Assessing Our Liquid Assets

We drink rain. Rain feeds our streams, ponds and becomes our groundwater. Island water sources are not replenished by off-island snow melt or aquifers. What falls from the sky, or discharges from our homes and businesses, is what we depend on to support our way of life, the quality of the water that we drink, and the fish and wildlife that share our Island.


Beall Creek pump station


Shinglemill Creek gravel


Vashon shoreline

How's Our Water Doing?

A Report Card to the Community

Reading a report card can be unnerving; "Am I going to get an 'A' in Biology or did I bomb that final?" This report on the state of our water resources, our liquid assets, comes to you from the Vashon-Maury Island Groundwater Protection Committee (GWPC). The report card documents the first ten years of data collection and shows that our water is generally in good shape. But, as a teacher might note, "There's room for improvement in some areas" and we found a mystery in our streams we need your help to solve.

In 2005, the community helped develop the Vashon-Maury Island Watershed Plan. In that plan, we committed *to use water sustainably so that our groundwater supply is neither diminished in quality nor quantity* and *to preserve our natural hydrologic functions*. That's a tall order—how do we measure whether we are achieving those goals?

We have identified 11 indicators to help assess the state of our ground, surface, and marine (Quartermaster Harbor) water resources. These indicators act as an "early warning system" to alert us to problem areas. We believe the target values we set represent protective or sustainable conditions. These Sustainability Indicators are presented in four main groups: water quality, water quantity, ecosystem health, and water use/management.

We realize the report card is an imperfect tool. It can't possibly reflect the nuances of our hydrologic system. With your help, we hope to refine the indicators and the reporting mechanism. We would appreciate your feedback on what makes sense, what doesn't, and whether more of you are willing to collect data. Please check out the back page to see where you can send your comments and other ways you can help us out, especially in solving our stream mystery!


Judd Creek at SW 204th Street

Valve cover for water main


Mouth of Judd Creek

Who is the Groundwater Protection Committee?

The Vashon-Maury Island Groundwater Committee (GWPC) formally began its work in 2001, although other committees had been studying groundwater for many years prior to 2001. The committee is comprised of community members representing a variety of interests such as private well owners, water purveyors, commercial agriculture, environmental organizations, and businesses, etc. Committee members are appointed by the King County Council for three-year terms. The group meets four times per year. Current members are Philip McCready, Bill Riley, Laurie Geissinger, Frank Jackson, Donna Klemka, Jay Becker, Gib Dammann, Jim Dam and Armin Wahanik (pending). King County Department of Natural Resources and Parks provide technical and support staff for the committee.

Vashon-Maury Island Sustainability Indicator Report Card

Assessing Our Liquid Assets

Reading the Report Card

Each indicator has a threshold or target value (our "early warning system") against which 2010 data was assessed. In addition, we looked for changes in the status of each indicator through time (2001-2010).

- The pie charts in the report card show the percentage of the data points for each indicator that fall into a particular category as defined in the legend.
- One column of pie charts is a snapshot of the indicators in the year 2010.
- Another column of pie charts represent whether the status of an indicator has changed over the time period 2001-2010.
- Thresholds and targets are based on state standards, criteria, or Maximum Contaminant Levels (MCLs).
- Maximum Contaminant Levels (MCLs) are standards set by the Environmental Protection Agency for drinking water quality.
- TREND—For locations with more than 10 years of water quality samples, new data will be compared to the baseline data to evaluate changes through time. At this point, we only have enough data points to establish a trend for nitrate.
- Check the Glossary of Sustainability Indicators to better understand why we are using a specific parameter as part of our early warning system.

For a more in-depth description of the sustainability indicators and the data to support this assessment, check out: www.kingcounty.gov/groundwater.

Legend

2010 Finding

Poor Conditions: Reported data are above Maximum Contaminant Level (MCL) and/or fails to meet the state standard or criteria for a given indicator; needs improvement.

Fair Conditions: On the average, data fell between the standards or criteria for "poor" and "good" and may be variable.

Good Conditions: Reported data are less than half the MCL and/or meet the state standard or criteria for a given indicator.

2001-2010 Status

Declining conditions over time: 2001-2010 data shows worsening conditions.

No change over time: 2001-2010 data shows no measurable change with time.

Improving conditions over time: 2001-2010 data indicate improving conditions.

Insufficient Data: reported data has too few data points and/or too short a period.

No Target Established

Glossary of Sustainability Indicators: What We are Tracking and Why

Groundwater Quality	**Nitrate** can reflect human activity and has some documented health effects at elevated levels. Concentrations are influenced by septic systems, fertilizers, manure, atmospheric deposition, and nitrogen-fixing vegetation.
	Arsenic has been detected in some Island wells and has potential carcinogenic effects. Sources can be natural geologic deposits, pesticides, and industrial pollution.
	Chloride concentrations in groundwater can be elevated by over-pumping of wells allowing saltwater from Puget Sound to enter aquifers. Elevated levels can also come from urine and be a tracer of animal-generated (including humans) pollution.
Surface Water Quality	**"Stream Water Quality Index"** integrates key factors into a single number comparable over time and across locations. The index uses monthly temperature, pH, fecal coliform, dissolved oxygen, suspended solids, and nutrient data. It calculates a composite number for each stream between1-100; the higher the score, the better the water quality.
Marine Water Quality	**Dissolved oxygen** is required by most marine organisms to live. The concentration of oxygen can be depleted due to nutrient input, particularly nitrogen. Measurements are taken in Quartermaster Harbor.
	Fecal coliform bacteria indicate fecal contamination from warm-blooded animals including humans and livestock.
Water Quantity	**Groundwater levels** are measured in numerous locations in several different aquifers to indicate water quantity. Levels can be influenced by the amount of precipitation, landuse changes, and changes in water use patterns.
	Stream summer low-flow rates can indicate changes in our hydrologic system. Sufficient water in summer is critical for in-stream wildlife, like salmon.
	Stream flashiness index indicates how fast and how much water gets to our streams after a typical rain storm. It is influenced by changes in development patterns and land cover, which can influence the habitat quality of a stream.
Ecosystem Health	**Stream benthic macroinvertebrates** are the critters—like mayflies, caddisflies, and stoneflies—which live on or near the bottom of the stream. A robust and diverse community of these organisms indicates ecosystem health. Changes in stream flow, increased sedimentation and excessive nutrients or contaminants can have a negative effect on this sustainability indicator, the "Benthic Index of Biologic Integrity" or BIBI score.
	Salmon populations are influenced by numerous factors beyond the purview of this community including oceanic conditions, fishing, and climate change. Our goal is to retain the hydrologic conditions conducive to salmon viability in our streams.
Water Use Management	**Annual total water usage** is estimated year to year using data from public water systems, some private well owners, and agricultural users. Water use is influenced by weather; overall usage is higher in the dryer years. Tracking annual water usage helps us understand how humans influence the local hydrology.
	Per capita water consumption is calculated from the total island-wide water use divided by the population.
	Summer peaking factor is an indicator of how much additional water people use during summer. It is the maximum consumption divided by average usage. Summer water use factors range from 1.2 to 4.4 based on data from selected larger public water systems. It can be influenced by weather conditions and water rates.

Gorsuch Creek, shows signs of "flashiness." The stream channel is wider than expected. There are large cobble-sized rocks which could only be moved there during much higher flows and there are signs of stream bank erosion up and down the stream. Gorsuch receives stormwater from the east side of Vashon town.

Groundwater Quality

1A Nitrate: Over the ten year period, nitrate levels are remaining constant in 13 wells, increasing in 4 and decreasing in 4. In 2010, 190 sites were monitored for nitrate and 4 sites had nitrate above half the MCL, but did not exceed it.

1B Arsenic: Our groundwater quality is generally in good condition, however in 2010 eleven wells of 95 sampled, exceeded the MCL for arsenic and 23 sites were above half the MCL, but did not exceed it.

Surface and Marine Water Quality

2 Stream Water quality varies from year to year with the 2010 water quality index indicating fair to good conditions and improving conditions over the ten year period.

3A-B Marine Water in Quartermaster Harbor shows low levels of fecal coliform bacteria at the three monitoring sites. It has periods of low dissolved oxygen, especially in the inner harbor, which can be hard on marine organisms and violates state water quality standards.

Water Quantity

We assess changes in water quantity by monitoring elevation of the water table in wells and by gauging stream flows.

4 Groundwater Levels: We have 15 wells with enough data to do a 10-year baseline assessment. Of those 15 wells, one site shows a statistically significant decline in water level while one shows an increase. The 2010 water table elevation snapshot was all over the place—three wells low, three really low, three high, and four with no change.

5 Summer Low Flows: The stream flow data from Shinglemill, Judd, Fisher, and Tahlequah creeks mirror changes in the total amount of annual precipitation: high flow during rainy years and low flow during dryer years.

6 Stream Flashiness: Another index assesses stream "flashiness" which is a measure of how much and how fast stormwater gets to a stream. A "flashy" stream tends to have big slugs of water moving down shortly after a storm which can be highly erosive and change the habitat characteristics of the stream. The "flashiness" index of our streams seems to be constant over the five years of measurements for Fisher and Tahlequah creeks and the ten years of measurements for Shinglemill and Judd creeks, but more data is needed to discern any trends.

Ecosystem Health

We chose to monitor two biologic indicators of ecosystem health in our streams: (1) insects and other non-fish organisms that live in the streams, collectively referred to as "benthic macroinvertebrates" and (2) salmon populations.

7 Stream Benthic Macroinvertebrates: The stream benthic macroinvertebrate scores in 2010 (2 sites were fair and 10 were poor to very poor) are lower than other rural King County streams. The Island-wide average has been getting worse since sampling started in 2005.

8 Salmon: The number of salmon reported per survey year has decreased since 2001 for several creeks, but the number of volunteers reporting information has also declined, so it is not clear exactly what is happening with salmon populations.

Water Use

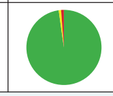
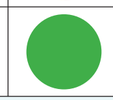
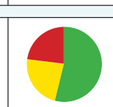
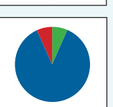
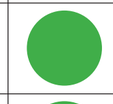
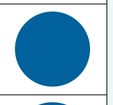
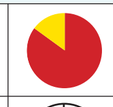
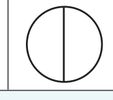
The estimated total amount of water used on the Island for the years 2001-2010 has been relatively constant. Our estimate is based on data from many public water systems and a few private well owners with meters on their wells. It also includes estimates of agricultural uses. We have not set a target value or condition for these parameters, so our estimates for 2010 could not be assessed against a target. That's why the 2010 Finding column is blank.

2010 Water Use Estimates

9 Annual Total Usage: Water use for 2010 is estimated at 495 million gallons.

10 Per Capita Usage: Based on average per capita use data from the two largest public water systems on the Island, we estimate average per capita usage of 80 gallons per person per day.

11 Peaking Factor: Water-use peaks in the summer by a factor of 1.8 on average in 2010.

Indictor Description		2010 Finding	2001-2010 Status
Groundwater	1A Nitrate		 TREND
	1B Arsenic		
	1C Chloride		
Surface Water	2 Stream Water Quality Index		
Marine Water	3A Quartermaster Harbor Disolved Oxygen		
	3B Quartermaster Harbor Fecal Coliform		
Groundwater	4 Water Levels		
Surface Water	5 Summer Low Flows		
	6 Stream Flashiness		
Stream Life	7 Stream Benthic Macroinvertebrate Population		
	8 Salmon Population		
Island-Wide Water Useage	9 Annual Total Usage	—	
	10 Per Capita Usage	—	
	11 Peaking Factor	—	

What's Next

Our work to develop this report card highlights the need to fill in data gaps. Although this assessment covered 2001-2010, most of the indicators have shorter periods of record, starting in 2005 or 2006. We want to update the report card when we have enough new data. We anticipate that to be every three years.

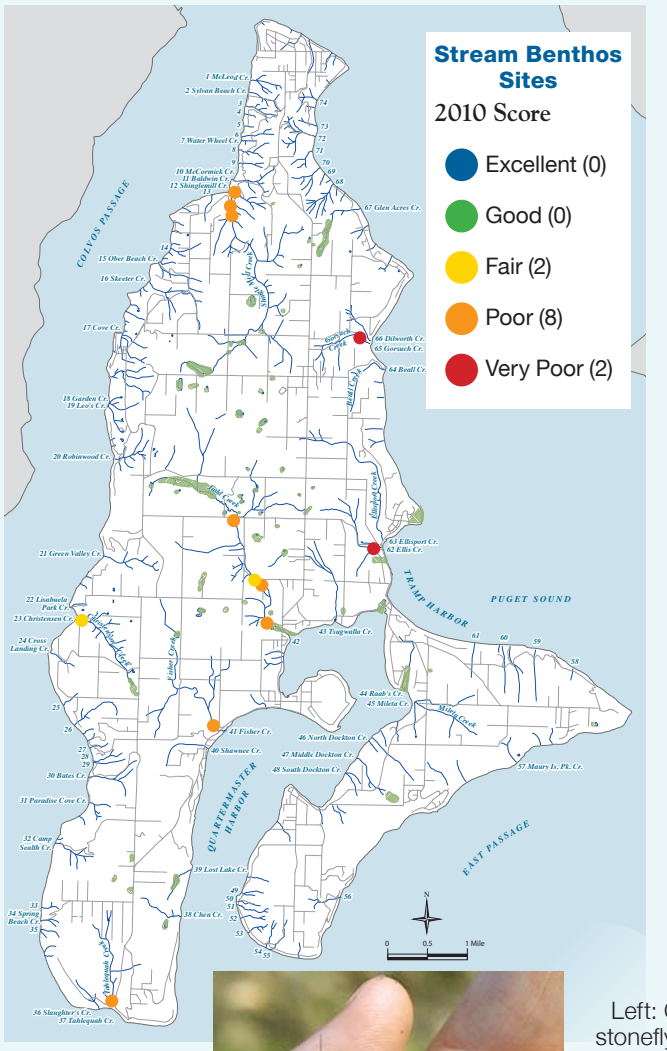
Most importantly, as a community, we must figure out what strategies need to be in place should our "early warning system" be triggered. What are we going to do if future assessments indicate our water resources are in decline? In fact, we already have a few indicators that are in the RED.

SEEING RED

The elevated arsenic in our deeper wells appears to come from naturally occurring deposits, not fallout from the ASARCO smelter. We can't change our geology, but we can let people know about our findings so they can decide to test their wells and, if needed, treat their drinking water. Water purveyors typically blend water containing elevated arsenic levels with other sources so that the final product complies with drinking water standards.

The low oxygen levels in Quartermaster Harbor are being studied by King County and others as part of the Quartermaster Harbor Nitrogen Management Study. Policy changes to better manage nitrogen, which is linked to low oxygen levels, are proposed in the 2012 King County Comprehensive Plan.

In response to the big red dot next to the benthic macroinvertebrate (stream critter) data, the GWPC asked Bianca Perla to galvanize the community to help identify potential causes for the poor scores. In addition, independent of the GWPC work, the Vashon Nature Center, LLC is spear-heading a more vibrant salmon-watching program.



Left: One of the larger stonefly larvae you might encounter.
Photo courtesy the Xerces Society and Jeff Adams

Right: Some caddisfly larvae carry around their home-made dwellings.
Photo courtesy of Jo Wilhelm

What's Happening in Our Streams? It's a Mystery!

The poor condition of stream-dwelling organisms —the benthic macro-invertebrate communities—in our creeks caught us by surprise. The GWPC hopes the community will help us solve this mystery. Bianca Perla, of the Vashon Nature Center, LLC, is inviting volunteers to help collect samples from more sites in more streams to see if we can figure out what is making our waterways inhospitable to these critters.

These invertebrates are an important food source for fish, amphibians, and water birds and they help with the breakdown and recycling of organics and nutrients in streams. If they decline, the streams are not a great place for juvenile salmon to reside either.

Some of the organisms are particularly sensitive to increased sedimentation. Some are sensitive to chemical pollution while others may have a difficult time holding on to the rocks if the steam flow increases dramatically in winter. Digging deeper into the data, establishing some hypotheses, and collecting additional samples to test the hypotheses should help us figure out what's going on and what we might be able to do about it.

Don't be squeamish. Take a look at what hangs out at the bottom of your stream!

Stream Bug Monitor

Become a Stream Bug Monitor!
For more information or to volunteer, contact Bianca Perla at bianca.vnc@gmail.com

We Want Feedback on the Report Card

Please let us know what you think about the report card. What works, what doesn't, what changes should we make in the future? You can e-mail your comments to the GWPC chair at: VMIGPC4@kingcounty.gov

Thank you so much for taking the time to read and respond!

Eric Ferguson—Water Man

Hydrogeologist, Eric Ferguson, is the Groundwater Protection Committee's "man in the water." He is responsible for making sure the monitoring equipment is working, collecting water quality samples, and compiling and evaluating the data. This summary of our findings would never have happened without his expertise and energy.

Want to Help?

- Are you interested in monitoring the elevation of the water table in your well on a monthly basis?
- Are you interested in getting a free water meter on your well and monitoring the amount of water you use every month?
- Do you test the water quality of your well on a regular basis? If so, would you be willing to provide that information to us?

If any of these activities are of interest to you, please contact Eric Ferguson at Eric.Ferguson@kingcounty.gov

Where to Get More Information

At www.kingcounty.gov/groundwater, you can:

- Find "Protecting Our Liquid Assets" for more background information on our water resources;
- Find information about the individual sustainability indicators;
- Find information on nitrogen loading and oxygen depletion in Quartermaster Harbor;
- Find out about the Groundwater Protection Committee.

Come Discuss This Report Card

at the VMI Community Council Meeting, Monday November 19th 7PM, McMurray Middle School.

Assessing Our Liquid Assets **A Report Card to the Community** Vashon-Maury Island Groundwater Protection Committee