



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.



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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
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TARGETS FOR SUMMER LOW FLOWS: -100% No river-specific targets met, -50%, 0, +50%, 100% All river-specific targets met.

CURRENT STATUS: 1975-2011

2020 TARGET:

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.

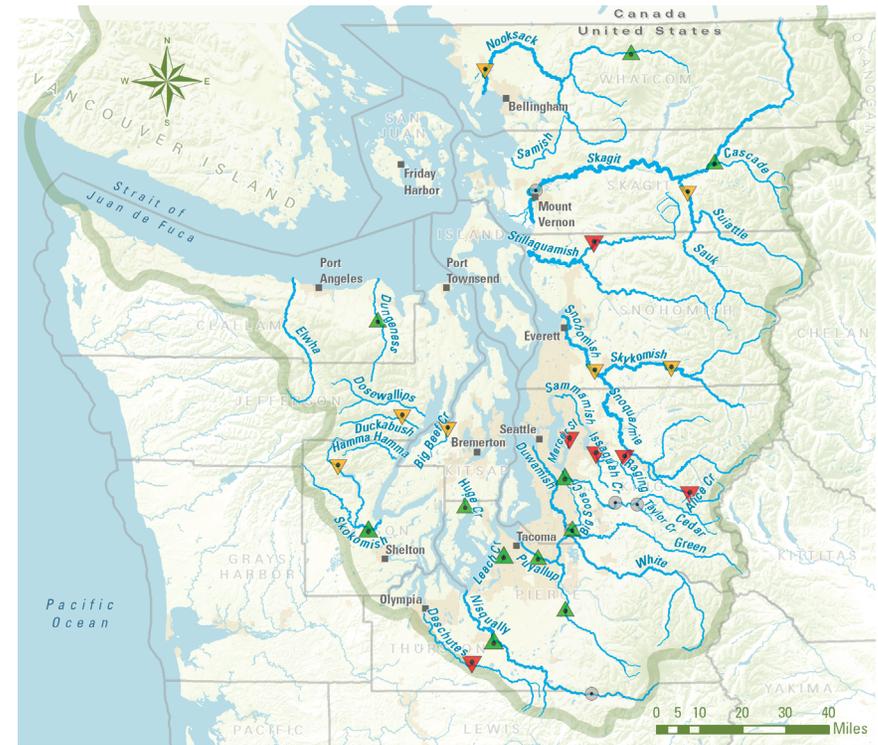
What Is This Indicator?

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.

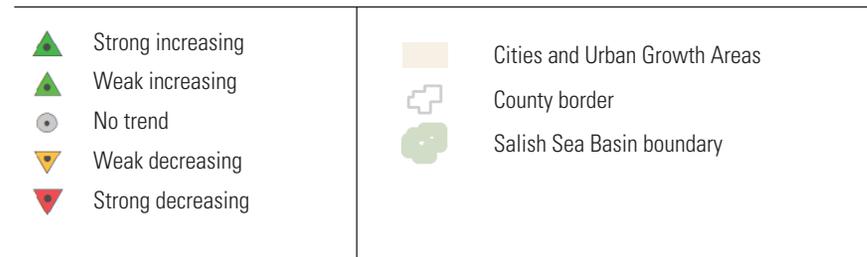
The summer low flow indicator measures trend over a long time period. The indicator tracks how flow conditions are changing over the years, rather than comparing flow levels to a fixed value. The indicator is not sensitive to changes over a shorter time period, which makes it difficult to measure improving 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)



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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

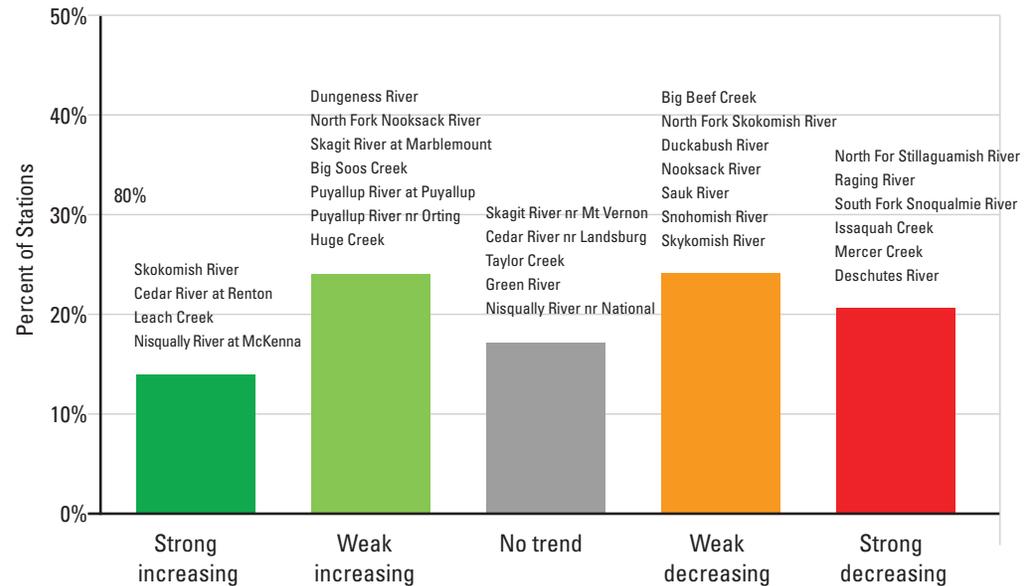


Figure 1. Summer low flow trends by category.
Source: USGS Flow Gaging Network

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.