## SECTION 3

# Ensuring a Safe Drinking Water Supply

## Keeping Hauser Lake Clean

## A Safe Supply?

Most people take a safe water supply for granted. We assume the water coming out of the faucet is safe to drink. Unfortunately, this assumption is not always correct. Households around the lake need to have any private water supply tested regularly to confirm it is safe to drink. At infrequently used vacation homes, the water supply should be tested every year, if the well is not used continuously. Drinking water wells near the lake and its tributaries may draw from shallow ground water and are at the most risk from contamination and need to be tested annually.

A majority of Hauser Lake residents obtain their water through the Hauser Lake Water Association which tests its water on a regular basis.

Some vacation dwellings may use surface water for household water supply which presents a different set of risks and problems. Information about special consideration and testing for surface water is available from the Panhandle Health District (PHD).

The most obvious concern about an unsafe water supply is the health risk to your family and guests. Contamination from wastewater (whether from septic system, outhouse or livestock) 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 which can present a serious health risk to infants as well as adults. If poisons, fertilizers or other chemicals are improperly used or disposed of they can get into your drinking water supply and may cause long-term, chronic health problems for humans or animals.

Property value and resale is another reason to make sure your water supply is clean. A safe water supply is an essential component of a valuable piece of property. At the time of property transfer, most lenders will not provide financing for purchasing property without a well test that meets the EPA's Primary Drinking Water Standards for several contaminants.

## Is There a Problem?

**Be sure to have your water tested:**

- if there are unexplained illnesses in the family.
- if there is a sudden or gradual change in taste, odor, or color.
- if visitors become sick shortly after arriving as family members may have developed a resistance to water contaminants.
- if there is a spill of chemicals or petroleum products near your well or into the surface water that services your drinking water supply.
- if an oily sheen appears when the water stands for a while.

## What is Groundwater?

Groundwater is the underground water found in the cracks of bedrock and in the porous spaces between gravel and sand particles. Ground water can occur just a few feet from the surface or may be buried several hundred feet down.

### Groundwater and the Hydrologic Cycle

The hydrologic cycle explains the movement of water through its various phases from vapor in clouds to liquid water on the land surface, in the ground, and in the oceans. Once rain or snow reaches the ground, it either evaporates, is taken up by plants, or it moves below or across the ground surface. If water stays on the surface it flows into lakes and streams. If it moves downward through the soil and rock it becomes groundwater (Figure 1, page 3-2).

As groundwater moves downward, it passes through the spaces and cracks of rock parent material. Near the surface, where the spaces in the ground consist of both air and water, groundwater is referred to as the unsaturated zone. Below this zone, the "saturated zone" is where water fills all spaces, and is considered the top of the water table.

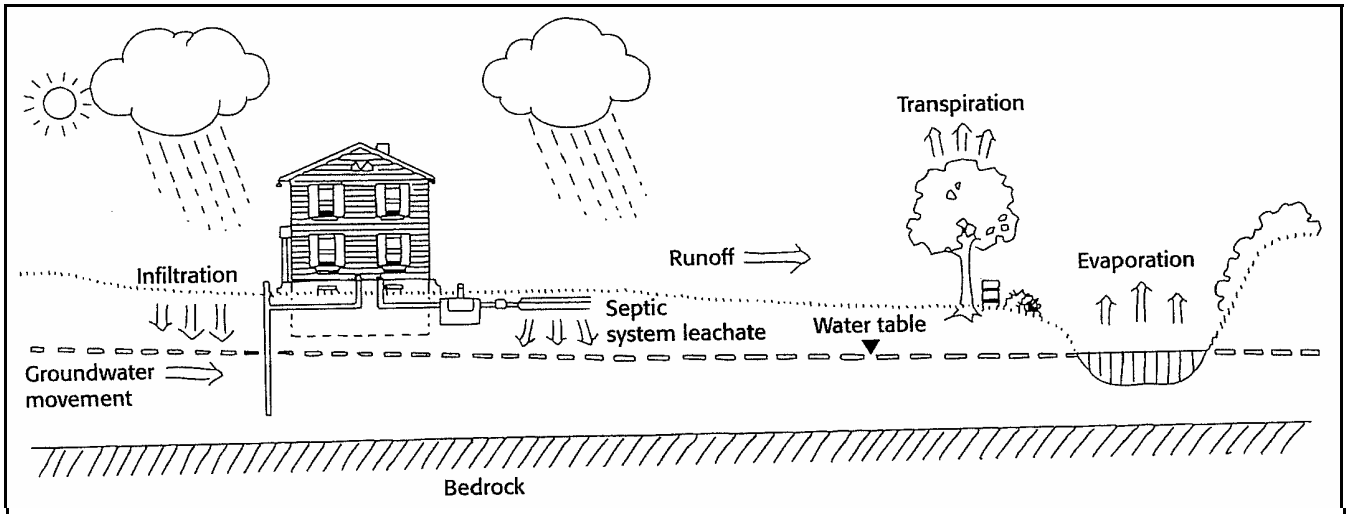



**Figure 1.** *In the hydrologic cycle, water falls to the earth as rainfall and snow and returns to the atmosphere through transpiration and evaporation.*

Like surface water, ground water moves horizontally, but it moves at a much slower rate, usually only a few inches per day. Its rate of movement depends upon the porosity and permeability of the soil, sand, gravel and /or bedrock.

Water also infiltrates the ground where it renews the water supply. First it moves through a zone of aeration, where air fills most of the pores (spaces) in the soil and rock. Much of the remaining water in the soil is available for plants to use.

Eventually, the water reaches a zone of saturation, where the pores between the rock and sediment are filled with water. The top of this zone is called the water table, and the water here is called ground water. Aquifers are areas in the zone of saturation which contain large quantities of water, generally enough to supply wells or springs. Ground water usually moves slowly through an aquifer. The water eventually leaves the aquifer. Ground water can flow naturally from springs, canyon walls, or as a seep; supplying water to rivers; or be pulled into wells. Once on the surface, the water may evaporate or again infiltrate the earth's surface - starting the cycle over.

## What is an Aquifer?

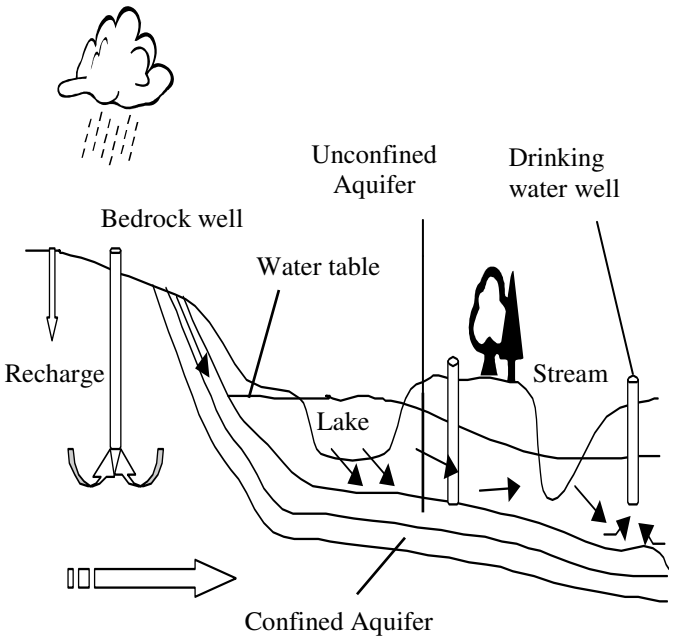
Aquifers are areas where large quantities of water fill the pore space between rocks and sediment.

As groundwater moves downward, it passes through the spaces and cracks of rock parent material. Near the surface, where the spaces in the ground consist of both air and water, groundwater is referred to as the unsaturated zone. Below this zone, the "saturated zone" is where water fills all spaces, and is considered the top of the water table.

Aquifers are defined as either confined or unconfined with confined aquifers overlain by one or more layers of impermeable rock or soil which restrict water to within the aquifer. Thus, water is confined under pressure much the same as the air in a balloon. Drilling a well into a confined aquifer causes the water to rise in the well. If the water comes to the top of the well, these wells are called artesian wells.

Unconfined aquifers are those which are not overlain by a layer of impermeable rock or soil. Water in a well will naturally stay at the level of the water table. As water is removed from the well, the water table is lowered, causing the surrounding ground water to flow toward the well.

The Rathdrum Prairie aquifer is unconfined and Hauser Lake is a Critical Recharge Area for the aquifer. If pollutants are allowed into Hauser Lake then that pollution could eventually reach the aquifer and contaminate community water sources.



# Protecting Your Drinking Water is Important!

Preventing contamination of both ground water and surface water in the Hauser Lake area is very important due to the dynamic interaction between the two drinking water sources called hydraulic continuity. Hydraulic continuity is the movement of water in a saturated environment between ground and surface water. Once either water source becomes contaminated both become contaminated making it very difficult to contain or clean up. Both ground and surface water then play an important role in supplying drinking water to the households around Hauser Lake.

**Drinking Water Sources:**

- Community Public Water System. This public system serves homes/cabins, trailer parks, taverns, restaurants and other businesses around the lake. At Hauser Lake the community owned water association extracts water from wells drilled into the Rathdrum Aquifer along Cloverleaf Road.
- Drilled wells which service individual home sites or a small development of homes. Drilled wells have been developed within sand/gravel upper layer aquifers, developed in sand/gravel aquifers below confining clay layers, or in some cases developed within fractured bedrock.
- Sand-point or drive-point wells developed in sandy soils which may be as shallow as 12 feet.
- Surface water extracted from the lake or streams. This water is not recommended for drinking unless treated.

It is the homeowners sole responsibility to protect their individual drinking water supply. Only public systems, which serve more than 15 connections or at least 25 individuals daily for at least 60 days of the year are regulated to meet State and Federal Drinking Water Regulations. If your home is served by other than a public system, either by an individual well or extraction from surface waters, then it is your responsibility to provide a safe drinking water supply. Contaminated drinking water sources can be extremely difficult and expensive to clean up.

# BMPs for Protecting Drinking Water

The following information addresses the management of your wellhead and surface water sources of drinking water and the location of contamination sources in relation to those sources.

**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. Locating a well in a safe place takes careful planning and consideration of factors such as where the well is located in relation to surface drainage and ground water flow. 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 as far as possible from potential sources of contamination.*

**Separation Distances**

Many states encourage good well location by requiring minimum separation distances from sources of potential pollution, thus using the natural protection provided by soil. Idaho Department of Water Resources (IDWR) Well Construction Standard Rules requires that constructed wells must meet all site and distance requirements set forth by Panhandle Health District and Department of Environmental Quality. For example, Idaho Rules require a minimum distance of 100 feet from a septic drain field to a well (see Figure 2 for distance requirements).

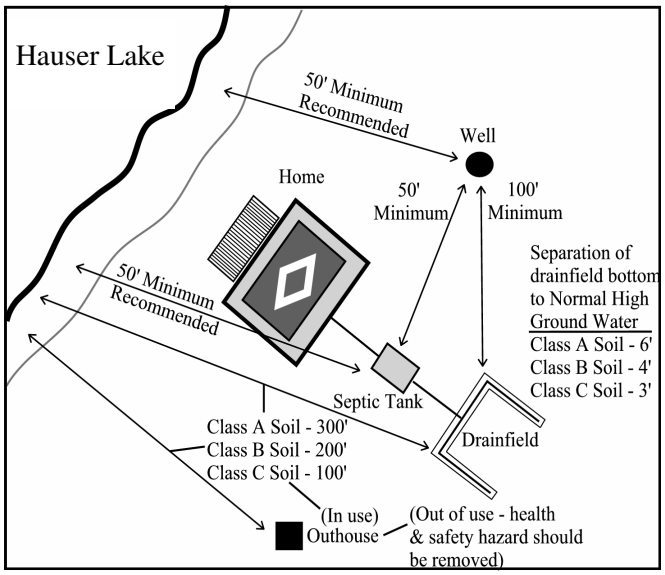



**Figure 2**. *Panhandle Health District minimum separation distance requirements between the drinking water well and some possible sources of contamination.*

Changing the location of contamination sources in relation to your well may protect your water supply, but not the ground water itself. 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.**

There is no specific distance that will guarantee that the well will not be affected. Make every effort, however, to always provide as much separation as possible between your well and any potential contamination source(s).

Both soil type and slope can make well location a tricky business. Keep in mind that separation distances listed by the state are minimums. You may want to chose greater separation distances in some cases, depending on factors at your well site. All surface runoff should be diverted away from the well. Be sure to consider possible contamination sources on adjacent properties as well.

**Well Construction**

Proper well design reduces the risk of contamination by sealing the well from anything that might enter it from the surface (Figure 3). Poor design can allow a well to become contaminated by letting rain or snowmelt reach ground water without filtering through the soil. 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.

Several items concerning well construction that should be checked are described in the following sections. Well construction information may be available from the person who drilled your well, the previous owner, or the well construction report. The IDWR has copies of well construction reports (well logs) on file and available on-line. You may contact any IDWR office in the state to request a copy. The location of your well, reported by township, range, section (1/4 of a 1/4 section or 40 acres) and the name of the person for whom the well was drilled will be needed to locate your well log. Well construction reports, for wells drilled prior to 1987, were not required to be filed with IDWR and therefore may not be readily available.

**Casing, Grout, Pitless Adapter, and Well Seal**

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 ground water. 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 at least 18 feet in depth from the ground surface with the ground surface sloping away from the well in all directions. This will cause surface water to flow away from the well.

You can visually inspect the condition of your well casing for holes or cracks at the surface, or look down inside the casing with a light or mirror. If you can move the casing by pushing against it, you have a problem with your well casing's ability to keep out contaminants. Check on the condition of your well casing by listening for water draining down into the well (pump should not be running). If you hear water, there could be a crack or hole in the casing, or your casing does not extend down to the water level in the well. Either situation puts your drinking water source at risk.

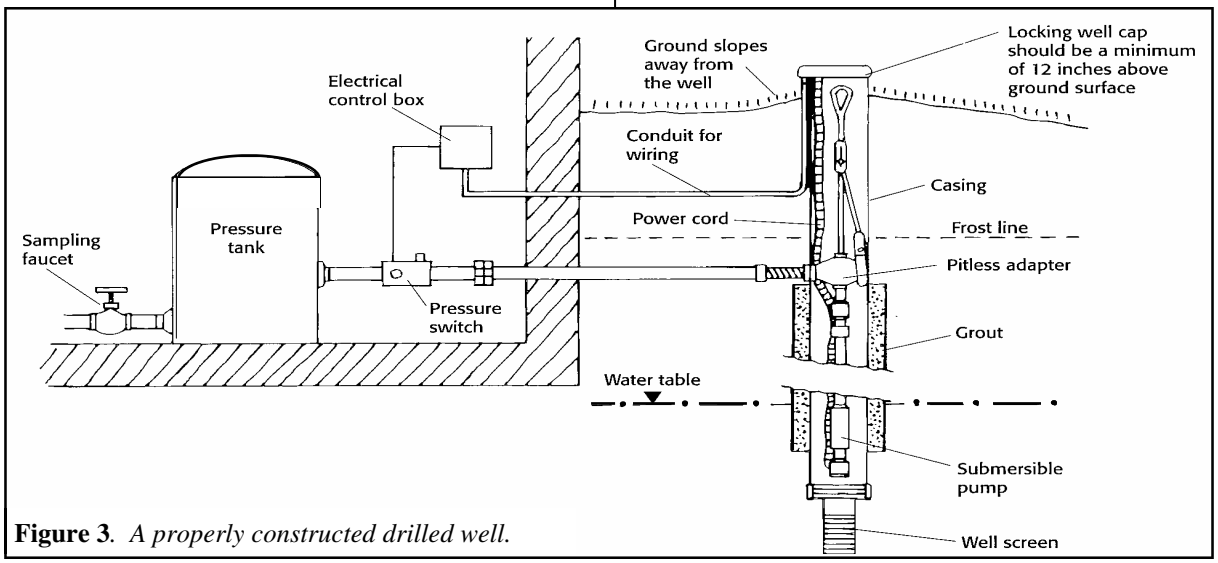



**Figure 3**. *A properly constructed drilled well.*

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.

**Casing Depth and Height**

As stated in Idaho Well Construction Standards, all wells are required to have a durable, watertight casing that extends to a minimum depth of 18 feet below ground level. This ensures that water is filtered through soil and geologic materials before entering the well. Since most contamination comes from the surface, grouting along with casing the well deeper can provide greater protection, so you may want to consider exceeding the minimum casing depth.

Typically, the casing extends one to two feet above surrounding land to prevent surface water from running down the casing or on top of the seal and into the well. Idaho well regulations require that at least 12 inches of casing pipe extend above the final grade of the land. The drilling of wells in areas that are subject to flooding is strongly discouraged. Check with IDWR for regulations concerning casing construction and minimum specifications.

**Well Depths**

Shallow wells which draw from the ground water nearest the land surface are generally more quickly affected by surface activities such as pesticide usage. Local geologic conditions determine how long it takes for this effect to happen. In some places, this process happens quickly—in weeks, days, or even hours. Areas with thin soils over fractured bedrock or sand and gravel aquifers are particularly vulnerable to contamination. On the other hand, thick clay soils can prevent contaminants from reaching the water table.

**Well Age**

If you have an older well, you should have it inspected by a licensed well driller. Older well pumps are more likely to leak lubricating oils, which can contaminate the ground water. In addition, older wells are also more likely to have a thinner casing that has corroded through. Even 30 to 40 year old wells with modern casings are subject to corrosion.

**Backflow Prevention and Cross Connections**

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

# BMPs for Maintaining Existing Wells

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 periodically having a qualified well driller check the well mechanics.

To maintain a safe water supply, follow these guidelines.

**Short-Term BMP's**

- Test the water annually for nitrate and at least annually for coliform bacteria.
- 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.
- Avoid diverting surface drainage to well areas where it may seep into your drinking water.
- Minimize the use of fertilizers and pesticides, particularly in sandy soils or with shallow wells; see Section #2.
- Properly dispose of hazardous household products; see Section #5.

**Long-Term BMP's**

- Use a licensed well contractor for installing new wells or sealing unused wells.
- When installing or replacing a well, follow the required isolation distances.
- When planning development on your lot, leave enough room for future expansion to avoid crowding the well.
- Immediately replace or repair wells in which the casing is no longer watertight because of damage or corrosion.
- Properly seal unused wells to prevent direct contamination of ground water.

## BMPs for New Wells

New wells are expensive, but they are a good investment 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. Some simple principles are:

- Prior to drilling a new well make sure groundwater is not already contaminated.
- Follow at least the required minimum distances from potential contamination sources that are set by your local public health district, as well as any other local ordinances when locating your new well.
- Locate your well on ground higher than contamination sources such as fuel tanks, livestock lots, septic systems, or pesticide mixing areas. Where practical, locate the well as far as possible from contamination sources. There is no specific distance from potential contamination source that will guarantee the well will not be affected.
- Build soil up around the well so that all surface water drains away from it, but maintain the minimum 12 inches of casing above the soil surface.
- Avoid areas that are prone to flooding.
- Make the well accessible for pump repair, cleaning, testing, and inspections.
- Hire a competent, licensed well driller. Make sure the driller disinfects the well with chlorine after construction, tests the water for bacteria after drilling, and provides a copy of the water well record, which includes detailed information about the well depth and construction.

## Unused Wells

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

If not properly filled and sealed, these wells can provide a direct conduit for surface water carrying contaminants to enter ground water without filtering through soil or can allow contaminant movement from one water source to another.

In addition to these wells being a threat to ground water, large open wells pose safety hazards for people and animals. The landowner, under Idaho law, is responsible for properly abandoning wells and test holes.

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. A local well driller can be helpful because they will have experience with well construction materials and methods as well as a working knowledge of the geology of the well site.

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 ground-water contamination.

**Locating Unused Wells**

Pipes sticking out of the ground around the home or under an old windmill are the most obvious places for finding unused wells. You may not know the history of your property, however, and old well locations may not be obvious. 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**

The IDWR administers the laws regulating the abandonment of wells. Well drillers and landowners are required to follow these laws so that the potential for aquifer contamination can be reduced.

Proper well closing takes time and money. Costs will vary with the well depth, diameter, and geology of the area. However, spending a few hundred dollars to properly abandon an old well near your home may prevent contamination of your drinking water. Please contact the IDWR in your area for additional information.

# Water Testing

Keep an eye on water quality in existing wells by testing them regularly. Wells should be tested immediately after construction, and then at least once annually for coliform bacteria. Well testing is particularly important for shallow wells, dug wells and 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 To Test Wells For

A good initial set of tests for a private well includes hardness, pH, conductivity, corrosivity, chloride, nitrate, coliform bacteria, and perhaps lead.

Annually test for total coliform bacteria which is the standard bacteriological test conducted on drinking water supplies. The presence of total coliforms is an indicator of system vulnerability. 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. 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 (hepatitis for example). A short term fix for coliform contamination is boiling water, a long term solution is disinfection of the supply (chlorination or the use of ultra-violet light).

Another primary contaminant is nitrate-nitrogen. Nitrate occurs naturally in waters, but levels above 10 mg/L (the Federal Drinking Water Limit) should not be consumed by infants under one year of age or pregnant women. High nitrates in ground water often stem 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 fetuses. The lead level should not exceed five parts per billion. Sample for lead if you have lead pipes or copper joints with lead solder. Soft or acidic water can accelerate leaching of lead from the plumbing system.

Laboratory tests for other possible contaminants can be quite 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 there has been a nearby use, spill or deposit (in dump or landfill) of oil, petroleum, or solvent. The same circumstances can be stated for pesticides.

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

Drinking waters may be tested at commercial laboratories, or in Kootenai County they may be tested through the Panhandle Health District in Coeur d'Alene. Follow the lab's instructions for water sampling to assure accuracy of the 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**.** You may also want assistance in interpreting test results. Contact your local public health district or Idaho Department of Environmental Quality (see contact list on page 3-8).

## Using Surface Water

The Idaho DEQ does not recommend using surface water as a drinking water supply unless it is treated. A few older homes/cabins in this area may extract water from either Hauser Lake or nearby streams for household use. Besides bacteria, surface waters can also contain single cell protozoan, *Giardia* and *Cryptosporidium*, whose cysts are intestinal parasites and considered as 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 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 ultraviolet light.

## BMPs for Surface Water

Protecting a surface drinking water source is difficult because of the many different environmental factors that can adversely impact the surface waters in the Hauser Lake watershed. Your first defense and only sound practice for safe drinking water is a filtration system. Beyond that anything you can do to prevent contamination of Hauser Lake and its tributaries is a bonus. Implementing the best management practices found in the Lake*A*Syst materials will help protect both ground and surface waters in the Hauser Lake watershed.

## Home Water-Treatment Systems

If you do not receive your water from the community water association and need to treat it, please be cautious about the multitude of available Home Water-Treatment Systems. First, make sure any treatment unit is certified by the National Sanitation Foundation (NSF). Home systems can be quite expensive, and you may get sold a system that is treating water for a whole host of compounds that are not a concern around Hauser Lake, and conversely does not treat for a compound that may be of specific concern. If you are drinking Hauser Lake water, you would want a system NSF certified for cyst reduction. There have been excellent articles in Consumer Reports on safe water and home treatment systems.

For home use, two types of filters are generally considered:

**Granular Activated Carbon.** This filter addresses taste, odor, removes chlorine and volatile organic chemicals (VOCs), and some inorganic chemicals (IOC) like lead. They are not as effective against microorganisms. This filter is higher maintenance than other types of filtration devices.

**Membrane Filtration.** Membrane filters (Microfiltration, Ultrafiltration, Nanofiltration, and Reverse Osmosis) remove particles by forcing water through very small openings.

- Microfiltration - removes particles down to micron and submicron sizes. These units typically do not remove dissolved material.
- Ultrafiltration – passes nearly all ions, but removes nearly all organisms and suspended particles.
- Nanofiltration – generally removes ions larger than one nanometer.
- Reverse Osmosis– removes virtually all particles and many ions. Higher maintenance due to cleaning.

## For More Information

**call, write or visit…**

Panhandle Health District
8500 N. Atlas Rd.
Hayden, ID 83835
(208) 415-5200

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

Idaho Department of Water Resources
7600 Mineral Dr. Ste 100
Coeur d'Alene, ID 83815
(208) 762-2800.

See Resource Directory (Appendix B) for additional agency contacts.

## Notes: