



Rainwater Catchment Systems

Some people in Hawaii depend on rainwater catchment systems for their water. The condition of your rainwater catchment roof, gutters, pipes, and tank affect the potential for contamination of your water supply. This is especially important to consider if you use your catchment water for drinking. You should be concerned about the system's surroundings, condition, and maintenance. Some contaminants in water may affect only appearance, while others such as bacteria, nitrate, and toxins can be extremely harmful and even fatal.

This worksheet will help you to better understand the water-pollution risks associated with your catchment system and help you to develop an action plan to address those risks and better protect your water supply from contamination.

Are the roof, pipes, or faucets made or coated with toxic materials?

Many roof coatings, paints, and collection materials contain toxic substances that can contaminate your tank water. For example, galvanized roofing is a source of zinc, roofs with copper flashing can have high copper and lead concentrations, and some roof coatings and roofing nails contain lead. Old copper pipes may contain lead solder, and brass faucets may also be a source of lead. You should consider replacing these materials and components or treating them with coatings that are made of nontoxic materials.

Heavy metal contamination (lead, copper, zinc) is potentially a bigger problem in places such as Volcano, Puna, Kau, and South Kona, where the rain is acidic because of volcanic emissions. To see the most current health effects information for chemical contaminants, visit the Web site <<http://www.epa.gov/safewater/mcl.html>>; Web access is available at most public libraries. If you suspect your collection system contains toxic materials, you should have your drinking water tested. Check with the

Hawaii State Department of Health (see contact information on page 4) for a list of approved testing facilities.

Are foreign materials kept out of the system?

Trees and branches that overhang your water-storage tank or roof can increase the risk of water contamination because leaves and twigs drop onto the roof or into the tank. Tree litter adds to the dirt and organics in your water supply and can affect the color and taste of the water. Overhanging trees provide access to your tank and roof for cats, rats, mongooses, birds, and geckos. When their urine and feces enter your water system, you are at greater risk for health problems such as diarrhea, giardia, and leptospirosis. Wires running from electrical or telephone poles to your roof also can make it easier for unwanted critters to get onto your roof. If these wires are attached to the side of your house or rat guards are installed, this problem can be reduced—contact your electric utility company for information and assistance.

Your maintenance program should include regular cleaning of rooftops (or other collection surfaces), gutters, and pipes leading to the tank. This will prevent clogging of the system and reduce bacterial contamination. Inspect the collection system for blockages and debris after every major storm event. Studies conducted in the Virgin Islands have found leaf litter and other organic debris left on rooftops and in gutters and tanks to be a primary source of bacteria in tank drinking water.

Screening gutters, downspouts, and any other pipes leading to the tank helps keep leaves, twigs, and animals out of the water system. Use a screen with mesh small enough to catch small leaves and twigs but large enough to prevent your system from getting rapidly clogged. Check all screens after major storms to remove any debris that may have collected. It is also a good idea to fence or screen any part of your collection system that may be accessible to animals and children.

The first water that washes off your roof when it starts raining is the dirtiest water because it contains dust, volcanic emissions like "Pele's hair," animal wastes, leaves, and other materials that have accumulated on the roof between rains. It can also contain agricultural pesticide residues if your house is located in an area where pesticides are sprayed. A first-flush diverter device can prevent this dirty water from entering catchment tank, lowering the risk of contamination. Lacking a device, you can manually divert the first flush of water from your tank, but this can only be done if you are home when it starts raining.

Even if you screen and cover your system and deflect the first flush, some contaminants such as dirt and small bits of organic matter usually get into your system. Installation of a filter can keep these materials out of your water supply. The industry standard is a 30-micron cartridge that is installed in the water line after the pump. Finer filters are also available and can be at individual faucets. All filters should be changed regularly according to the manufacturer's recommendations. Although some filters can remove very small particles, they cannot remove disease-causing organisms such as bacteria and viruses. If you intend to drink the water from your catchment system, you should install an additional water-treatment system.

Because the tank may hold the catchment water for a long time, tank materials can have a significant influence on your water quality. Do not use materials in or on your tank that will contaminate your water. For example, if you have a redwood or concrete tank, the inside should not be painted with an oil-based paint or paint containing lead. For tanks with liners, use a "food-grade" plastic liner approved by the National Sanitation Foundation, <<http://www.nsf.org>>. Some "swimming-pool grade" liners are treated with algae-killing chemicals that can contaminate your drinking water.

The water catchment tank should always have a cover. A solid cover is best because it helps prevent debris and animal urine and feces from entering your tank. It also prevents sunlight from reaching the water and reduces the growth of algae in the tank. However, solid covers can be expensive. A shade-cloth cover that has a support system to prevent the cloth from drooping into the tank water is the second best option. If the shade-

cloth droops into the water, this provides an area for debris to accumulate and for animals and birds to drink and bathe and contaminate the water.

Is your tank properly maintained?

The quality of your water supply depends directly on how you manage the collection system. The tank should be emptied and cleaned as often as needed to remove sludge accumulation. Clean the tank if you notice the water getting discolored or sludge appearing. Even if you do not notice problems, you should completely clean your tank at least once every three years. This will minimize the amount of bacteria and other contaminants in your drinking water.

Leaks in above-ground tanks are usually easy to detect and usually do not result in water contamination. However, leaks in underground storage tanks are hard to detect and can increase the risk that your water can become contaminated. Any cracks or leaks in the water storage tank should be immediately filled and sealed with nontoxic filling or sealing material. Check your tank for leaks if you notice that you seem to be using water unusually quickly.

You should add chlorine to your system on a regular basis to disinfect your water supply. National Farm and Home Assessment documents recommend that catchment water be treated with 2 fluid ounces of 6% sodium hypochlorite solution per 1000 gallons of water, and that amount should be added periodically (monthly or bimonthly, depending upon the frequency and amount of rainfall) so as to maintain the chlorine level at a constant level. Unscented liquid household laundry bleaches generally have approximately 6% sodium hypochlorite. Since these products are not labeled for water purification, people using them for that purpose do so at their own risk. Health officials generally recommend that only municipal water be used for drinking and cooking, and that catchment water be used only for nonconsumption purposes.

Chlorine treatment alone does not reduce risks for all potentially harmful organisms, including the ones that cause giardia. Health risks from such organisms can be reduced only by boiling water before drinking or by using an additional treatment system designed for the particular sanitation purpose.

Assessing your risks

To determine your rainwater catchment system's risks for contamination, compare the items in the table below with your management practices and rate your risk level as low, moderate, or high for each category. Then, go to page 4 to develop an action plan to reduce your risk of water pollution.

Risk Assessment Table for Rainwater Catchment Systems

	Low risk	Moderate risk	High risk	Your risk
Roof materials and catchment system pipes	Roofing materials and pipes contain no potentially hazardous materials	Not sure what roofing materials and pipes contain; may contain lead-headed nails or lead solder in copper pipes; catchment water is acidic	Roofing materials or pipes contain lead-based paint, lead-headed nails, or other hazardous materials; system uses copper piping or brass fixtures; water is acidic	<input type="checkbox"/> low <input type="checkbox"/> moderate <input type="checkbox"/> high
Roof maintenance (leaves, twigs, other debris)	Regularly clean roof, no overhanging trees	Regularly clean roof, few overhanging trees, first flush sometimes manually deflected	Irregularly clean roof, many overhanging trees	<input type="checkbox"/> low <input type="checkbox"/> moderate <input type="checkbox"/> high
Screens to keep out leaves, twigs, and animals	All gutters, downspouts, and other openings screened; screens cleaned regularly	Most gutters and all downspouts and other openings screened; screens cleaned when clogged	Gutters, downspouts, and other openings not screened	<input type="checkbox"/> low <input type="checkbox"/> moderate <input type="checkbox"/> high
First-flush water	Automatic first-flush diverter installed	Manually divert first-flush water from collection tank	First-flush water goes directly into collection tank	<input type="checkbox"/> low <input type="checkbox"/> moderate <input type="checkbox"/> high
Tank materials	No potentially hazardous coating materials, or use a food-grade plastic liner	Uncertain of coating material used	Use potentially hazardous coating materials (e.g., lead paint) or nonfood-grade liner	<input type="checkbox"/> low <input type="checkbox"/> moderate <input type="checkbox"/> high
Tank covers	Solid cover	Shade-cloth cover, with support system, no trees or branches over tank	No cover, or shade cloth cover that droops into water	<input type="checkbox"/> low <input type="checkbox"/> moderate <input type="checkbox"/> high
Tank maintenance (cleaning and leaks)	Cleaned tank within past 3 years, check for leaks regularly	Cleaned tank within past 5 years, check for leaks at least annually	Haven't cleaned tank in more than 5 years, seldom check for leaks	<input type="checkbox"/> low <input type="checkbox"/> moderate <input type="checkbox"/> high
Tank chlorination	Add appropriate amount of chlorine to tank monthly or according to water use	Add chlorine to tank irregularly and without regard to water use	Seldom add chlorine	<input type="checkbox"/> low <input type="checkbox"/> moderate <input type="checkbox"/> high

Your action plan

Now that you have assessed your management practices, you can take action to change practices that may be causing water pollution. For areas that you identified as high or moderate risk, decide what action you need to take and fill out the Action Plan below.

Write down all your moderate-risk and high-risk activities below	What can you do to reduce the potential risk for water pollution?	Set a target date for action
<i>Samples of action items:</i> <i>Haven't cleaned water tank since 1993</i>	<i>Clean the tank</i>	<i>Next Saturday</i>

For additional information

The Safe Drinking Water Branch of the Hawaii State Department of Health responds to inquiries from rain-water catchment system owners and users.

- Island telephone number
- Hawaii: 974-4000 ext. 64258
- Maui: 984-2400 ext. 64258
- Kauai: 274-3141 ext. 64258
- Molokai and Lanai: 1-800-468-4644 ext. 64258
- Oahu: 586-4258

Two Internet sources of general information on water catchment systems are *The Sourcebook of Alternative Technologies for Freshwater Augmentation in Latin America and the Caribbean*, <<http://www.unep.or.jp/ietc/Publications/TechPublications/TechPub-8c/rooftop.asp>>, and the DTU Roofwater Harvesting Program, <<http://www.eng.warwick.ac.uk/DTU/rainwaterharvesting/index.html>>. Another site of interest is the National Sanitation Foundation (NSF) at <<http://www.nsf.org>>, which provides information on the effectiveness of various water treatment and filtration devices.



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