A Consideration Of The Harbor Porpoise As A Sentinel Species For The Salish Sea

Research by the Harbor Porpoise Project
Biota Maxima

The Salish Sea: A Once Thriving Resource On The Rebound

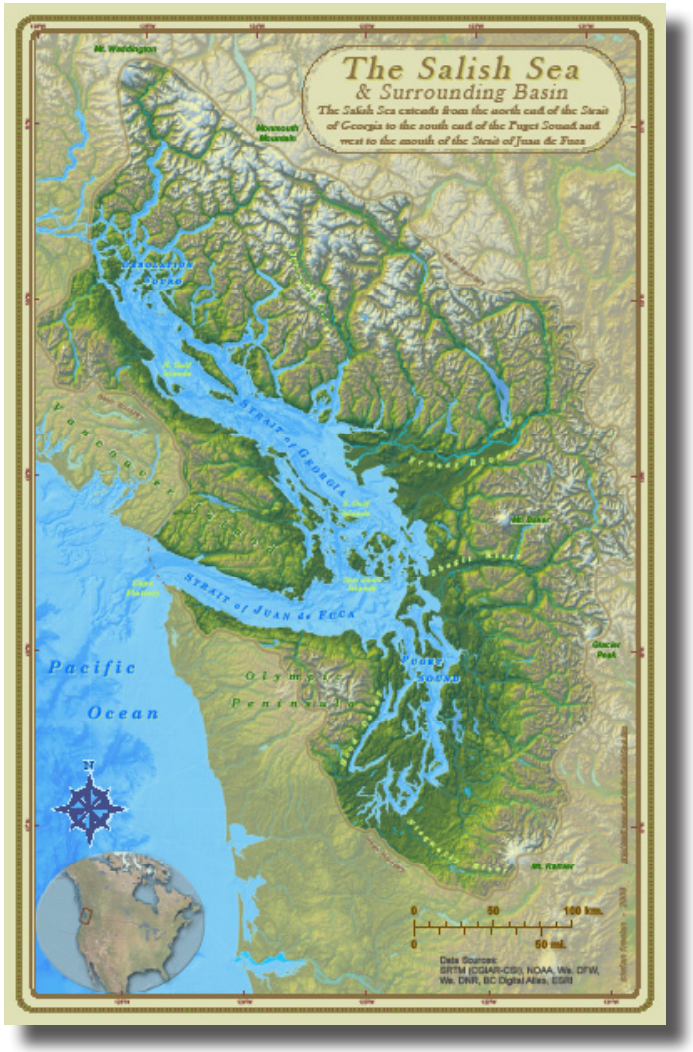
Prior to the settlement era, the Salish Sea teemed with an enormous diversity of life. Native American communities and the earliest settlers benefited from the abundance of valuable resources. In less than a century, the rapid growth of the settlement communities located around the Salish Sea depleted many of the once abundant resources and seriously degraded the marine environment. A wide variety of pollutants were introduced, significantly altering the habitats critical to the life of many marine organisms.

The health of the Salish Sea ecosystem had diminished by the 1970s to the point that many components of the ecosystem were in critical condition. Several species were virtually eliminated.

After the 1970s, public recognition of the degraded state of this ecosystem grew and concerned citizens launched efforts to restore the health of this body of water. In the United States, non-profit organizations, such as People for the Puget Sound, and governmental agencies, including Puget Sound Partnership, Washington Department of Fish and Wildlife, Washington Department of Ecology, the Environmental Protection Agency and the National Oceanic and Atmospheric Administration, became active in a variety of efforts to restore ecosystem components, protect habitat, reduce pollution and regulate exploitation of resources.

Today, we are beginning to see signs that these efforts are starting to have a positive effect, but the health of the Salish Sea ecosystem is still greatly diminished from its pre-settlement state.

The Salish Sea ecosystem is arguably the region's greatest asset. Efforts to restore the health of this ecosystem and monitor this progress are essential to our future. We won't be able to fully realize the benefits provided to our society by this unique marine ecosystem unless we restore it.



Map of the Salish Sea and Surrounding Basin.
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Monitoring A Sentinel Species Is A Practical, Cost-Efficient Solution

Monitoring the health of the Salish Sea ecosystem is a priority for the current conservation, restoration and clean-up efforts directed at this ecosystem. Without objective monitoring, it will be impossible to gauge whether efforts to restore this high-value ecosystem have been effective.

Many methods of monitoring the health of marine ecosystems are possible. The Puget Sound Partnership has suggested 61 indicators for monitoring the health of the Puget Sound (O'Neill et al 2008).

The expense of monitoring every different component of a complex ecosystem is out of the range of public agencies that are coping with extensive budget cuts. Fortunately, the complex interaction networks that comprise marine ecosystems are organized in such a way that a few "sentinel species" can be used as indicators of the health of the entire ecosystem.

From a practical perspective, having a few reliable species that are relatively easy to monitor helps multiple agencies and organizations work together and share data. It is also easier for citizen science efforts to help fill gaps in the research on ecosystem conditions.

Aileen Jeffries began studying the harbor porpoise in 2007. We have concluded that the Inland Waters Harbor Porpoise meets the characteristics of an ideal sentinel species for the Salish Sea. We are working to see that efforts to monitor this species are furthered and expanded upon.

Characteristics of the Harbor Porpoise

Its diet, range, status and life span all add up to make the harbor porpoise an ideal sentinel species for the Salish Sea

**** It's a marine mammal.***
Numerous scientists have already concluded that marine mammals, in general, are effective sentinel species for monitoring marine ecosystem health.

**** The harbor porpoise's diet is a measure of health.***
In a marine environment, the health and size of the forage fish populations are critical indicators of ecosystem health. Species near the apex of complex food webs can illustrate the overall health of the entire ecosystem.

The harbor porpoise feeds on small forage fish such as herring, smelt, sand lance and others. Consequently, the balance and health of the Salish Sea ecosystem may be measured by the foraging success of the harbor porpoise.

**** It's a sensitive creature.***
The population of an ideal sentinel species will fluctuate with a changing environment. Such a population goes up when the environmental conditions improve and goes down when those conditions deteriorate.

The harbor porpoise shows this trend, having declined significantly from its pre-settlement abundance, but it now may be making a rebound.

**** Harbor porpoises don't leave the Salish Sea.***
An ideal sentinel species will spend the vast majority of its life within the area that is being monitored. Only when this is the case can changes in population be tied to changes in the ecosystem within the monitoring area and not outside of it.

The harbor porpoise is the only cetacean found in the Pacific Northwest that is entirely resident to the Salish Sea.

**** Harbor porpoises aren't endangered yet.***
An ideal sentinel species is sufficiently abundant that it is both reasonably easy to monitor and that the population can respond to changes in environmental conditions.

Very rare species will be too isolated, and not well distributed in the area to be monitored. Their small populations can be less responsive to, or much slower to respond to changes in environmental conditions, especially positive ones.

A more abundant species that at least has the potential to be well distributed across the area to be monitored can be a better indicator of both positive and negative changes in environmental conditions within localized areas. That information can more readily the applied across the studied landscape.

Harbor porpoises have been listed as a Species of Special Concern in Canada and they are a Candidate Species of Concern in Washington State. While significantly impacted by negative factors in the environment, harbor porpoises are not a threatened or endangered species. They are still relatively abundant and, potentially, well distributed throughout the Salish Sea.

**** The harbor porpoise bears young frequently, allowing us to see if restoration efforts have been successful sooner.***
An ideal sentinel species will have a relatively fast reproductive rate, responding more quickly to changing environmental conditions. Populations with slower reproductive rates will exhibit more lag in their response to changing conditions.

Female harbor porpoises can produce one calf each year for approximately 15 years of their 20-year life span.

**** Citizen scientists can monitor the harbor porpoise population.***
To be most cost effective, an ideal sentinel species must be relatively easy to monitor. Important considerations in the choice of a sentinel species are that it can be easily observed and that its distribution and population information can be easily recorded in an objective fashion without excessive costs.

Trained observers can distinguish the harbor porpoise from other marine creatures without much difficulty. They are also a species that people find intriguing almost instantly.

**** A harbor porpoise's blubber holds pollution that we need to be aware of for our own health.***
Monitoring a sentinel species is primarily used to determine the health of an ecosystem, but, with certain sentinel species, scientists can also watch for threats to human health.

Harbor porpoises' blubber collects and stores pollutants. "The harbor porpoise, being vulnerable to pollutants, may be an excellent sentinel species for detecting high levels of pollutants in nearshore waters" (Money and Trites 1998).

Phocoena phocoena