

6. Surface water: Stream Flashiness

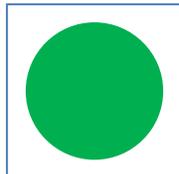
Target: Flashiness Indicator is maintained or improved

About this indicator: A metric to indicate how a stream responds to increased flow associated with routine storm events. The R-B Index has lower inter-annual variability than many other flow regime indicators, making it well suited for detecting gradual changes in flow regimes associated with changes in land use and in land management practices.

Influencing factors: Changes to the hydrologic pathways from development or modifications to the land cover. Amount of precipitation for a given year. The index values increase as the frequency and magnitude of storm events increase and decrease accordingly.

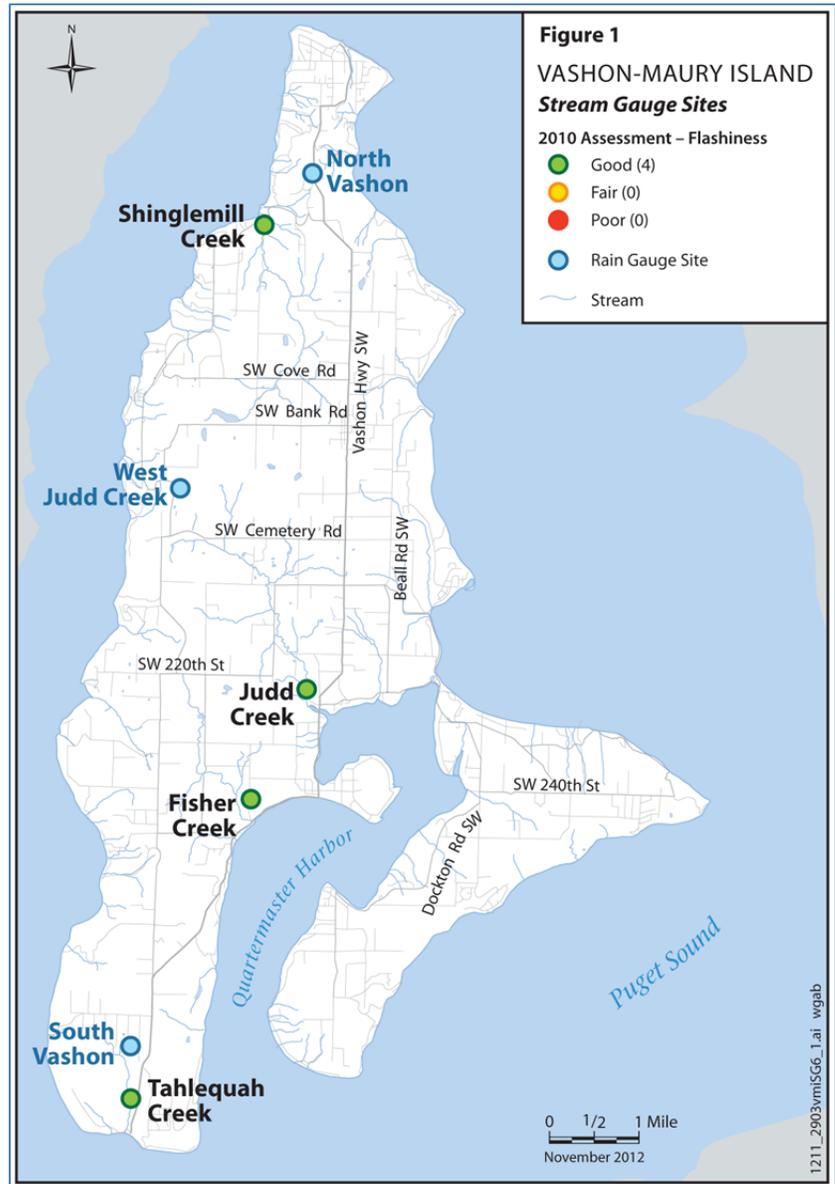
2010 Target: The flashiness indicator is maintained or improved.

2010 Finding:
4 sites – 2010 data for all sites are within historic mean values



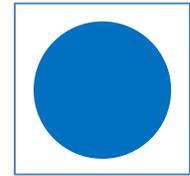
2010 Status: Four sites have flow monitored continuously on Vashon-Maury Island – Shinglemill, Tahlequah, Fisher and Judd Creeks, Figure 1. All sites have maintained their R-B index values since measurements began however more time is necessary before a trend can be determined. For Shinglemill and Judd Creeks that began in 1999 while Fisher and Tahlequah creeks have been monitored since 2005. The R-B index values are shown in Table 1 and Figure 2 for the last ten years; 2001-2010.

Figure 1. Stream gauge locations used in this indicator. Four sites have flow monitored continuously on Vashon-Maury Island – Shinglemill, Tahlequah, Fisher and Judd Creeks. All sites maintained or improved in 2009 and 2010.



2001-2010 Target: Flashiness Indicator is maintained or improved

2001-2010 Assessment: All sites maintained in 2009 and 2010.



2001-2010 Status: When assessing the ten year period of 2001-2010, all four sites respond to changes to the environment such as lower R-B index values for years with lower precipitation totals and higher values when the opposite occurs, Figure 2. Judd and Shinglemill Creek have 10 years of flow data and appear to be maintaining R-B index values however additional data (5+ years or more) is required to determine if any changes are more than variations in total amount of precipitation.

Table 1. R-B Index data for 4 creeks on Vashon-Maury Island for each Water Year 2001-2010. The R-B Index has annual variability and the overall trend (over many years) can indicate gradual changes in flow regimes associated with changes in land use and in land management practices. Locations of each site are shown in Figure 1. A range of R-B index values is shown in Figure 3. Units are cubic feet per second.

Creek\Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Judd	0.2	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3
Shinglemill	0.2	0.4	0.3	0.4	0.3	0.3	0.4	0.3	0.3	0.3
Fisher	—	—	—	—	0.2	0.2	0.3	0.2	0.2	0.2
Tahlequah	—	—	—	—	0.2	0.3	0.3	0.3	0.3	0.3

Technical Notes Surface Water: Stream Flashiness

Data source: The data for this indicator comes from monitoring done by King County Water and Land Resources Division.

Collection frequency: King County has been monitoring stream flow continuously at four sites since 2005 – Shinglemill, Judd, Fisher, and Tahlequah Creeks. Shinglemill and Judd Creeks have been monitored since 1999 and 2000, respectively.

Methods for analysis: Each site has flow measured continuously. The R-B index is calculated for each site for a given water year. The flashiness indicator is the sum of the absolute values of the day-to-day changes in mean daily flow divided by mean daily flow for the year. The resulting index is unit-less. The data are presented for the last 10 water years 2001 - 2010, Figure 2. Lower values represent a more stable hydrologic system than higher values, Figure 3.

Data Reliability and Quality: The data quality of this indicator is high based on the KC SAP/SOP of the data collection. The reliability is good based on the consistent and regular collection of the data. The R-B index is an indicator that shows trends with longer (~20 years or more) data sets. As notes above, additional data will need to be collected before a full assessment can be done. Vashon-Maury Island has over 70 stream basins. Judd, Shinglemill, Fisher, and Tahlequah Creeks are the four largest basins representing 32% of the total area of the island.

Data Reference:

King County - Water Resources Evaluation Project – Data Report 2005-2009.

<http://www.kingcounty.gov/environment/waterandland/groundwater/management-areas/vashon-maury-island-gwma/vashon-island.aspx>

Baker et al., 2004, A new flashiness index: Characteristics and applications to Midwestern rivers and streams, Journal of the American Water Resources Association (JAWRA) 40(2):503-522.

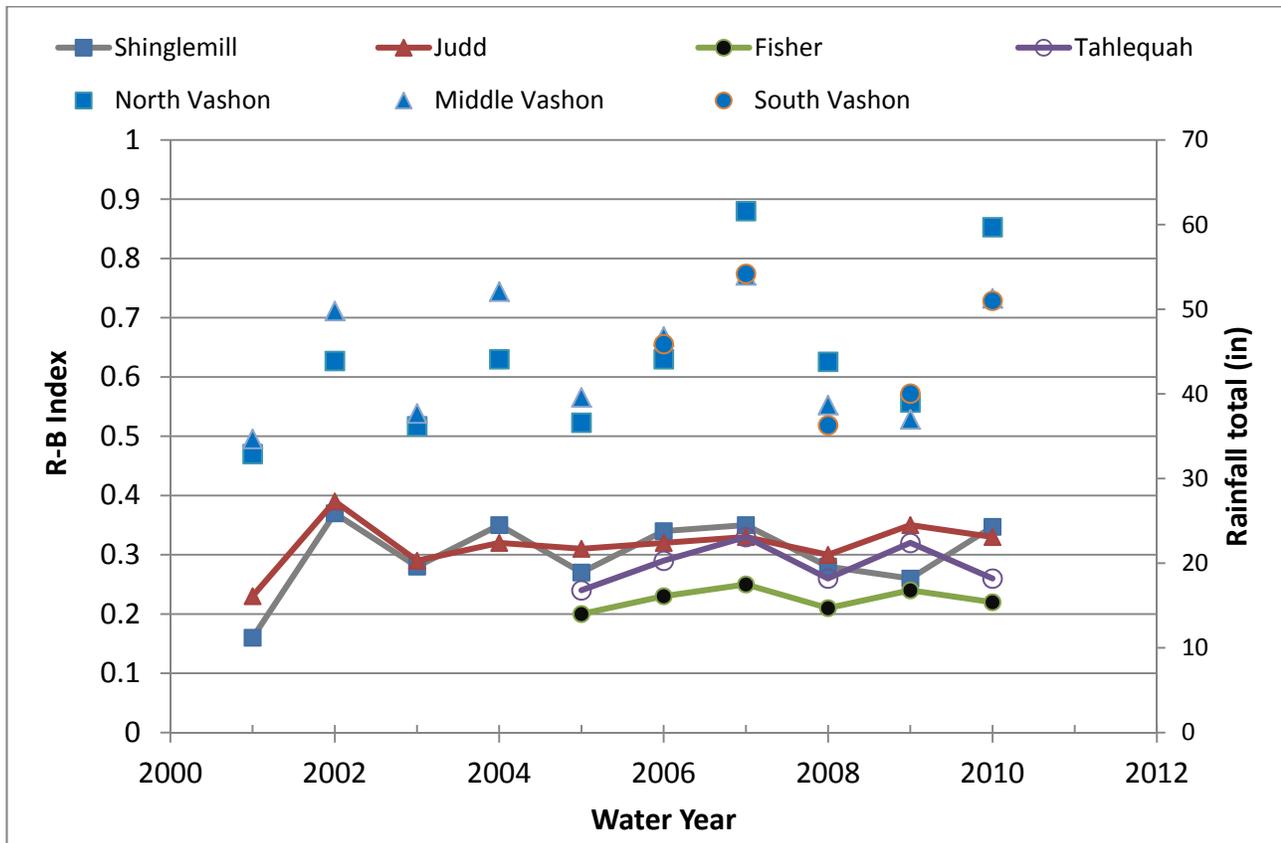


Figure 2. Flashiness indicator shown as R-B index for 4 creeks on Vashon-Maury Island. Data are shown by Water Year 2001-2010. The R-B Index has annual variability and the overall trend (over many years) can indicate gradual changes in flow regimes associated with changes in land use and in land management practices. Rainfall totals (inches per water year) are shown on the second axis for three (North, Middle and South) precipitation sites on Vashon Island.

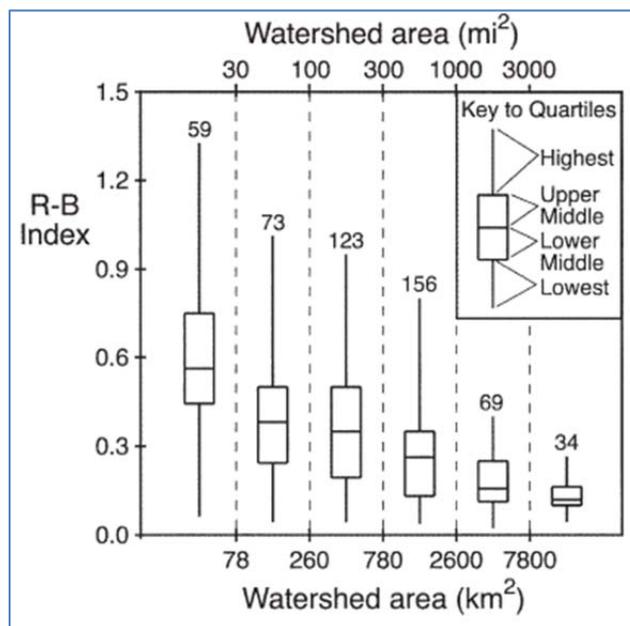
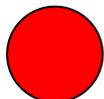


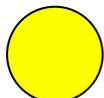
Figure 3. Distribution of R-B Index Values for stream in 6 size classes of watersheds. Quartiles of index values along a continuum of Stable (lower values) to Flashy (higher values) streams. Vashon streams would be within the first size class and have the lowest quartile values, Table 1. [Adapted from Baker et al., 2004 – figure 4.]

Legend

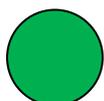
2010 Finding



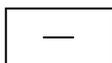
Poor Conditions: Reported data are above Maximum Contaminant Level (MCL) and/or fails to meet the state standard or criteria for a given indicator; needs improvement.



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

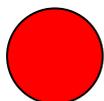


Good Conditions: Reported data are below MCL and/or meet the state standard or criteria for a given indicator.



No Annual Assessment

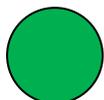
2001-2010 Status



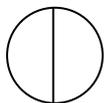
Downward Trajectory: 2001-2010 data shows decreasing or worsening conditions



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



Upward Trajectory: 2001-2010 data indicate increasing or improving conditions



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

