

# Protecting Our Liquid Assets

**We drink rain.** Rain feeds our streams, ponds and becomes our groundwater. These fluid features make up a hydrologic system that supports our way of life, the quality of the water we drink, the salmon in our waterways and the wildlife that share our Island.

**Water is fundamental** to our health, to our property values and our sense of place. Together, we Islanders can work to sustain the amount of clean water available to us and our surrounding environment. This mailer explores our “Liquid Assets,”—from the ditches along our roads to the geology beneath our feet. Join us

on this journey through our Island water landscape.

**Vashon-Maury Island Groundwater Protection Committee** Laurie Geissinger, Philip McCready, Jay Becker, James Dam, John Gerstle, Frank Jackson, Donna Klemka, Yvonne Kuperberg and Bill Riley (pending).

## Island Stories

Islands are defined by water, so Islanders seem to have an unusual affinity for the stuff.

Here are a few examples of the many swell things our neighbors are doing for water...

### Neighborhood conservation

Mike Feinstein worked with three neighbors to bring nine contiguous parcels into the public benefit rating system (PBRs) in his Luana Beach neighborhood on Maury. The neighbors all agreed to retain most of their property in forest cover. They receive a tax benefit for protecting open space resources like critical aquifer recharge areas. By working together and bringing contiguous parcels under separate ownership into the PBRs program, the group received a greater tax benefit than they would have individually.



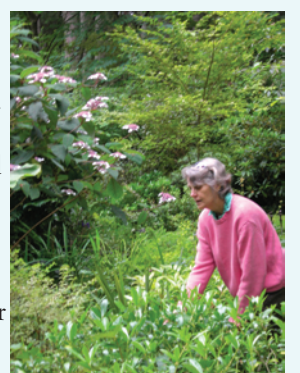
### Restoration with native plants

Four acres of Martin Baker's parcel has been in pasture for 40 years and heavily compacted by large livestock. Martin is restoring a 30-foot perimeter of the pasture with native plants. He has a five-year Restoration Plan that qualifies for the Public Benefit Rating System tax incentive program. The tax savings have allowed him to purchase a rototiller and two years' worth of plants to implement the project. Besides providing habitat for wildlife, native plants are adapted to our climate and shouldn't require much watering once established. Converting the pasture has required de-compacting the soils, which will help rain-water infiltrate and recharge groundwater.



### Pesticide-free property

Sapphire Blue has extensive gardens that are all pesticide-free. Her gardens, both vegetable and ornamental, include a labyrinth of contemplative spaces. The garden has been featured in 10 regional garden tours, proving that beauty and protecting water quality can go hand in hand.



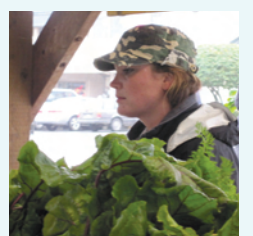
### BioChar



Ken Miller and Barb Adams walk the talk when it comes to their gardens, rain barrels and BioChar. Ken uses tin cans, a crimper, a can opener and tin snips to make a burner which he fills with scrap wood, blackberry vines, even avocado pits. He throws the burner into his wood stove during the winter. He then grinds up the baked material producing what looks like fine black ash. This is moistened and mixed with garden soil. He doesn't have statistics yet, but, his greens growing on BioChar-amended soil were 50 percent bigger and bushier than those in the same bed growing in regular garden soil. And, like compost, the BioChar soaks up and holds water.

### Organic farms

Emily Beagle, an intern at Hogsback Farm, sells organically grown produce at Saturday Market. Organic farming focuses on building nutrient-rich soils without the use of inorganic fertilizers and pesticides, which can be flushed into our streams and groundwater. These soils are high in organic matter and hold water well, requiring less irrigation than conventional farming.



### Conservation rebates

Water District 19 is a leader in water conservation. They have offered rebates to their customers for low-flow washers and toilets since 2007, averaging 17 washers and eight toilets replaced each year. The replacements use about half the water of the previous appliance. Melody Snyder, District 19 Office Manager, reports a noticeable decline in water usage. The District is committed to a policy of continued water conservation, which has included landscape audits for large water users and making suggestions for keeping plants green while using less water. Their customers can also get rebates on rain barrel purchases. Says Snyder, “It's a win for the Island water situation.”



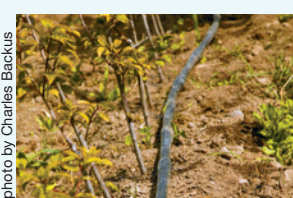
## HOT LINKS

### Want to know more?

At the end of this document in “Resources,” (pg. 9) find more places to dig deeper. There is an on-line version of this document, too with hot links to more info. Check it out at [www.kingcounty.gov/groundwater](http://www.kingcounty.gov/groundwater)

### Drip irrigation

Many Islanders have started to water their gardens using drip irrigation systems on timers. The water goes where it is needed — to the roots of the plants — and isn't running down the driveway.



### Well monitors

Joe Meeker and Greg Beardsley have been measuring the elevation of the water in their wells for 10 years. The data has been invaluable as we try to better understand how groundwater works on the Island.



### Rain water collection

Michael Laurie fills 14 rain barrels during the rainy season. He is a Heights Water customer, so he watches for notices to conserve water and then uses his rain barrel water. This helps reduce “peak” demand for water during our summer droughts.



### Underground gas & oil tank removal

When Silvija Paza bought the Old Colvos store, she didn't think that an old gas tank might still be underground. Under the advisement of clean-up consultants, she removed the old tank and surrounding soils. For homeowners with oil heat, it's a good idea to get free insurance offered by Washington State and bring heating oil tanks to the surface so that if they leak, you can fix it!



### Low Impact Development

Carol Eggen is achieving the goal of having all stormwater absorbed on her property. All the rain from her roof is captured in a pipe and is taken away from her drainfield to a patch of native vegetation where it is allowed to infiltrate into the ground. Fifty percent of her surface water management fee is waived as a result of keeping all stormwater on site.



### Don't flush the drugs

Vashon Youth and Family Services, working with the

Vashon Healthy Community Network, conducted “Operation Medicine Cabinet” in May 2010 and collected 84 pounds of unwanted or out-of-date medicine. Not only does this keep pharmaceuticals off the street, it keeps them out of our groundwater.



### Manure management

Every day, Kathy Zapp picks up the manure from her two horses. The manure composts in the bins and, once composted, is used to augment Pacific Potager's garden soils. The manure piles can be covered with a tarp in the rainy season so that harmful organisms and nitrates aren't transported to our ground and surface waters.





# Watch Out for that Ditch!

Most of us have gotten to know the Island from behind a windshield. There are about 150 miles of county-maintained roads on the Island and many of those roads have ditches on both sides. These ditches are work horses, having to manage all the rain that runs off the roads as well as other hard surfaces, like our driveways, that feed into them. Have you ever wondered what the ditches do with all the water they carry?

## Map Orientation, Don't get lost

The map below is a road map of Vashon-Maury Island. Roads are how most of us know where we are. Notice the arrows ➡ adjacent to some of the roads. These show which way the stormwater flows in the road-side ditches. The black circles ● around town show where the ditches disappear underground. Look for icons on the map and discover what they mean in the text boxes sporting the same symbol.



The outfall from this stormwater detention pond at Vashon Meadows housing development empties into the ditch along the main highway. Some of the water will sink into the ground and some will make its way to Ellisport Creek.



## Ponds and flood prevention

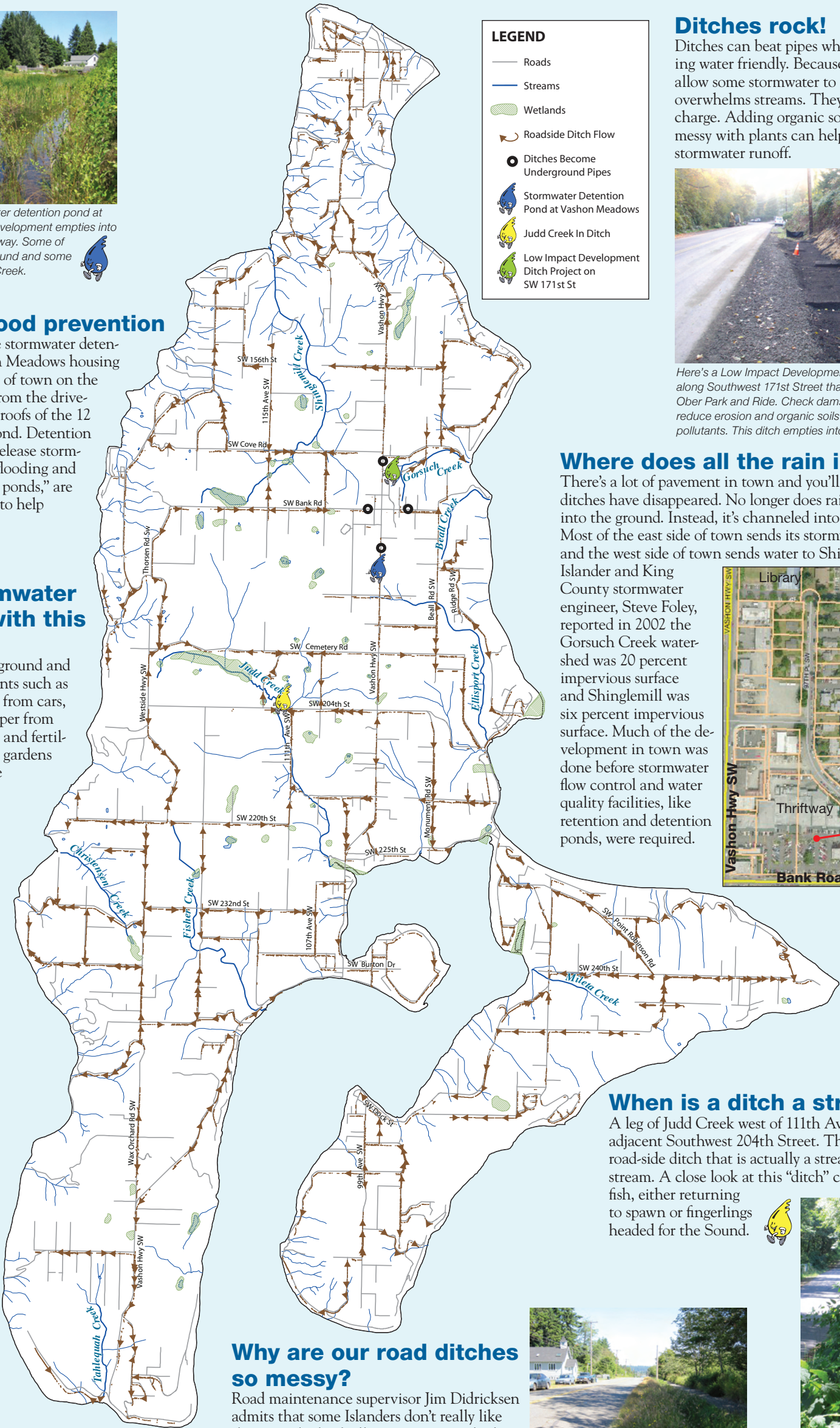
One of the most visible stormwater detention ponds is at Vashon Meadows housing development just south of town on the main highway. Water from the driveway, parking areas and roofs of the 12 homes collect in the pond. Detention ponds are designed to release stormwater slowly to reduce flooding and some, called “retention ponds,” are designed to hold water to help recharge groundwater.

## What is stormwater running off with this time?

Rain, when it hits the ground and travels, collects pollutants such as oil and grease dripping from cars, zinc from tires and copper from worn brakes. Pesticides and fertilizers used in lawns and gardens can be washed into the road-side ditches.



Land Trust staff members, Tom Dean and Beth Bordner, stand in an erosion gully on a tributary to Shinglemill Creek. Dean thinks this gully was formed by increased runoff due to land clearing and by drainage tiles funneling water and releasing it in one spot. Shinglemill Creek also receives stormwater from the west side of Vashon town.



## Ditches rock!

Ditches can beat pipes when it comes to being water friendly. Because they are open, they allow some stormwater to evaporate before it overwhelms streams. They allow groundwater recharge. Adding organic soils and keeping ditches messy with plants can help clean-up pollutants in stormwater runoff.



Here's a Low Impact Development project to improve the ditch along Southwest 171st Street that receives stormwater from Ober Park and Ride. Check dams help slow the water to reduce erosion and organic soils help take out pollutants. This ditch empties into Gorsuch Creek.



## Where does all the rain in town go?

There's a lot of pavement in town and you'll notice that the road ditches have disappeared. No longer does rainwater get to percolate into the ground. Instead, it's channeled into pipes and is shipped off. Most of the east side of town sends its stormwater to Gorsuch Creek and the west side of town sends water to Shinglemill Creek. Former Islander and King County stormwater engineer, Steve Foley, reported in 2002 the Gorsuch Creek watershed was 20 percent impervious surface and Shinglemill was six percent impervious surface. Much of the development in town was done before stormwater flow control and water quality facilities, like retention and detention ponds, were required.



### Life in the gutter

The red line in this aerial photo depicts the route a raindrop that falls on the Thriftway parking lot would take through stormwater pipes to Gorsuch Creek and eventually to Puget Sound.

## When is a ditch a stream?

A leg of Judd Creek west of 111th Avenue Southwest runs adjacent Southwest 204th Street. This is an example of a road-side ditch that is actually a stream. Judd is a salmon stream. A close look at this “ditch” can provide a glimpse of fish, either returning to spawn or fingerlings headed for the Sound.



Typical grassy road-side ditch in Dockton.



The thick vegetation along Southwest 204th Street conceals the east fork of Judd Creek which runs adjacent the road.





# What's Your Watershed Address?

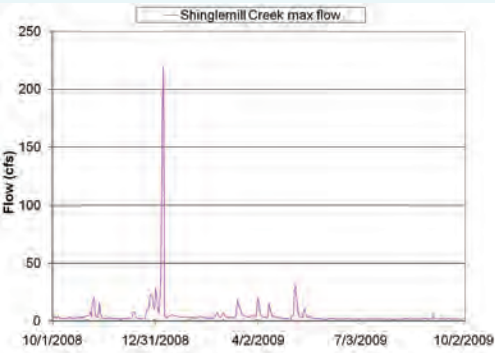
We all know our street address, but if we took away the roads, do you know where you live in our landscape? Think about the slope of your land. After a heavy rain storm, which way does the water flow from your property? Can you locate the watershed in which you live? Who are your watershed neighbors?

## Map Orientation, Living watersheds

The map below depicts the boundaries of drainages on the Island. Look at the Island's "neck" on the north end. There are 11 capillary-like creeks that flow out the west side before you get to a big artery, Shinglemill Creek. Lots of these creeks are unnamed and were given numbers by Washington Trout in 2001. The light brown lines are topographic lines. The closer together they are, the steeper the landscape. Notice how close together they are in Shinglemill canyon and on the southeast side of Maury.

## Shinglemill Creek watershed

Shinglemill covers 1,846 acres, 8 percent of total Island land area. It is our second largest watershed. The stream is 2.7 miles long and has suffered from erosion and sedimentation, making it tough for salmon to successfully reproduce.



This hydrograph shows the daily 15-minute peak flows of water in Shinglemill Creek October 2008–September 2009. The winter peak flow was about 200 times the summer base flow.

## Forested land

Analysis of satellite pictures taken in 2001 divided the Island into three broad categories of land cover: 73 percent forested, 16 percent non-forested and 11 percent developed. Keeping each watershed at least 65 percent forested with less than 10 percent impervious surface would lessen runoff and encourage groundwater recharge.



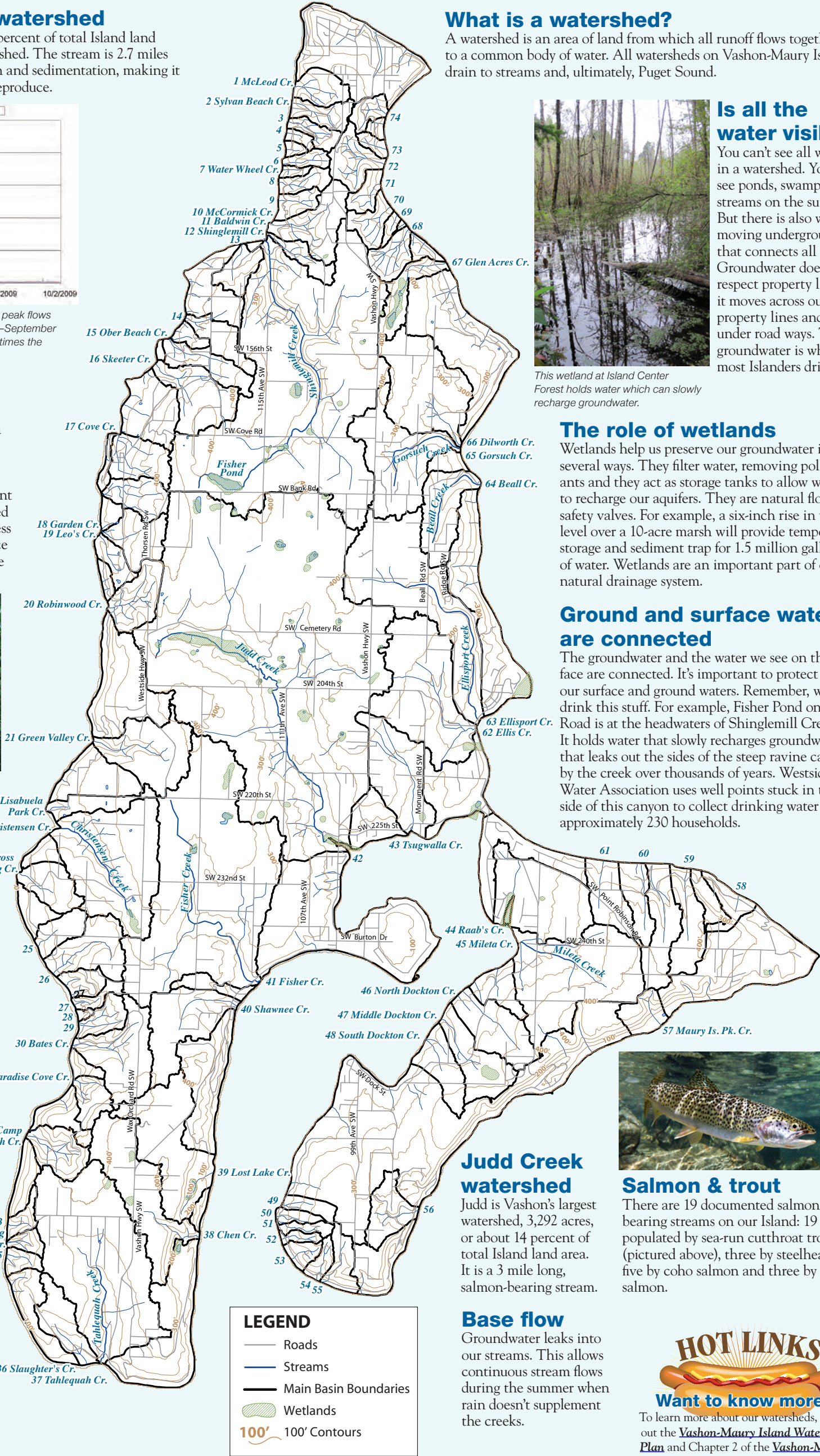
Forested land, like Island Center Forest, helps reduce stormwater runoff. Winter rain is stored in the organic duff layer on the forest floor, where it can percolate into the soils below and either be taken up by plants or recharge groundwater.

## Christensen Creek watershed

Roland Carey's history of Vashon-Maury Island used this watershed to reflect the thinking of the time that our water resources were fed by the Cascades. Current research indicates that the ground and surface water we drink comes only from the rain that falls on the Island.

## Monitoring

As part of the effort to better understand our ground and surface water system, we monitor stream flow on some streams. Stream gauges with continuous readings are maintained in Tahlequah, Fisher, Judd, Beall, Mileta and Shinglemill creeks.



## What is a watershed?

A watershed is an area of land from which all runoff flows together to a common body of water. All watersheds on Vashon-Maury Island drain to streams and, ultimately, Puget Sound.



This wetland at Island Center Forest holds water which can slowly recharge groundwater.

## Is all the water visible?

You can't see all water in a watershed. You can see ponds, swamps and streams on the surface. But there is also water moving underground that connects all of us. Groundwater doesn't respect property lines; it moves across our property lines and under road ways. This groundwater is what most Islanders drink.

## The role of wetlands

Wetlands help us preserve our groundwater in several ways. They filter water, removing pollutants and they act as storage tanks to allow water to recharge our aquifers. They are natural flood safety valves. For example, a six-inch rise in water level over a 10-acre marsh will provide temporary storage and sediment trap for 1.5 million gallons of water. Wetlands are an important part of our natural drainage system.

## Ground and surface waters are connected

The groundwater and the water we see on the surface are connected. It's important to protect both our surface and ground waters. Remember, we drink this stuff. For example, Fisher Pond on Bank Road is at the headwaters of Shinglemill Creek. It holds water that slowly recharges groundwater that leaks out the sides of the steep ravine carved by the creek over thousands of years. Westside Water Association uses well points stuck in the side of this canyon to collect drinking water for approximately 230 households.

## Judd Creek watershed

Judd is Vashon's largest watershed, 3,292 acres, or about 14 percent of total Island land area. It is a 3 mile long, salmon-bearing stream.



## Salmon & trout

There are 19 documented salmonid-bearing streams on our Island: 19 populated by sea-run cutthroat trout (pictured above), three by steelhead, five by coho salmon and three by chum salmon.

## Base flow

Groundwater leaks into our streams. This allows continuous stream flows during the summer when rain doesn't supplement the creeks.

## HOT LINKS



### Want to know more?

To learn more about our watersheds, check out the [Vashon-Maury Island Watershed Plan](#) and Chapter 2 of the [Vashon-Maury Island Rapid Rural Reconnaissance Report](#).





# Going Under Ground Geology of “The Rock”

Vashon-Maury Island’s nickname, “The Rock,” is somewhat of a misnomer. The Island is essentially the refuse left by the comings and goings of glaciers. It is a pile of cobbles, gravel, sand, silt and clay; a scattering of boulders with a bit of organic matter thrown in.

## Map Orientation, Diving inside “The Rock”

The map below shows the surface geology of our Island. The different colors represent different geologic layers. You can see how the layers stack up by looking at the cross section view. It represents what we might see if someone took a chain-saw and cut through part of the Island. Take a look at the key to help you understand the Island’s innards and how geology affects water.

### Water from sand

About 80 percent of our drinking water comes from a sand and gravel formation often referred to as the “primary aquifer.” It’s identified on geologic maps as the “Qva” unit. The ease by which water moves through these sand and gravels is highly variable and depends upon the size of the particles.

### Water moves

Water can move through glacial sands and gravels 10–100,000 times faster than it can through silts and clays deposited in non-glacial periods.

### Till: Our dense overcoat

Much of the Island is covered by a protective overcoat called glacial till. It’s material that is laid down in front of a glacier and then is overridden and compacted by the glacier. It’s also called “hardpan” and invariably frustrates local gardeners when they try to dig.

### What’s an aquifer?

Geologic formations which hold and let water move easily are called “aquifers.” A mixture of sand and gravel makes a good aquifer. The amount and rate at which you can withdraw water depends on the specific characteristics of the aquifer at the well site.

### What’s an aquitard?

Geologic layers that impede the movement of water are called “aquitards.” Silt and clay, which are made up of small particles, are aquitards because water has a hard time squeezing between the tiny particles.

### Gravel, sand, silt and clay

Below the primary aquifer are clay and silt formations. Although clay does a great job of holding water, it won’t give it up easily and forms a barrier that slows the downward progress of water. Some water does eventually make its way through clay to other sand and gravel formations often called “deep aquifers.”

#### LEGEND

— Cross Section Line

#### Geologic Layers In Map

**Predominantly sands and gravels deposited by streams as a glacier recedes or subsequent flowing waters** - these units are *aquifers* and when exposed on the surface of the Island are particularly at risk of contamination (Geologic name - Qvr)

**Glacial Till** - a mixture of cobbles, sand, gravel, silt and clay compacted by the weight of the glacier, often referred to as “hardpan.” It impedes the infiltration of water and is an *aquitard*. (Qvt, Qpdt, Qpogt)

**Predominantly sand and gravels deposited by streams** - these units are considered *aquifers*, but are not always saturated with water. (Qva, Qpdc, Qwbc, Qdbc)

**Interbedded layers of sand and gravel and silt and clay** - deposited during non-glacial periods in streams/floodplains. This unit offers both *aquifer* and *aquitard* pockets. (Qob, Qpf, Qpdf)

**Predominantly silt and clay deposited in lakes or marine environments** - clay impedes water infiltration. These units are *aquitards*. (Qpff, Qpdf, Qds, Qdbf, Qpof)

**Other Geologic Units** (Qw, Qoal, Qf, af)

This simplified geologic map and cross section was adapted from Geologic Map of the Vashon 7.5' Quadrangle and Selected Areas, King County, Washington by Booth and Troost; 2007. The cross-section shown is from this report.

### Deep aquifers

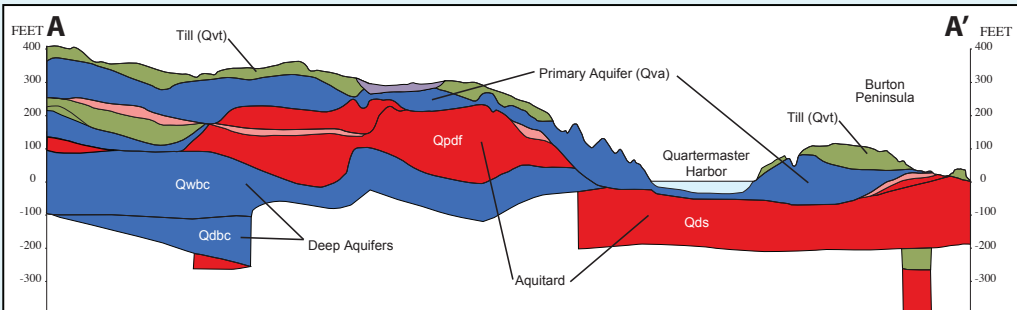
Less is known about these aquifers because fewer deep wells have been drilled on the Island. Notice on the cross section that the Qwbc layer, for example, extends from about 100 feet above sea level to 100 feet below sea level. Some wells extend to over 300 feet below sea level.



Unsaturated sands and gravels of the primary aquifer (Qva) on Maury Island.



Springs emerge where groundwater moves laterally along the interface between the sand and clay layers and squirts out the side of the Island and inland ravines.



### A slice of geologic cake

Above, you will find a cross section of the Island. It’s like taking a look at a slice of layer cake. A-A’ depicts a slice of Vashon from mid-Island to the tip of the Burton Peninsula. Notice how the thicknesses of the different layers change and how some layers are discontinuous.



To learn more about the Island’s geologic characteristics, see Chapter 4 of the [Vashon-Maury Island Rapid Rural Reconnaissance Report](#) and check out the geologic map created by [Derek Booth and Kathy Troost](#).



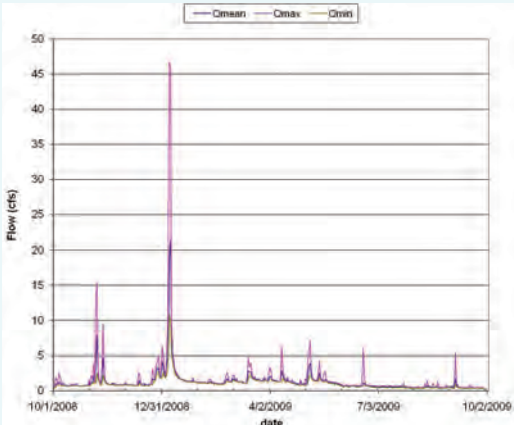


# Setting the Water Table

You can't see it, but there are hills of groundwater beneath our feet. In some locations on the Island, water infiltrates downward more easily and begins to build up, forming mounds of water. These groundwater mounds will try to flatten out, so the water beneath our feet is always on the move.

**Map Orientation, Peel away the skin**

Imagine that you have peeled away the top layers of the Island and are now looking at the sand and gravel that is our primary aquifer. The map below shows contour lines depicting the elevation above sea level of the water table in this aquifer. The aquifer is saturated with water below the water table. The orange squares represent wells with the water elevations denoted in black.



The graph depicts the daily 15-minute peak flows in Fisher Creek during water-year 2009. Winter flows are supplemented by rain storms which cause the dramatic peaks, while summer flows are fed primarily by groundwater with an occasional shower contributing surface water to the creek.

## What's a "water year?"

Scientists who study water, report data like "total rainfall" during a "water year." A water year runs from October 1 through September 30.

**LEGEND**

- Roads
- Streams
- Groundwater "Peaks"
- Outline of Vashon Advance Outwash (Qva)
- Water Table Contour Interval 50 feet
- Approximate Flow Direction
- Monitored well sites in the primary aquifer (Qva) w/watertable elevation

## Gravity reigns

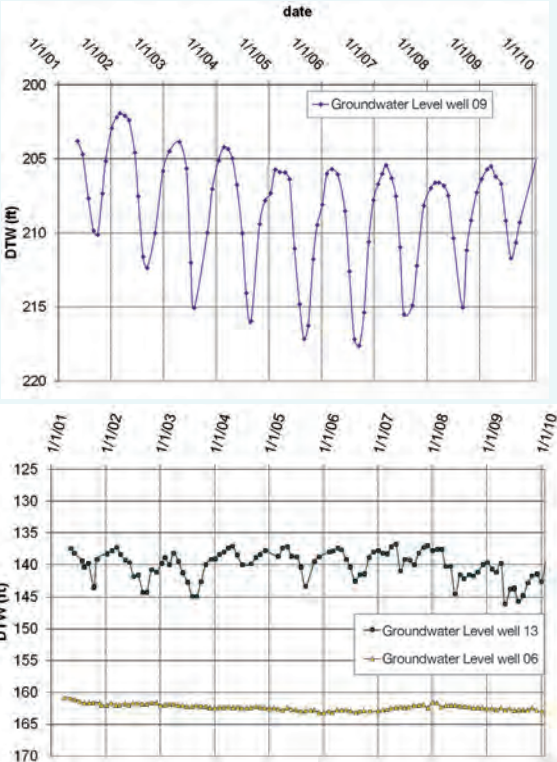
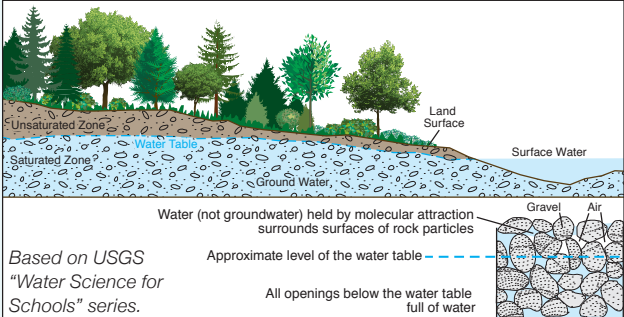
The dark yellow shading on the water table map shows that we have two "peaks" of groundwater. One is west of town and the other is northwest of Burton. Water obeys gravity and will move downward, seeking sea level. The arrows show the direction groundwater is moving.

## Water level monitoring

Island volunteers have monitored the elevation of the water in their well since 2001. They do this by measuring the "depth-to-water" from the top of their well. In water year 2009, four of the five wells monitored by volunteers showed a decrease in water table elevation compared to baseline levels established in 2002 and 2003.

## What is a "water table?"

In the diagram below, you can see that the ground below the water table is saturated with water. Above the water table there still is some water adhered to the soil and rock particles, but there is also air, so it is not totally saturated.



## Depth-to-water measurements

The graphs above depict depth-to-water measurements in feet taken from the top of wells by volunteers since 2001. Note the seasonal variation of almost 10 feet in Groundwater Level (GWL) in well 09. The gradual increase in the average depth-to-water measurements from 2001 to 2007 shows the elevation of the water table in the vicinity of this well was decreasing until 2008. There is much less variation in GWL in well 06, but GWL in well 13 also shows a seasonal variation and a slight decline in the water table over the last two years.

## Groundwater connects neighbors

It takes time, but groundwater will find its way to a stream or squirt out the side of the Island as a spring or be captured by us to drink. Because groundwater is on the move and does not respect property lines, what we throw on our property today could soon show up in our neighbor's well.

## Why is Maury's water table elevation lower than Vashon's?

The water table near Dockton appears to be only 80 feet above sea level while the water table on Vashon reaches 300 feet above sea level. Why the difference? Well, there's up to 10 inches less rain annually on the east side of the Island than on the west side. And, the clay layer below the primary aquifer on southern Maury is below sea level. On Vashon, this clay layer is in the range of 200-250 feet above sea level. Raindrops must dig deeper on Maury before they reach a clay aquitard and begin to saturate the sands and gravel above it.

## Creeks closed to water withdrawals

The state Department of Ecology no longer issues new rights to withdraw water from Christiansen Creek, Fisher Creek, Judd Creek and Shinglemill Creek in an effort to retain enough water in the creeks to support aquatic wildlife. In the summer, these creeks are fed primarily by groundwater. Keeping the water table high helps keep our creeks flowing in the summer.



To learn more about groundwater, see the [Vashon-Maury Island Water Resources Evaluation Project](#) and Chapter 4 of the [Vashon-Maury Island Rapid Rural Reconnaissance Report](#).





# Sipping Sand Slurpies

We drink rain. Rain seeps into the Island and is stored between grains of sand and gravel. We punch big straws into the ground and suck water back up to quench our thirst. We lap up rain from streams and capture it in springs before it makes its great escape to Puget Sound. Rain is Island life.

## Map Orientation, Hundreds of little straws

The map shows the service areas of the seven largest public water systems on the Island. They cover about half of the Island's area. The red and pink squares are the approximate locations of public water systems' water sources. The black dots represent private wells. We have hundreds of little straws sucking water from the Island's aquifers.

### “Exempt” wells

Private residential wells using less than 5,000 gallons of water per day are “exempt” from applying for water rights from the state Department of Ecology. We estimate there are approximately 1,000 exempt wells on the Island.



Well drilling rig at work



Pump house on Beall Creek serving Water District 19. Creek water is filtered through sand and gravel and then chlorinated for drinking water at Water District 19's filtration plant on Bank Road

### We drink groundwater

The median depth of exempt wells with available depth data is 100–150 feet.

### We drink springs

Besides using drilled wells, most of the large water systems capture shallow ground water, before it surfaces as a spring, using hand driven well points that are only five to 20 feet long.

### We drink streams

Water District 19 has wells, but about 61 percent of its water is taken from Beall and Ellis creeks.

### Vulnerable water sources

Our drinking water; our groundwater and streams are replenished only by one source: Rain. There is no evidence that we are connected to off-Island aquifers. We're self-reliant when it comes to fresh water, so keeping it clean is crucial.

### Test your water

Homeowners with private water systems aren't mandated by law to test their water quality. We think it's a good idea and suggest that you test your well or spring for fecal coliform, nitrate plus nitrite and arsenic. A good time to do this is in the fall after the rains have begun.

Water System	Total Connections	Water Sources
District 19	1421	wells, streams
Heights	764	wells, springs
Burton	409	well, springs
Dockton	387	well, springs
Westside	225	well, spring, stream
Gold Beach	196	wells
Maury Mutual	95	well, spring
14 small Grp A systems	387	wells, springs
134 Grp B systems	588	wells, springs, surface water
Total Public Water Connections (approx)	4472	
*Exempt private wells approximate	1000	wells

Source: DOH, Office of Drinking Water \*Eric Ferguson, King County Groundwater Program, personal communication, 7-12-10

### Little water systems

Group B public water systems generally serve two to 14 households and are usually co-owned and managed by neighbors. There are approximately 134 active Group Bs on the Island.

### Bigger water systems

Group A water systems generally serve 15 or more households. Because camps sometimes house a lot of people, they are often considered Group A systems, too. There are 23 Group A systems on the Island. Four of the seven largest water systems have a moratorium on issuing new water shares. They are: Burton, Maury Mutual, District 19 and Westside.

### Harvesting the rain

Washington state now allows you to collect a limited amount of rainwater from your rooftop without a water right. This water can be used to irrigate and flush your toilet. King County is exploring the possibility of using rainwater for drinking water, too. More information is available at [Ecology's Rainwater Harvest](#) website.

### What's the nitrogen fuss?

78 percent of the earth's atmosphere is nitrogen, so why do we care if it's in the water? Nitrates, nitrites and ammonia are all forms of nitrogen. Increasing nitrates in groundwater often reflect human inputs. This might be from fertilizers, our poop and our livestock's poop. Nitrates can reduce a baby's ability to utilize oxygen, so the U.S. Environmental Protection Agency has limited the amount that can be in drinking water.

### Keep waste out of water

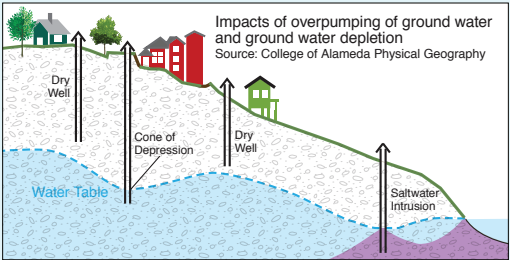
- Forget the weed and feed—join the dandelion wine club instead
- Reduce pesticide use—embrace your inner bug
- Switch to slow-release organic fertilizers
- Keep manure piles under cover
- Be septic sensible
- Fix those leaks in the old car or truck
- Dispose of household hazardous waste at drop-off events

### Be below average

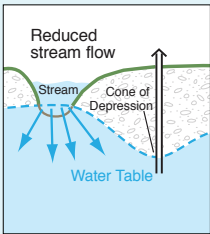
- Use less than the national average of 80-100 gallons per day of water
- Install a timed drip irrigation system
- Purchase low-flow utilities and toilets
- Install aerators on faucets and flow restrictors on showerheads
- Collect roof runoff for summer irrigation
- Fix the drips

### Impacts of over pumping

This diagram illustrates how over pumping a well can reduce the water table in the vicinity of that well. This decrease in the water table is called a “cone of depression.” Over pumping can cause:



- your neighbors' wells to run dry
- saltwater intrusion
- reduced summer stream flows



### HOT LINKS

#### Want to know more?

To learn more about water supply, see the [Vashon-Maury Island Watershed Plan](#) and the [Vashon-Maury Water Resources Evaluation Project](#). Check out [USEPA's sole-source aquifer designation](#).





# Experienced Water, Where Does It Go?

Island sewage only has a few options. It can be collected and piped to a wastewater treatment plant; it can stay at home and be treated in your own backyard, or in some instances it might be collected with the neighbors’ wastewater and taken care of in a community system. It all depends upon where you live.

## Map Orientation, Wastewater options

A small area around town center, the Community Care Center and Bunker Trail are served by sewer. The rest of the Island relies on septic systems to treat “experienced” water. The yellow dots depict developed parcels outside of the Vashon Sewer District service area that rely on some sort of on-site sewage disposal. Though not shown here, many households in the sewer service area still use septic systems. The green areas along the shoreline are designated Marine Recovery Areas.

### Every body poops

U.S. Geological Service scientists estimate that people deliver about 10 pounds of nitrogen per year per person to their septic system. The Puget Sound Action Team estimates that a 1,000 pound horse or beef cow produces about 109 pounds of nitrogen per year. That’s over 10 times more than a human.

### We’re septic-dependent

Over 90 percent of Island homes are not served by sewer. In fact, both Vashon High School and McMurray Middle School depend on septic systems to treat wastewater.

### Septic sensibility

Local installers remember that septic systems used to be buried “the deeper the better,” fostering an out-of-sight out-of-mind attitude—a definite problem for groundwater. Now, there’s an emphasis on making sure your septic system is accessible to encourage long-term monitoring and maintenance.

### Beulah Park-Cove Beach community system

Beulah Park, an upland neighborhood with small lots and Cove Beach, a series of mostly walk-in beachfront homes at the base of a steep hill were annexed by Vashon Sewer District to solve the problem of failing septic systems. A new community sewage collection and treatment system began operation in 2001, serving 47 single family homes and six apartment units. The sewage is treated and discharged into a neighborhood drain field on a .64 acre lot; open space amidst the busy Beulah Park neighborhood.

### Marine Recovery Areas (MRA)

The goal of a Marine Recovery Area is to protect, preserve and restore shellfish harvest opportunities. Property owners within an MRA must inspect and repair or replace as necessary, their on-site sewage system. Public Health–Seattle & King County designated a **Vashon-Maury Island Marine Recovery Area** in 2008. Currently, the focus of our MRA is on shore-front properties.

### Shellfish harvest

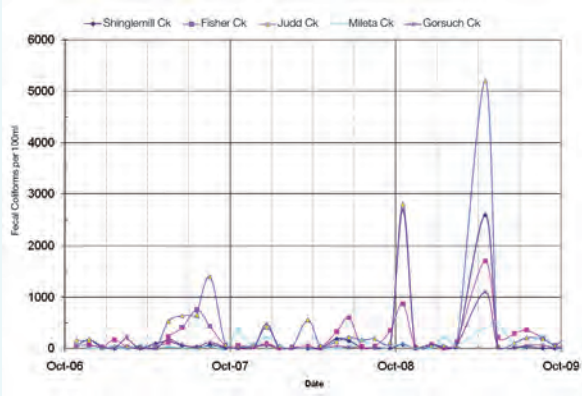
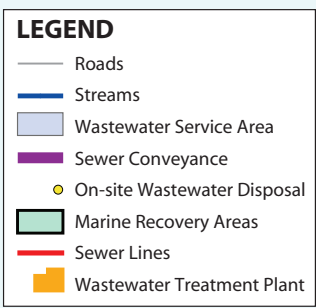
Greg Combs, from state Public Health shellfish program, reports there are more areas open for commercial and recreational shellfish harvest on the Vashon-Maury Island shoreline than there were 15 years ago, thanks largely to the wastewater treatment plant’s outfall extension and the sewer line extension to Bunker Trail.

### Bunker Trail

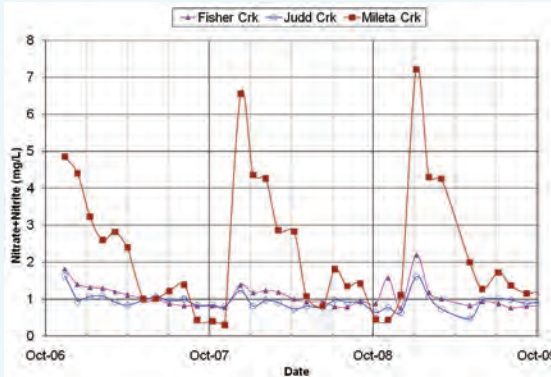
Sewage from 26 single family homes on Bunker Trail, some apartments, a restaurant and the ferry landing, is sucked up by vacuum (some of the pipe is buried under the beach) and pumped up Parking Lot Hill all the way to the wastewater treatment plant northeast of Ober Park.

### Vashon Sewer District

Many Islanders are unaware that we have a small sewer system on the Island. **The Vashon Sewer District**, managed by a locally-elected three-member Board of Commissioners, owns and maintains sewer pipes. Sewage collected by Vashon Sewer District is treated at a **King County wastewater treatment plant** just northeast of Ober Park. Solids are broken down by sewage-eating bacteria. Liquids pass through ultraviolet lights to kill harmful organisms before traveling through a pipe off Gorsuch Road and being released into Puget Sound 2,800 feet off-shore.



*Fecal coliform* bacteria from the feces of warm-blooded animals (including humans and livestock) get particularly high in Judd Creek. For reference, there should be zero fecal coliforms per 100 milliliters in drinking water.



Mileta Creek shows unusually high **nitrate plus nitrite** levels in winter. Nitrogen levels in Quartermaster Harbor and in localized areas of our primary aquifer are increasing.

### Chemicals in groundwater

The U.S. Geological Survey has been conducting research on the presence of contaminants that enter the environment via human and animal waste. Groundwater collected from 47 wells in 18 states was analyzed for 65 chemicals. The most frequently detected chemicals included an insect repellent, a plastic and epoxy manufacturing ingredient, a fire retardant, a veterinary and human antibiotic and a detergent metabolite.

### Who needs oxygen?

Oxygen levels in Quartermaster Harbor get so low in late summer that it can be hazardous to marine organisms. Scientists think elevated nitrogen levels are the culprit because nitrogen spurs the growth of algae and oxygen is consumed as the algae decays.

### Watershed approach to Quartermaster

Researchers will be looking at nitrogen contributions from three watersheds that discharge into the harbor: Judd Creek, Mileta Creek and Fisher Creek. Since this approach will include the contribution from upland properties, not just shoreline households, this study will help identify the most likely sources of nitrogen in our groundwater, too. For more information, see the **Quartermaster Harbor Nitrogen Loading Study**.



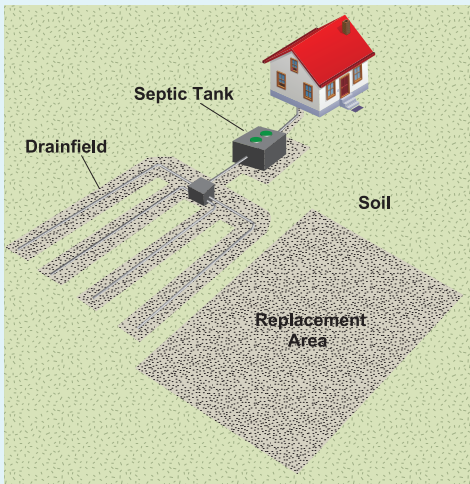


# Doing Our Business

Upland runoff and groundwater feed our creeks. In spring, Judd Creek has high fecal coliform bacteria from the feces of warm-blooded animals. Autumn nitrogen levels in Mileta Creek are five times higher than the other creeks. Because runoff gets to creeks faster than it percolates to groundwater, the creeks serve as an early warning system for potential threats to our groundwater and potable water supply. Not all of the bacteria and nitrogen in the creeks come from humans, but it is a safe bet that some does and we don't really want to drink it no matter who put it there.

## Gravity systems

New-fangled septic systems weren't common until about 15 years ago. Most homes on the Island use a simple gravity septic system. This is an example of a conventional gravity septic system.



Right, is a typical two-chamber septic tank.

## Seeing in black and grey

Composting and incinerating toilets are allowed in King County. Although these waterless toilets take care of "black water" (e.g. feces and urine), "greywater" from the washing machine, bathtub and sinks still needs to be treated. Septic tanks and drainfields are not obsolete, but they can be downsized if used with a waterless toilet.

## Waterless toilets

Composting and incinerating toilets may be a suitable alternative for retrofitting small lots. The Septic Solutions Committee of the Vashon-Maury Island Community Council encourages homeowners who currently have little or no on-site treatment systems to install a composting or incinerating toilet as a way of "getting blackwater out of the front yard and off the beach" in a quick and affordable manner.

### Orientation, The septic tank

Most on-site sewage treatment systems start with a septic tank. Let's take a spin through. Most of the solids settle out in the first compartment. Fats rise and form a scum layer. Liquid is allowed to flow to the second compartment through a baffle which keeps scum out of the second chamber. More settling occurs here and effluent flows through the outlet to the next stop on the road which, in a conventional system, is the drainfield.



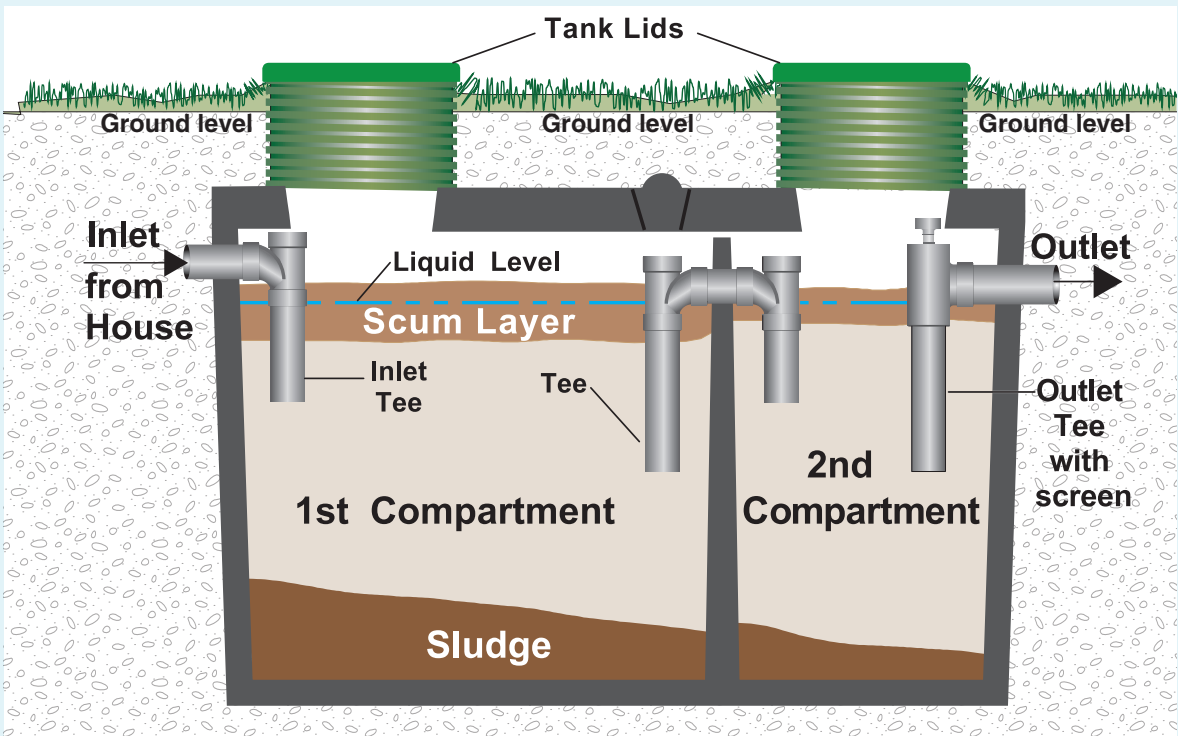
Susan Tobin shows off an incinerating toilet at Sludge Fest 2009



An example of a composting toilet at Sludge Fest 2009



Dale Korenek explains how a newly installed pressure distribution on-site septic system works while homeowner Charlie Pieterick looks on.



## Keep your septic system purring Dos

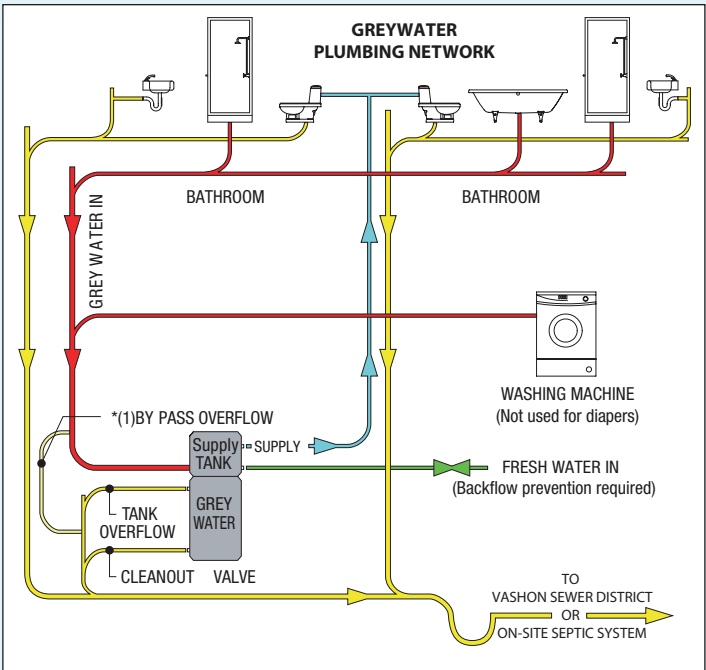
- Do regularly inspect and maintain your septic system
- Do pump your septic tank every three to five years—have your pumper evaluate need first
- Do be water-wise—fix leaks and spread out washing loads
- Do direct water from land and roof drains away from the drainfield
- Do landscape with love—use shallow-rooted drought-tolerant plants
- Do keep septic tank lids easily accessible
- Do contact a certified professional to repair your system

## Don'ts

- Don't use a garbage disposal
- Don't flush anything except water, poop, urine and toilet paper into your septic system
- Don't put household chemicals down the drain
- Don't park cars and trucks on your drainfield or septic tank
- Don't use septic tank additives
- Don't drain water from hot tubs into your septic system

## Greywater reuse

When you think about it, flushing toilets with drinking water doesn't make sense. We spend a lot of money collecting and treating water so that it is drinkable and then we use it to flush the toilet? Now you can have your home plumbed so that you can reuse water from your washing machine, sinks, tub and shower to flush your toilet.



Above is a system for greywater recycling in the home. Used water from wash basins (except the kitchen sink), bathtubs, showers and clothes washers is used to flush the toilets. Note: Permit required for installation.

## Greywater irrigation

New rules for the use of **greywater for subsurface irrigation** are due by December 2010. The major problem with greywater is that it can contain disease-causing organisms as well as oils, grease and soap. Surprisingly, water from kitchen sinks contains similar amounts of fecal coliforms as blackwater. The cleanest water is from the shower, bath and hand basins.

## Aerobic treatment systems

In a conventional septic system, bacteria use up all the oxygen in the septic tank. Aerobic treatment systems inject air into the tank which encourages sewage-digesting bacteria to decompose the waste more efficiently. Aerobic systems are often used to retrofit failing drainfields based on the idea that oxygen can help decompose organic mats that build up in the drainfield.

## Sub-surface drip fields

Similar to the drip irrigation lines that you may have installed in your garden, effluent from your septic system can be released in a drainfield using sub-surface drip lines installed only six inches below the surface. An advantage of this system is that it is installed in the root zone of plants which can take up nutrients, like nitrate, before they make their way to groundwater.

## What systems are available on the Island?

King County allows the use of all Washington state-approved on-site treatment systems and products.

## Septic monitoring requirements

On-site sewage disposal systems are required to be inspected by a licensed maintainer. For gravity systems, the inspection should be done every three years and can be done by the homeowner or a licensed maintainer. Other systems should be inspected every six months or annually, depending on the type of system you have. Although the rules apply to all homes using on-site systems, enforcement is currently triggered at the time of sale. However, an annual inspection and report is required in the Marine Recovery Area.

## Permits

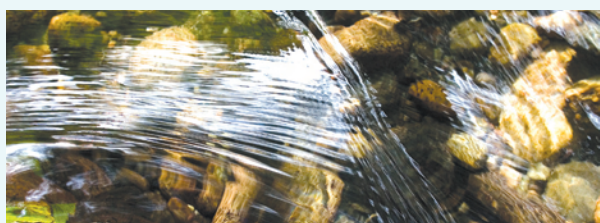
Permits are required for any alterations or repairs to your septic system as well as for changes to your plumbing. Be sure to contact Public Health-Seattle & King County, Environmental Health Services before you work on your plumbing or septic system.





# References

There is an on-line version of this publication with hot links at [www.kingcounty.gov/groundwater](http://www.kingcounty.gov/groundwater). Note: links to references and resources may change. Use your favorite search site to locate materials by topic or discover additional information.



Bergrud, Shawn. 2010. Engineer/Drainage Inspections, King County. Personal communication with Susie Kalhorn regarding Vashon town drainage and detention ponds.

Booth, DB. and Troost K.G. 2007. In review, **Geologic map of the Vashon 7. 5-minute quadrangle, Washington**, U. S. Geological Survey, Miscellaneous Field Investigation, scale 1:24,000. <http://www.geomapnw.ess.washington.edu/index.php?toc=maintoc&body=services/publications/map/vashondisc.htm>

Cantrell, David. 2010. Senior Plumbing Inspector, King County. Personal communication with Susie Kalhorn regarding greywater re-use and plumbing code.

Combs, Greg. 2010. Public Health Adviser, Washington State Department of Health. Personal communication with Susie Kalhorn regarding shellfish growing areas.

Ferguson, Eric 2010. Water Quality Planner, King County. Personal communication with Susie Kalhorn regarding exempt well counts and Maury Island water table elevation.

Island County. 2007. **Our Islands, Our Water, Our Future**. Planning and Community Development Resource

Enhancement Program. Coupeville, Washington.

King County. 2004. **Ambient Groundwater Monitoring—2001-2004 Results**. Prepared by Anchor Environmental and King County Department of Natural Resources and Parks, Water and Land Resources Division. Seattle, Washington.

King County. 2004. **Vashon-Maury Island Rapid Rural Reconnaissance Report**. Prepared by Adolfson and Associates, Shannon and Wilson and TetraTech/KCM Inc. in coordination with Department of Natural Resources, Water and Land Resources Division. Seattle, Washington. <http://www.kingcounty.gov/environment/watersheds/central-puget-sound/vashon-maury-island/recon-report.aspx>

King County. 2006 - 2010. **Vashon-Maury Island 2005-2009 Water Resources Data Reports** (five separate volumes). Prepared by Eric W. Ferguson, Water and Land Resources Division. Seattle, Washington. <http://www.kingcounty.gov/environment/waterandland/groundwater/management-areas/vashon-maury-island-gwma/vashon-island/project-documents.aspx>

King County. 2005. **Vashon-Maury Island Watershed Plan**. Department of Natural Resources and Parks, Water and Land Resources Division. Seattle, Washington. <http://www.kingcounty.gov/environment/watersheds/central-puget-sound/vashon-maury-island/watershed-plan.aspx>

King County. 2002. **Vashon Town Center Stormwater Study**. Prepared by Steve Foley. Department of Natural Resources, Water and Land Resources Division. Seattle, Washington.

U.S. Department of the Interior. 2010. **Groundwater Depletion—Water Science for Schools**. U.S. Geologic Survey. <http://www.ga.water.usgs.gov/edu/gwdepletion.html>

U.S. Department of the Interior. 2010. **The Water Cycle—Water Science for Schools**. U.S. Geologic Survey. <http://www.ga.water.usgs.gov/edu/watercyclegwstorage.html>

U.S. Department of the Interior. 2010. **Toxics Substances Hydrology Program**. U.S. Geologic Survey. <http://www.toxics.usgs.gov/highlights/gwswe.html>

Vashon Sewer District. 2010. **Quarterly Report of Sewerage Customers**. Submitted by Thomas D. Bass. Seattle, Washington.

Washington State. 2010. **Sentry Internet - Washington State Water System Data**. Department of Health, Office of Drinking Water. [http://www.doh.wa.gov/ehp/dw/our\\_main\\_pages/data.htm](http://www.doh.wa.gov/ehp/dw/our_main_pages/data.htm)

Washington Trout. 2001. **Water Type and Stream Mouth Assessment, Vashon Island**. <http://www.washingtontrout.org/Vashon/Vashon2001/VashonTitle.shtml>



## Additional Resources... If You Want to Dig Deeper

### Groundwater and Drinking Water

**Drinking Water Fact Sheets**. King County Drinking Water Program. <http://www.kingcounty.gov/healthservices/health/ehs/water/facts.aspx> or call 206.296.4932. Find information on bacterial contamination and how to disinfect a private well. Learn about shallow wells and springs.

**Vashon-Maury Island Groundwater Resources Project**. King County Groundwater Protection Program <http://www.kingcounty.gov/environment/waterandland/groundwater/management-areas/vashon-maury-island-gwma.aspx> or call 206.296.1910. Find Island -specific groundwater data, reports, modeling efforts, a searchable database and related studies.

**Vashon-Maury Island Sole-Source Aquifer Designation**. USEPA Region 10. <http://yosemite.epa.gov/R10/WATER.NSF/Sole+Source+Aquifers/Vashon-Maury+SSA>

**Washington State Water System Data**. Washington Department of Health. [http://www.doh.wa.gov/ehp/dw/our\\_main\\_pages/data.htm](http://www.doh.wa.gov/ehp/dw/our_main_pages/data.htm). Find information about public water systems on the Island including water quality data using the Sentry Internet link.

**Water Science for Schools**. U.S. Geologic Survey. <http://ga.water.usgs.gov/edu>. Find extensive information about the water cycle, water quality and water uses, though not Vashon-Maury Island specific.

### Keeping Waste Out of Water

**Local Hazardous Waste Management Program**. Public Health-Seattle & King County <http://www.lhwmp.org/home/default.aspx>. Household Hazardous Waste Line 206.296.4692. Find out when the roving waste-mobile will be on the Island. Check out alternatives to using toxic cleaning and garden products and safe ways to dispose of anything from paint to pesticides.

**Washington Toxics Coalition**. <http://watoxics.org/healthy-living/healthy-homes-gardens-1> or call 206.632.1545. Learn how to evaluate the safety of the product you want to use and explore safer options.

### Rainwater Harvest and Greywater Reuse

**Washington Department of Ecology Rainwater Harvest**. <http://www.ecy.wa.gov/programs/wr/hq/rwh.html>

Printed with soy-based inks on paper made with 30% post-consumer waste.

**Washington Department of Ecology Greywater Re-Use Rule Development**. <http://www.doh.wa.gov/ehp/Ts/WW/greywater/greywater-rac.htm>

### Related Research

**Quartermaster Nitrogen Management Study**. <http://www.kingcounty.gov/environment/watersheds/central-puget-sound/vashon-maury-island/quartermaster-nitrogen-study.aspx>. Find research results of the different sources of nitrogen input to Quartermaster Harbor.

**Vashon-Maury Island Marine Recovery Areas**. <https://www.kingcounty.gov/healthservices/health/ehs/wastewater/mra.aspx> or call 206.296.1910. Find information on where the marine recovery areas are, maps of the different MRA areas and the status of the onsite-septic system records for each parcel in the MRA.

### Septic Systems, Wastewater Treatment and Plumbing

**Licensed On-Site Septic System Maintainers**. <http://www.kingcounty.gov/healthservices/health/ehs/wastewater/pros/list.aspx>

**Plumbing Permits**. <http://www.kingcounty.gov/healthservices/health/ehs/plumbing.aspx> or call 206.296.1174. Find out how to apply for a plumbing permit. A permit is needed for the review and installation of a greywater re-use system.

**Septic Education and Care**. <http://www.kingcounty.gov/healthservices/health/ehs/wastewater/owners/care.aspx>. Find information on the different types of septic systems, how they work and how to care for them. Learn how to order “as built” drawings of your system and what to do when you are ready to buy or sell a house with a septic.

**Septic Sense, Scents, Cents. Supreme Insights to the Fearless Flush**. <http://www.wsg.washington.edu/mas/pdfs/SepticSense.pdf>. An easy to read and fun description on how to care for your septic systems. Washington Sea grant has additional resources for the shorefront property owner.

**Septic System Repair Permits**. <http://www.kingcounty.gov/healthservices/health/ehs/wastewater/owners/repair.aspx> or call 206.296.4932

**State Approved On-Site Treatment Systems**. <http://www.doh.wa.gov/ehp/Ts/WW/default.htm>

**Vashon-Maury Island Wastewater Treatment Plant**. <http://www.kingcounty.gov/environment/wtd/About/System/Vashon.aspx>

### Shellfish Harvest

**Commercial and Recreational Shellfish Growing Area Map**. <http://www.doh.wa.gov/ehp/sf/Pubs/ai-map.pdf>

**Shellfish Harvest Safety Information**. Hotline: 1.800.562.5632. <http://ww4.doh.wa.gov/scripts/esrimap.dll?name=bioview&Cmd=Map&Step=1>. The clickable map works with Internet Explorer only at 100% resolution.

### Tax Incentive Programs

**Resource Incentive Programs**. <http://www.kingcounty.gov/environment/stewardship/sustainable-building/resource-protection-incentives.aspx> or call 206.205.5170. Learn about incentive programs including the Public Benefit Rating System, Forestland, Timber Land and Farm and Agricultural Land current-use taxation programs.



### Vashon-Maury Island Groundwater Protection Committee

takes a break at their July 28, 2010 meeting. From left to right: Bill Riley (pending), Donna Klemka, Philip McCready, Frank Jackson, Laurie Geissinger, John Gerstle, Yvonne Kuperberg and Jim Dam. Not pictured, Jay Becker.

