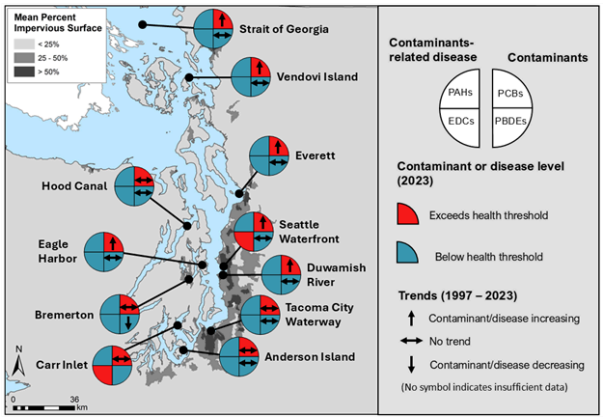
PUGET SOUND
VITAL SIGNS

INDICATOR
CONTAMINANTS IN ENGLISH SOLE

Contaminant concentrations are measured in English sole fillets and used, along with disease occurrence in the liver and gonads, to assess impacts of contaminants in the benthic (seafloor) habitat. PCBs and PBDEs in fillets indicate contaminant levels people may be exposed to from eating benthic fish. Liver tumors and the presence of a female-specific protein, vitellogenin, in male fish indicate health impairments due to PAH and EDC exposure, respectively, in the benthic habitat.



Contaminant and disease levels in English sole from 11 index sites. For contaminants, red indicates high contamination where some samples (5th percentile or greater) exceed the specific health thresholds and blue indicates low contamination, with most samples (95th percentile or greater) below the thresholds. For PAH- or EDC- related disease, red indicates significantly higher odds of disease compared to baseline, whereas blue indicates no significantly elevated odds.

Indicator Progress

MIXED RESULTS

Target Status

BELOW TARGET

Target

By 2030, 95% of the samples gathered across Puget Sound habitats exhibit a declining trend of contaminant levels, or are below thresholds of concern for species or human health.

By 2050, 95% of the samples gathered across Puget Sound habitats exhibit contaminant levels below thresholds of concern for species or human health and show no increasing trends.

Target fact sheet

Data Source

PCB and PBDE contaminant levels and time trends calculated from West et al. 2017 and from Causey et al. *in prep*.

PAH-induced liver disease and EDC-induced vitellogenin odds ratios calculated from Washington Department of Fish and Wildlife, Toxics Biological Observation System unpublished data.

Indicator Lead

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Key Vital Sign Indicator Results

- Contaminants in English sole did not meet the recovery goal (see target description) because PCB levels in English sole fillet tissue exceeded the human health screening value and English sole males showed signs of reproductive impairment at Central and South Puget Sound locations.
- PCB levels in English sole fillet tissue exceeded the human health threshold at 11 out of 11 (all) index sites. PCB levels have **increased** at six locations (Strait of Georgia, Vendovi Island, Everett, Seattle Waterfront, Eagle Harbor & the Duwamish River) in the past 26 years and have held steady at the remaining five locations (Hood Canal, Bremerton, Tacoma City Waterway, Carr Inlet & Anderson Island).
- English sole fillet PBDE concentrations were below the human health screening value at all 11 locations, where they are either **holding steady or decreasing.**
- Liver disease resulting from exposure to PAHs has significantly declined at six index sites including Everett, Eagle Harbor, Seattle Waterfront, Duwamish River, Anderson Island and Tacoma City Waterway. In the mid-1990s, the odds of disease were 2.5 to 40 times higher at these sites compared to baseline, but are no longer significantly elevated compared to background levels. **In 2019, the 2030 recovery target for PAHs was reached for all index sites.**
- Male English sole from two out of 11 (18%) sites showed symptoms of EDC-related reproductive impairment.
- **We consider this indicator to exhibit "MIXED RESULTS"** because although there has been some improvement in the contaminants in English sole (PAHs and PBDEs), PCB concentrations remain high in fish from urban and near-urban bays and EDC-related vitellogenin induction continues in both urban and non-urban (rural/residential) areas. These results suggest continued PCB and EDC inputs to Puget Sound, likely via legacy superfund sites, stormwater runoff and wastewater effluent (EDCs). These sources will likely increase as the Puget Sound region population continues to grow.

CONTRIBUTING PARTNERS

Washington Department of FISH & WILDLIFE