distributed and difficult to control, watermilfoil is considered to be the most serious aquatic weed problem in the Northwest.

Eurasian watermilfoil is a perennial, which means unless exposed to air and killed by a hard frost, plants will come back the next growing season. Plants can be found growing in up to 30 feet of water, depending on water clarity. It can grow as deep as light will penetrate. Massive rooted colonies can become so dense that they not only compromise the water quality but can suffocate fish and destroy spawning habitat for some species.

Most water-based recreational activities are affected to some degree by Eurasian watermilfoil. Boats can have trouble navigating through the nearly solid floating mats occasionally getting stuck. Fish populations can decline and, in rare instances, swimmers have drowned after being entangled. Dense floating mats can also clog the inlets of power generating plants and increase the cost of maintenance.

Figure 9-10. *Eurasian watermilfoil shown sprouting a white adventitious root off stem in left corner. The upper right shows four leaves with 12 or more leaflet pairs.*

Figure 9-11. *Typical appearance of Eurasian milfoil.*

Identifying Eurasian Watermilfoil

As a group, watermilfoil is easy to identify; however, identifying the exact species is more challenging. All watermilfoil have feather-like leaves arranged in a whorl of four leaves around the stem. The Eurasian variety usually has 12 or more leaflet pairs per leaf while the native northern variety has fewer than 10 (Figure 9-10). The leaves of the Eurasian variety tend to collapse around the stem when taken out of water, while the northern species tend to remain more rigid. Also, the stem is generally more reddish with the Eurasian species (Figure 9-11).

- Twelve or more leaflet pairs on each leaf (Figure 9 -12).
- Leaves tend to collapse around the stem when removed from the water. Other milfoil species have thicker stems and are usually more robust.
- Mature leaves are typically arranged in whorls of four.

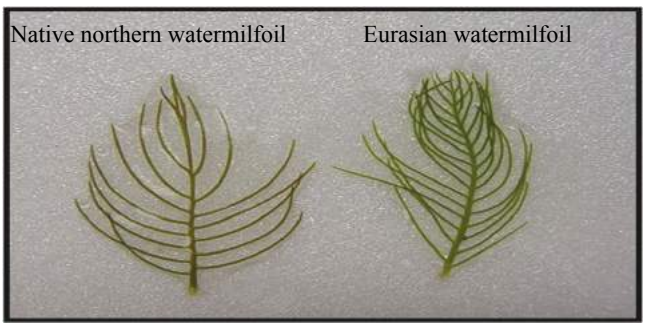


Figure 9-12. *Native Northern watermilfoil (left) has fewer than 10 leaflet pairs. Eurasian watermilfoil (right) has more than 12 leaflet pairs.*

Curlyleaf Pondweed

Potamogeton crispus

Like most invaders, curlyleaf pondweed is not native to North America. It was brought to the United States as a popular aquarium plant. Curlyleaf tolerates low water clarity and will readily invade disturbed areas. It is believed to spread from one waterbody to another primarily by the unintentional transfer of seed pods (Figure 9-13) carried on trailers, boats, and personal watercraft.

Curlyleaf is a submersed aquatic plant that generally grows in 3-15 feet of water. In spring, curlyleaf pondweed can form dense mats that may interfere with boating and other recreation on lakes. Curlyleaf can also cause ecological problems because it can displace native aquatic plants. In mid-summer, curlyleaf plants usually die back, which results in mats of dying plants piling up on shorelines. Decomposing plants add excess ***nutrients*** to the water.

Long-term management requires reducing or eliminating seed pods to interrupt the lifecycle. Cutting can be effective, if the precautions are taken to retrieve seed pods. Ultimately, the most important action that you can take to limit the spread of curlyleaf and other non-native aquatic plants is to remove all vegetation from your watercraft before moving it from one waterbody to another.

Prevent the Spread!

- Clean, drain, and dry your boat and trailer (see "Prevention", p. 9-3)
- Do not release aquarium or water garden plants into the wild. Seal them in a plastic bag and dispose in the trash.
- Consider using plants native to Idaho in aquariums and water gardens.

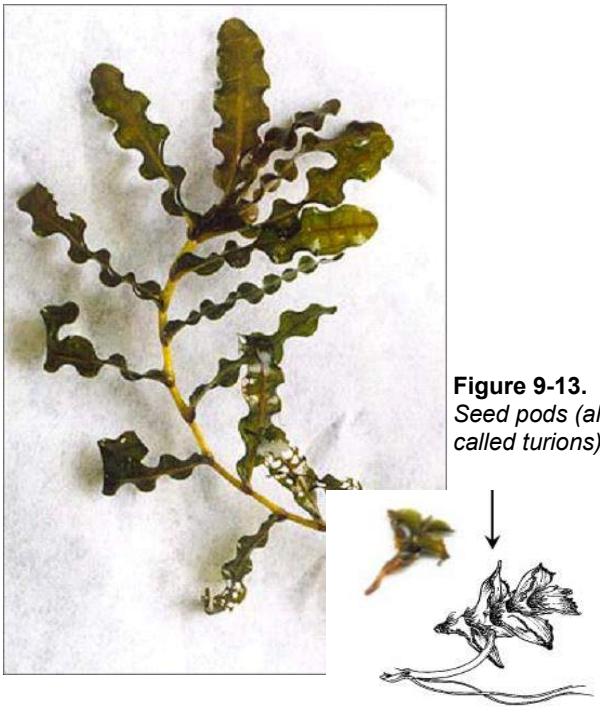


Figure 9-13. *Seed pods (also called turions).*

Identifying Curlyleaf Pondweed

Curlyleaf is similar in appearance to many native pondweeds commonly found in Idaho lakes, but it can be distinguished from other pondweeds by its unique life cycle and distinct curly leaf.

- Curlyleaf is identifiable by its distinctive leaves, which have very wavy edges, with fine teeth along the leaf margins.
- Unlike other pondweeds, curlyleaf begins growing in early spring. In some regions it will die back mid-summer. In north Idaho it persists into fall.
- Flower stalks and seed pods stick up above the water surface in June and appear reddish-brown.

Brazilian Elodea

Egeria densa

Brazilian elodea is a popular aquarium plant often sold under the name "anacharis." It was likely introduced into the United States from the aquarium trade and is often transported on boat trailers and propellers. Although the sale of Brazilian elodea is now prohibited, it is present in some Idaho waters.

Brazilian elodea can grow in waters up to 20 feet deep, or it may grow as floating mats. Because it can form dense stands, it impedes swimming and boating. Brazilian elodea can spread at a rate of 100 acres per year and spreads fastest under drought conditions. Infestation by the noxious weed may slow water flow resulting in sediment buildup and constricted waterways. Brazilian elodea may clog intakes, shutting down hydroelectric plants.

A variety of methods have been known to control the spread of Brazilian elodea with mixed results. Hand removal of the plant may result in small fragments growing into entirely new plants. Some herbicides are effective at killing the plant, but no herbicide specifically targets Brazilian elodea, so application often kills native plants as well. Given the risks of herbicide use in aquatic systems, prevention is the best way of keeping Brazilian elodea out of the Coeur d'Alene Basin.

- Clean, drain, and dry your boat and trailer (see " Prevention," p. 9-3).
- Do not release aquarium or water garden plants into the wild. Seal them in a plastic bag and dispose in the trash.
- Consider using plants native to Idaho in aquariums and water gardens.
- If you detect this plant in a lake, pond, or stream, contact IDEQ, the Coeur d'Alene Tribe, or your local noxious weeds supervisor (see Resource Directory, p. 9-23).

Figure 9-14. *Brazilian elodea (large plant on right) compared to native Elodea canadensis (smaller plant on the upper left).*

Identifying Brazilian Elodea

Brazilian elodea looks very much like a larger, more robust version of its commonly-found native relatives, Canadian waterweed *(Elodea Canadensis)* and Western waterweed *(Elodea nuttallii)* (Figure 9-14).

- Bright green leaves and stems.
- Leaves in whorls of 4-6 (Figure 9-15).
- Leaves are linear to oblong in shape, and 1-1¼" long, ⅛" wide, with finely toothed leaf margins, toothless midrib.
- Showy flowers with 3 white petals.
- The plant has a very leafy appearance and grows until it reaches the surface where it forms a dense mat.

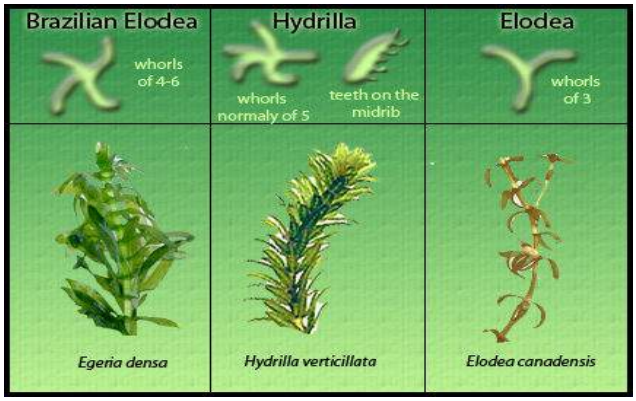


Figure 9-15. *Comparative diagram of similar species.*

Hydrilla

Hydrilla verticillata

Hydrilla is native to Africa, Australia, and parts of Asia. It was introduced to the United States in 1960 through the aquarium trade. It has quickly spread across the country and is now considered to be one of the most problematic aquatic weeds nationwide. In southern states, managing its spread costs millions of dollars a year. Although limited populations exist in Idaho, early identification and prevention are keys in controlling its spread.

Once established, hydrilla forms dense mats that interfere with recreation and wildlife. Hydrilla outcompetes native plants by growing under less light, more efficiently utilizing nutrients, and effectively reproducing. Hydrilla propagates through various mechanisms including dispersing seedlings and sprouting new plants from root and stem fragments.

However, hydrilla's real secret to its success is the ability to produce turions and tubers (Figures 9-16 and 9-17). Turions are small green structures that form at the base of leaves. Turions can break free and produce entirely new plants. Tubers are small potato-like structures that reside underground and may remain dormant for several years. Tubers and turions can withstand drying, freezing, herbicides, and ingestion by waterfowl. One square meter of hydrilla can produce 5,000 tubers!

Figure 9-16. *Hydrilla turions.*

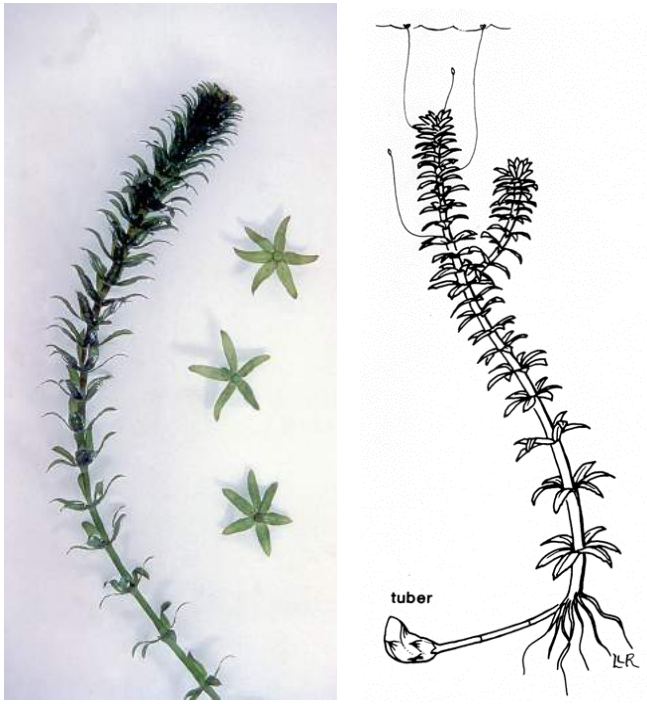


Figure 9-17. *Hydrilla can be distinguished from Brazilian elodea and native elodea species by the presence of tubers.*

Identifying Hydrilla

Hydrilla closely resembles the non-native Brazilian elodea (Figure 9-15) and native elodea species. Hydrilla is distinguished from these look-alike species by the following characteristics:

- The presence of tubers (0.2" to 0.4" long, off-white to yellowish, pea-like structures buried in the sediment). Neither Brazilian elodea nor native elodea has tubers.
- Leaves in whorls around the stem (generally 5 leaves per whorl).
- Serrations or small spines along the leaf edges.
- The midrib of the leaf is often reddish when fresh.

Parrotfeather Milfoil

Myriophyllum aquaticum

Parrotfeather milfoil was introduced to the United States from South America for the aquarium and water gardens trade. Parrotfeather rapidly spreads into shallow waters by fragmentation of stems and rhizomes.

Parrotfeather can form dense mats of vegetation entirely covering the water's surface. Because the stems of the plant are so tough, it is difficult to swim, ski, boat, or fish in parrotfeather stands. The plant is of particular concern because it provides an ideal habitat for mosquito larvae, deteriorates water quality, blocks passage of migrating fish, and causes flooding due to its large mass.

Parrotfeather is extremely difficult to control. Because it forms dense mats above the water's surface, herbicide application is difficult, and its waxy leaves and stems inhibit herbicide uptake. Biological control is limited because sterile grass carp find the plant unpalatable. Physical removal of parrotfeather often produces fragments that actually spread the plant.

Prevention is the best way to stop the spread of parrotfeather!

- Clean, drain, and dry your boat and trailer (see "Prevention", p. 9-3).
- Never release aquatic plants or animals into streams, rivers, or lakes. Place them in a plastic bag, and dispose of them in the trash.
- Use native plants in water gardens.

Identifying Parrotfeather Milfoil

Look for the following characteristic when identifying parrotfeather:

- Bright green, fir tree-like leaves and stems that rise above the water level (emergent).
- Leaflets arranged in whorls (4-6) around the stem.
- Leaflets with feather-like leaf arrangement.
- Dense mat of intertwined brownish stems (rhizomes) in the water.
- Reddish, feathery-leaved, limp, underwater leaves may be present.
- Although parrotfeather and Eurasian watermilfoil are closely related, Eurasian watermilfoil doesn't have above-water leaves.

Yellow Floating Heart

Nymphoides peltata

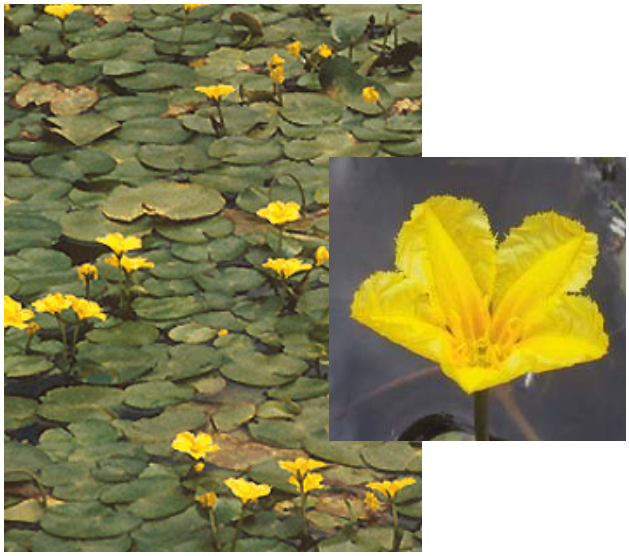
Yellow floating heart was introduced to the United States as an ornamental water plant. It is native to Asia but now occurs in over 15 states in the United States. Common names include Asaza, entire marshwort, floating heart, and fringed water lily. A very small population has been found in Idaho; however, dense populations have been found in Washington on the Spokane River and Long Lake (Lake Spokane).

Yellow floating heart is an aggressive perennial aquatic plant that grows in dense patches, limiting light for native species and creating stagnant areas with low oxygen levels underneath the floating mats. These mats make it difficult to fish, water ski, swim, or paddle. Primary reproduction is by seed, but the stolen, a long stem attached to the underside of the leaf, can also form new plants. The rope-like stems are attached to adventitious roots on the lake's bottom (Figure 9-18). This plant prefers slow moving rivers, lakes, reservoirs and ponds.

Yellow floating heart is very difficult to control through mechanical and chemical means once it is established. Bottom barriers can be used in small areas to prevent growth. If plants are harvested or cut, all plant pieces should be removed from the water. Given the risks of herbicide use in aquatic systems, prevention is the best way of keeping yellow floating heart out of the Coeur d'Alene Basin.

Prevent the Spread!

- Clean, drain, and dry your boat and trailer (see "Prevention", p. 9-3).
- Do not release aquarium or water garden plants into the wild. Seal them in a plastic bag, and dispose in the trash.
- Consider using plants native to Idaho in aquariums and water gardens.
- If you detect this plant in a lake, pond, or stream, contact IDEQ, the Coeur d'Alene Tribe, or your local noxious weeds supervisor (see Resource Directory, p. 9-23).



Identifying Yellow Floating Heart

Look for these characteristics when identifying yellow floating heart:

- Shiny green leaves are heart-shaped and the size of a silver dollar.
- Leaves are arranged alternately along the stem, and oppositely on the flower stalks. Leaf margins are often rippled and purplish underneath.
- Two to five showy yellow flowers are supported several inches above the water on strong stalks.
- Flowers have 5 petals with fringed margins, and are usually 3-5 cm in diameter. Flowers generally bloom from July to September.
- Rope-like stems (Figure 9-18) are attached to adventitious roots on the lake's bottom.
- Similar plants include native spatterdock and native watershield.

Figure 9-18. *Rope-like stems.*

Common Reed

Phragmites australis

Common reed, also known as phragmites, has a native strain and an introduced invasive strain. Both strains have been identified in the Coeur d'Alene Basin. This invasive wetland grass is threatening the ecological health of wetlands across the United States by creating tall dense stands that crowd out native plants and animals, block shoreline views, reduce access for swimming, fishing, and hunting and can create fire hazards.

Phragmites usually grows in sunny open areas and does not appear to spread into areas where there is dense vegetation. The plant spreads primarily through rhizomes, but it will also reproduce from seed. Each node on the canes can root and grow into a new plant.

Controlling established invasive phragmites can be difficult. Early identification greatly increases the chances for eradication. Methods for control include mowing, burning, crushing, shading, grazing, or herbicides. In most cases a combination of methods and multiple treatments is effective. Given the possible risks of herbicide use in or near aquatic systems, prevention is the best way to rid this invasive giant from the Coeur d'Alene Basin.

Figure 9-19. *Invasive phragmites is primarily distinguished by its very large size.*

Figure 9-20. *Invasive and native phragmites.*

Figure 9-21. *Invasive phragmites on the left is dense with dark green leaves. Native phragmites on the right is less dense and light green.*

Identifying Invasive Phragmites

Look for the following characteristics when identifying common reed:

- Grows up to 16 feet in height (Figure 9-19).
- Stems are very stiff and light green (Figure 9-20).
- Dark green leaves grow to 2 feet long, 1 inch wide and are alternated along the stem (Figure 9-21).
- Very thick, very long rhizomes.
- Flowery seed plumes are 1-2 feet long, silvery-tan and often drape to the side.

Flowering Rush

Butomus umbellatus

Flowering rush is an exotic plant that was likely introduced to North America from Europe as a garden ornamental. Once in a watershed, it spreads locally by rhizomes and root fragments, transported by animals, boats, flowing water, and ice movement.

Flowering rush grows as an emergent plant along shorelines and as a submersed plant in lakes and rivers. This plant can form dense stands that interfere with lake use and crowd out native vegetation. Flowering rush can create a marsh out of a bay in very short order (Figure 9-22).

Protecting native riparian or shoreline plants is an important way to help keep flowering rush out of your shoreline. It likes exposed, bare soils so keep your native vegetation intact and dense.

It is very difficult to control and eradicate flowering rush. Inappropriate control methods can worsen the flowering rush problem. Hand digging can be used to remove small isolated plants, but use extreme care to remove all root fragments, as the rhizomes break easily, risking further spread. Any disturbance to the root system will cause small reproductive structures on the roots to break off and spread to other areas. Methods such as raking or pulling only disturb the root system and are not recommended. If this method is used, dispose of plants far away from shoreline and thoroughly dry all the flowering rush plants once they are removed from the water. Any amount of moisture will aid their survival.

It is very difficult to kill flowering rush with herbicides. Herbicides are easily washed away from the narrow leaves of this plant. At this time, no specific herbicide has been successful at long-term control of flowering rush.

Figure 9-22. *What was once open water is now dense with flowering rush.*

Identifying Flowering Rush

Flowering rush looks very similar to native rushes that occur in wetland areas. It is easy to identify by the stem, which is triangular in cross section, by pinching the stem in half (Figure 9-23). It also has a distinctive root system (Figure 9-24). Most flowering rush plants do not flower.

- Plants can be found growing along the shore and submerged in water with erect leaves, reaching to about 3 feet in height.
- When the plant emerges, it will often lay limp on the surface of the water.
- When first emerging in spring, new leaves appear purple and are difficult to see in mud.

Figure 9-23. *Stem in cross section.*

Figure 9-24. *The roots of flowering rush contain abundant rhizomes.*

Purple Loosestrife

Lythrum salicaria

This plant is native to Europe and Asia and arrived in North America in the early 1800s as an ornamental landscape plant and through imported soil. It made its way into the Northwest in the 1980s and can be found growing in gardens, gravel pits, potholes, roadsides, stream banks, and lakes. Don't be fooled by this plant's beauty; it will wreak havoc on your landscape.

Commonly referred to as lythrum, purple loosestrife is a robust perennial found in riparian areas and wetlands. Listed on the ISDA's noxious weed list, this plant poses a serious threat to riparian ecosystems by crowding out native grasses, sedges, and other flowering plants that provide a higher quality of nutrition and habitat for fish and wildlife.

Purple loosestrife spreads both by seeds and buds that are attached to its roots. Each flower spike is capable of producing up to 120,000 seeds. Because of its deep spreading roots and prolific seed production, it is difficult to control and eradicate. It is often found in wetland environments, so the use of herbicides is limited to chemicals designed for aquatics. Five insect species have been approved for release in North America to manage purple loosestrife. Hand pulling and digging are effective on early established plants; however, one must be careful to dispose of all roots, stems, and seeds by burning.

Identifying Purple Loosestrife

Purple loosestrife is sometimes confused with fireweed. Fireweed has alternate (staggered down the stem) leaves which are not shaped like a heart. Flowers of fireweed have four petals and eight stamens.

- Plant grows 6 to 10 feet tall.
- Showy flower spikes are purple to magenta with 5-6 petals each. Flowers bloom from July to September.
- The stems are boxy in shape and can have 4 to 8 sides. Leaves are opposite or whorled, and shaped like a long heart, similar to a willow.

Yellow Flag Iris

Iris pseudacorus

Yellow flag iris is not native to North America and is spreading rapidly throughout the United States and Canada. It is a perennial native to Europe, Great Britain, and northern Africa. Introduced as an ornamental for garden ponds, it is still being sold commercially for that purpose. This plant is on the ISDA's noxious weed list, so retail distribution in Idaho is not permitted. Purchases made out of the state and online are still a concern.

Yellow flag iris reproduces prolifically through its rhizomes and seeds, which has enabled it to escape its garden boundaries. The plant's rhizomes form such dense clumps, that it is capable of outcompeting other aggressive wetland plants, such as the cattail. If a small rhizome fragment breaks off, it can drift with the water to another location and form a new plant. This problem is enhanced in the winter months when rhizomes are fragile and brittle and break off easily.

Yellow flag iris grows in all wetland habitats: lakes, streams, rivers, and ponds. It likes very shallow water or mud and prefers part shade or full sun exposure. This plant will sometimes remain green during mild winters but will die back in harsh winter conditions where the rhizomes successfully over-winter just fine.

As with any weed, the control technique depends on the size of the infestation and its location. Rhizomes can be removed by hand digging, but all plant parts need to be thoroughly removed. Just one piece of a rhizome will form a plant. Dispose of plant matter in the garbage, as the rhizomes can survive being dried out for a considerable time. Removing flowers and seed pods greatly reduces the spread of this plant. Seeds are buoyant due to gas inside a hard outer shell. This allows the seed to float downstream, finding a new location to grow. Shade will also reduce seed germination, so covering or mulching where plants have been removed is effective.

Chemical control has been effective, but because these plants grow close to water, contacting your local weed specialist is highly recommended. Given the risks of herbicide use in aquatic systems, prevention is the best way of keeping yellow flag iris out of the Coeur d'Alene Basin.

Figure 9-25. *Rhizomes.*

Identifying Yellow Flag Iris

Look for these characteristics when identifying yellow flag iris:

- Showy yellow flowers that bloom in late spring or early summer. Flower petals are often streaked with brown/purple lines.
- Thick rhizomes that break into pieces easily. Rhizomes are often found close to the surface (Figure 9-25)
- Leaves stand erect or bend at the top with shorter leaves appearing toward the outside of the plant.
- When not in bloom, yellow flag iris can be mistaken for the common cattail.

Quagga and Zebra Mussels

Dreissena bugensis and Dreissena polymorpha

Quagga and zebra mussels, known as the dreaded dreissenid species, are native to the Black and Caspian Seas in eastern Europe. Quagga and zebra mussels are freshwater, bivalve mussels that were introduced to North America via trade and transport (from the ballast of ocean-going ships) and first discovered in the Great Lakes region in the mid-1980s. Since then, the shelled devils have been marching across the nation, east to west and north to south (Figure 9-29).

Dreissenids are dreaded because of their ability to wreck aquatic ecosystems, water and irrigation intakes, hydropower facilities, docks, and local infrastructure (Figure 9-26). These mussels are filter feeders, so they impact ecosystems by filtering the nutrients required by the entire food chain. Over time, it becomes hard for native species to outcompete the invaders for the resources available. One mussel can filter up to one liter of water per day!

Dreissenids have small bysal threads that allow them to stick to hard surfaces and multiply (Figure 9-27). Often, mussels are found in large colonies, sticking on top of each other. For both species, color patterns vary widely with black, cream, or white bands.

Report These Mussels Immediately!
Quagga and zebra mussels attach themselves to hard surfaces, and native mussels do not, so if you see a mussel attached to anything, contact ISDA immediately (see Resource Directory, p. 9-23)!

Figure 9-26. *Clogged intake pipe.*

Figure 9-27. *Pile of zebra mussels removed from the Mississippi River.*

Until 2007, the West was seemingly still free of these invasive and highly transportable mollusks. In January of 2007 quagga mussels were discovered at Lake Mead in Nevada. Since then, they have spread to Arizona, California, Colorado, and Utah.

Dreissenids' ability to rapidly colonize hard surfaces causes serious problems to our local economies. Even people who don't recreate or use surface water for drinking or irrigation can still be seriously affected. Utility rates can increase due to the extra amount of work and maintenance at hydropower facilities, water treatment plants, and wastewater facilities. Food costs can increase due to the farmer's extra efforts required to keep irrigation pipes free and clear of quagga and zebra mussels. Recreation-based industries and activities could also be impacted: docks, breakwater walls, buoys, boats, and beaches becoming heavily colonized by dreissenid mussels. According to the Idaho Species Invasive Species Council, these mussels would cost Idaho up to *$100 million a year* in maintenance costs!

Many people are curious about the differences between quagga and zebra mussels (Figures 9-28 & 9-30). Quagga mussels are larger and colonize at deeper depths (up to 500 feet) while the zebra mussels prefer cooler temperatures. They do the same thing however: attach themselves to every hard surface, filter nutrients, and multiply like mad.

Figure 9-28. *Image using dime to demonstrate size of zebra (left), and quagga (right) mussels.*

A mature female quagga or zebra mussel, in the right conditions, is capable of producing up to one million eggs per season. To date, there are no "silver bullet" solutions to dreissenid eradication. The best solution to the quagga and zebra problem is prevention. In 2009 Idaho implemented a user-fee Aquatic Invasive Species sticker program to fund mandatory boat inspection stations to keep dreissenids out. Be on the watch for these stations each summer. Let's all be part of the preventive solution!

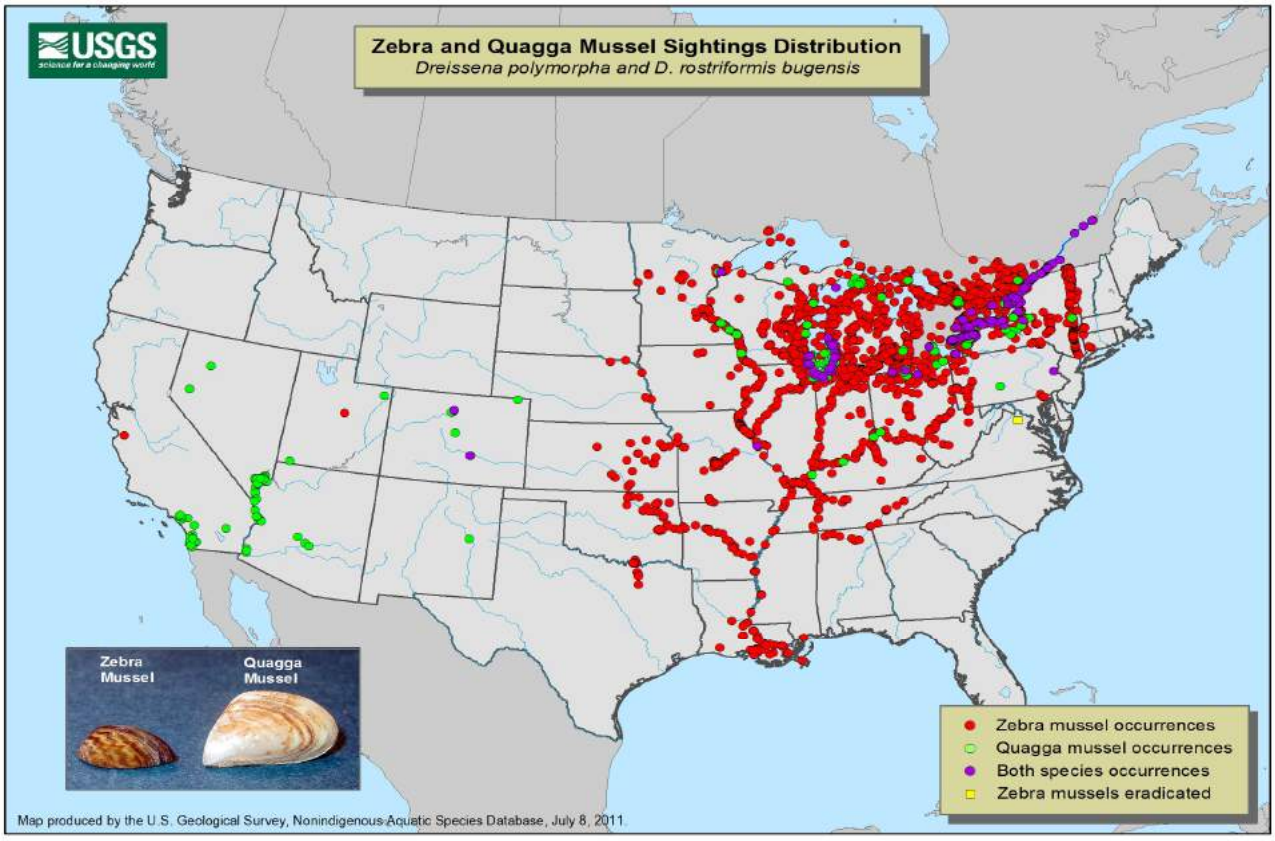


Figure 9-29. *2011 map showing nationwide infestations.*

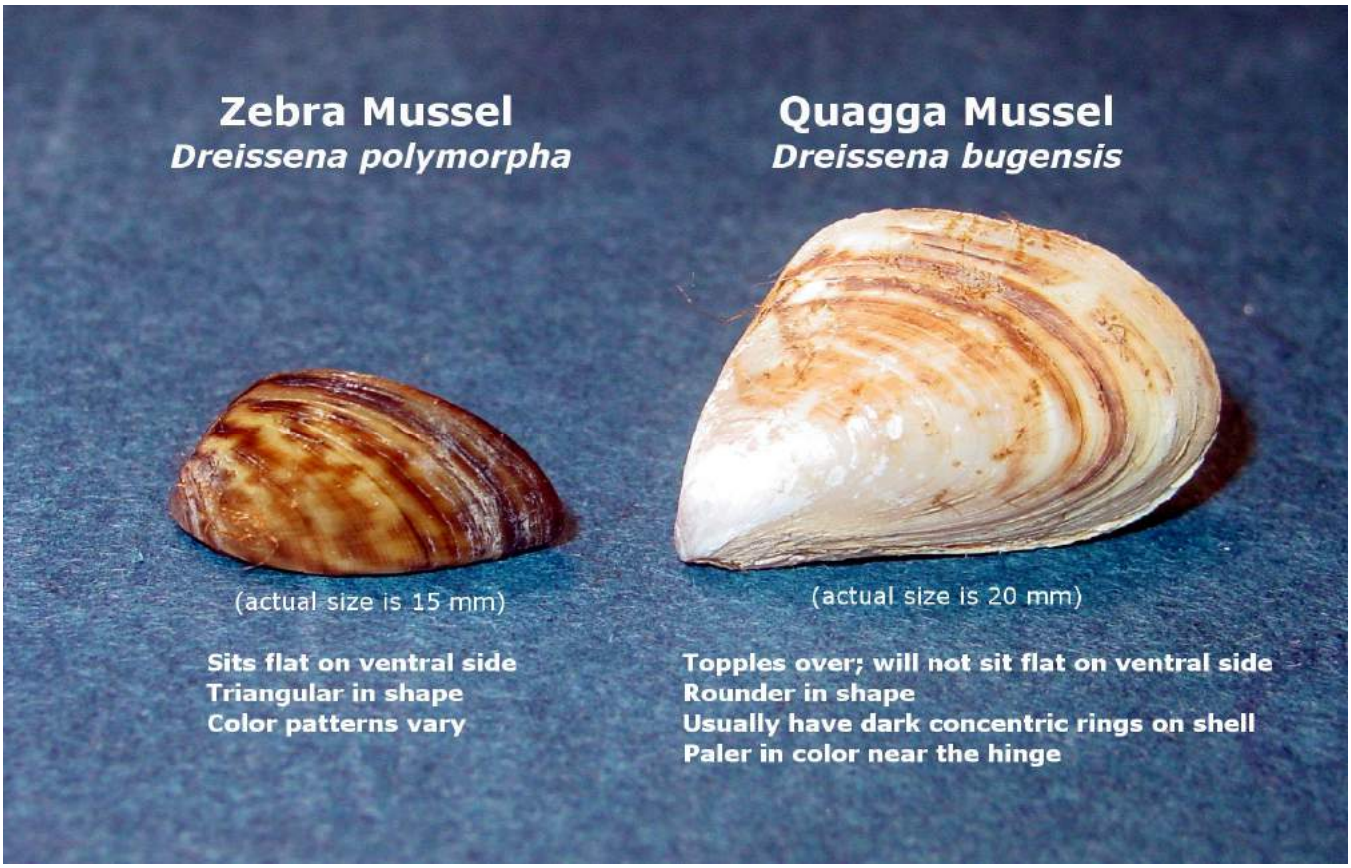


Figure 9-30. *Zebra (left) and quagga (right) mussel comparison.*

Crayfish

Crayfish are eco-engineers and are among the most impactful of AIS. They can wreak havoc on aquatic systems by destabilizing banks, shredding vegetation, and increasing turbidity. Although no invasive crayfish to date have been identified in Coeur d'Alene Lake, the virile crayfish is established in nearby Fernan Lake and was recently identified in Lake Pend Oreille.

Crayfish are most frequently introduced from aquariums and by the use of live bait

- Never release aquarium pets into the environment. Dispose of unwanted crayfish humanely by placing them in water and freezing them.
- **Live bait is prohibited in Idaho, except for live crayfish that have been caught on the body of water being fished.**
- Learn how to identify crayfish using the USGS Fact Sheet on Invasive Crayfish in the Pacific Northwest *(http://pubs.usgs.gov/fs/2011/3132/).*

Figure 9-31. *A native to the Idaho Panhandle, the signal crayfish (Pacifastacus leniusculus).*

The native signal crayfish (Figure 9-31):

- It is the only native crayfish in the Idaho Panhandle.
- It grows up to 6 inches in length.
- The top of its claw is smooth with a white band.

Invasive Crayfish

If you see something suspicious, call the Idaho Invasive Species Hotline at 1-877-336-8676.

Red swamp crayfish (*Procambarus clarkii*)

Virile (Northern) crayfish (*Orconectes virilis*)

Rusty crayfish (*Orconectes rusticus*)

Ringed crayfish (*Orconectes neglectus*)

Asian Clam

Corbicula fluminea

The Asian clam is an invasive bivalve that has spread rapidly in lakes, canals, streams, rivers, and reservoirs throughout North America. The Asian clam is known to aggressively out-compete native invertebrates; limit ***phytoplankton***; foul water intakes; add nitrogen and phosphorus to systems; and impact aesthetic and recreational values of public beaches, lake front properties, and swimming areas.

The Asian clam has high rates of filtration, metabolism, reproduction, and tolerance, which provide it with a wide range of habitats. Producing 2,000 juveniles per day, Asian clams quickly colonize and invade areas by creating "beds" (Figure 9-32). The clam excretes high levels of nitrogen and phosphorus into the water and bottom sediments, which stimulates the growth of certain algae (Figure 9-33). They also filter high volumes of water, removing nutrients and food sources vital to other native species, especially fish populations. They are capable of both filter feeding (feeding from the water) and pedal feeding (feeding directly from the sediment), which is why the Asian clam is so successful in so many different environments. In cool regions they grow to be as large as 28 mm, but in warmer systems they are as large as 55 mm. They are found at water depths of 5 to 250 feet, and within the sediments buried up to 7 inches below the surface.

Asian clams emit a unpleasant odor as they die and decompose. Once dead, their shells fragment, wash up on the beaches and make walking barefoot precarious for beach goers. Additionally, scientific studies predict that high levels of calcium produced by the clams could provide an environment conducive to the introduction of quagga and zebra mussels.

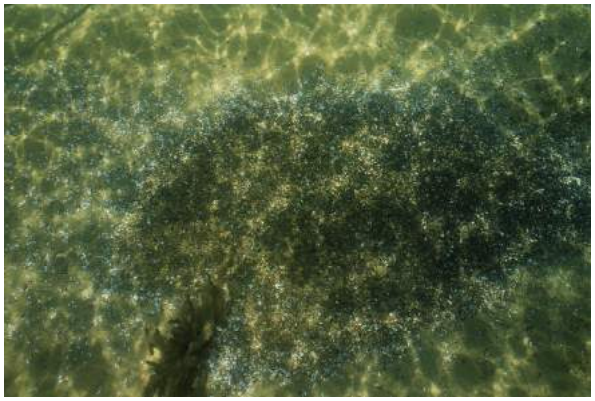


Figure 9-32. *Asian clams forming a "bed."*

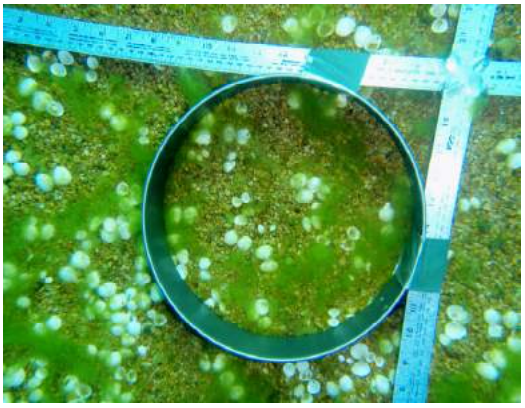


Figure 9-33. *Measurement taken in clam bed; typical algae bloom found growing with clams.*

Identifying the Asian Clam

Look for these characteristics when identifying Asian clams:

- Shell has deep concentric rings (Figure 9-34).
- The inside of the shell is polished and slightly purple, and there will be 3 cardinal and 2 lateral teeth (Figure 9-34).
- The outside of the shell is normally yellow-green, but the color can flake, leaving white spots (Figure 9-35).
- Usually not more than 1.5 inches (3.8 cm) wide (Figure 9-35).

Figure 9-34. *Asian clams.*

Figure 9-35. *Peeling shell produces white spots.*

Didymo

Didymosphenia geminata

Native to northern North America and Europe, *Didymosphenia geminata,* also known as didymo or rock snot, is rapidly spreading and invading streams in several western states (Figure 9-36). Unfortunately, it appears that primary carriers of didymo include fishing equipment, waders, boats, dogs, and just about anything that may come in contact with didymo-infested waters.

Didymo is a microscopic algae known as a diatom that can smother entire stream beds with mats as thick as 8 inches and can ruin just about any river or creek. In areas where didymo is found, it has been documented that widespread loss of most aquatic insect species result, and fish populations decline or move elsewhere.

Didymo can be found on rocks in moving water and is often mistaken for fiberglass or toilet tissue. Unlike most other algae, didymo feels like wet cotton and isn't slimy. It is generally brown, tan or yellow in color.

Preventing the Spread

Disinfect your boat, trailer, boots and other gear before entering a new waterbody. Felt waders have recently been banned in several states (Maryland, Vermont, and Alaska) due to this invasive species. Remember, you can't see individual didymo cells, so **thoroughly disinfect all of your equipment.** See "Prevention", p. 9-3, for cleaning tips.

Clean

Remove all plants, animals, and mud. Thoroughly wash everything, including crevices and other hidden areas.

Drain

Thoroughly drain your boat before leaving the area, including wells, ballast, and engine cooling water.

Dry

Allow time for your boat to completely dry before launching in other waters.

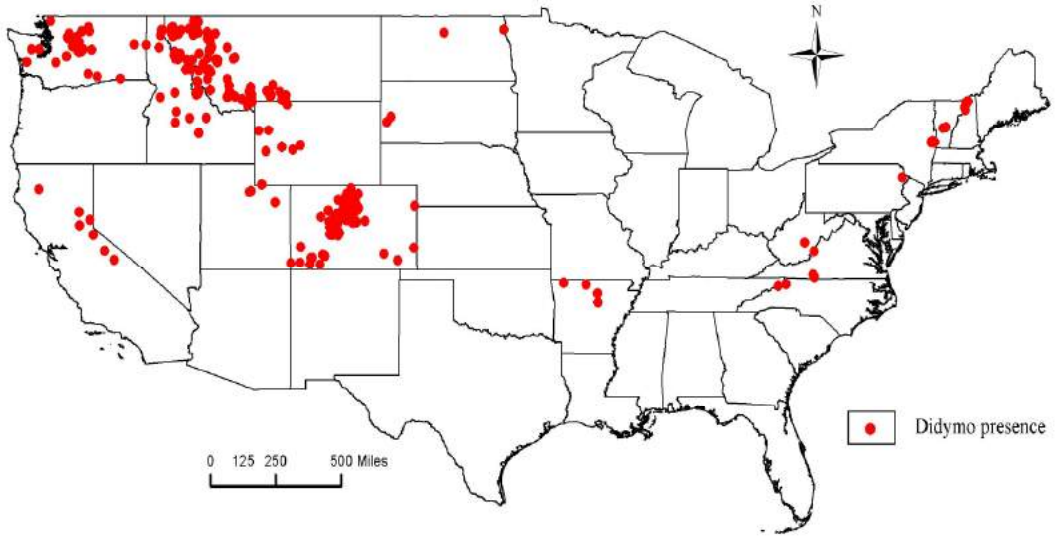


Figure 9-36 *Didymo distribution in the continental US.*

Resource Directory
Aquatic Invasive Species

Kootenai-Shoshone
Soil and Water Conservation District
7830 Meadowlark Way, Suite C-1
Coeur d'Alene, ID 83815
(208) 762-4939 ext. 101

Kootenai County
Noxious Weed Control Department
10905 N. Ramsey Road
Hayden, ID 83835
(208) 446-1290

Benewah Soil and Water Conservation District
900 E Street
PO Box 488
Plummer, ID 83851
(208) 686-1699

Coeur d'Alene Tribe
Lake Management Department
Plummer Office
850 A Street
PO Box 408
Plummer, ID 83851
(208) 686-5302

Idaho Department of Environmental Quality (IDEQ)
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Idaho State Department of Agriculture (ISDA)
P O Box 790
Boise, ID 83701-0790
(208) 332-8500

In northern Idaho:
(208) 608-3404

Idaho Department of Parks and Recreation (IDPR)
2885 Kathleen Avenue, Suite 1
Coeur d'Alene, ID 83815
(208) 767-1511

Idaho Department of Lands (IDL)
Coeur d'Alene/Mica Supervisory Area
3258 W. Industrial Loop
Coeur d'Alene, ID 83815
(208) 769-1577

Other Resources

United States Department of Agriculture
www.usda.gov

United States Geological Survey
Invasive Crayfish in the Pacific Northwest
http://pubs.usgs.gov/2011/3132/

Idaho State Department of Agriculture - Idaho's Invasive Species Program
www.invasivespecies.idaho.gov

National Invasive Species Council
www.invasivespecies.gov/

National Oceanic Atmospheric Administration
www.reserach.noaa.gov/oceans/t_invasivespecies.htm

University of Idaho Extension
www.extension.uidaho.edu/mg/resources
www.uidaho.edu/cda/idah2o

Aquatic Plant Identification

Noxious Weed Identification and Control Handbook. Inland Empire Cooperative Weed Management Area.
www.kcweeds.com/accounts/kc_weeds/data_documents/11/files/noxious weed identification & control handboo.pdf

Center for Aquatic and Invasive Plants
http://plants.ifas.ufl.edu/

Invasive Species Technical Notes
U.S. Department of Agriculture Natural Resources Conservation Service
www.mt.nrcs.usda.gov/technical/ecs/invasive/technotes/

Quagga and Zebra Mussels

100th Meridian Initiative
www.100thMeridian.org

Protect Your Waters and Stop Aquatic Hitchhikers!
www.Protectyourwaters.net

Idaho's Invasive Species Council
www.invasivespecies.idaho.gov

Idaho Department of Parks and Recreation
www.parksandrecreation.idaho.gov/

Risk Assessment Worksheet
Aquatic Invasive Species

Assessment Worksheet 1 - Invasive Species

The assessment worksheet below will help you identify potential environmental risks. 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 Aquatic Invasive Species Action Worksheet on page 9-25 and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section to help you determine the best solution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Early detection	I am knowledgeable in aquatic invasive species identification, and I routinely monitor the lake.	I know that Eurasian watermilfoil is a problem, but I don't know how to tell it apart from other water plants.	I don't know why aquatic invasive species are a problem, and I never think about it.	☐ Low ☐ Medium ☐ High
Aquatic weed control	I always contact a weed specialist before addressing aquatic plant problems on my property.	I pull, dig, or cut aquatic plants throughout the season (some plants may spread with pulling, digging, or cutting).	I use herbicides to control aquatic weeds around my dock, without consulting a weed specialist.	☐ Low ☐ Medium ☐ High
Boat and trailer inspection and cleaning	I always clean and inspect my boat and equipment before and after launching, to prevent spreading aquatic invasive species to other water bodies.	I check my boat and equipment only when time allows.	I never clean and inspect my boat and equipment.	☐ Low ☐ Medium ☐ High
Shoreline vegetation	I have preserved or added native plants along my shoreline to reduce maintenance, provide wildlife habitat, filter nutrients, and prevent erosion.	My lawn stretches all the way to the water's edge, but I don't use fertilizers or apply herbicides within 25 feet of water.	My lawn stretches all the way to the water's edge, and I regularly mow, fertilize, and apply herbicides.	☐ Low ☐ Medium ☐ High
Invasive Species Fund sticker	I have stickers on all of my watercraft.	I have a sticker on my motorized watercraft, but not on my canoe or kayak.	I do not have stickers on any of my watercraft.	☐ Low ☐ Medium ☐ High

Action Worksheet
Aquatic Invasive Species

Write all high and medium risks below.	What can you do to reduce the risks?	Set a target date for action.
Sample: I don't know how to identify Eurasian watermilfoil.	Look at identification books and materials, then go out and get hands wet looking at the real thing. Hopefully you can't find any!	When plants begin emerging in mid July.

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SECTION 10
BOATING AND RECREATION

This fact sheet addresses the impacts boating and recreation can have on water quality and how *you* can make a difference with ***Best Management Practices (BMPs)***. BMPs are actions you can take to protect our natural resources. **The ultimate goal of this information is to prevent negative impacts to water quality.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheet (p. 10-6) in order to analyze your individual situation.
3. Fill out the action worksheet (p. 10-7), then **take action!**

Play Smart

You likely live in this beautiful area for the abundant recreational activities it provides: boating, water-skiing, camping, swimming, and fishing. Continue to enjoy these activities, but at the same time, put in place some simple BMPs to keep the water clean for generations to come. The waterways in the Coeur d'Alene Basin are becoming increasingly populated and preventing water pollution and preserving water quality are especially important (Figure 10-1).

A number of potential pollutants are associated with boating and recreation. These include: human waste from long term boating trips and camping, petroleum spills during boat maintenance and operation, ***erosion*** resulting from large wakes and speeding boats, and ***aquatic invasive species*** (AIS) introduction and spread.

The BMPs described in this section may seem inconvenient at a time when you just want to relax on the lake or you feel a time constraint, but please keep in mind that a real inconvenience would be polluted water. Thank you for doing your part.

Figure 10-1. *Best management practices will keep Idaho's water bodies clean for generations to come.*

Personal Watercraft

Personal Watercrafts (PWCs) are small jet propelled boats designed to carry one to three passengers on top rather than inside. These watercraft are considered motorboats and are subject to the same regulations as motorboats. PWCs *must* follow no-wake guidelines (see "No-Wake Zones Prevent Erosion," p. 10-4).

When operating your PWC, consider the effect you may have on the environment (Figure 10-2).

- Operate in water at least 30 inches deep, to prevent disturbing bottom sediments and aquatic vegetation.
- Avoid causing erosion. Operate at a slow speed, and do not create a wake when operating near shore.
- Do not dock or beach your PWC in reeds and grasses. This could damage fragile environments and encourage the spread of AIS such as Eurasian watermilfoil.
- Take extra care when fueling in or near the water. Oil and gasoline spills are detrimental to the aquatic environment. Fuel on land if possible, with a catchment device underneath in case of spillage.
- Never use your PWC to disturb, chase, or harass wildlife.

Figure 10-2. *Operate your personal watercraft in a manner that considers the environment.*

Boat Sewage and Waste

Discharge or dumping of sewage or other wastes from any vessel into State waters is prohibited.
(*Idaho Code 67-7505*)

Untreated sewage (black water) is a pollutant in surface water because it can contain disease causing bacteria and viruses leading to illness such as dysentery and infectious hepatitis. Discharged sewage water and gray water also cause aesthetic degradation and can contain high levels of ***nitrogen*** and ***phosphorus*** that can stimulate ***algae*** growth in lakes.

Although many boats have onboard sanitation devices, it is important to become familiar with the many vault toilets, restrooms, and pump-out stations around the lake, and whenever possible, use these land facilities rather than onboard ones. The *Our Gem* map showing onshore facilities can be obtained from the Idaho Department of Environmental Quality (IDEQ) and the Coeur d'Alene Tribe (see Resource Directory, p. 10-5).

Reducing Sewage and Gray Water Impacts

- Use onshore restrooms when docked and before casting off. Plan ahead for restroom stops.
- Do not discharge untreated sewage in any lake, river, or stream.
- Always use a sewage pump-out facility to empty holding tanks (Figure 10-3).
- If pump-outs are not available at your marina, ask them to have one installed.
- For sanitation systems that require treated chemicals, look for chlorine- and formaldehyde-free products.
- Use onshore facilities for dirty dishes and showers on shorter day trips.
- Use phosphate-free and nontoxic soaps.
- Use alternative cleaners. Baking soda, lemon juice, and vinegar all perform as well as commercial cleaning products.

Figure 10-3. *Marine pump-out station.*

Marine Sanitation Devices

Federal law requires all installed toilets to be U.S. Coast Guard Certified. Marine sanitation devices (MSD) are rated I, II, or III.

- **Types I and II MSDs** treat waste with special chemicals to kill bacteria. If you have a Type I or II MSD, it must have a holding tank for untreated waste and a "Y" valve must be secured in a closed position while operating in all state and tribal waters.
- **Type III MSDs** provide no treatment and are either holding tanks or portable toilets. Collected waste must be taken ashore and disposed in a pump-out station or onshore toilet.

Large Boats and Houseboats

Many large boats and houseboats have installed toilets. Installed toilets must have a holding tank for sewage (black water).

Idaho Panhandle Health District Code (IDAPA 41.1.200) prohibits any boat containing wastewater facilities to be on district rivers or lakes unless the facilities are sealed to prevent untreated or treated sewage discharge or spilling.

Pump-Out Stations

Discharge of human waste into all state and tribal waters is prohibited. Surface waters, such as lakes and streams, are considered state waters. Human waste must be pumped into a boat pump-out station (Figure 10-3). Many pump-out stations are located throughout the Coeur d'Alene Basin. Become familiar with these locations and use them. The *Our Gem* map showing pump-out locations can be obtained from IDEQ and the Coeur d'Alene Tribe (see Resource Directory, p. 10-5).

Pump-out locations in the Coeur d'Alene Basin

Coeur d'Alene Lake
- Third Street Docks
- Eleventh Street Marina
- Silver Beach Marina
- Arrow Point
- Neachen Bay
- Carlin Bay Resort
- Rockford Bay
- Gateway Marina, Harrison
- Conkling Bay Resort
- Heyburn State Park—Chatcolet and Hawley's Landing

St. Joe River
- Aqua Park

Spokane River
- Templin's Marina
- Yacht Club

Boat Maintenance and Operations

Numerous risks to water quality are associated with boating. Boats require fluids for maintenance that can have detrimental impacts to aquatic life. When caring for boats, a significant amount of solvents, paint, oil, and other pollutants can potentially seep into groundwater or be washed directly into surface water. Many boat cleaners contain chlorine, ammonia, and phosphates, which can harm plankton and fish. Oil spills from motors and refueling contain petroleum products harmful to fish, wildlife, and human health.

Reduce pollution from boats and marinas

- Select nontoxic cleaning products.
- When replacing fluids such as oil, fuel, and coolant, always use safety measures, such as a drop cloth or bucket, to prevent chemicals from entering water.
- Carefully fuel boat engines using a funnel and fuel-absorbing materials. If your local marina doesn't provide these products, encourage them to do so.
- Keep boat motors well-tuned to prevent fuel and lubricant leaks and improve fuel efficiency. Because the bilge is continually pumping potentially contaminated water into the lake, it is critical that your engine is clean and well maintained.
- Stow it, don't throw it! Keep your trash onboard and out of the water. This includes cigarette butts, fishing line, and any food or drink packaging.
- No power loading! Using the motor to load your boat onto and off of the trailer stirs up sediment at the end of ramp creating a large hole where trailers can become stuck (Figure 10-4).

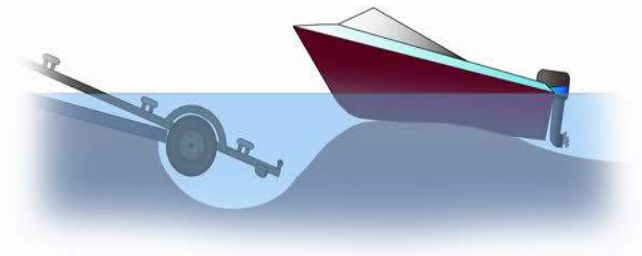

Figure 10-4. *Power loading stirs-up sediment and creates large hole at the end of boat ramp.*

Aquatic Invasive Species

AIS are also referred to as *nuisance* and *exotic* species, and they are one of the greatest threats to our water resources. AIS often travel from one waterbody to another by attaching to watercraft, recreational equipment, and animals. Call the Idaho State Department of Agriculture (ISDA) if you see anything suspicious (see Resource Directory, p. 10-5). See Section 9, Aquatic Invasive Species, for detailed information on this topic.

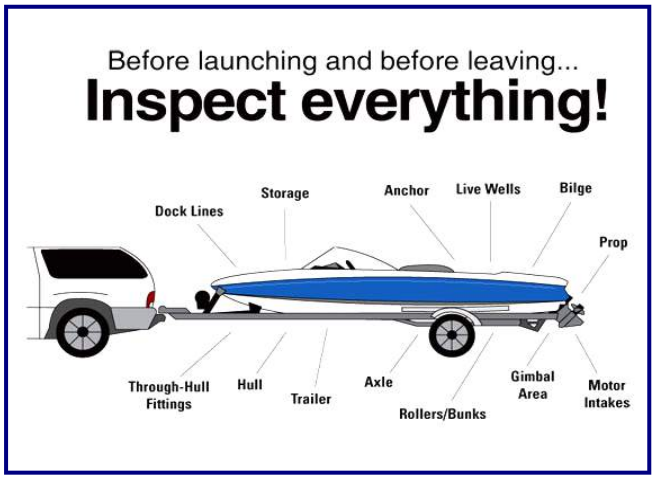

Figure 10-5. *Use best management practices before launching and before leaving water bodies to ensure you are not transporting aquatic invasive species.*

Clean

Remove all plants, animals, and mud. Discard away from waterbodies, storm drains, and ditches. Thoroughly wash everything, including crevices and other hidden areas.

Drain

Thoroughly drain your boat before leaving the area, including wells, ballast, and engine cooling water.

Dry

Allow time for your boat to completely dry before launching in other waters. If you have been in a known zebra and quagga mussel-infested waterbody, dry your boat for at least 30 days (Figure 10-5).

No-Wake Zones Prevent Erosion

The impact of waves continually hitting the shoreline cause it to erode and wash away (Figure 10-6). When shorelines erode, the damage decreases property value, degrades fish habitat, decreases riparian habitat, and causes excess nutrient loading, which encourages the growth and spread of algae blooms and AIS.

No-Wake Zones (5 mph) in State Waters

- 200 feet from any shoreline, dock, pier, structure, or any person in the water within Coeur d'Alene Lake; 100 feet from the shoreline in the Coeur d'Alene River.
- Within 100 feet of any other vessel (15 mph).
- The area surrounding all bridge structures.
- Within 100 feet of a dive flag.
- Wherever a "No-Wake Zone" sign is posted.

No-Wake Zones in Coeur d'Alene Tribal Waters

The southern third of the lake is under the jurisdiction of the Coeur d'Alene Tribe, except for Heyburn State Park. Be aware that different rules and regulations may apply within those boundaries.

- 100 feet of any shoreline, dock, pier, other structure or any person in the water.
- Observe a reasonable and prudent speed but not in excess of 15 mph within 100 feet of any other vessel.
- 20 mph at night where the speed is not otherwise restricted.

Figure 10-6 *Bank erosion caused by boat wakes and flooding. Bank lacks a healthy vegetative buffer.*

Recreation Along the Shoreline

When using the waterfront for recreation and leisure, make sure your activities do not cause lasting damage to the shoreline or water. Cleaning up, washing, burning, and waste disposal on the shoreline needs to be done responsibly to keep these resources beautiful for future use.

Follow these BMPs when camping near and swimming in waterbodies:

Camping

- Use the restroom/latrine whenever one is provided. If none is available, bury human waste a minimum of 150 feet from the water's edge.
- Never dispose of fish guts or other waste in the water. It attracts pests and adds nutrients to the water.
- Never wash in the lake or river; wash dishes, hair, clothes, and yourself at least 150 feet from the water's edge. Use only biodegradable soap.
- Handi-wipes work well for cleaning, but pack them out!
- Properly dispose of all garbage, including litter you find. Pack it in, and pack it out.
- In areas with established fire rings, keep your fire within designated areas. Ashes washed into water introduce unwanted phosphorus.
- Camp at least 150 feet from the lake shore, stream banks, and riparian areas.

Swimming

- Do not use soap or shampoo in the water.
- Do not use the water as a bathroom.

Off-Road Vehicles

The use of off-road vehicles, such as all-terrain vehicles (ATVs), mountain bikes, and snowmobiles can have a severe effect on lakes and rivers by increasing erosion, ***turbidity***, and ***sedimentation***. Always stay on well-maintained trails, and stay away from sensitive areas during spring melt when the ground is thawing and most susceptible to rutting and erosion.

Resource Directory
Boating and Recreation

Kootenai County

Sheriff
5500 N. Government Way
Coeur d'Alene, ID 83815
(208) 446-1300

Parks and Waterways
10905 North Ramsey Road
Hayden, ID 83835
(208) 446-1275

Shoshone County Sheriff
717 Bank Street
Wallace, ID 83873
(208) 556-1114

Benewah County Sheriff
701 W. College Avenue, Suite 301
St. Maries, ID 83861
(208) 245-2555

Coeur d'Alene Tribe

Tribal Police
125 10th Street
PO Box 408
Plummer ID, 83851
(208) 686-2050

Lake Management Department
Coeur d'Alene Office
424 Sherman Avenue, Suite 306
Coeur d'Alene, ID 83814
(208) 667-5772

Plummer Office
850 A Street
PO Box 408
Plummer, ID 83851
(208) 686-5302

Fish and Wildlife Programs
401 Anne Antelope
PO Box 408
Plummer, ID 83851
(208) 686-5302

State of Idaho

Idaho Department of Environmental Quality (IDEQ)
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Idaho State Department of Agriculture (ISDA)
2270 Old Penitentiary Road
Boise, ID 83712
(208) 332-8500

Idaho Department of Parks and Recreation (IDPR)
2885 Kathleen Avenue, Suite 1
Coeur d'Alene, ID 83815
(208) 769-1511

Other Resources

Boat U.S. Foundation
www.boatus.com/foundation/

100thMeridian Initiative
http://100thMeridian.org

Protect Your Waters and Stop Aquatic Hitchhikers!
http://Protectyourwaters.net

Earth911
http://Earth911.com

Suggested Reading

Boat Green: 50 Steps Boaters Can Take to Save Our Waters. Ford, C.W. 2008. New Society Publishers. New Gabriola, BC.

Risk Assessment Worksheet
Boating and Recreation

Assessment Worksheet 1 - Boating and Recreation

The assessment worksheet below will help you identify potential environmental risks. 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 Boating and Recreation Action Worksheet on page 10-7, and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section to help you determine the best solution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Boat maintenance	My boat is maintained by a professional mechanic before boating season begins, ensuring the motor doesn't leak oil and fluids.	I have my boat maintained every couple of seasons.	I don't maintain my boat until there is a noticeable problem.	☐ Low ☐ Medium ☐ High
Boat fueling	I carry fuel-absorbing products with me at all times, and I have encouraged my local marina to carry similar products.	When fueling, I am careful not to overflow or spill.	I have never been concerned with gasoline spilling in the water. I pump directly over water.	☐ Low ☐ Medium ☐ High
Aquatic weed prevention	I always clean and inspect my boat and equipment before and after launching to prevent spreading aquatic invasive species to other waterbodies.	I check my boat and equipment only when time allows.	I never clean and inspect my boat and equipment.	☐ Low ☐ Medium ☐ High
No-wake zones	I know the no-wake zones are 200' from the lakeshore and 100' from the banks of the Coeur d'Alene River. I always follow this rule.	Mostly I abide by no-wake rules, but sometimes I let it slip.	I have never known where the no-wake zones are.	☐ Low ☐ Medium ☐ High
Disposal of boat waste	I use onshore facilities to pump out my boat or dispose of my portable toilet waste. or I use onshore restrooms.	I dispose of gray water (from bathing and washing dishes) into the lake or river.	I dispose of sewage into the lake or river, or my Y-valve is unsealed and leaky.	☐ Low ☐ Medium ☐ High

Action Worksheet
Boating and Recreation

Write all high and medium risks below.	What can you do to reduce the risks?	Set a target date for action.
Sample: Bathing in the lake with soap.	Don't take baths in the lake, but if necessary, use biodegradable soap. Look at your local stores for biodegradable soap.	When it is warm enough to go swimming.

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SECTION 11
HEAVY METALS

This fact sheet addresses heavy metals from historical mining practices in the Coeur d'Alene Lake Basin and how *you* can make a difference with ***Best Management Practices (BMPs)***. BMPs are actions you can take to protect our natural resources. **The ultimate goal of this information is to protect public health and natural resources.**

1. Read the facts and information in the following pages.
2. Fill out the risk assessment worksheet (p. 11-8) in order to analyze your property's specific needs.
3. Fill out the action worksheet (p. 11-9), then **take action!**

Historic Mining

The Coeur d'Alene Basin's waters have been and continue to be essential to the success of the region's mining, timber, agriculture, and hydropower industries. In particular, mining activities along the South Fork of the Coeur d'Alene River and its tributaries have a significant influence on basin watershed conditions and on the welfare of its inhabitants.

From the 1880s to the early 1980s, the Silver Valley was the nation's largest producer of silver, lead, zinc, and other metals (Figure 11-1). The mining and ore-processing methods used to extract this wealth produced large quantities of heavy-metal-related waste materials containing toxic or environmentally hazardous substances such as cadmium, arsenic, lead, and zinc. Much of this mining-related waste was directly discharged and washed into the South Fork of the Coeur d'Alene River and its tributaries. The beds, banks and floodplains of the Coeur d'Alene River, Coeur d'Alene Lake, and (to a lesser extent) the Spokane River, contain vast quantities of ***heavy metal***-contaminated ***sediments*** that continue to be transported downstream and dispersed by hydrologic processes and floods in the Coeur d'Alene Basin. An estimated 75 million metric tonnes of trace-element rich sediments from mining-related activities have been deposited into the lake since the late 19th century (Horowitz et al. 1995, Figure 11-2).

Water quality in the lake has generally improved since the mid-1970s, with the passing of the ***Clean Water Act.*** As the era of large-scale upstream mining-related activities tapered off, environmental cleanup activities got underway in the Silver Valley, and environmental regulations were implemented throughout the basin. While there have been advancements in mining practices and requirements, significant challenges remain for addressing metal contamination that continues to persist and be transported throughout the basin.

In 1983, the affected areas of the Coeur d'Alene basin were listed as a ***Superfund*** site under ***CERCLA***, and there are ongoing efforts to remediate contamination. Metals contamination in Lake Coeur d'Alene is being addressed through the Coeur d'Alene Lake Management Plan, a joint program of the Coeur d'Alene Tribe and the State of Idaho.

Figure 11-1. *Historic mining activities in Burke, Idaho along Canyon Creek in the early 1900s.*

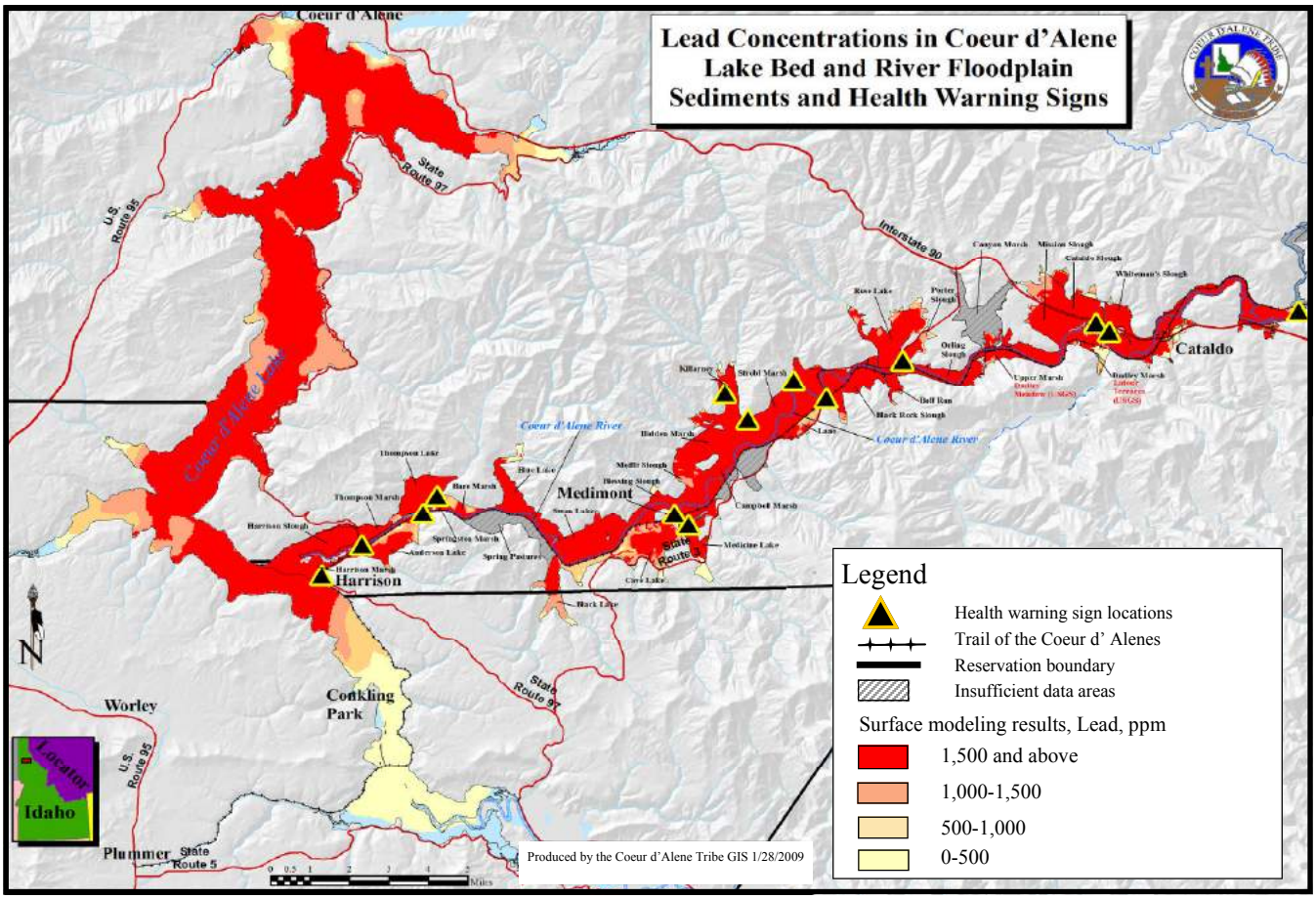


Figure 11-2. *Lead concentrations in sediments.*

Nutrient Effects on Heavy Metals

The primary environmental concern in Coeur d'Alene Lake is the potential for release of metal contaminants contained in lake bottom sediments into the water column. To prevent this from occurring, oxygen levels must be maintained in the bottom waters. Oxygen is controlled by the amount of decomposing organic matter (plant and animal), which is controlled by the amount of ***nutrients*** coming into the lake. Increased loads of nutrients (***phosphorus*** and ***nitrogen***) into the lake increase algae and rooted ***aquatic plant*** growth through a process known as ***eutrophication*** (Figure 11-3). When this organic material decomposes, ***dissolved oxygen*** is consumed in the water. Depletion of dissolved oxygen (***anoxia)*** in lake bottom waters will promote geochemical reactions that can release mining-related hazardous metals from lakebed sediments.

The basic strategy to prevent metals release from the lakebed into the water column is to limit basin-wide nutrient inputs to the lake. Acceleration of the eutrophication process occurs due to human activity and land use such as wastewater discharge, agricultural runoff, sediment runoff from unpaved roads and stream bank erosion, excess fertilizer, and shoreline development.

The goal is to protect and improve lake water quality by limiting basin-wide nutrient inputs that impair lake water quality conditions, which in turn influence the solubility of mining-related metals contamination contained in lake sediments.

2009 Coeur d'Alene Lake Management Plan,
Coeur d'Alene Tribe and Idaho DEQ

Figure 11-3. *High nutrient levels may lead to an algae bloom.*

Drinking Water

Many homes in the Coeur d'Alene Basin pull their drinking water directly from surface water. Even with a sophisticated filtration system, some contaminants may make their way to the tap. Unlike iron, which may leave rust deposits, many metals are invisible, so it is important to have your water tested regularly. Contact your area Panhandle Health District office for more information (see Resource Directory, p. 11-7).

Metal concentrations are usually highest during flood conditions, so avoid drinking surface water during these periods. For detailed information on how to protect your drinking water supply, read Section 3, Safe Drinking Water.

The following tables outline the current U.S. Environmental Protection Agency (EPA) standards for some metals in public drinking water systems. Please refer to the glossary on the right for definitions.

Primary Standards

Contaminant	MCLG (mg/L)	MCL (mg/L)
Arsenic	0	0.010
Cadmium	0.005	0.005
Lead	0	TT Action Level = 0.015
Mercury (inorganic)	0.002	0.002

Secondary Standards

Contaminant	Secondary Standard (mg/L)
Iron	0.3
Manganese	0.05
Zinc	5

Note: milligram per liter (mg/L)

Drinking Water Glossary

Primary standards are legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water.

Secondary standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply.

Maximum contaminant level goal (MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.

Maximum contaminant level (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

Treatment technique action level (TT Action Level)—lead is regulated by a treatment technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps.

Health Effects of Metals

Metals-contaminated sediments are human health concerns if they are ingested (through hand-to-mouth contact) or inhaled as dust. Metals may also enter surface water from sediments and become available for ingestion by humans, fish, and wildlife. Most of these metals you cannot see or smell.

Lead

Lead can affect almost every organ and system in your body, such as the following:

- Targets the nervous system.
- May cause joint weakness, high blood pressure, and anemia.
-
- Can severely damage the brain and kidneys.
- May cause death in extreme cases.

Pregnant women, fetuses, and children are especially vulnerable to lead.

- It may cause miscarriage, premature birth, and low birth weight.
- Infants and children may have decreased mental ability, learning disabilities, and reduced growth.

Zinc

Harmful effects generally begin at levels 10-15 times higher than the amount needed for good health. Large doses taken by mouth even for a short time can cause stomach cramps, nausea, and vomiting. Taken longer, it can cause anemia and decrease the levels of your good cholesterol.

Arsenic

Small, long-term exposure to arsenic has been linked to cancer, diabetes, liver disease, nervous system disorders and hearing difficulties.

Mercury

Exposure to high levels of mercury can permanently damage the brain, kidneys, and developing fetus.

- Long-term exposure can decrease brain function, incite tremors, and change vision or hearing.
- Short-term exposure to mercury may cause lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

Fetuses and very young children are especially vulnerable to mercury, which:

- May pass through the mother's body to the fetus causing brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak.
- May pass to a nursing infant through breast milk.
- May create problems with nervous and digestive systems and cause kidney damage.

Cadmium

Breathing high levels of cadmium can severely damage the lungs. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea.

Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys, and kidney disease can occur. Other long-term effects are lung damage and fragile bones.

When Recreating in the Coeur d'Alene Basin, Protect Your Health!

KEEP CLEAN! Wash your hands and face before you eat anything. Wash toys, bottles, and pacifiers if they have been in contact with soil or dust. Remove loose soil from your clothing, camping equipment, and pets before leaving the area. Wash all items when you return home.

EAT CLEAN! Drink, cook and wash only with water from home or other approved source. Do not use river water. Always eat at a table or clean surface off the ground. Clean fish thoroughly and only eat fish fillets.

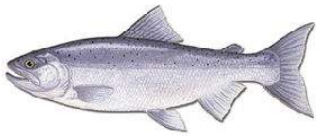
PLAY CLEAN! Children should play in grassy areas and avoid loose soil, dust and muddy areas. No mud pies.

Riley Raccoon Cares

Healthy Choices-Healthy Kids!

A big thanks to Panhandle Health District and Kellogg IDEQ for this message

Fish Consumption Advisory for Coeur d'Alene Lake



Kokanee

Bullhead

Pregnant women, women who are nursing or planning to become pregnant

Kokanee	
All CDA lakes	10 gutted whole fish meals or 10 fillet meals per month
***Bullhead**	
Northern lake	4 gutted whole fish meals or 24 fillet meals per month
Central lake	2 gutted whole fish meals or 13 fillet meals per month
Southern lake	3 gutted whole fish meals or 15 fillet meals per month

Children under 15 years of age

Kokanee	
All CDA lakes	6 gutted whole fish meals or 6 fillet meals per month
***Bullhead**	
Northern lake	3 gutted whole fish meals or 14 fillet meals per month
Central lake	NO gutted whole fish meals or 7 fillet meals per month
Southern lake	8 gutted whole fish meals or 9 fillet meals per month

General public (people not in the first two groups)

Kokanee	
All CDA lakes	12 gutted whole fish meals or 20 fillet meals per month
***Bullhead**	
Northern lake	20 gutted whole fish meals or 69 fillet meals per month
Central lake	8 gutted whole fish meals or 14 fillet meals per month
Southern lake	33 gutted whole fish meals or 61 fillet meals per month

*All people are advised to eat bullhead fillets rather than gutted or whole fish (Figure 11-4). People with increased blood lead levels or living in an area with high concentrations of lead in their yard soil or house dust should eat less whole bullhead than suggested in this advisory. **This is especially true for children and pregnant women**.

Statewide Mercury Advisory For Bass

A statewide advisory has been issued for all lakes, rivers, reservoirs and other water bodies in Idaho for **BASS** due to mercury contamination. To be safe it is recommended that:

- Women who are pregnant, planning to become pregnant, nursing and children under age 15 should not eat more than 2 meals a **MONTH** of bass.
- The general population (women not of child bearing age, those older than age 15) should not eat more than 8 meals a **MONTH** of bass.
- All people **SHOULD NOT** eat any other fish during the month if you eat these amounts of bass caught in Idaho.

Other Fish

Kokanee and bullhead are similar to many fish in the lake that were not tested. It is possible that other fish have high levels of lead, arsenic, and mercury.

For bluegill, crappie and perch less than 8 inches, pumpkinseed, rainbow trout, brook trout, cutthroat trout, and tench, follow kokanee guidelines.

For channel catfish and suckers, follow the bullhead guidelines.

For the complete Fish Consumption Guide, visit the Idaho Department of Health and Welfare web site (see Resource Directory, p. 11-7).

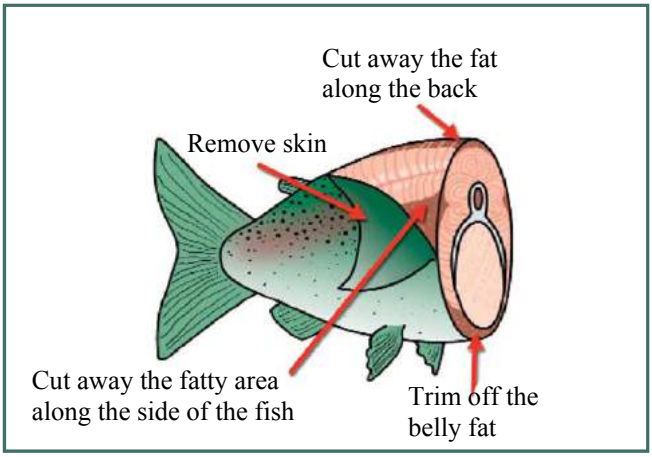


Figure 11-4. *Reduce your risk, trim your fish.*

Institutional Controls Program

If your property is within the Superfund area, including the Coeur d'Alene River corridor, it may be within the Institutional Controls Program (ICP) boundary. This boundary was identified by the State of Idaho and Panhandle Health District (PHD) as the areas where contamination is present or the potential for exposure exists. If your property falls within this boundary, a permit is required for any work done within its limits.

Even if you are located outside of a contaminated area, your living patterns could affect those upstream and downstream of your property. How you handle nutrients and other wastes will impact potential metals release or other forms of contamination exposure.

What is the ICP?

The Institutional Controls Program (ICP) is a locally enforced set of rules and regulations designed to ensure the integrity of clean soil and other protective barriers placed over contaminants that exist throughout the Bunker Hill Superfund site (Figure 11-5).

The ICP's purpose is to protect public health and assist with local land transactions within the Superfund site.

The ICP also provides the following:

- Education
- Sampling assistance
- Clean soils for small projects
- Pickup of soil removed from small projects
- A permanent disposal site for contaminated soils

For more information, contact Panhandle Health District-Kellogg ICP Office (see Resource Directory, p. 11-7).

Figure 11-5. *Yard remediated through the Basin Property Remediation Program.*

Protection and Prevention

Unfortunately, mine waste contamination has already occurred, and how we deal with the contamination now is our only defense to exposure. Fortunately, homeowners can prevent interaction with contaminated sediments.

Protect Yourself and Your Property

Some areas of your property may be contaminated. Have your property tested for contamination. If you learn you have contaminated property, a number of solutions are available for your safety. A commonly accepted practice is to place barriers on top of the contaminated sediment. Barriers can include a hard pavement (concrete, asphalt), gravel capping, or vegetation. If a barrier is constructed, proper maintenance and care is required. Homeowners can also remove the contaminated sediments and haul them to an EPA approved repository through the ICP Program. Contact Panhandle Health District for more information on these locations. Homeowners should also be aware that flooding can contaminate their land. Homeowners are encouraged to coordinate with the Idaho Department of Environmental Quality (IDEQ), Coeur d'Alene Tribe, and PHD-ICP staff to appropriately design and construct any modifications to their property.

Quick Safety Tips

- Use protective measures when moving dirt on your property. Take contaminated clothing and shoes off before entering your vehicle or your home. A simple water "decontamination" procedure will remove any particles still on your shoes. Wash clothing separately to remove any fine dust.
- During construction or any earth movement, have proper ventilation in your home to prevent fine sediment dust blowing in through windows.
- Watch children to make sure they wash their hands after playing outside and before eating or drinking.
- Always wash your hands after handling any sediment, and remember the saying, "Suds after Mud."

Resource Directory
Heavy Metals

Panhandle Health District (PHD)

Benewah County
137 N. 8th Street
St. Maries, ID 83861
(208) 245-4665

Kootenai County
8500 N. Atlas Road
Hayden, ID 83835
(208) 415-5100

Shoshone County
114 Riverside Avenue
Kellogg, ID 83837
(208) 786-7474

Institutional Controls Program (ICP)
114 Riverside Avenue
Kellogg, ID 83837
(208) 783-0707
www.phd1.idaho.gov/institutional/institutionalindex.cfm

Idaho Department of Environmental Quality (IDEQ)
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Coeur d'Alene Tribe
Lake Management Department
Coeur d'Alene Office
424 Sherman Avenue, Suite 306
Coeur d'Alene, ID 83814
(208) 667-5772

U.S. Environmental Protection Agency (USEPA) Region 10

1200 Sixth Avenue, Suite 900
Seattle, WA 98101
(800) 424-4372

Coeur d'Alene Field Office
1910 Northwest Boulevard, Suite 208
Coeur d'Alene , ID 83814

Other Resources

Idaho Department of Health and Welfare (IDWR) Fish Advisory Program
www.healthandwelfare.idaho.gov/Health/EnvironmentalHealth/FishAdvisories/tabid/180/Default.aspx

Basin Environmental Improvement Project Commission (BEIPC) - The Basin Commission
www.basincommission.com

Risk Assessment Worksheet
Heavy Metals

Assessment Worksheet 1 - Assessing your contamination risk

The assessment worksheet table below will help you identify potential risks related to your exposure to heavy metals contamination on 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 Heavy Metals Action Worksheet on page 11-9, and record your medium and high-risk practices. The goal is to lower your risks. Use the BMP recommendations provided in this section to help you decide how to best reduce your risks.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Knowledge of heavy metals contamination in the Coeur d'Alene Basin	I am well aware of the contamination due to mining activities in the area and take steps regularly to protect water quality.	I have determined that my property falls within the ICP boundary, but I have not taken any other precautions.	I was not aware that heavy metals contamination was present in the Coeur d'Alene Basin.	☐ Low ☐ Medium ☐ High
Nutrient effects on heavy metals	I understand the eutrophication process and how it relates to the release of heavy metals in lake bottom sediments. I prevent ***nutrient loading*** on my property.	I was not aware that heavy metals can be released when plants break down. Our property falls within the ICP boundary.	Our property has a lawn directly on the lake and is fertilized regularly. The shoreline is also eroding.	☐ Low ☐ Medium ☐ High
Fish consumption	I check the Idaho Department of Health and Welfare website annually to determine safe fish consumption rates.	I was not aware that excess fish consumption in the Coeur d'Alene Lake or River was a potential concern. I rarely consume fish.	I fish on a regular basis but was not aware of a fish consumption advisory. I eat fish from the Coeur d'Alene Lake and River daily.	☐ Low ☐ Medium ☐ High
Institutional Control Program (ICP)	I have checked to see if my property falls within the ICP boundary. I utilize the ICP to remediate contamination on my property.	I knew the program existed and that my property qualified, but I haven't taken the time to find out more.	I have never heard of the ICP program.	☐ Low ☐ Medium ☐ High
Recreation/health risks	I always wash my hands before eating. I always wash my gear, clothes, and dog after recreating in the Coeur d'Alene Basin.	I shake the dirt off my gear and do a visual inspection.	I am unconvinced of the health risks in the Coeur d'Alene Basin, and I take no extra precautions.	☐ Low ☐ Medium ☐ High

Action Worksheet
Heavy Metals

Write all high and medium risks below.	What can you do to reduce the risks?	Set a target date for action.
Sample: I live within the ICP boundary, but have taken no action to remediate potential contamination.	Call the Kellogg PHD office to find out more about the ICP program. Test soil for contamination. Cap soil with vegetation if determined that is the most effective.	Today.

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Appendix A
Glossary of Key Terms

Algae – Small aquatic plants lacking stems, roots, or leaves that occur as single cells, colonies, or filaments. Free-floating algae are called phytoplankton. There are also algae that attach to rocks, lakebed sediments, leaves of rooted plants, and artificial structures such as piers and boats.

Anoxia – The condition in which a water body has become deficient or completely depleted of dissolved oxygen.

Aquatic invasive species – Plants and animals that are not native to a local water body but have been introduced by various mechanisms including deliberate release. These plants and animals may out-compete native species, and grow and develop to a greater extent than in their native habitat due to reasons such as lack of native predators. Invasive species may become a *nuisance species* and impart great damage to the environment, recreation activities, and infrastructure.

Aquatic (rooted) plants – Vascular plants that are rooted in sediments of lakes, rivers, and steams, and grow submersed under the water. Upper plant stems may grow up to the water's surface, and flower stalks may emerge above the water.

Best Management Practices (BMPs) – Accepted methods for controlling nonpoint source pollution. BMPs may include one or more physical, structural, and/or managerial conservation practices that reduce or prevent pollution from entering a water body.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – Congress enacted CERCLA on December 11, 1980. Among the statute's provisions, CERCLA established (1) broad federal authority to respond directly to releases or threatened releases of hazardous substances to the environment that threaten or potentially threaten public health or the environment; (2) prohibitions and requirements concerning closed and abandoned hazardous waste sites; (3) a tax on the chemical and petroleum industries, which expired in 1996 without reauthorization, and whose proceeds funded a trust fund - the *Superfund* – the purpose of which is to finance CERCLA cleanup at hazardous waste sites that have been listed on the National Priorities List; and (4) a liability scheme by which federal, state, and tribal governments can recover their costs in responding to CERCLA hazardous waste sites from those responsible for conditions at those sites.

Class I Streams – Used for domestic water supply, or are important for the spawning, rearing or migration of fish.

Class II Streams – Usually headwater streams or minor drainages that are used by only a few, if any, fish for spawning or rearing.

Clean Water Act (CWA) – Formerly titled the Federal Water Pollution Control Act of 1972, the CWA is the primary federal law in the U.S. governing water pollution. The goal of the CWA is to restore and maintain the physical, chemical, and biological integrity of the nation's waters so that they can support both the protection and propagation of fish, shellfish, wildlife, and recreation in and on the water. The CWA has grown over the years to incorporate efforts to control both point and nonpoint sources of pollution as well as shift the focus from being based solely on the chemical constituents found in the water to the overall chemical, physical and biological integrity of the watershed. Major changes were

enacted in 1977 when it officially became known as the Clean Water Act. Other changes that have been enacted occurred in 1981, 1987, and 1990.

Coliform bacteria – A commonly used bacterial indicator of sanitary quality of food and water. Rod-shaped coliform bacteria can be found in the aquatic environment, soils, and within the feces of warm-blooded animals. When testing drinking water for health safety, a positive test for total coliform bacteria leads to a further test for the presence of fecal coliforms, a subgroup of coliform bacteria (including *E. coli*) that originate in feces. A positive test for fecal coliform indicates contamination of drinking water by sewage or animals and often leads to a *boil-water* order. While coliforms are themselves not normally the cause of serious illness, they may indicate the presence of other pathogenic organisms of fecal origin such as viruses and multicellular parasites.

Critical areas (habitat) – Areas of special value that should be identified during site assessment of a new construction project and protected during construction. Floodplains, wetlands, riparian zones, aquifers, historical areas, and endangered species habitat near construction sites are all critical areas.

Cut-and-Fill slopes – The process of timber road construction where the amount of material excavated to create upper cut banks roughly matches the amount of fill material needed to cover culverts and build up nearby embankments.

Dissolved Oxygen (DO) – The oxygen gas dissolved in water. Adequate dissolved oxygen is vital to fish and other aquatic life.

Erosion – The wearing away of the landscape by water, wind, ice, or gravity.

Eutrophication – The process by which lakes and ponds become enriched with dissolved nutrients and sediments, resulting in increased growth of algae and rooted aquatic plants and reduced water clarity. Cultural eutrophication is a term for the acceleration of the eutrophication process caused by humans' land-use activities.

Heavy metals – Metals of relatively high atomic weight, which, within mining-impacted areas of the Coeur d'Alene Basin, may be in concentrations harmful to humans or aquatic organisms. Heavy metals of concern within the Coeur d'Alene Basin include lead, cadmium, zinc, copper, and mercury. Although arsenic and antimony are classified as metalloids, they are also toxic elements of concern in the basin, and are commonly referred to as heavy metals.

IDAPA – The Idaho Administrative Procedures Act is found in Title 67, Chapter 52 of the Idaho Code Statutes Annotated. IDAPA allows Idaho state agencies to promulgate and publish rules (statute-like general standards) in the Idaho Administrative Code using IDAPA-numbered designations. IDAPA specifies the administrative procedures agencies must follow to establish final rules.

Idaho Forest Practices Act (IFPA) – The Forest Practices Act was passed by the 1974 Idaho Legislature to ensure the continuous growing and harvesting of forest trees and to maintain forest soil, air, water, vegetation, wildlife, and aquatic habitat. The Act requires forest practices rules for state and private lands to protect, maintain, and enhance our natural resources.

Impervious – Does not allow water to penetrate. Examples of impervious surfaces include roads, driveways, sidewalks, or compacted soil.

Limiting nutrient – Relating to the growth and biomass of aquatic plants, a limiting nutrient is a substance that, in relation to the needs of the organism, is least abundant in the environment and limits growth potential of that organism. In lakes, phosphorous has most often been identified as the nutrient in shortest supply. Increases in phosphorus loading to a lake from human activities can result in undesirable increases of phytoplankton growth, a process called cultural eutrophication.

Nitrate – The nitrate ion (NO_3) is an essential inorganic nutrient source of nitrogen for aquatic plants. Nitrate is quickly assimilated by spring phytoplankton blooms within lakes. By summer months, nitrate can be in short supply, and, like phosphate, becomes a limiting nutrient. Nitrate is also a pollutant of concern in drinking water.

Nitrogen – An essential nutrient for plants and animals. Ammonia (NH_3), nitrite (NO_2), and nitrate (NO_3) are common forms of nitrogen in aquatic systems.

Nonpoint source pollution – A dispersed source of pollutants generated from a geographic area when pollutants are dissolved or suspended in runoff and then delivered into receiving waters. Sources include, but are not limited to stormwater runoff from construction, roads, agricultural lands, urban areas, forest lands, and direct inputs from stream bank erosion.

Nutrient loading – The addition of nutrients, usually nitrogen or phosphorus, to a water body (often expressed in amount of weight per unit of time).

Nutrients – Elements or compounds essential to life, including but not limited to oxygen, carbon, nitrogen, and phosphorus. The term commonly refers to nitrogen and phosphorus, which can limit growth (see ***limiting nutrient***).

Phosphorus – An essential nutrient for plants and animals. The phosphate ion (PO_4) is rapidly assimilated by aquatic plants and often controls phytoplankton growth in lakes (see ***limiting nutrient***). Phosphorus is incorporated into human-made products such as fertilizers and detergents.

Phytoplankton – Free-floating microscopic (usually) aquatic plants consisting of single cells, filaments, or colonies. Phytoplankton are an important part of the food web in aquatic systems.

Pitless Adapter – A special pipe fitting that fits on a well casing below ground. It allows a distribution pipe to pass horizontally through the casing so that no pipe is exposed above ground where it could freeze.

Point source pollution – Pollutants discharged from any discernible, confined, and discrete conveyance, including, but not limited to: any pipe, ditch, channel, sewer, tunnel, conduit, well, discrete fissure, container, concentrated animal feeding operation, marine vessel, or other floating craft.

Pollutants (pollution) – Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Riparian (zone) – The area of land next to a stream, river, or lake. Plants found in a riparian zone have roots that are adapted to saturated soils and are tolerant of occasional flooding. Maintenance of natural plants in the riparian zone serves to protect water temperature and acts like a filter for runoff (i.e., a vegetative buffer).

Sediment – The fragmented solid material (rock, mineral, and organic) that is the product of erosion. It is transported to surface waters by wind, water, ice, and gravity, and may be in suspension, rolling, or settled at the bottom of a water body.

Sedimentation – The process of sediment settling and building up on the bottom of a creek, river, lake, or wetland.

Sheet flow – An overland flow of water taking the form of a thin, continuous film over relatively smooth soil, rock or concrete surfaces and not concentrated into a channel.

Signal words – Words found on pesticide product labels that describe the acute (short-term) toxicity of the formulated product. Signal words include "Danger" (products that are the most toxic), "Warning," or "Caution."

Stormwater runoff (pollutants) – Surface water runoff that is usually associated with urban development, carrying both natural and human-caused pollutants. Stormwater runoff can be conveyed to lakes, rivers, and streams either through point or nonpoint sources.

Stream Channel Protection Act - The Idaho Stream Channel Protection Act requires that the stream channels of the state and their environment be protected against alteration for the protection of fish and wildlife habitat, aquatic life, recreation, aesthetic beauty, and water quality. The Idaho Department of Water Resources must approve in advance any work being done within the beds and banks of a continuously flowing (perennial) stream.

Stream Protection Zone (SPZ) – In Idaho**,** the SPZ is a mandated 75-foot minimum distance from a Class I stream (both sides), lake, or other water body that must be protected because of its special importance.

Superfund – see *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA).

Tribal Forest Management Plan (Coeur d'Alene Tribe) – The Tribal Forest Management Plan has similar goals to the Idaho Forest Practices Act but applies to tribal lands on the Coeur d'Alene Reservation. The plan restricts timber harvests within a 100-foot buffer of a Class I Stream.

Turbidity – Cloudiness caused by the presence of suspended solids, such as clay, silt, and microscopic organisms in the water. Turbidity is an indicator of water quality.

Uplands – An area of land that has a higher elevation and is not located directly on the shoreline. In this document, it refers to the land higher than the shoreline but that may still influence surface water due to its proximity.

Vegetative buffers – An undeveloped area of grasses, shrubs, and trees that is between new construction or existing development and a water body. Buffers can be comprised of existing plants on the site and/or new plantings. They filter stormwater runoff from land-use activities that may adversely affect surface water quality.

Wastewater – Treated or untreated sewage, industrial waste, or agricultural waste. Sometimes referred to as effluent.

Water quality – A term used to describe the chemical, physical, and biological characteristics of water with respect to its suitability for a beneficial use.

Water Quality Standard (WQS) – States' and tribes' adopted, and EPA-approved, ambient standards for waterbodies. The standards identify those designated uses of a water body and establish the water quality criteria that must be met to protect uses. Standards are legally mandated by the Clean Water Act and are enforceable.

Watershed – An area of land that is drained into a distinct lake, stream or river system and is separated from other similar systems by ridgetop boundaries (also referred to as a *basin*).

Wetlands – Lands where water saturation of the soil for at least part of the year is the dominant factor determining the nature of soil development and the types of plant and animal communities living within the area and surrounding environment. Types of wetlands include sloughs, ponds, swamps, marshes, bogs, and riparian areas.

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Appendix B
Master Resource Directory

Benewah County

Public Works
701 W. College Avenue
St. Maries, ID 83861
(208) 245-4122

Sheriff
701 W. College Avenue
St. Maries, ID 83861
(208) 245-2555

Transfer Station
75 Landfill Road
St. Maries, ID 83861
(208) 245-1694

Benewah Soil and Water Conservation District
900 E Street
PO Box 488
Plummer, ID 83851
(208) 686-1699

Coeur d'Alene, City of

Engineering
710 E. Mullan Avenue
Coeur d'Alene, ID 83814-3958
(208) 769-2285

Stormwater Utility
710 E. Mullan Avenue
Coeur d'Alene, ID 83814-3958
(208) 769-2233

Wastewater Utility
765 W. Hubbard Avenue
Coeur d'Alene, ID 83814
(208) 769-2281

Water Department
3820 Ramsey Road
Coeur d'Alene, ID 83815
(208) 769-2210

Coeur d'Alene Tribe

Fish and Wildlife Programs
401 Anne Antelope
PO Box 408
Plummer, ID 83851
(208) 686-5302

Lake Management Department
Coeur d'Alene Office
424 Sherman Avenue, Suite 306
Coeur d'Alene, ID 83814
(208) 667-5772

Lake Management Department
Plummer Office
850 A Street
PO Box 408
Plummer, ID 83851
(208) 686-5302

Natural Resources Department
*Forest management plans
PO Box 408
Plummer, ID 83851
(208) 686-1315

Tribal Police
125 South 10th Street
Plummer ID, 83851
(208) 686-2050

Eastside Highway District
6095 E. Mullan Trail Road
Coeur d'Alene, ID 83814
(208) 765-4714

Idaho, State of

Department of Agriculture (ISDA)
PO Box 790
Boise, ID 83701-0790
(208) 332-8500

In north Idaho:
(208) 608-3404

Idaho, State of (cont.)

Department of Agriculture
Pesticide Disposal Program
(208) 332-8628

Department of Environmental Quality (IDEQ)
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Kellogg Superfund Office
1005 W. McKinley Avenue
Kellogg, ID 83837
(208) 783-5781

Department of Fish & Game (IDFG)
2750 Kathleen Avenue
Coeur d'Alene, ID 83815
(208) 769-1414

Department of Lands (IDL)
*Forest management plans
Coeur d'Alene/Mica Supervisory Area
3258 W. Industrial Loop
Coeur d'Alene, ID 83815
(208) 769-1577

St. Joe Supervisory Area
1806 Main Avenue
St. Maries, ID 83861
(208) 245-4551

Cataldo Supervisory Area
80 Hilltop Overpass Road
Kingston, ID 83839
(208) 682-4611

Department of Parks and Recreation (IDPR)
2885 Kathleen Avenue, Suite 1
Coeur d'Alene, ID 83815
(208) 767-1511

Department of Water Resources (IDWR)
Coeur d'Alene Regional Office
7600 N. Mineral Drive, Suite 100
Coeur d'Alene, ID 83815
(208) 762-2800

Idaho Native Plant Expert
Idaho Panhandle National Forest
(208) 765-7417

Kootenai County

Community Development (Planning and Building)
451 Government Way
Coeur d'Alene, ID 83814
(208) 446-1070

Noxious Weed Control Department
10905 N. Ramsey Road
Hayden, ID 83835
(208) 446-1290

Parks and Waterways
10905 N. Ramsey Road
Hayden, ID 83835
(208) 446-1275

Sheriff
5500 N. Government Way
Coeur d'Alene, ID 83815
(208) 446-1300

Solid Waste and Hazardous Materials Transfer Stations
(208) 446-1430

Ramsey Transfer Station
3650 N. Ramsey Road
Coeur d'Alene, ID 83815
Accepts household waste on Wednesday and Saturday

Post Falls Transfer Station
15580 W. Prairie Avenue
Post Falls, ID 83854
Accepts household waste on Friday and Saturday

Kootenai-Shoshone Soil and Water Conservation District
7830 Meadowlark Way, Suite C-1
Coeur d'Alene, ID 83815
(208) 762-4939 ext. 101

Lakes Highway District
11341 N. Ramsey Road
Hayden Lake, ID 83835
(208) 772-7527

Panhandle Health District 1 (PHD)

Benewah County
137 N. 8th Street
St. Maries, ID 83861
(208) 245-4665

Kootenai County, Environmental Health
8500 N. Atlas Road
Hayden, ID 83835
(208) 415-5100

Shoshone County
114 W. Riverside Avenue
Kellogg, ID 83837
(208) 783-0707

Institutional Controls Program (ICP)
114 Riverside Avenue
Kellogg, ID 83837
(208) 783-0707

Plummer, City of

Planning, Zoning, and Building
880 C Street
PO Box B
Plummer, ID 83851
(208) 686-1641

Public Works
PO Box B
Plummer, ID 83851
(208) 686-1386

Wastewater Treatment Plant
324 Toetly Road
Plummer, ID 83851
(208) 686-1386

Plummer Gateway Highway District
866 D Street
Plummer, ID 83851
(208) 686-1410

Shoshone County

Public Works
700 Bank Street, Suite 35
Wallace, ID 83873
(208) 753-5475

Sheriff
717 Bank Street
Wallace, ID 83873
(208) 556-1114

Transfer Station
52619 Silver Valley Road
Kellogg, ID 83837
(208) 784-5190

Spokane Regional Solid Waste System
(509) 625-6580

North County
N. 22123 Elk-Chattaroy Road
Colbert, WA 99005

Valley Recycling
3941 N. Sullivan Road
Spokane Valley, WA 99216

Waste to Energy Facility
2900 S. Geiger Boulevard
Spokane, WA 99224

United States Government

U.S. Department of Agriculture Natural Resources Conservation Service (NRCS)
*Grazing plans
7830 Meadowlark Way, Suite C-1
Coeur d'Alene, ID 83815
(208) 762-4939

900 E Street
Plummer, ID 83851
(208) 686-1260

United States Government (cont.)

U.S. Environmental Protection Agency (USEPA) - Region 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101
(800) 424-4372

Coeur d'Alene Field Office
1910 Northwest Boulevard, Suite 208
Coeur d'Alene, ID 83814

University of Idaho Extension
Master Gardeners and Plant Clinic
Benewah County Extension
701 College Avenue, Suite LL2
St. Maries, ID 83861
(208) 245-2422

Coeur d'Alene Reservation Extension
402 Anne Antelope
Plummer, ID 83851
(208) 686-1716

Kootenai County Extension
1808 N. 3rd Street
Coeur d'Alene, ID 83814
(208) 446-1680

Worley Highway District
6887 W. Kidd Island Road
Coeur d'Alene, ID 83814
(208) 664-0483

Websites and Readings:

100th Meridian Initiative - Information on zebra/quagga mussels and other aquatic nuisance species.
www.100thMeridian.org

Basin Environmental Improvement Project Commission (BEIPC) - Coordinates cleanup and related measures in the Coeur d'Alene Basin.
www.basincommission.com

Boat Green: 50 Steps Boaters Can Take to Save Our Waters. Ford, C.W. 2008. New Society Publishers. New Gabriola, BC.

Boat U.S. Foundation - Information on boater safety.
www.boatus.com/foundation/

Catalog of Storm Water Best Management Practices for Idaho Cities and Counties. Idaho Department of Environmental Quality. 2005 update. Boise, ID: DEQ.
www.deq.idaho.gov/media/622263-Stormwater.pdf

Center for Aquatic and Invasive Plants
http://plants.ifas.ufl.edu/

Center for Watershed Protection - Stormwater and watershed science and management.
www.cwp.org

City of Coeur d'Alene Phosphorous Laundry Detergent Ban. Chapter 13.28 City Ordinance (Ord 2267 §1, 1990). Prohibits the sale and distribution of laundry-cleaning products containing phosphorus in the City in order to reduce the introduction of phosphorus into public wastewater and into the Spokane River.
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Coeur d'Alene Tribe
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Division I Soil and Water Conservation Districts
www.northidahoswcds.org

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http://Earth911.com

EnergyStar - Energy efficient products, building plans, and home improvement information.
www.energystar.gov

eXtension - National Extension clearinghouse of online resources.
www.extension.org

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www.rngr.net/publications/fnn

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Idaho Department of Environmental Quality
www.deq.idaho.gov

Idaho Department of Health and Welfare Fish Advisory Program
www.healthandwelfare.idaho.gov/Health/EnvironmentalHealth/FishAdvisories/tabid/180/Default.aspx

Idaho Department of Lands State Forester Forum
www.idl.idaho.gov/bureau/ForestAssist/state_forester_forum.htm

Idaho Department of Parks and Recreation
www.parksandrecreation.idaho.gov

Idaho Native Plant Society (Calypso Chapter)
www.idahonativeplants.org

Individual/Subsurface Sewage Disposal Rules - Idaho Department of Environmental Quality rules IDAPA 58.01.03.
http://adminrules.idaho.gov/rules/current/58/0103.pdf

Institutional Controls Program – Panhandle Health District 1.
www.phd1.idaho.gov/institutional/institutionalindex.cfm

Invasive Species Council - Idaho State Department of Agriculture – Idaho's Invasive Species Program.
www.invasivespecies.idaho.gov

Invasive Species Technical Notes - U.S. Department of Agriculture Natural Resources Conservation Service.
www.mt.nrcs.usda.gov/technical/ecs/invasive/technotes/

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Kootenai County
www.kcgov.us

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National Invasive Species Council
www.invasivespecies.gov/

National Oceanic Atmospheric Administration (NOAA) - Information on aquatic invasive species.
www.research.noaa.gov/oceans/t_invasivespecies.html

National Pesticide Information Center
(800) 858-7378
www.npic.orst.edu

National Response Center - Online reporting for oil and chemical spills.
(800) 424-8802
www.nrc.uscg.mil/

Northern Idaho Fertilizer Guide: Northern Idaho Lawns. Mahler R.L. and V.J. Parker-Clark. 1998. University of Idaho Extension, Moscow, ID. CIS 911.
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http://plantsofthewild.com/Newsletter.html

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www.stateforesters.org/stewardship_handbook

Stormwater – The Journal for Surface Water Professionals.
www.stormwater.org

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

Stormwater Manager's Resource Center - Technical assistance on stormwater management issues.
www.stormwatercenter.net

U.S. Department of Agriculture (USDA)
www.usda.gov

U.S. Environmental Protection Agency - Groundwater and Drinking Water.
www.epa.gov/safewater/

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University of Idaho Extension

College of Agricultural and Life Sciences Publications and Multimedia Catalog
www.cals.uidaho.edu/edcomm/catalog.asp

Forestry Extension Resources
www.uidaho.edu/extension/forestry

Master Gardener Resources
www.extension.uidaho.edu/mg/resources

Master Water Stewards Resources
www.uidaho.edu/cda/idah2o

WaterSense - U.S. Environmental Protection Agency - water conservation information.
www.epa.gov/watersense

Web Soil Survey - U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) - soil information, maps, and data.
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

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Appendix C
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Figure 2-9. Lady bug-eating aphid.
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Figure 2-12. Douglas Spirea.
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Figures 2-10 and 2-11.
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Figure 3-2. Correct well construction.
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Figure 3-3. Well location diagrams.
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Figure 3-4. Backflow prevention diagram.
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Page 7-1. Photo of road erosion.
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Figure 7-14. Ditch cross drain diagram.
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Figure 7-21. Logging truck over arch culvert.
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Figure 7-24. Stream diversion.
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Figure 7-25. Culvert clogged with sediment.
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The Coeur d'Alene Basin

Scale 1:220,000

Map Produced by Coeur d'Alene Tribe GIS on 6/19/2012
File Name: GIS-JG\D:\Data\RandomTasks\NRDA_Map4.mxd
For information on this map or other maps please contact us at
gisinfo@cdatribe-nsn.gov


The Coeur d'Alene Basin
Hy Line Ditch Canal
Mikelson Canal
Cedar Creek
Cedar Creek
Skalan Creek
Cougar Creek
Cougar Creek
405s
North Fork Mica Creek
North Fork Mica Creek
South Fork Mica Creek
Bozard Creek
Lake Creek
Fighting Creek
Lake Creek
Lake Creek
Fighting Creek
Coeur d'Alene Lake
Turner Creek
Carlin Creek
Carlin Creek
Thompson Creek
Cottonwood Creek
Lune Creek
Killarney Lake
Killarney Creek
Armstrong Creek
No Creek
Carrill Creek
Varnum Creek
South Fork Cedar Creek
Reserve Creek
Fourth Of July Creek
Mill Creek
Rose Creek
Rose Lake
Wolf Lodge Creek
Cedar Creek
Beauty Creek
Blue Creek
Blue Creek
Fernan Lake
Wolf Lodge Creek
Searchlight Creek
Burton Creek
Skitwish Creek
Marie Creek
Alder Creek
Cedar Creek
Thompson Lake
Blue Lake
Swan Lake
Cave Lake
Medicine Lake
Anderson Lake
Canary Creek
Robinson Creek
Clark Creek
Willow Creek
Evans Creek
East Fork Evans Creek
Swan Creek
Black Creek
Lamb Creek
North Fork Rock Creek
North Fork Rock Creek
North Fork Rock Creek
Hidden Lake
Chatcolet Lake
Round Lake
Goose Heaven Lake
Benewah Lake
Deep Creek
Street Creek
Thomas Creek
Street Creek
Rochat Creek
Turtle Lake
Porrett Lake
Jacot Creek
Plummer Creek
Plummer Creek
Plummer Creek
Little Plummer Creek
Pedee Creek
Benewah Creek
Cherry Creek
Mulch Creek
Coon Creek
Canyon Creek
Thorn Creek
Thorn Creek
Bull Creek
Little Hangman Creek
Little Plummer Creek
Benewah Creek
Mike Creek
Syringa Creek
Carlin Creek
Moctelme Creek
Moctileme Creek
Moctileme Creek
West Fork Benewah Creek
N
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