

Puget Sound Partnership – ecosystem outcomes and provisional indicators

The legislation that created the Puget Sound Partnership (RCW 90.71) provides six goals and requires that the Partnership identify measurable outcomes for each goal, specifically describing what will be achieved, how it will be quantified, and how progress toward outcomes will be measured.

This document presents the ecosystem outcomes and indicators identified (to date) by the Partnership. These outcomes and indicators are a critical component of the Partnership's performance management approach, which will also include performance measures by which strategies, tactics, and actions will be evaluated.

The indicators listed here, for four of six goals, were identified through a technical evaluation of available indicators. Partnership staff and partners continue to work with science panel members to evaluate and organize indicators for the two remaining goals and identify benchmarks to further specify success in achieving the desired outcomes. For many indicators, the Partnership will describe success as an improvement in the condition measured by the indicator (i.e., a measurable change in the desired direction). For some indicators (at least one per goal), the Partnership will identify quantitative 2020 targets and interim benchmarks.

1. A healthy human population supported by a healthy Puget Sound that is not threatened by changes in the ecosystem

Shorthand name: Human health

- Fish and shellfish are safe for people to eat
 - Available indicator: Marine fish consumption advisory
 - Available indicator: Acres and trends in shellfish commercial growing area closures
 - Available indicator: Shellfish closures for Paralytic Shellfish Poison (PSP)
 - Available indicator: Domoic acid contaminant levels (biotoxins)
 - Potential indicator: Shellfish consumption advisory
 - Potential indicator: Freshwater fish consumption advisory

- Air is healthy for people to breathe
 - Available indicator: Air quality index - # good days
 - Available indicator: Air quality – particulates

- Freshwaters are clean for drinking
 - Available indicator: Drinking water quality
 - Potential indicator: Groundwater quality for drinking water

- Marine and freshwaters are clean for contact
 - Potential indicator: Percent of swimming beaches that meet safe swimming standards at all times during the summer

2. A quality of human life that is sustained by a functioning Puget Sound ecosystem

Shorthand name: Human well-being

Outcome statements from 2006 Puget Sound Partnership:

- Aesthetic values, opportunities for recreation, and access for the enjoyment of Puget Sound are continued and preserved.
- Terrestrial and marine resources are adequate to sustain the treaty rights, as well as the cultural, spiritual, subsistence, ceremonial, medicinal needs, and economic endeavors of the tribal communities of Puget Sound.
- The Puget Sound ecosystem supports thriving natural resource and marine industry uses such as agriculture, aquaculture, fisheries, forestry, and tourism.
- The Puget Sound's economic prosperity is supported by and compatible with the protection and restoration of the ecosystem.

Ecosystem indicators for each outcome are TO BE DETERMINED. A staff effort to evaluate and recommend potential indicators from a lengthy list of candidates is underway.

3. Healthy and sustaining populations of native species in Puget Sound, including a robust food web

Shorthand name: species and food webs

Outcomes and indicators for this goal TO BE DETERMINED. A staff and science panel group continues work to evaluate and organize candidate indicators.

4. A healthy Puget Sound where freshwater, estuary, near shore, marine, and upland habitats are protected, restored, and sustained

Shorthand name: Habitat

- Marine/nearshore habitats sustain diverse species and food webs and are formed by natural processes and human stewardship so that ecosystem functions are sustained
 - *Do we need to articulate more specific outcomes – e.g., specific habitat types? processes? functions?*
 - Available Indicator: Marine parameters
 - Available indicator: Eelgrass
 - Potential indicator: Marine shoreline geomorphology
 - Potential indicator: Kelp and other seaweeds
 - Potential indicator: Saltmarshes
 - Potential indicator: Intertidal biotic community status and trends
 - Potential indicator: Shoreline armoring of marine/nearshore habitats

- Freshwater habitats sustain diverse species and food webs and are formed by natural processes and human stewardship so that ecosystem functions are sustained
 - *Do we need to articulate more specific outcomes – e.g., specific habitat types? processes? functions?*
 - Available indicator: Physical habitat and freshwater parameters
 - Potential indicator: Maximum temperature in freshwater
 - Potential indicator: Channel armoring in freshwater habitats
 - Potential indicator: Floodplain connectivity in freshwater habitats
 - Potential indicator: Change in wetland acreage
 - Potential indicator: Number of artificial fish barriers
 - Potential indicator: Fish passage barrier improvements
- Terrestrial habitats sustain diverse species and food webs, sustain marine and nearshore habitats, and are formed by natural processes and human stewardship so that ecosystem functions are sustained
 - Available indicator: Old growth forest change
 - Available indicator: Transportation pressure
 - Available indicator: Road densities
 - Available indicator: Land cover status and trends
- Non-native species do not significantly impair habitat quality, quantity, or the processes that form and maintain habitats
 - Potential indicator: Non-native invasive aquatic marine species
 - Potential indicator: Non-native invasive species threat on all habitats

5. An ecosystem that is supported by ground water levels as well as river and stream flow levels sufficient to sustain people, fish, and wildlife, and the natural functions of the environment

Shorthand name: Water quantity

- Freshwater quantity is sufficient to support freshwater and terrestrial food webs and human uses and enjoyment
 - Available indicator: Snow pack
 - Available indicator: Glacier mass balance
 - Potential indicator: Annual maximum daily flow
 - Potential indicator: Annual mean flow
 - Potential indicator: TQmean – flow flashiness
 - Potential indicator: Annual 7-day low flow
 - Potential indicator: Violations in Ecology instream flows
- Freshwater delivery to shorelines and estuaries supports estuarine, nearshore and marine food webs and the habitats upon which they depend
 - Potential indicator: Stream flows to Puget Sound marine/nearshore habitat
- Flooding hazards do not harm people, residences, and transportation
 - Available indicator: Frequency of flood events

6. Fresh and marine waters and sediments of a sufficient quality so that the waters in the region are safe for drinking, swimming, shellfish harvest and consumption, and other human uses and enjoyment, and are not harmful to the native marine mammals, fish, birds, and shellfish of the region

Shorthand name: Water quality

- Loadings of toxics, nutrients, and pathogens do not exceed levels consistent with healthy ecosystem functions
 - Available indicator: Oil spills
 - Potential indicator: Toxics in biosolids from WWTP
 - Potential indicator: Nutrient loadings in rivers to Puget Sound
 - Potential indicator: Microbial pollution assessment – Sinclair-Dyes inlets
- Toxics in marine waters and sediments, and in mammals, fish, birds, shellfish, and plants in these waters, do not harm the persistence of these species
 - Available indicator: Chemical contamination in Puget Sound sediments
 - Available indicator: Toxics in marine benthic fish
 - Available indicator: Toxics in marine pelagic fish
 - Available indicator: Liver disease in English sole
 - Potential indicator: Sediment quality triad index
 - Potential indicator: Acute toxicity associated with Puget Sound sediments
 - Potential indicator: Toxics in clams
 - Potential indicator: Toxics in mussels
 - Potential indicator: Fish tissue contamination index
 - Potential indicator: Contaminants in whole fish
 - Potential indicator: Toxics in juvenile salmon
 - Potential indicator: Toxics in osprey eggs
 - Potential indicator: Toxics in harbor seals
- Pathogens, nutrients, and ocean influences do not harm the mammals, fish, birds, shellfish, and plants that depend on the marine waters of Puget Sound
 - Available indicator: Marine water quality (multiple parameters)
 - Available indicator: Nutrients in marine waters
 - Available indicator: Fecal pollution index (FPI) for commercial shellfish beds
 - Potential indicator: Sensitivity to eutrophication in marine/nearshore habitats
- Pathogens, nutrients, toxic contamination, sedimentation, elevated temperatures, and other water quality concerns do not harm fish, invertebrates, and wildlife that depend on the fresh waters of Puget Sound
 - Available indicator: Water quality parameters in streams
 - Potential indicator: Water quality index
 - Potential indicator: Phosphorous levels in small lakes and large lakes
 - Potential indicator: Water quality – dissolved oxygen and temperature in lakes
 - Potential indicator: Fecal bacteria in streams
 - Potential indicator: Fecal bacteria at lake non-swimming beaches
 - Potential indicator: Fecal bacteria at lake swimming beaches
 - Potential indicator: Toxics in freshwater
 - Potential indicator: Toxics in freshwater fish – multiple sources