

PUGET SOUND VITAL SIGNS

INDICATOR NITRATE CONCENTRATION IN SOURCE WATER

This indicator measures the ecosystem's ability to provide clean drinking water by tracking the concentration of nitrate in groundwater, before water enters public drinking water systems (raw groundwater, pre-treatment). Nitrate occurs naturally in groundwater but is also a widespread chemical that can cause adverse health effects if consumed in too large amount. The detection of elevated concentrations of nitrate may help identify areas that are at greater risk of groundwater contamination.

Indicator
Progress

Target
Status



Target

No targets are currently set for this indicator.

Data Source

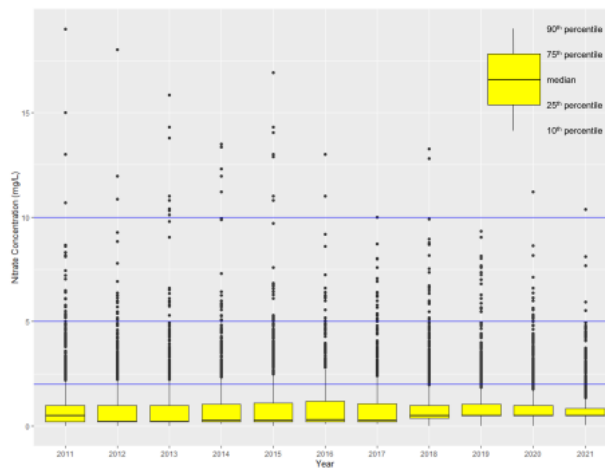
Washington State Department of Health, Water System Data [Sentry Database](#)

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Annual nitrate concentration (mg/L) in groundwater sources for Group A systems across Puget Sound (2011-2021). The yellow boxes illustrate the middle 50% of the concentration values, showing the first quartile (25th percentile), median (center), and third quartile (75th percentile). Whiskers are drawn to the 10th and 90th percentile; points outside the whisker boundaries represent outlier values. Blue reference lines are drawn at 2, 5 and 10 mg/L to show regulatory and health thresholds. Nitrate concentrations below 2 mg/L reflect levels found in natural groundwater. Concentrations above 2 mg/L indicate human activities contribute to contamination. When concentrations exceed 5 mg/L the frequency of sampling increases to better monitor concentrations. 10 mg/L is the EPA's maximum contaminant level for nitrate.

Key Vital Sign Indicator Results

- The vast majority of Puget Sound residents get their drinking water from public water supply systems. Nearly 98% of the Puget Sound population is served by large systems known as Group A water systems, which have more than 14 connections or serve 25 or more people 60 or more days per year; over half of these people receive water sourced primarily from groundwater supplies.
- Nitrates occur naturally in groundwater but are also found in fertilizers, animal manure and waste from septic systems, which may greatly increase nitrate concentration in groundwater. If consumed in too large amount, nitrates pose a health risk. The Safe Drinking Water Act nitrate limit for delivery of water from public water systems, set to protect against adverse health effects, is 10 mg/L.
- Most groundwater in Puget Sound is not contaminated by nitrates. Across Puget Sound, the average concentration of nitrate in source groundwater (pre-treatment) remained at low levels from 2011 to 2021. Concentrations of nitrates above 2 mg/L in groundwater supplies indicate human activities are the source of the contaminant (Nolan et al., 1998). Regionally, the annual median concentration ranged from 0.25 to 0.50 mg/L meaning that the majority of groundwater sources to public water systems do not show signs of human caused nitrate pollution (see [Interpretation of Results](#)). Less than 15% of groundwater samples collected each year have nitrate concentrations above 2 mg/L.
- In most years, only 2% of groundwater samples exceed 5 mg/L. For these water sources, samples are taken more frequently to ensure concentrations stay “regularly and consistently” below 8 mg/L.
- If nitrate concentrations exceed 10 mg/L, the system must notify customers and install expensive treatment systems in order to provide clean water to the public. Five Group A water systems in Puget Sound treat water for nitrate contamination: four in Whatcom County and one in Island County.
- Whatcom and Island counties had a higher proportion of groundwater samples with nitrate concentrations above 5 mg/L relative to other Puget Sound counties. Widespread and decades-long nitrate contamination, primarily from manure applied to crops and fertilizers, has been well documented in northwestern Whatcom County groundwater. Education and outreach is ongoing in this county to address nitrate pollution. Potential areas to watch for increasing nitrates are in Clallam, Pierce, and Thurston County.

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