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)

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.

Marine Puget Sound water quality is monitored through a variety of means by various stakeholders in Washington state. King County DNRP conducts monthly water quality monitoring at 14 offshore locations in Puget Sound, measuring for temperature, salinity, density, dissolved oxygen, nutrients, chlorophyll and fecal coliform bacteria. In 2007, two of the offshore stations sampled in Quartermaster Harbor on Vashon-Maury Island registered at a high level of concern using this index, while one of the stations sampled in Elliott Bay registered at a level of moderate concern. Meanwhile, fecal bacteria are not a concern in parts of the Puget Sound that surround King County; all ambient and outfall sites met the fecal coliform bacteria geometric mean standard in 2007.

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.

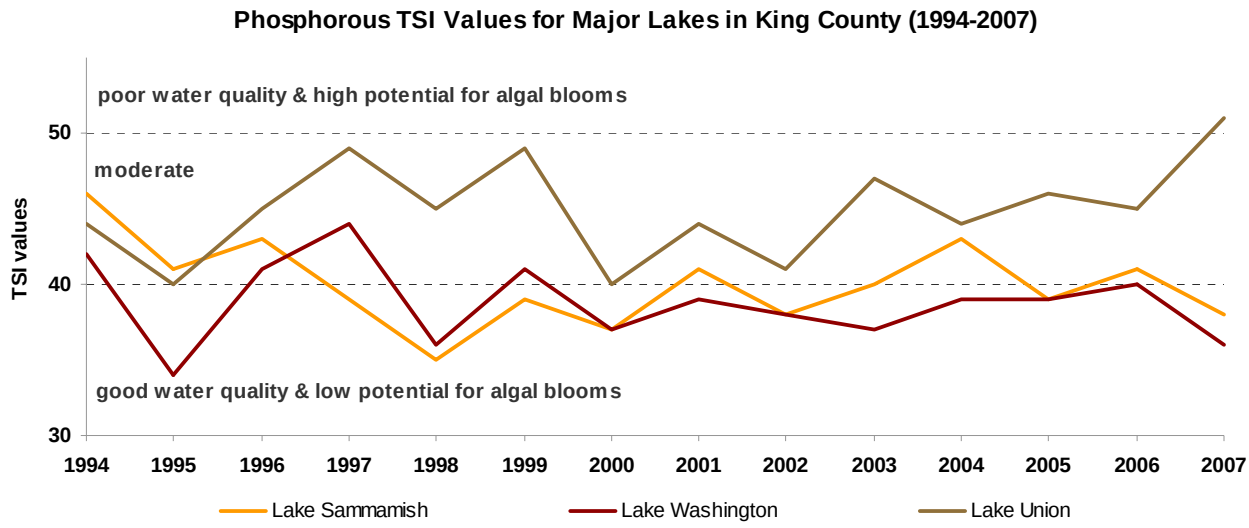
Figure 13.1

Trophic State Index Values and Attributes

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

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 2007 phosphorus level in Lake Union increased to the highest value since before 1994, while the phosphorus level in both Lake Washington and Lake Sammamish decreased.

Figure 13.2

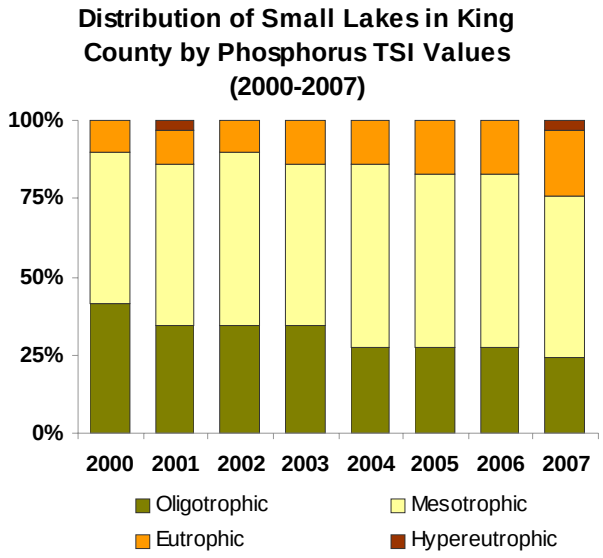


Small Lakes Figure 13.3 shows the distribution of 23 small lakes between 2000 and 2007 by phosphorus trophic state. As shown, over two-thirds of the lakes monitored in 2007 had low to moderate phosphorus levels (oligotrophic and mesotrophic TSI values).

Overall, 11 of the lakes had lower phosphorus levels in 2007 than their 2000 levels. The number of lakes in the eutrophic range has doubled since 2000, while the number of oligotrophic lakes has decreased by almost half the level in 2000.

In 2007, six lakes were found to have high phosphorus levels (eutrophicTSI values): Killarney and Trout Lakes in South King County; Paradise and Cottage Lakes in North King County; and Francis and Allen Lakes in East King County. All six lakes are within the unincorporated area of King County. Only one, Allen Lake in East King County, was found to have very high phosphorus levels (hypereutrophic TSI values).

Figure 13.3



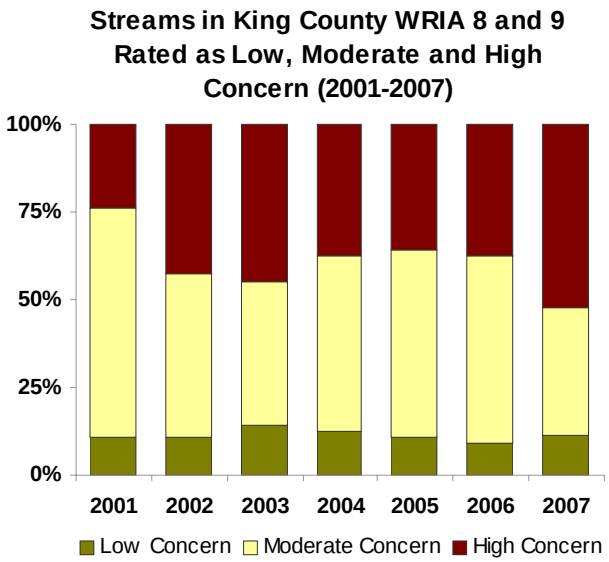
The map on page 11 shows the location of the monitored lakes by trophic state.

Rivers & 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. The map on page 11 shows the location of the stream monitoring stations by quality rating.

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

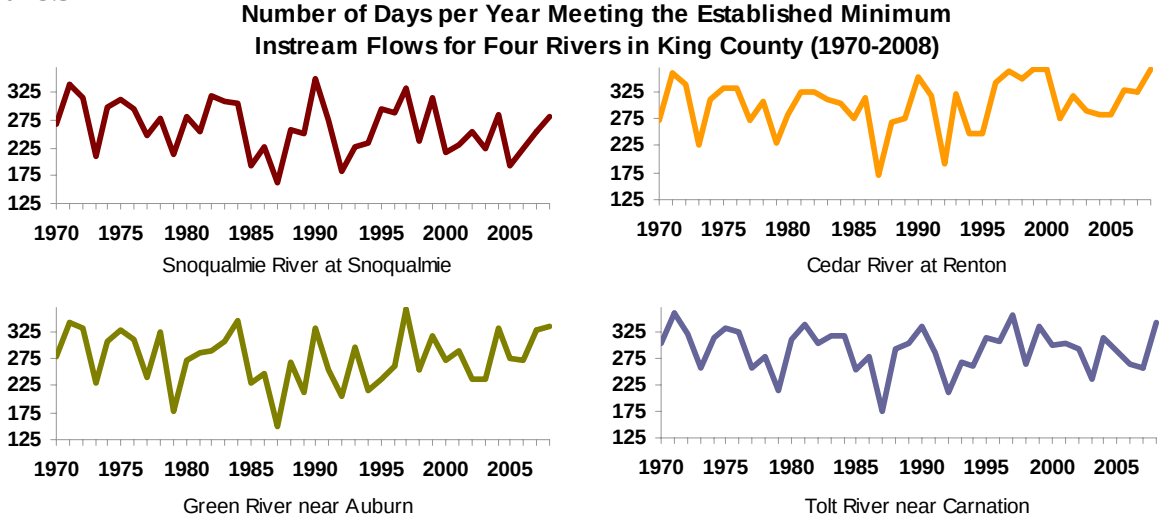
As figure 13.4 illustrates, about half of the streams sampled in 2007 were rated as "low concern" or "moderate concern". The number of "high concern" stream locations in 2007 have doubled since 2000. Most of the streams of "high concern" are located in WRIA 8, predominantly in highly urbanized areas between Interstate 90 and the King-Snohomish County line. Two thirds of all monitored streams in WRIA 8 rated "high concern" in 2007.

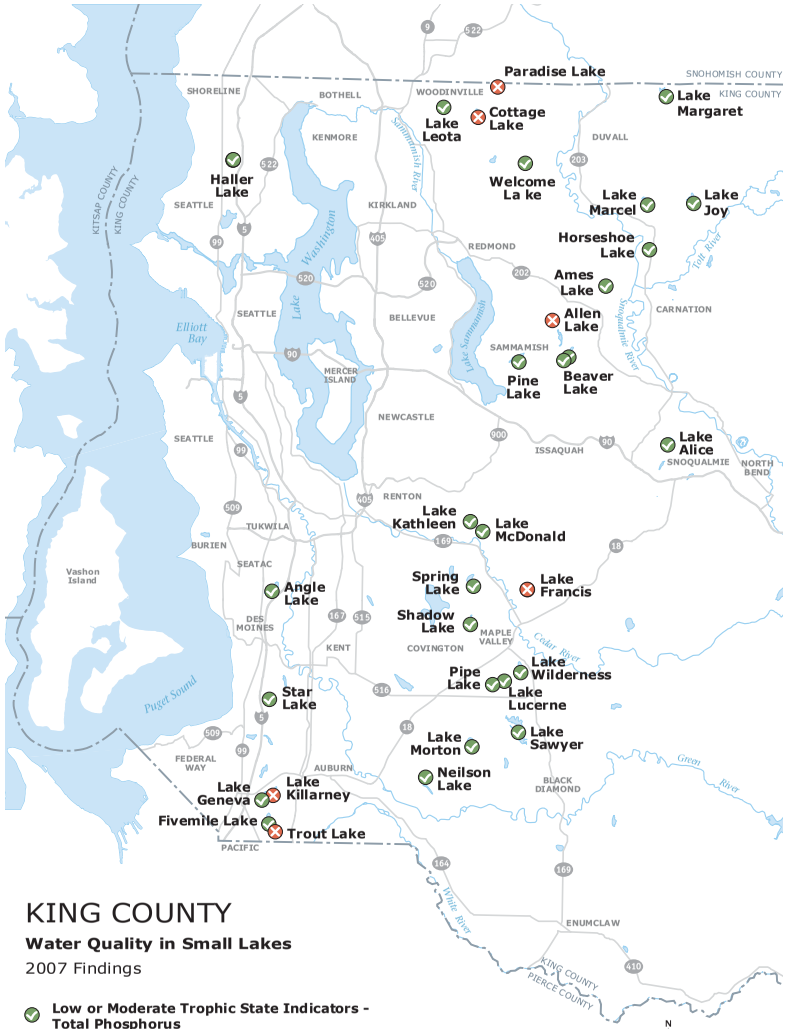
Figure 13.4



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. Instream flows fluctuate naturally as a result of weather and climate cycles. They may also be influenced by human activities, such as land use practices, deforestation, water supply withdrawls and stream diversions.

Figure 13.5





KING COUNTY

Water Quality in Small Lakes

2007 Findings

- **Low or Moderate Trophic State Indicators - Total Phosphorus**
- **High Trophic State Indicators - Total Phosphorus**

N

0 3 6 Miles

May 2009

Map produced by King County DNRP GIS and WLR Visual Communication Unit.
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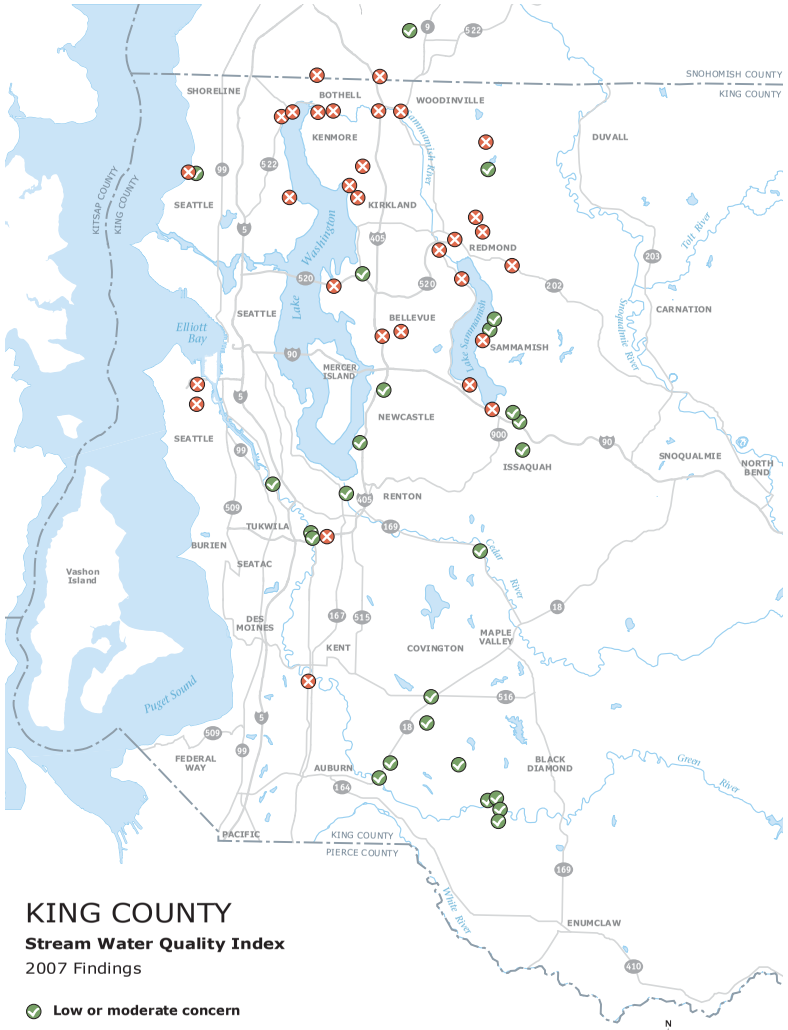
King County



KING COUNTY

Stream Water Quality Index

2007 Findings

- **Low or moderate concern**
- **High concern**

N

0 3 6 Miles

May 2009

Map produced by King County DNRP GIS and WLR Visual Communication Unit.
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King County