Freshwater Quantity

Although Puget Sound is known for plentiful rain most of the year, the roaring torrents of spring can slow to a trickle during our dry and sunny summer months. Although this seasonal variation is normal, development that draws water away from streams can exacerbate the problem.

Low summer flows can affect salmon runs, wildlife, and our water supply. New wells that tap ground water and new buildings, roads, and parking lots that prevent water from percolating into the ground reduce the amount of water that would otherwise recharge summer streams.

Freshwater Quantity

INDICATOR:

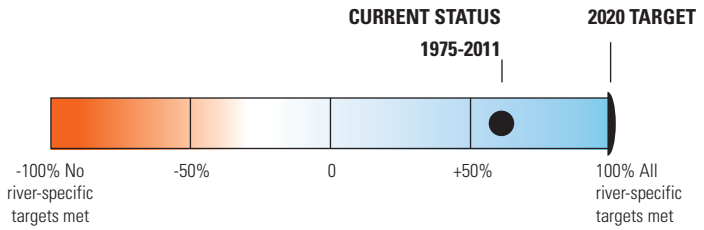
Summer Low Flows

Indicator lead:Paul Pickett, Washington Department of Ecology

TARGET:
Increase, maintain, monitor, and/or restore summer flows in 12 key rivers, including those regulated by dams (Nisqually, Cedar, Skokomish, Skagit, and Green Rivers,) and those that are not (Puyallup, Dungeness, Nooksack, Snohomish, Deschutes, North Fork Stillaguamish, and Issaquah Rivers).

PROGRESS:

IS THE TARGET MET?	NO	IS THERE PROGRESS?	Mixed



Targets for summer low flows were met in 2011 for seven out of 12 rivers (58%).

Progress Towards the 2020 Target

The trend in summer low flows for seven of the 12 rivers met their targets in 2011. With just 58% of target rivers trending positively, progress is mixed.

The target for low summer flows (maintain, increase, monitor, or restore) varies per river:

- Maintain stable or increasing flows in highly regulated rivers: Nisqually, Cedar, Skokomish, Skagit, and Green.
- Monitor low flow in the Elwha River after dam removal. (There is no specific flow target established for the Elwha River because of the dynamic changes occurring from river restoration activities). See page XX53 for more information on the Elwha Dam removal.
- Maintain stable flows in unregulated rivers that currently are stable: Puyallup, Dungeness, and Nooksack.
- Restore low flows to bring the Snohomish River from a weakly decreasing trend to no trend.
- Restore low flows to bring the Deschutes River, North Fork Stillaguamish River, and Issaquah Creek from a strongly decreasing trend to a weakly decreasing trend.

All five rivers that are highly regulated by dams were expected to maintain or increase their flows. The Green and Skagit Rivers were stable and the Nisqually, Cedar and Skokomish Rivers had strongly increasing flows.

Three rivers not regulated by dams were expected to maintain stable flows. The Puyallup and Dungeness Rivers had weak increasing flows and Nooksack had a weak decreasing flow; thus, two out of three met their target.

The Snohomish River remained weakly decreasing and did not meet its target. The Deschutes River, North Fork Stillaguamish River, and Issaquah Creek did not improve from strongly decreasing trends; thus, all four failed to meet their targets.

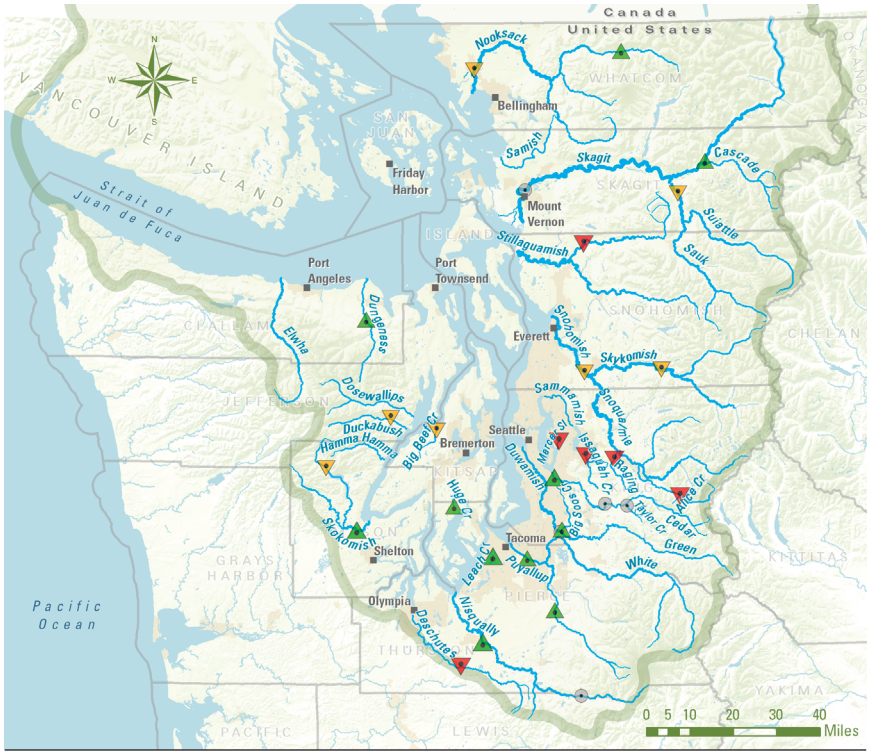
What Is This Indicator?

Low flow occurs during summer months when there is less rain and warmer temperatures. Summer low flow is measured as the 30-day minimum water flow at river and stream gaging stations.

The summer low flow indicator measures trend over a long time period. The indicator tracks how flow conditions are changing over the years, rather than comparing flow levels to a fixed value. The indicator is not sensitive to changes over a shorter time period, which makes it difficult to measure improving trends by 2020, even if significant flow restoration occurs. To measure a change, either large changes in flow must occur, such as a dam setting minimum downstream flows, or a very consistent change over a long period of time will be needed.

The indicator tests whether the long-term trends of annual summer low flow levels are declining or increasing. The trend test uses data collected since 1975, representing more than 30 years of measurements. The advantage of a long-term data set is that the influence of climate changes associated with regional cooling and warming cycles (e.g., the phases of the Pacific Decadal Oscillation) are minimized over time.

One possible way to address this limitation would be to develop a method to evaluate trend over a shorter time period. One approach to accomplish this would be to standardize flows by removing the influence of climate and rainfall over a shorter time period (five-10 years).



Trends in 30-day average summer low flow (1975–2011)

Strong increasing	Cities and Urban Growth Areas
Weak increasing	County border
No trend	Salish Sea Basin boundary
Weak decreasing	
Strong decreasing	

Freshwater Quantity

Interpretation of Data

Status and Trend

River-specific targets were created for 12 locations for the Action Agenda. To provide a more complete regional picture, 17 additional gages were also evaluated. Of the 29 gages used to measure summer low flow (Table 1):

- 15 gages are located near the mouth of major rivers or small streams that drain directly to Puget Sound
- Six gages are from upstream sites on the mainstem of major rivers
- Eight gages are from tributaries to major rivers.

Of the stations assessed, 55% had stable or increasing summer low flows (16 out of 29; Figure 1). Rivers regulated by dams with mandatory minimum downstream flows generally showed increasing or no trends (Skagit, Cedar, Green, Puyallup, Nisqually, and Skokomish Rivers). Some of the glacier-fed upper tributaries had increasing trends (North Fork Nooksack River, Puyallup River at Orting). This could be the result of climatic warming trends and glacial recession.

The Cedar River near Landsburg immediately below the reservoir but above the City of Seattle water diversion showed no trend, while the Cedar River at Renton (near the mouth) showed a strong increasing trend. Low flows upstream were almost twice the low flows downstream. Taken together this shows the effect of the implementation of the City of Seattle Habitat Conservation Plan.

Stream Flow Trends in 29 Puget Sound Rivers
30-day average summer low flow, 1975-2011

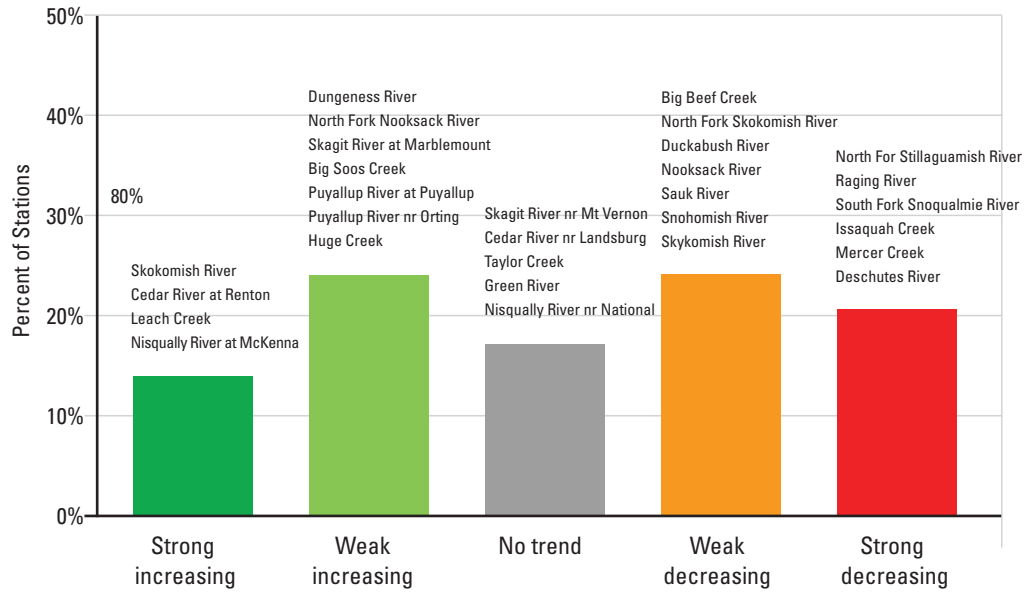


Figure 1. Summer low flow trends by category.
Source: *USGS Flow Gaging Network*

Unregulated rivers and streams that showed decreasing summer low flows included the Issaquah and Mercer Creeks, which are in urban areas, and the North Fork Stillaguamish, South Fork Snoqualmie, and Raging Rivers, which are in areas of rapid population growth. The effect of increased impervious surfaces and ground and surface water withdrawals may be affecting those summer low flow levels. The Deschutes River showed a strong decreasing trend even though the watershed above the gaging station is mostly forested land. Decreasing summer low flows there may be due to forest practices or climate change. The Dungeness River showed a weak increasing trend for the upper watershed. Current work to restore flows in the developed areas of the lower watershed is downstream of this gage.

How Much is Water Worth?

The Nisqually and Snohomish Pilot Watersheds Services Transaction Projects

Two Washington state watersheds—the Nisqually and Snohomish—have been credited with protecting and restoring the largest amount of habitat in Puget Sound to date. Now these watersheds have been selected as the most likely candidates for an innovative strategy to keep working forests in the State of Washington from being converted to non-forest uses. How? By getting potential buyers, such as utilities, flood districts, or tribal nations, to pay forest landowners to undertake specific land management activities that achieve measurable improvements in watershed services and enhance water quality, increase water supplies, and improve salmon habitat protection.

The Watershed Services Transaction Project was launched in June 2011 by the State Department of Natural Resources in collaboration with the University of Washington Northwest Environmental Forum. After extensive deliberation during the Forums held in 2010 and 2011, the Snohomish and Nisqually watersheds were identified as the most likely pilot locations for watershed services transactions, primarily because critical organizations presented themselves to lead the projects.

Forested watersheds provide almost two-thirds of the drinking water in the United States. Many other critical services, such as timber, flood control, habitat for animals and birds, and carbon sequestration and recreation, are provided by forests, but we too often assume that forest landowners will continue to manage their lands to realize all of these values and that they do not need to be compensated.

A few locations around the country are developing comprehensive valuations of the benefits provided by forests, and creating incentives for private landowners to manage their forests for these diverse public values. "Payments for watershed services" is an approach that has been implemented successfully in a few communities, and is now being considered in Washington.

The Snohomish River Basin pilot project addresses the second largest drainage in Puget Sound. Seventy four percent of the drainage is forest land. The basin is also one of the fastest growing areas in the region, and it is critical to balance the area's growth needs with maintaining a healthy ecosystem. A recent study valued the potential benefits provided in the watershed to range from a low of $383.1 million to a high of $5.2 billion. Snohomish County Department of Public Works is leading this demonstration transaction, joined by several key watershed partners, including the Tulalip Tribes, Forterra, King County, and Washington DNR.

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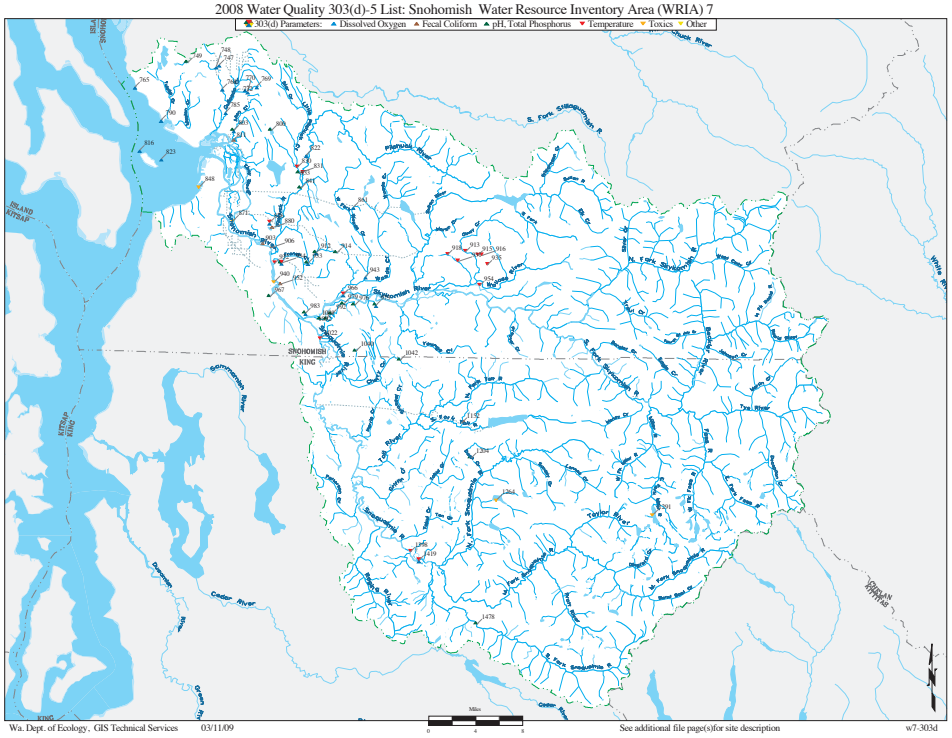
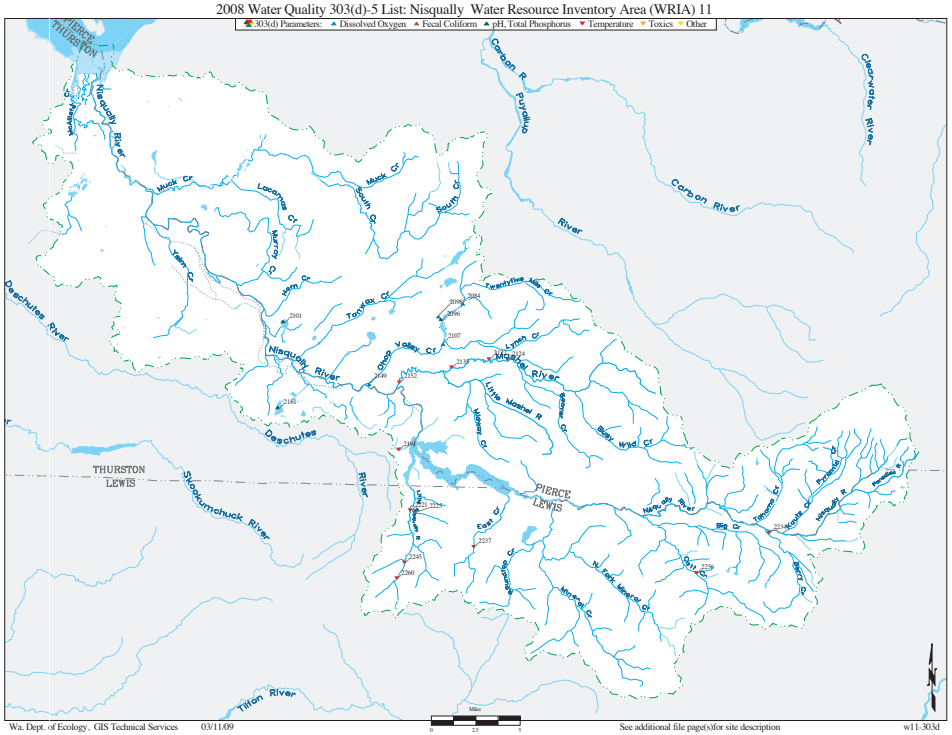
How Much is Water Worth?

LOCAL STORY

The Nisqually pilot project focuses on the Nisqually watershed, which encompasses 78 miles of habitat, from the Nisqually Glacier on Mount Rainier to the delta in the Nisqually National Wildlife Refuge. The watershed has a range of land uses, including rural communities; parks, such as Mt Rainier; hydropower projects; military bases and the Nisqually Indian Reservation. The communities, tribes, and organizations in the watershed have worked together to conserve, restore and protect habitat in the basin. The Nisqually River Council, Nisqually Land Trust, and Northwest Natural Resource Group are spearheading the watershed services pilot project. As in the Snohomish project, their focus will be to provide a demonstration transaction and deliver new sources of income to forest landowners that help them offset the costs of new practices that improve water quality and quantity.

The pilot projects are intended to benefit the individual watersheds, and also provide an effective and transferable model for a state or perhaps national watershed services program. A successful Watershed Services Transaction Project in these two locations can lead the way to address future water supply and water flow needs and create a new financing mechanism for restoration and recovery of the Puget Sound and to sustain Washington's valuable private forest lands.





Snohomish and Nisqually watershed