SURFACE WATER QUALITY

Outcome: Protect Water Quality and Quantity

Countywide Planning Policy Rationale

"Natural drainage systems including associated riparian and shoreline habitat shall be maintained and enhanced to protect water quality, reduce public costs, protect fish and wildlife habitat, and prevent environmental degradation. Jurisdictions with shared basins shall coordinate regulations to manage basins and natural drainage systems which include provisions to: a. Protect the natural hydraulic and ecological functions of drainage systems, maintain and enhance fish and wildlife habitat, and restore and maintain those natural functions; b. Control peak runoff rate and quantity of discharges from new development to approximate pre-development rates; and c. Preserve and protect resources and beneficial functions and values through maintenance of stable channels, adequate low flows, and reduction of future storm flows, erosion, and sedimentation." (CA-9) "All jurisdictions shall implement the Puget Sound Water Quality Management Plan to restore and protect the biological health and diversity of the Puget Sound Basin." (CA-15) "Each jurisdiction's policies, regulations, and programs should effectively prevent new development and other actions from causing significant adverse impacts on major river flooding, erosion, and natural resources outside their jurisdiction." (CA-12)

About This Indicator:

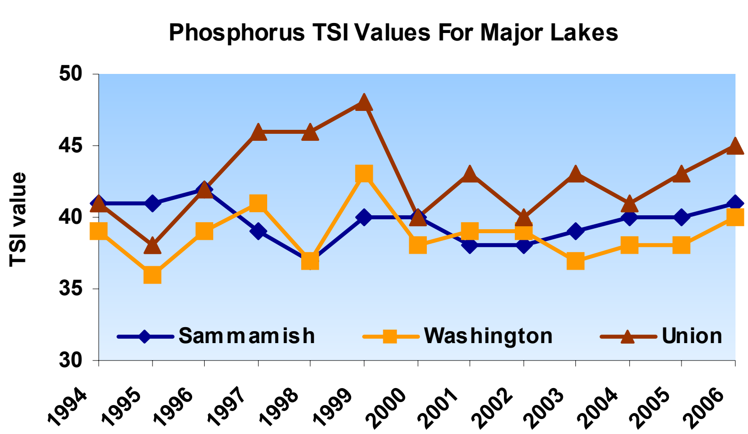
The King County Countywide Planning Policies require all jurisdictions to implement the *Puget Sound Water Quality Management Plan* to restore and protect the biological health and diversity of the Puget Sound Basin. The Puget Sound Management Plan identifies jurisdictional actions to maintain and improve Puget Sound's health by: preserving and restoring wetlands and aquatic habitats; preventing increases in the introduction of pollutants to the Sound and its watersheds; and eliminating harm from the entry of pollutants to the waters, sediments and shorelines of Puget Sound. As such, this indicator focuses on the condition of lakes, streams and rivers within King County's watersheds as well as that of Puget Sound itself.

Lakes Monitored by the King County Department of Natural Resources and Parks, Carson's Trophic State Index (TSI) assesses the condition of lakes in King County. A lake's trophic state is defined as the total weight of living biological material in its waters and includes measurements of water clarity, phosphorus levels and algal levels. These attributes provide a good indication of a lake's biological activity, which is influenced by a variety of factors, both natural (including watershed size, lake depth and climate) and man-made (including land development, increases in impervious land surfaces and the introduction of sewage to a lake). The increase in a lake's biological activity is referred to as eutrophication. Natural eutrophication occurs over centuries and is often not observable in a single human lifetime, but human activity can accelerate these natural processes.

Figure 13.1

Trophic State Index Values and Attributes	
TSI Value and Trophic State	**Attributes**
<40 Oligotrophic	• high water clarity • low algae values • low phosphorus
40-50 Mesotrophic	• moderate water clarity • moderate algae values • moderate phosphorus values
50-60 Eutrophic	• lower water clarity • higher chlorophyll values • higher phosphorus value
>60 Hypereutrophic	• low water clarity • high potential for nuisance algae blooms

Figure 13.2

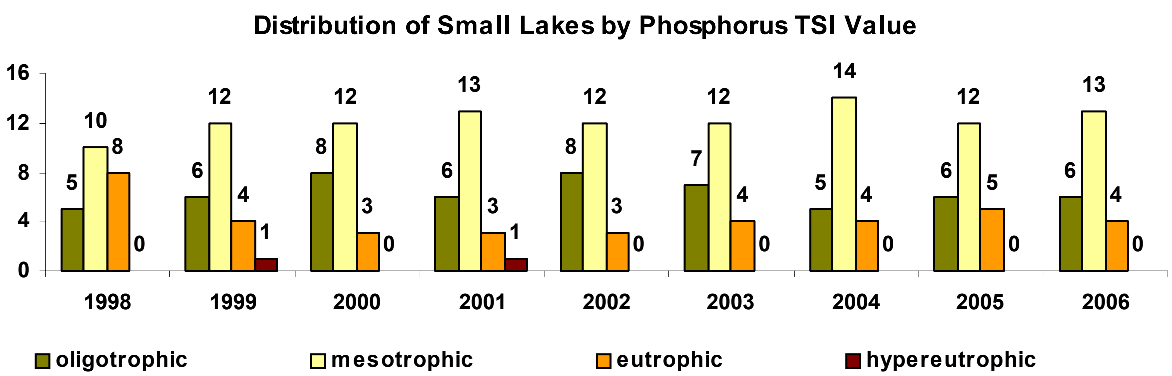


Major Lakes Figure 13.2 illustrates the annual fluctuations in the Phosphorus TSI value of the county's large lakes. While phosphorus is necessary for plant and animal growth, excessive amounts can increase the likelihood of nuisance algal blooms. Because phosphorus enters water bodies via the discharge of detergents, runoff containing fertilizers, or septic system seepage, efforts to decrease stormwater discharge and to improve wastewater treatment are meant to decrease excessive phosphorus levels in these lakes. As shown, the 2006 phosphorus level in Lake Sammamish returned to its 1994 baseline, while the phosphorus levels in both Lake Union and Washington increased.

Small Lakes Figure 13.3 shows the distribution of 23 small lakes between 1998 and 2006 by phosphorus trophic state. As shown, over two-thirds of the lakes monitored in 2006 had low to moderate phosphorus levels (oligotrophic and mesotrophic TSI values). This is an improvement from 1998 when about one-half of them had low to moderate phosphorus levels. Overall, 13 of the lakes had lower phosphorus levels in 2006 than their 1998 levels. The percentage of lakes in a eutrophic state fell by one-half in the eight-year period. Only one lake transitioned from a mesotrophic to a oligotrophic state.

In 2006, only four lakes were found to have high phosphorus levels (eutrophicTSI values): Trout Lake in South King County, Paradise and Cottage Lakes in North King County, and Allen Lake in East King County. All four lakes are within the unincorporated area of King County. The map on page 11 shows the location of the 23 monitored lakes by trophic state.

Figure 13.3



Marine Puget Sound water quality is monitored through a variety of means by various stakeholders in Washington state. This section focuses on eutrophication and sediment quality. King County DNRP conducts monthly water quality monitoring at 12 offshore locations in Puget Sound, In 2006, all of the offshore stations sampled were at a level of lower concern for eutrophication potential. Similarly, all of the sites met the fecal coliform bacteria geometric mean standard in 2006, suggesting that fecal bacteria are not a concern in the Puget Sound waters surrounding King County.

From 1997 to 1999, the Washington State Department of Ecology conducted a random sampling of sediments at 300 stations throughout Puget Sound, covering approximately 2,363 km^2. The samples were tested for sediment chemistry, toxicity and invertebrate community analyses. Figure 13.4 shows the distribution of sediment quality throughout Puget Sound study area. Overall, high quality sediments were found in over 68% of the study area, including over one-half of the Central Sound's waters. The highest quality sediments were prevalent in passages, deep basins and rural embayments. Conversely, the largest percentage of samples with degraded sediments was found in harbor areas, exhibiting high chemical concentrations and toxicity and lacking an abundant and diverse invertebrate community.

Figure 13.4

Marine Sediment Quality in Puget Sound (1998)

	High	Intermediate/ High	Intermediate/ Degraded	Degraded
Strait of Georgia	81%	18%	1%	0%
Whidbey Basin	82%	15%	3%	<1%
Admiralty Inlet	100%	0%	0%	0%
Central Sound	***54%***	***41%***	***2%***	***3%***
Hood Canal	74%	24%	1%	1%
South Sound	48%	36%	16%	<1%
Entire Puget Sound	**68%**	**27%**	**4%**	**1%**

Streams Through the Stream Monitoring Program, King County Department of Natural Resources and Parks routinely monitors the quality of a number of the county's streams and rivers. Water samples are collected during routine baseflow conditions and are analyzed for a variety of parameters including: temperature, dissolved oxygen, turbidity, total dissolved solids, pH, conductivity and nutrient content. The parameters are aggregated into a single value – the Water Quality Index (WQI)—which allows for comparative analysis over time and across sampling locations. Based on its WQI value, a stream location is identified as being of low, moderate or high concern with regard to its water quality. Figure 13.7 shows the location of the 56 stream monitoring stations by quality rating.

This indicator reports stream water quality based on the WQI monitoring performed by the Stream Monitoring Program. The 56 sites reported here are found in Water Resource Inventory Areas (WRIA) 8, which roughly combines the Lake Washington/ Cedar River and Lake Sammamish/ Sammamish River Watersheds and WRIA 9, which roughly combines the Green/ Duwamish Watershed and South Puget Sound Drainage Basin.

Figure 13.5

Distribution of Stream Quality Ratings WRIA 8 and 9

		WRIA 8*		WRIA 9		combined	
		2000	2006	2000	2006	2000	2006
streams tested		*39*	40	*16*	16	*55*	56
rating	low concern	*3*	1	*6*	4	*9*	5
	moderate concern	*27*	20	*8*	10	*35*	30
	high concern	*9*	19	*2*	2	*11*	21

* the upstream Little Bear monitoring station was tested in 2006 (as moderate concern). It was not tested in 2000.

As figure 13.5 illustrates, over one-third of the streams sampled in 2006 were given a "high concern" rating. The number of "high concern" stream locations almost doubled from those in 2000, driven largely by degrading stream conditions in WRIA 8. In fact, almost one-half of the 40 monitored streams in WRIA 8 are of "high concern," the vast majority of them being in highly urbanized areas, between Interstate 90 and the King-Snohomish County line. Despite the increase in "high concern" stream locations, nearly two-thirds of the sample stream locations are considered to have good to moderate water quality, with either "low concern" or "moderate concern" ratings.

Instream flow—a specific stream flow at a specific location and time of year—is another important aspect of water quality. The Washington State Department of Ecology establishes minimum instream flows that are necessary to protect and preserve the resources and uses served by the stream, such as fish, wildlife and recreation.

Figure 13.6 illustrates the cyclical stream flows, which occur naturally as a result of weather and climate cycles. It also reveals the general instream flow trends at each location from the period 1966-1970 to 2001-2005. The average number of days per year that the Cedar River (at the Renton gauge site) exceeded its established minimum instream flows increased nominally, while the Green (near Auburn), Snoqualmie (near Snoqualmie) and Tolt (near Carnation) Rivers all experienced fewer days of adequate flows. The Tolt River (near Carnation) showed the most dramatic decrease, with an average of 46 fewer days per year with adequate stream flows between 2001 and 2005. As with the cyclical fluctuations, these instream flow trends may be attributed to natural causes, such as rainfall, temperature and the presence of groundwater. They may also be caused by human activities, such as land use practices, deforestation and stream diversions.

Figure 13.6