COASTAL WATER PROTECTION BEGINS WITH YOU

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CONTENTS

PREFACE

Introduction to Water Quality in the Texas Coastal Zone

America's coastal waters are a source of life for people and marine species that reside near them. While some of us may think of our coastal waters as a great place to enjoy swimming, fishing, kayaking, boating and other fun water recreation activities, for many communities, they are much more than that. Many people's livelihoods, whether based on fishing or tourism, depend on clean and safe coastal waters. Citizens and communities of the Texas coast are proud of the diverse ecosystems, natural beauty, cultural bounty, and way of life they experience living along the Gulf of Mexico. The economy, cultural heritage, and environmental quality of the small communities and rural areas throughout the Texas coastal counties are inextricably linked to the health of tidal streams, bays, and estuaries along the Gulf Coast. Texas coastal waters sustain freshwater and marine water habitats that, in turn, support an abundance of fish and wildlife, tourism, and recreation. Threats to water quality, coastal habitats, and fish and wildlife populations are direct threats to the Gulf Coast economy.

While stormwater runoff from larger cities and metropolitan areas is regulated through a state permitting process, small cities remain largely unregulated. The purpose of this document is to provide guidance to communities in the Texas Coastal Zone on the management of stormwater runoff from new and existing development. Development may include a variety of projects such as residential, commercial, and office projects. This handbook is meant to specifically describe practices that local residents can adopt to reduce the impact of stormwater runoff and manage water usage from their own properties. It includes a variety of topics including management of lawns and landscapes, domesticated animal waste, use of herbicides and insecticides, maintenance of septic systems, and at-home rainwater harvest.

HOW RESIDENTS CAN HELP PROTECT WATER QUALITY

- ✔ Sustainable "Water-Smart" Landscape Maintenance
- ✔ Disposal of Household Hazardous Waste
- ✔ Septic System Maintenance
- ✔ Pet Waste Disposal
- ✔ Rainwater Harvesting and Use

Figure 1: Garden featuring fall asters, a Texas native plant. Photo courtesy of Lady Bird Johnson Wildflower Center at The University of Texas at Austin.

There are opportunities for everyone living along the Gulf Coast to help protect the quality of our water resources. Even very simple changes in how landscaping is designed, pet waste and ordinary household hazardous waste are disposed of, and how septic systems are maintained, make a difference downstream from a homeowner's property. Ideas presented can be implemented at the individual household or neighborhood scale and can have beneficial effects on managing stormwater volumes.

Making Landscape Part of the Solution

Properly designing landscapes to receive stormwater runoff from streets and other "impervious surfaces" can help reduce soil erosion and allow natural processes in the soil to break down pollutants. Often, landscaping is recognized as the best form of erosion control; properly designed landscapes are shown to provide the most effective "treatment" in both reducing stormwater volume and velocity and removing pollutants. However, there are also many commonplace, negative landscaping practices that contribute to water quality problems, as described below.

- The application of synthetic pesticides and herbicides can contribute to water quality problems. Many pesticides are toxic to aquatic life and may also enter the food chain upon entering a water body.
- The use of quick-release fertilizers can be harmful to aquatic life. When entering receiving waters, the high levels of nutrients in synthetic fertilizers stimulate excessive growth of algae and other aquatic plants. After consuming the nutrients from these fertilizers, the algae or plant dies and begins to decompose, creating low oxygen conditions that adversely affect many aquatic species.
- Excessive irrigation, in addition to contributing to water supply challenges, can contribute to water quality problems. Runoff from over-saturated landscapes and overspray from sprinklers onto sidewalks, streets, and parking lots can become dry-weather runoff. This flow of runoff can mobilize pollutants (such as oil and grease) on adjacent pavement and carry the pollutants into creeks and other receiving waters.

WATER-SMART LANDSCAPE MAINTENANCE PRACTICES

Getting started with water-smart landscaping can be as simple as applying mulch and compost. Using these readily available natural materials can help improve plant health, as well as the health of local creeks.

Water-Smart Landscaping Tip #1: Nurture the Soil

Developing and maintaining healthy soil is an important part of reducing or eliminating the need for quick release fertilizers and pesticides. The practices listed below help protect and improve soil conditions:

- Cover exposed soil with plants or mulch;
- Fertilize with compost; and
- Never mow more than one-third of the grass height.

Water-Smart Landscaping Tip #2: Select the Right Plants

In addition to nurturing the soil, proper plant selection can reduce the need for synthetic pesticides and fertilizers. The following practices can help with successful plant selection:

- Landscape using native plants. Lists of plants suitable for local conditions, such as the following, should be consulted:
  - Plants for the entire Texas coastal area: aggie-horticulture.tamu.edu/southerngarden/coastplants.html
  - Lady Bird Johnson Wildflower Center Native Plant Recommended Species Collections, includes species recommended for South Texas: www.wildflower.org (click on Collections)
- Choose the right turf grass to reduce fertilizer and water needs:
  - Texas A&M Agrilife Extension, in its publication, *Turf Grass Selection for Texas: Ecological Turf Tips*, which may be downloaded at: http://galveston.agrilife.org/files/2011/05/L-5519-Turfgrass-Selection-for-Texas-6-2010.pdf.
- Plan for growth, keeping in mind that newly planted shrubs and perennials will need room to grow.

Figure 2: Purple pleat leaf iris (top) and Beach evening primrose (bottom), native plants of the Coastal Bend. Photo courtesy of Dick Klopshinske, Native Plant Society of Texas, South Texas Chapter.

Water-Smart Landscaping Tip #3: Reduce Irrigation Use

Irrigation requirements can be reduced by selecting plants adapted to the local climate, as described above. The following additional tips can help reduce the use of potable water for irrigation, and avoid over watering that can result in runoff flowing from saturated landscapes:

- Avoid water runoff from sprinklers and irrigation systems; and
- Use efficient irrigation to reduce overspray, evaporation, and runoff (Figure 3).

Figure 3: Irrigation overspray onto pavement can carry pollutants to creeks. Photo courtesy of The Texas Coastal Watershed Program of Texas A&M University.

Water-Smart Landscaping Tip #4: Use Integrated Pest Management

Pest problems can be minimized by following previously listed tips for nurturing the soil, choosing the right plants, and providing sufficient irrigation, which can reduce stress on plants and enhance their resiliency against pests and disease. When infestations occur, recommended integrated pest management (IPM) approaches described below should be followed. IPM is a common sense approach to managing pests.

- Encourage beneficial insects (Figure 4); and
- Reduce or eliminate fertilizers, pesticides and fungicides.

Figure 4: Dragonflies, a beneficial insect, eat mosquitoes, midges and other pests. Photo courtesy of Lady Bird Johnson Wildflower Center at The University of Texas at Austin.

DISPOSAL OF HOUSEHOLD HAZARDOUS WASTE

Some consumer products contain chemicals that can present safety concerns if used or disposed of improperly. These materials are often called household hazardous waste and may include items such as:

- Corrosive cleaners (such as lye-based oven cleaner);
- Drain cleaners;
- Fluorescent light bulbs (including CFLs);
- Fuels (gasoline, propane, diesel);
- Paints (oil-based or some anti-mildew latex);
- Pesticides;
- Pool chlorine and acid; and
- Wood stains or varnishes.

These materials should never be poured down the drain or disposed of on the ground or in storm drain systems. If waste from these materials is generated by a household, it is often not required to be disposed as hazardous waste, and can be placed in your regular trash. However, because these materials contain toxic, ignitable, or reactive ingredients, local governments typically offer opportunities to dispose of these items in a more protective manner.

Figure 5: An assortment of hazardous waste bottles. Improper disposal of these products is illegal and poses a risk to human health and the environment.

How to Dispose of Household Hazardous Waste

Many towns and cities in Texas have designated facilities where residents can drop off hazardous waste items while others may hold monthly or seasonal collection events. TCEQ maintains a list of ongoing household hazardous waste disposal facilities and programs, as well as individually scheduled events that are posted on the agency's Household Hazardous Waste web page (https://www.tceq.texas.gov/p2/hhw/contacts.html).

Tips for Safe Storage, Transportation and Care of Household Hazardous Waste

For the protection of homeowners and sanitation workers who collect hazardous waste, the following guidance and tips are provided:

- Products should be kept in their original container and labels should be readable. This ensures that household hazardous waste can be easily identified.
- Chemicals should be stored and transported in an upright position to avoid leaking – which could result in the mixing of incompatible chemicals.
- Products should never be mixed together, which can result in dangerous, even deadly, fumes.
- Chemicals should be kept in a cool, dry place out of the reach of children and pets.

Nonhazardous Items that May Be Collected with Household Hazardous Waste

Many programs that collect household hazardous waste will also accept other common nonhazardous household material that can be recycled or offered to others in the community for reuse. These may include new or used:

- Antifreeze;
- Motor oil or oil filters; and
- Nonhazardous latex paint.

Items Exempt from Statewide Household Hazardous Waste Programs

Collections of any combination of batteries, used oil, latex paint, or antifreeze are exempt from requirements of the TCEQ's household hazardous waste program because these materials generally do not present substantial hazards.

Figure 6: For resources on other materials including Batteries, Pharmaceuticals, and Used Electronics visit the Texas Commission on Environmental Quality's website at https://www.tceq.texas.gov/p2/hhw.

Figure 7: There are many opportunities to dispose of unwanted waste responsibly. For a list of Household Hazardous Waste Collection Program contacts by county, visit https://www.tceq.texas.gov/assets/public/assistance/hhw/hhw_contacts.pdf. Photo courtesy of Montgomery County Planning Commission.

SEPTIC SYSTEM MAINTENANCE

Septic systems are common along the Gulf Coast, where many residential properties are not served by centralized sewer systems. These underground wastewater treatment structures use a combination of nature and time-tested technology to treat wastewater from household plumbing by removing harmful bacteria, viruses, and nutrients from the wastewater. These systems require a regular program of maintenance to function properly. Figure 8 shows how a typical septic system works. The system consists of a buried, watertight septic tank and a drain field, or soil absorption field. The steps shown below illustrate the following processes that occur in such a system:

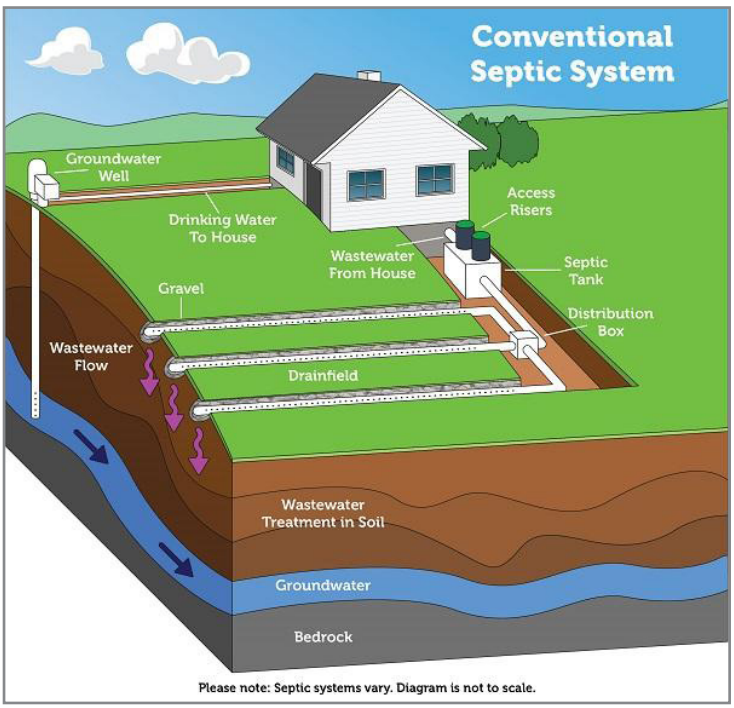

Figure 8: Schematic cut-away view of a typical septic system. Photo courtesy of US EPA.

1. The septic tank receives wastewater from the house by way of a main drainage pipe.
2. The septic tank holds the wastewater long enough to allow solids to settle down to the bottom (forming sludge), while the oil and grease floats to the top (as scum). Compartments and a T-shaped outlet prevent the sludge and scum from leaving the tank and travelling into the drain field area.
3. After a period of settling, the liquid wastewater (effluent) exits the tank into the drain field. If the drain field is overloaded with too much liquid, it will flood, causing sewage to flow to the ground surface or create backups in toilets and sinks.
4. Finally, the wastewater percolates into the soil, naturally removing harmful coliform bacteria, viruses, and nutrients.

Why Maintain the Septic System?

Often, septic systems can be "out of sight, out of mind," but there are many reasons that maintaining a septic system should be an important priority. Through routine maintenance alone, you can expect to cut costs for repairs, safeguard property value, protect your own health and that of the environment surrounding the system. Regular maintenance is generally less expensive than the cost of repairing or replacing a malfunctioning system, and an unmaintained septic system will lower property value. Additionally, insufficiently treated sewage from septic systems can cause surface and groundwater contamination, affecting people and the surrounding environment.

How to Maintain a Septic System

To avoid costly system failures and establish a routine schedule of septic system maintenance, alwaysuse a licensed maintenance provider for regular and standard inspections. TCEQ maintains an online listing, by county, of local government contacts for information regarding any local septic system requirements. This list can be accessed at https://www6.tceq.texas.gov/oars/.

It is also important to note that system pumping is required if the bottom of the scum layer is within 6 inches of the bottom of the outlet, or if the top of the sludge layer is within 12 inches of the outlet. While pumping is generally required every three to five years, the need for pumping will be influenced by the size of the household, total wastewater generated, the volume of solids in water, and the size of the septic tank.

Signs of Septic System Failure

A foul odor isn't always the first sign of a malfunctioning septic system. A septic professional should be contacted if any of the following occur:

- Wastewater backing up into household drains;
- Bright green, spongy grass on the drain field, even during dry weather;
- Pooling water or muddy soil around the septic system or in the basement; and
- A strong odor around the septic tank and drain field.

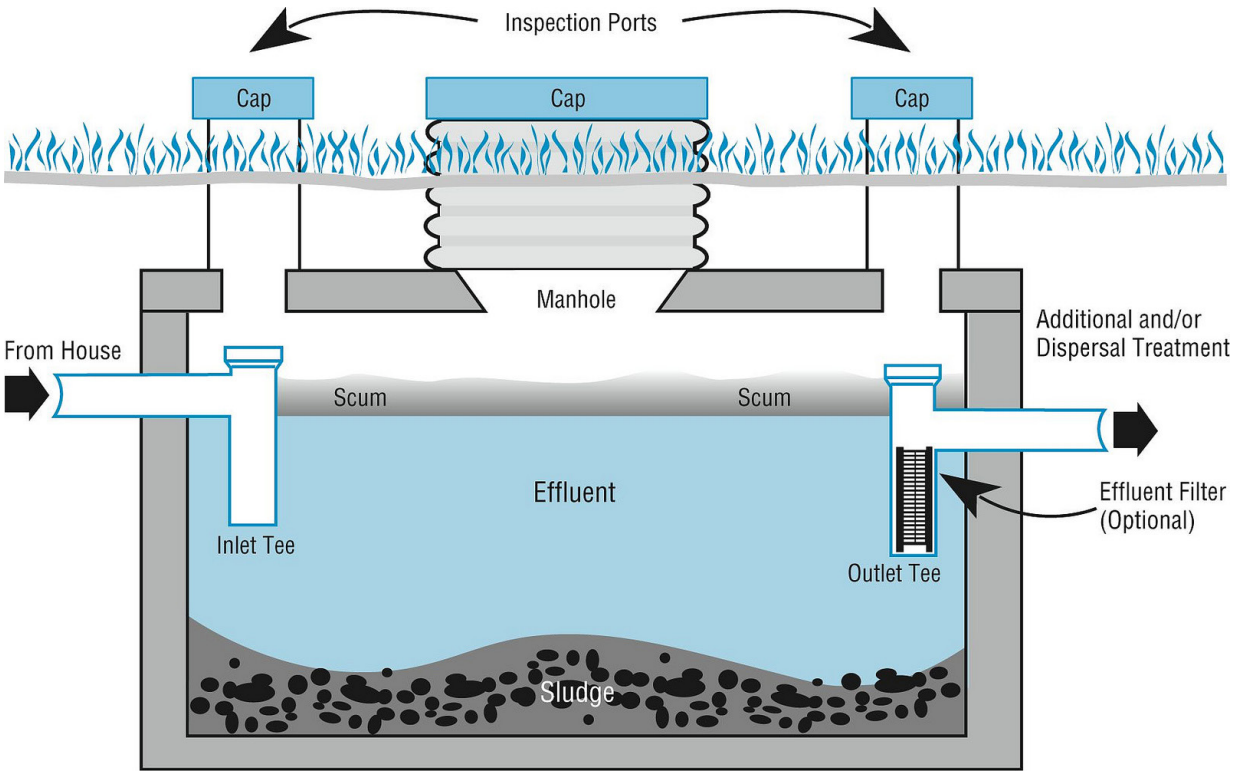

Figure 9: Schematic side view of a septic holding tank. Photo courtesy of wfeiden, Flickr.

DISPOSAL OF WASTE FROM PETS & OTHER DOMESTIC ANIMALS

Pet waste is a water quality problem for creeks, rivers, lakes, and the Gulf. Microbial tracking studies performed on various watersheds in Texas found that domestic animals were the source contributor for 14 to 55% of the bacteria detected at sampling stations. Waste from domestic animals that is left on trails, sidewalks, streets, and grassy areas can be washed into the nearest waterway when it rains, which contributes to the following water quality problems:

Figure 10: Pet waste station. Photo courtesy of Poop Patrol 911.

- **Bacteria and viruses:** Like human waste, animal waste may contain harmful bacteria and viruses, making the water unfit for irrigation, recreation, or other uses.
- **Excessive nutrients:** Animal waste contains nutrients which, in excessive amounts, speed up the growth of nuisance weeds and algae in receiving water bodies. Overly fertile water becomes cloudy and green – unattractive for swimming, boating, and fishing and often dangerous for resident wildlife.
- **Low oxygen levels:** When animal waste is washed into lakes or streams, the waste decays, using up the dissolved oxygen in the water and often releasing ammonia. Low oxygen levels and ammonia combined with warm temperatures can kill fish and other aquatic species.

Safe Methods of Pet Waste Disposal

The most effective way for pet owners to limit their pet's contribution to water pollution is to simply clean up and dispose of their waste. Remember the following safe methods for pet waste disposal:

- **Flushing:** As long as droppings are not mixed with other materials, pet waste should be flushed down the toilet. This allows waste to be properly treated by a community sewage plant or septic system. Pet owners should use plastic bags to pick up after their pet.
- **Tossing:** Pet waste can be sealed in a plastic bag and put into the garbage if local law allows it. This is good for water quality health, as well as the health of humans (especially children) and pets.
- **Burying:** Pet waste can be buried, if allowed by local law. Pet waste should be buried in a hole at least 1 foot deep, placing 3 to 4 inches of pet waste at the bottom. A shovel should be used to chop and mix the waste into the soil at the bottom, then covered with at least 8 inches of soil to keep away rodents and pets. Pet waste should only be buried around ornamental plants, and never in vegetable gardens or food-growing locations. Pet waste is not recommended for backyard compost piles because parasites carried in dog and cat feces can cause diseases in humans.

Other Water-Smart Pet Care Tips

The following practices will help pets be part of the solution to water pollution:

- Keep pets away from streams, ponds, or lakes;
- Keep pet waste off of sidewalks, streets, and gutters; and
- Use the "Long Grass Principle" in your yard. Long grass (about 6 inches high or taller) helps filter pollutants so the waste can decompose naturally with minimal pollution of runoff.

Managing Waste from Larger Animals

Many of the practices listed above also apply to other domestic animals such as horses, cattle, swine, poultry, goats, or donkeys that may be kept on large residential or rural properties along the Gulf Coast. An animal waste management program to protect water quality would generally also include the following:

- **Correct Siting and Design:** Keep as much filtering vegetation as possible between livestock barns, corrals, etc., and any water body. High-use areas should be away from creeks/other water bodies.
- **Collection and Storage:** Manure and soiled bedding should be collected from stalls and paddocks daily and placed in temporary long-term storage protected from rainfall and runoff.
- **Disposal and Use:** Manure should be collected and applied to cropland or pasture as fertilizer, if measured levels of nutrients are adequate. Two to three weeks should pass before allowing livestock to graze on the pasture.

Figure 11: Photo courtesy of ???

Figure 12: Agriculture tractor spreading fertilizer on crops. Photo courtesy of ???????

RAINWATER HARVESTING & USE

Rain barrels and cisterns can be installed to capture stormwater runoff from rooftops and stored for later use. These are low-cost systems that allow homeowners to supplement their water supply with a sustainable source and help preserve local watersheds by detaining rainfall.

Capturing even a small amount of roof runoff can have significant environmental benefit by simply reducing the quantity of stormwater runoff flowing to local creeks in storm events. This collected rainwater can be retained in the area and used for landscape irrigation. Backyard rain barrels typically store anywhere between 50 and 200 gallons (Figure 13). They require very little space and can be connected or "daisy chained" to increase total storage capacity.

Cisterns are larger storage containers that can store 200 to over 10,000 gallons. These come in many shapes, sizes, and materials, and can even be installed underground to save space.

Figure 13: Residential rain barrel. Photo courtesy of TCEQ.

Feasibility of Rain Barrels or Cisterns

Rain barrels and cisterns are appropriate for properties with the following characteristics:

- Roof areas that drain to downspouts;
- A level, firm surface to support a rain barrel(s) or cistern and prevent shifting or falling over - keep in mind that a full, 55-gallon rain barrel will weigh over 400 lbs;
- A landscaped area where the captured water can be used (and where it can be drained by gravity flow), located within a reasonable distance from the rain barrel(s); and
- A landscaped area or safe path to the storm drain system that can handle overflow.

Roofing Material Considerations

Surface materials on the area from which rainwater will be collected affect the quality of captured rainwater, which has implications for the recommended uses. If the roof has asphalt or wooden shingles, harvested rainwater should only be used for non-edible landscapes, unless the water is treated first. Petroleum or other chemicals from these roofing materials can leach into the rainwater. Roofs with cement, clay, or metal surfaces are ideal for harvesting water for a wider variety of uses.

Gutter and Downspout Considerations

Properly sized and maintained gutters and downspouts are essential to a rainwater harvesting system. New downspouts should be strategically located in an area where the rain barrel or cistern will be most useful. Installing a fine mesh gutter guard on gutters to keep leaves and other debris from entering and clogging the gutters is a great way to reduce the need for maintenance, such as cleaning out accumulated sediment.

First Flush Diverters, Filters and Screens, and Downspout Consideration

Leaves, twigs, sediment, and animal waste are common in runoff, especially at the beginning of a storm ("first flush"). This debris can result in clogged systems and increased bacterial growth. A first flush diverter helps remove debris and contaminants by directing the first few gallons of runoff from the roof to landscaping, away from the rain barrel or cistern.

Rainwater Harvesting Design

There are a variety of available system designs that provide for water conservation as well as stormwater management. Sources for additional information include:

- Texas A&M AgriLife Extension: http://rainwaterharvesting.tamu.edu/
- American Rainwater Catchment Systems Association: http://www.arcsa.org/

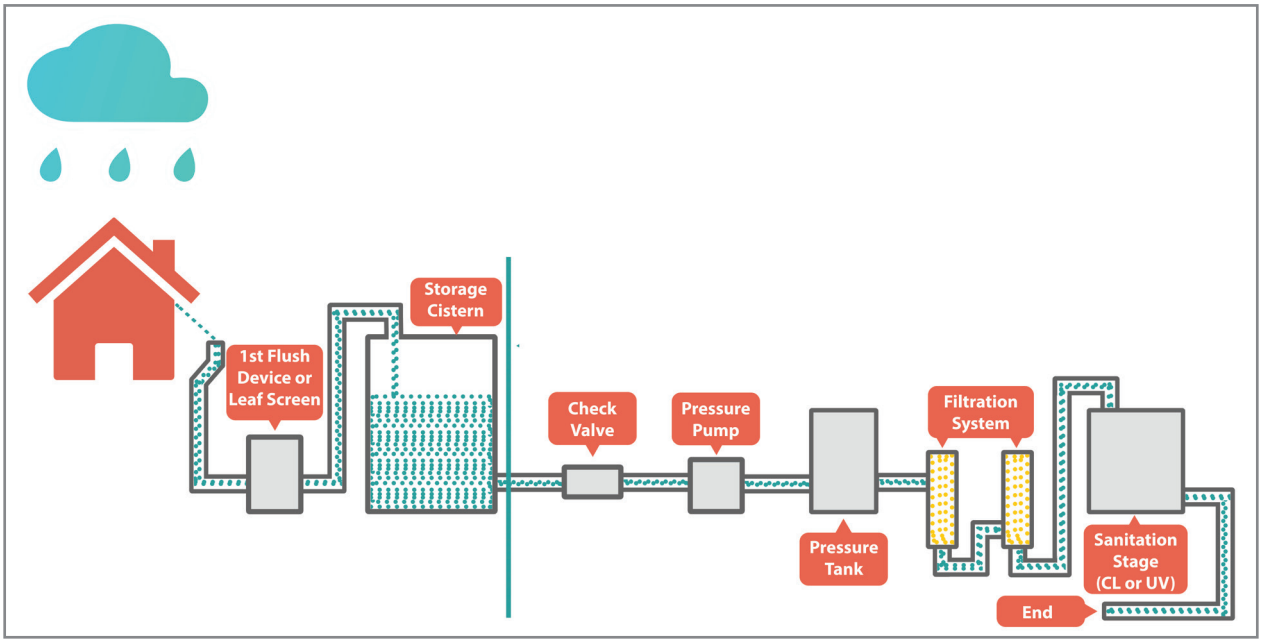

Figure 14: Diagram of rainwater harvesting components. Photo courtesy of The Meadows Center for Water and the Environment at Texas State University.

Operation and Maintenance

After installing a rain barrel or cistern, these tips should be followed for long-term safety and functionality:

- Gutters and gutter guards should be regularly checked to make sure debris is not entering the rainwater harvesting system.
- Screens on the rain barrel or cistern should be inspected to make sure debris is not collecting on the surface and that there are no holes allowing mosquitoes to enter the rain barrel. Inspect screens more frequently if there are trees that drop debris on the roof.
- The inside of the rain barrel should be cleaned once a year to prevent buildup of debris. If debris cannot be removed by rinsing, vinegar or another nontoxic cleaner should be used.
- Clean out debris from cisterns once a year.
- Drain wash water to landscaping.