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The 'Discovery' of the Salish Sea

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The world has a new sea, the Salish Sea

By Bert Webber, June 19, 2011

As marine scientists learned about the integrated marine life of Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia, they realized the need for a common name. The key advocate recounts the tale of the naming of the Salish Sea.

The story of naming the Salish Sea starts with the discovery of crude oil on Alaska's arctic shores and the plans to bring, in the mid 1970s, much of this oil into Washington state's inland marine waters for refining. The oil industry was getting ready for this North Slope oil to come to Washington. A new refinery was being built at Cherry Point for the ARCO Company and tankers were being constructed (including the Exxon Valdez) for the trip from Valdez, Alaska to various locations in Washington's inland marine waters, mostly around Anacortes and Cherry Point. The potential for oil spills awakened the state and federal government's interest in studying the risk to marine resources.

The scientific knowledge that evolved because of the threat of spilled oil, combined with my lifelong interest in things associated with salt water, led me to understand that people living by the Strait of Juan de Fuca, Puget Sound, and the Strait of Georgia all live by an unified inland sea, then unnamed.

It is the sea on which I grew up. I spent many summers as a young kid with my grandparents in White Rock, British Columbia. I would sit on the beach and wonder about the islands (mostly Orcas Island) that dominated the horizon and invited curiosity about what was beyond. As I grew older I explored, fished (recreation and commercial), sailed on, dived under, and studied the inland marine waters of British Columbia and Washington.

In 1970 I joined the faculty of Huxley College of Environmental Studies at Western Washington University in Bellingham. I was interested in the human impact on marine resources, and joined the deliberations of business leaders, citizens, industry representatives, and government policy makers who were trying to understand the impact of the soon-to-come oil tankers from Alaska.

One of the issues under discussion was that of names used for parts of this inland sea. At a public hearing held by the Washington state Department of Ecology to take public input on the potential threat of oil spill, the state employees used the name “northern Puget Sound” to describe the area where I lived.

This was puzzling to me because Bellingham Bay borders on the Strait of Georgia and Rosario Strait. From what I knew from charts and maps you did not get to Puget Sound until you went south of a line between Port Townsend and Admiralty Head on Whidbey Island. At one point in the hearing, a veteran tug boat captain who had skippered tugs in the area for over 20 years asked the government folks just “where is northern Puget Sound?” He said in all his years he had never seen a chart with that name.

For me the lesson of that night was the importance of being clear about the meaning of a name.

Public concern over bringing "supertankers" into Washington's inland marine waters and the consequences of a major oil spill grew during the 1970s. A glimpse of what might happen with an oil tanker spill occurred in 1971 when 230,000 gallons of diesel fuel escaped from a fuel barge in Guemes Channel near Anacortes. There was very little ability to contain the spill, nor to evaluate its impacts. State and federal governments were unprepared to clean up and quantify the damage from this relatively small spill.

In the 1974 book *Superspill*, Mary Kay Becker and Patricia Coburn described a scenario of a large oil spill in Rosario Strait, foreshadowing what was to happen when the Exxon Valdez supertanker hit a rock in Prince William Sound and released an estimated 33 million gallons of crude oil into the marine environment with devastating impacts on marine life. To a large part the public concern about oil spills convinced the Washington state government to require tug escorts for tankers carrying crude oil into the inland sea.

Public concern also convinced both state and federal governments to start and continue programs of quantifying the marine resources along the tanker routes. The state Department of Ecology started an extensive study of shoreline organisms around 1974. A few years later the National Oceanic and Atmospheric Administration started a Marine Ecosystem Analysis Program (MESA), to describe the ecology of the areas most at risk from an oil spill. MESA was an ecosystem-based study and a pioneering approach to understanding the structure and function of an entire ecosystem.

The MESA program brought together scientists from different specialties to study the ecosystem properties of the Strait of Juan de Fuca and the southern part of the Strait of Georgia. Oceanographers studied the circulation of the marine waters and how and where they mixed with fresh water from the rivers. Chemists studied the ways in which the fresh water from rivers diluted

the salt water from the ocean and described these patterns of salinity from the surface to the bottom and from the mouth of the rivers to the Pacific Ocean. Chemists also described the patterns of the concentration of nitrogen (the nutrient in the salt water that drives the rate of biological productivity and when in excess can cause eutrophication).

Biologists cultured the bacteria of marine sediments to learn if forms existed that could break down the hydrocarbons of crude oil (they can). The relationships of the plants and animals that live in the three-dimensional water space, (called the pelagic zone) were studied. The interactions of benthic organisms (those living in and on the substrates of shallow water), were also studied. Population numbers of many species were estimated. The resulting picture showed that organisms of the inland sea could be understood as a single food web.

I was part of that science team. What we found was an ecosystem that is best understood as an integrated inland sea consisting of Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia. This inland sea ecosystem had not been previously described. From our studies we learned that the foundation of this ecosystem is the interaction between the fresh water discharges from rivers flowing into the inland sea with the salt water from the Pacific Ocean.

Our inland sea is an estuary with water fresher than the ocean and saltier than the rivers. The mixing of the fresh water from the rivers and the salt water from the ocean creates a circulation of water in the inland sea that is the foundation of the estuarine ecosystem. As the fresh water of the rivers mixes with the salty ocean water, the water near the surface of the inland sea, now a diluted mixture of Pacific Ocean water and river water pushes seaward towards the western mouth of the Strait of Juan de Fuca.

To replace this somewhat diluted estuarine surface salt water as it leaves the inland sea, deep ocean water at the western entrance of the Strait of Juan de Fuca is pulled in and flows near the bottom of

the Strait of Juan de Fuca towards Puget Sound and the Strait of Georgia. This deep oceanic water gradually is pulled to the surface by the estuarine circulation and joins the surface current that pulls it towards the mouth of the Strait of Juan de Fuca. The volume of water exchanged between the Pacific Ocean and the inland sea by this estuarine circulation is huge. Each year a volume equal to the entire volume of the inland sea exits to the Pacific Ocean in surface waters and fills the inland sea at depth with Pacific Ocean water.

If our inland sea did not have tides, the surface lower-salinity water (that has a lower density than the deeper, saltier water) would tend to "float" on top of the heavier saltier ocean water and would mix only slowly. However we know that the tidal currents of the inland sea are vigorous. As the tide of the Pacific Ocean drops, water of the inland sea flows towards the ocean. As the ocean tide rises, water floods into the inland sea. Where the inland sea forms narrow passages, the ebbing and flooding tidal currents tend to mix surface and deeper water. In some of the narrow passages (Rosario Strait, Haro Strait, and Tacoma Narrows) the tidal current completely mixes the surface waters with the deep and produces water with little or no difference in salinity between the bottom and the surface.

If tidal mixing did not occur a layer of low salinity would "float" on top of saltier water below, a condition we see only in areas close to where rivers flow into the sea. The vertical mixing from tidal currents results in the surface waters of much of Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia having salinity closer to that of the Pacific Ocean than that of the fresh water rivers. The Pacific Ocean is around 3.4 percent salt while Puget Sound and the Strait of Georgia have salinity closer to 2.9 percent salt.

Although all of the rivers of our inland sea contribute to the estuarine circulation, one stands out. The Fraser River, in southern British Columbia by itself contributes 70-80 percent of the total fresh water flowing into the estuarine ecosystem. Some of the Fraser River water, because of the tidal mixing, circulates into Puget Sound.

The movement of water in Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia cannot be understood if each is considered as a separate body of water. Only by considering all three as an integral estuarine ecosystem can we understand the circulation of the marine water and how this water mixes with the fresh water from the rivers.

One of the most important results of the estuarine circulation of the inland sea is the effect on the amount of nitrogen in the water. Nitrogen in the oceans of the planet tends to be found in higher concentrations in deeper water, while surface waters are generally nitrogen poor. Remember that the water coming into our inland sea from the Pacific Ocean is along the bottom of the Strait of Juan Fuca. This deeper water is, at most times of the year high in nitrogen. In fact the amount of nitrogen brought in by the inward flow along the Strait of Juan de Fuca dwarfs all other sources, including the river-borne nitrogen and that resulting from human activities. This nitrogen carried by estuarine circulation has a major impact on the biological life of our inland sea by providing ample fertilizer for biological systems.

We know from studies in all oceans that estuaries are places of high biological productivity. The foundation of the plant and animal communities found in the inland sea is made of those organisms that are photosynthetic. These primary producers are found floating in the surface waters of the water column as well as attached to rocks and embedded in the muds in shallow water close to shorelines. Stimulated by ample concentration of nitrogen, single-cell phytoplankton form clouds in the surface waters at many times during the year. This phytoplankton is eaten by microscopic herbivore zooplankton and the inland sea pelagic food chain is started. The zooplankton is eaten by herring and other bait fish. These small fish in turn support a diverse and rich assortment of larger animals including many carnivorous fish species. At the top of the pelagic food web are many species of birds, marine mammals, and humans.

The rocky and muddy substrates of shallow waters close to shore also support rich biological communities. The algae of the intertidal and subtidal areas produce as much “plant material” as the

most productive agriculture crops. Diatoms that live in the surface layers of mud flats; sea grasses found in large meadows and just offshore of many beaches; and marshes found near the high tide line of sandy and muddy flats — all contribute large amounts of energy rich carbon molecules that in turn nourish a diverse group of animals.

And thus the richness of life forms in our inland sea is a result of the estuarine circulation caused by the interaction of rivers with ocean waters.

Studies on the structure and function of this estuarine ecosystem that defines our inland sea that were started in the 1970s continued and expanded with time. By the mid 1980s our understanding of the ecology of the Strait of Georgia, Puget Sound, and the Strait of Juan de Fuca showed without question that these three bodies of water were better understood as a single integral ecosystem.

From the perspective of ecology there is no one place where the Strait of Georgia ends and Puget Sound begins. Likewise there is no place that the Strait of Georgia ends and the Strait of Juan de Fuca begins. This inland sea then, is an estuary ecosystem that differs from the ecosystems of the Pacific Ocean to the west of the Strait of Juan de Fuca and the deep fjord-like channels of the inside passage to the north of the Strait of Georgia.

We were also learning that the estuarine ecosystem of our inland sea is not in very good health. Pollution from many sources burdens the water quality. Toxins are accumulated in the food chain and are concentrated in unsafe levels for both the animals and humans who eat them. Marine and estuarine species from other parts of the world have made their way to our estuary with uncertain impacts on the native species.

Populations of many species of commercial importance have been decimated by over harvesting and destruction of habitat. Many of our river deltas and marine shorelines have been modified with

negative impacts on many species. Areas with low water circulation are oxygen-deprived, reducing marine life and in some cases causing all life forms dependent on oxygen to disappear.

Some feel that for some parts of the sea it is already too late. Billy Frank, one of Washington State's best known Indian spokesperson, has often said **"**Puget Sound is a dead zone. It's gone and no one is doing a damn thing… our backyard that's dying."

Billy Frank may be right about areas of low oxygen in Puget Sound. However, there are many people that are trying to stop the insults to the environment and to help to heal the damage we have done to the ecosystem. Many are using the approach of ecosystem management to understand how to restore the marine life of our inland sea. One of the first steps in ecosystem management is to define the boundaries, the structure, and the function of the ecosystem of interest. We know Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia are an estuarine ecosystem that forms an inland sea. In order to better manage the resources of this ecosystem we need to understand how this inland sea works. In order to better understand the inland marine sea, we needed to be able to accurately and consistently reference it.

And to do that, this inland sea needed a name.

In the later part of the 1980s there was considerable interest about the names used for the parts of Washington state's inland marine waters. Some noted that when Puget Sound was first named by George Vancouver in 1792, the area referred to as Puget Sound was restricted to the waters south of the Tacoma Narrows. Since that time the area covered by the Puget Sound has "crept" northward. As I noted earlier, by the 1970s state employees were calling southern Georgia Strait and the area around the San Juan Islands "northern Puget Sound."

In the mid 1980s the Washington legislature created the Puget Sound Water Quality Authority to respond to pollution in all of the state's inland marine waters. This legislation included a renaming of Puget Sound. The boundary of what was then Puget Sound (a line between Port Townsend and Admiralty head on Whidbey Island) was extended northward to the political boundary with Canada. According to the Puget Sound Water Quality Authority the new Puget Sound includes all of Washington's inland marine waters. By this act the legislation renamed the southern part of the Strait of Georgia and the southern half of the Strait of Juan de Fuca.

Why the legislature did this was understandable. The hope was that by using a single brand for all of Washington's inland marine waters state residents would identify more strongly with the need for its protection. This idea has found some support. Oyster growers in Drayton Harbor (on the Strait of Georgia) refer to their area as Puget Sound. However, many more people are uncomfortable with the expansive use of Puget Sound, particularly residents of the San Juan Islands.

Moreover, the legislative decision for the expanded name runs contrary to the evolution of our understanding of the estuarine ecosystem. This new definition of Puget Sound does not acknowledge the scientific understanding of the ecology of the inland sea and that Puget Sound is just part of an integral ecosystem that makes the inland sea. It is only with great difficulty that this expanded use of the Puget Sound name can be considered an ecosystem.

This northward expansion of the Puget Sound name caught the attention of Harvey Manning a noted outdoor author. Manning opposed the Puget Sound name extension and instead suggested that the name "Whulj" (a traditional Salish name) be used for U.S. water north and west of Port Townsend, but not including "southern Puget Sound."

What was missing in this discussion of names for the Washington's inland marine waters was recognition of the ecosystem science that showed clearly that the inland marine waters of

Washington and British Columbia formed a single integrated estuarine ecosystem. It seemed to me that any concerted effort to reduce pollution and restore habitat and bring populations of marine resources back to healthy levels must be based on the science of the ecosystem. It was clear to me that a name that brought attention to the ecosystem interrelationships and unified the inland marine waters of both British Columbia and Washington State would be helpful.

But what to call this inland Sea? I knew that the tribes around our inland sea from both British Columbia and Washington all shared a historical connection with the Salish language. I also knew that the indigenous people occupying our inland sea were different from those living on the northwest coast of Washington and those of the west coast of Vancouver Island. As well, the indigenous people of the tribes living to the north on the British Columbia coast differed from those with a link to Salish languages. The name Salish Sea acknowledges the first peoples to live on the shores of our inland sea.

There are two ways to have a name formally adopted in the state of Washington. The first is by legislative decision, the approach taken by the government of Washington in forming the Puget Sound Water Quality Authority. The second is to have the Washington State Board of Geographical Names, then a committee in the state's Department of Natural Resources, formally adopt a name. (The committee was abolished as part of the budget cuts of 2009-10). In 1989 I submitted an application to the Board of Geographical Names requesting that the estuarine ecosystem consisting of Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia be named the Salish Sea. At that time the board judged that the name did not have popular usage and should be considered experimental. It decided not to consider the application further.

Nonetheless, the Salish Sea name had its supporters. Those who live in the San Juans and the British Columbia Gulf Islands supported the idea of being part of the Salish Sea. The Whale Museum in Friday Harbor and the whale-watching industry with their interest in orca whales saw the usefulness of a single name for the whale's summer home. Land use planners in the Gulf islands

used the Salish Sea as a framework in which to better understand the land use in their islands. Educators who were aware of the importance of ecosystems saw the value of the name. The Padilla Bay National Estuarine Research Reserve championed the name in its education programs. Songs were composed and books written. Over time the popular support for the Salish Sea name continued to grow.

Somewhat more slowly the Salish Sea name came to the attention of natural resource managers interested in problems that did not recognize the international boundary. Scientific studies directed to a better understanding of the unified estuarine ecosystem continued during and beyond the 1980s, although government agencies did not immediately adopt the Salish Sea name. A review of what we knew of the estuarine ecosystem published in 1994 referred to the inland sea as the "Strait of Georgia, Puget Sound, and the Juan de Fuca Strait." The governments of British Columbia and Washington state increasingly recognized the efforts and importance of the natural resource managers and made agreements to facilitate the sharing of information on transboundary issues. Periodic conferences brought together natural resource scientists and managers interested in transboundary issues and these efforts needed a name in order to define the inland marine ecosystem as an entity. The name used informally for these conferences was the "Georgia Basin Puget Sound Ecosystem."

As the Salish Sea name became more widespread, maps of the inland sea started to appear. None of the early maps approached the quality of that produced by Stefan Freeland of Western Washington University in 2008. This map has found local, national, and international attention. It is available online for all to use.

By the year 2003 the Salish Sea name started to be used instead of the more cumbersome "Georgia Basin Puget Sound Ecosystem." In 2005 the transboundary natural resource management conference was titled "Science for the Salish Sea: a sense of place, a sense of change." The 2007 conference was titled "Knowledge for the Salish Sea: toward collaborative transboundary solutions";

and in 2009 “the Future of the Salish Sea…. A call to action.” Natural resource managers saw the value of calling our estuarine ecosystem the Salish Sea.

The Indian tribes in Washington state and the First Nations in British Columbia also found the Salish Sea name useful. Starting in 2000 the tribal leaders from both British Columbia and Washington recognized the need to work together to protect and restore the health of the estuarine ecosystem that defines our inland sea and is fundamental to Coast Salish culture.

In 2005, 70 Tribes and First Nations from Washington and British Columbia that are located on or near the Salish Sea joined together and collectively formed the “CoastSalishGathering.” The purpose of the CoastSalishGathering is to work with the governments of Canada and the United States to protect and manage the resources of their Salish Sea.

The CoastSalishGathering informally adopted the Salish Sea name as reflected in their statement: “We have come together to share, prioritize, develop, and recommend policies and actions to ensure the protection of our shared environment and natural resources in our homeland, the Salish Sea.” By 2008 the protection of the Salish Sea was more formally adopted by the Gathering by incorporating the Salish Sea name in their mission statement: “To conserve and restore the Salish Sea ecosystem to a level that insures the sustainability of the Coast Salish People and our cultural life ways.”

The credit for the first formal recognition of the Salish Sea name rightfully belongs to the Coast Salish people. By 2008 the Coast Salish tribes and first nations had incorporated the Salish Sea name into their collective culture. There was no question in their minds of the legitimacy of the name.

It took two more years for the governmental bureaucracies of Washington state and British Columbia to formally accept the Salish Sea name. What prompted me to ask the Washington State Board of Geographic names to revisit the Salish Sea name application was an event in British Columbia in the spring of 2008, George Harris, an elder of the Chemainus First Nation on Vancouver Island, suggested to the British Columbia government that the Strait of Georgia be renamed the Salish Sea. After initial interest in the proposal the BC government did not move forward on the idea.

As a strong supporter of the science that shows clearly that the Strait of Georgia is an integral part of the larger estuarine ecosystem, I thought that renaming the Strait of Georgia the Salish Sea was inappropriate. In Dec 2008 I approached the Washington State Board of Geographic names and asked that the board revisit the 1989 application for formally adopting the Salish Sea name as an umbrella encompassing Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia. At the same time I submitted a similar application to the Geographical Names Office of the British Columbia government.

The Washington state board agreed to reconsider the name in their spring meeting of 2009 and the similar board in British Columbia also agreed to review the Salish Sea application. A review conducted jointly by the British Columbia and Washington offices followed. On Oct 30, 2009, the Washington State Board of Geographic Names approved the name. On Nov 14 the United States Board of Geographic Names approved the name and the Geographical Names Board of Canada around the same time voted in principle to approve the name. Around this time the Cabinet of the Province of British Columbia decided to review the name request and the Cabinet approved the name on Dec 9 2009, but did not make any public announcement until February 9, 2010 when approval of the name was announced in the Government's "Speech from the Throne."

A celebration by the Salish Tribes of Washington and the First Nations of British Columbia, along with the Province of British Columbia was held in mid July of 2010 at the Songhee First Nation in

Esquimalt BC. The event attracted over 2,500 participants who celebrated and formally recognized in word, dance and song the Salish Sea name.

I believe the Salish Sea name has a promising future. My hope is that the name will help heighten the awareness of the over 7 million people who ring its shores to the task of stopping the degradation of natural resources and help to focus our attention on restoring the damage done.

There are two examples of this happening already. The Coast Salish people have rallied to the challenge of natural resource management of their Salish Sea. The Salish leaders of Washington state tribes and the First Nations of British Columbia are committed to joining the decision making process of the provincial, state, and federal governments to protect the Salish Sea and its resources. Tribes and First Nations have been encouraged by recent judicial rulings in their favor (Boldt phase 2 in Washington state and the Calder and Delgamuukw decisions of the Canadian Supreme Court). Coast Salish leaders anticipate that they will be welcomed as co-managers as decisions relating to natural resource management are developed. The Salish Sea name is central to the Coast Salish people's ambitions for natural resource management.

The second new initiative for protection of the Salish Sea comes from the governing bodies of the British Columbia Gulf Islands and the Washington San Juan Islands. These governing bodies are concerned with increasing movement of crude oil (from Alberta oil sands) by tankers through British Columbia waters of the Salish Sea. The Washington state government has been dealing with tanker traffic of crude oil for over 35 years and has a reasonably good program of spill protection and clean up capability. The movement of crude oil in British Columbia waters is a new event, and the governing bodies of the San Juan and Gulf Islands are concerned that the government agencies responsible for the Canadian waters of the Salish Sea are not adequately prepared to respond to a possible spill. In a joint statement by the Gulf Islands Island Trust and the San Juan County Council on Dec 16, 2010, they encouraged the governments of Canada and the United States to "develop

compatible regulations on both sides of the border to provide the best oil spill protection possible for the Salish Sea."

Thus the story of the naming of the Salish Sea has come full circle. The path to the name started with the concern over crude oil being transported through Washington state waters of the Salish Sea. This new concern of the local governments of the San Juan and Gulf Islands is also about the risks of oil transportation.

The Salish Sea name has its roots in the science of the ecology of the inland sea. That the name is being used to focus attention on management of the Salish Sea indicates to me that the formal adoption of the name by Tribes, First Nations, and the governments of the United States and Canada was meant to be.