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Layers of Change: The Nanaimo River Estuary (Nanaimo, British Columbia, Canada)

Estratos das mudanças: o Nanaimo River Estuary (Nanaimo, British Columbia, Canada)

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Resumo

A recuperação do estuário do Rio Nanaimo passa por um processo que remonta os anos 60/70, os usos intensos de atividades portuárias, industriais e de ocupação reduziram as populações de animais e plantas e provocaram uma série de problemas ambientais. O Comitê da Bacia do Rio Nanaimo, produziu um Plano de Manejo do Estuário a partir de 2004 que está baseado no replantio de plantas aquáticas e algas.O futuro projeto baseado no planejamento compreensivo está baseado no resgate das várias etapas das ações antrópicas no estuário do Rio Nanaimo.

Palavras-chave: Bacias Hidrográficas. Comitês de Bacia. Plano de Gestão Ambiental. Conflitos. Recuperação.

Figure 1: *City of Nanaimo*

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Restoration and Balance

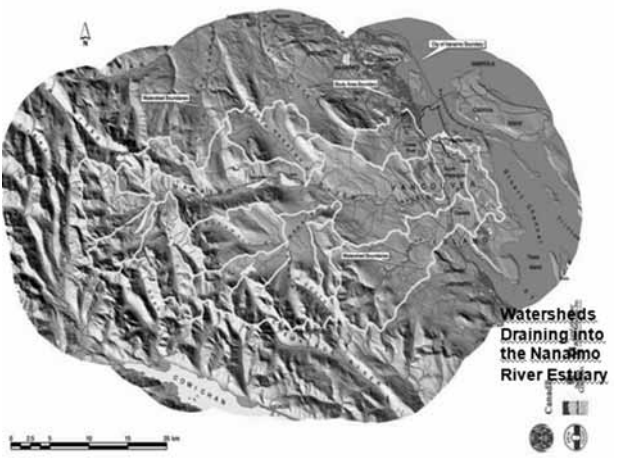
The Nanaimo River Estuary is a place of connection: where land meets the sea, where freshwater meets saltwater, and where human impacts converge with a fragile ecosystem. Less than 3% of British Columbia's 27,000 coastline is considered estuarine, yet these fragile ecosystems are among the most productive areas on earth.

The Nanaimo River Estuary is the largest estuary on Vancouver Island, covering approximately 84,000 hectares. It is one of the highest ranking estuaries in terms of fisheries resource value, productivity, and social/recreational value according to the Ministry of Environment.

The Nanaimo River Estuary was once the breadbasket of the Snuneymuxw First Nation: an abundance of aquatic and terrestrial species provided food and medicine to the villages that circled the estuary. Today, the ecological balance in the estuary has been changed by 100 years of coal mining and production, agricultural development, urban growth, and industrial intensification. The estuary is closed to shellfish harvesting, and other contaminants have entered into the estuarine system. However, more than a decade of partnership among key players in the estuary is resulting in positive change, with restoration and balance as the goal.

Overview

The Nanaimo River estuary is the largest estuary on Vancouver Island. The major watersheds of the Nanaimo and Chase Rivers, plus the drainages of Wexford, Beck, Holden and York Creeks together drain an area of approximately 84,000 hectares. The lower 12 kilometres of the Nanaimo River and its estuary lie within the Nanaimo Lowland, a relatively low area along the east coast of Vancouver Island underlain by sedimentary rocks comprised mainly of conglomerate, sandstones and shales (see the watershed drainage map, below)[1].



[1] The following is in part excerpted from the Nanaimo Estuary Management Plan, which is available at www.nanaimoestuary.ca.

The Nanaimo estuary area has a wide variety of oceanographic conditions related in part to a fairly complex shoreline and topographic configuration. The rivers and streams introduce a considerable amount of fresh water into Nanaimo Harbour from fall to spring. However, when the Fraser River is in freshet during May and June, fresh water can move into the Nanaimo area from the Strait of Georgia. Surface waters in the harbour are strongly influenced by winds, while the deeper waters have a significant tidal component. Wave action in the inner part of the estuary is limited by the protection of the islands and points, but northwesterly winds can affect the outer delta of the Nanaimo River. In general, the rate of flushing increases towards the north. Tides in the Nanaimo River Estuary are mixed and mainly diurnal, with two high and two low tides of different heights in a tidal day of about 25 hours. Tidal rise and fall corresponds to those in Georgia Strait. Currents in the estuary are mainly derived from winds and to some extent tides, but river runoff contribute little to circulation patterns except during peak run-off. At times, during large tidal amplitudes, currents from tides, particularly the ebb, can be quite strong.

Benthic invertebrates are a key link in the salmon-supporting, detritus-based food web of the Nanaimo estuary. Dungeness crab populations near Jack Point support fisheries, but bivalve shellfish harvesting has been closed since 1949 due to coliform contamination. Five species of Pacific salmon and two species of migratory trout historically occurred in the estuary. The estuarine and near-shore environments are important in supporting the residency of juveniles. The Nanaimo estuary is also utilized by juvenile herring. The estuary supports riparian, marsh and intertidal floral communities. Eelgrass beds occur over a large area in subtidal zone, extending up into the intertidal area. The upland vegetation, where recently undisturbed, is characteristic of the Coastal Douglas-fir moist maritime biogeoclimatic subzone. The Nanaimo estuary, in conjunction with surrounding areas, is used by thousands of over-wintering birds. The estuary is critical to waterfowl survival during severe winter weather, and is part of the larger complex of estuaries that are vital feeding, resting and marshalling areas for migrating birds of the Pacific flyway. More than 200 bird species have been observed within the estuary, of which 18 are blue-listed and 15 are red-listed. Deer and other smaller mammals are also supported by the estuary.

The first human inhabitants of the area were the people of the Snuneymuxw First Nation. In 1850, they occupied several villages on Nanaimo Harbour and the Nanaimo River, and their population is roughly estimated to have been approximately 5,000. The Hudson's Bay Company established a base in Nanaimo in the mid 1850s to develop the Nanaimo coalfields. With the depletion of the coal resources in the 1950s, the economy of the area became dependent on the forest industry, forest products manufacturing, and tertiary industries. A small amount of farming still occurs in the watershed, limited by the availability of arable land.

The Port of Nanaimo and the forest products industry are the principal industrial users within the estuary. The estuary is used extensively for recreation and tourism uses are expanding with the new Port of Nanaimo Cruise Ship Terminal. Population growth will likely place additional pressures on the estuary.

Estuaries and coastal wetlands comprise less than 3% of BC's coastline, while providing habitat to over 80% of all coastal fish and wildlife species. In British Columbia, approximately 500 species of named plants and animals are associated with wetlands and estuaries, and 70 of those species are federally listed as endangered or threatened.

Vancouver Island contains significantly higher ranked estuaries than any other eco-region in the province (CWS Technical Report Series #476, 2007). Of the 8 Class 1 estuaries in BC, 4 are located on Vancouver Island; one of them being the Nanaimo River Estuary.

Despite their importance and rarity, approximately 43% of the province's estuaries are threatened by coastal development, modification, and pollution; approximately 60% of marsh habitat along the Strait of Georgia estuaries has been lost.

Stakeholders

In the early 2000s, a number of organizations came together to prepare an overall management plan for the Estuary; it was agreed this plan would serve as a guiding document, encouraging collaboration among the groups and agencies with jurisdiction in the estuary, but that the document would not legislate or otherwise regulate the activities of any of the partners.

The *Nanaimo Estuary Management Plan* was completed in 2004, after more than two years of discussion and two public consultation events. More than 10 years later, the partners in the plan (along with some newer partners including Vancouver Island University) continue to work together on issues of cross-jurisdiction and shared interests in the Nanaimo River Estuary.

The overall objective of the partnership is to integrate activities and achieve shared goals that focus on restoration and balance.

The partners include:

- Snuneymuxw First Nation
- Department of Fisheries and Oceans
- Nanaimo Community Coalition

- Georgia Strait Alliance
- Log Storage and Industry Association
- Ministry of Environment
- Nanaimo Port Authority
- The Nature Trust
- Ducks Unlimited Canada and Canadian Wildlife Service
- Vancouver Island University
- Ministry of Transportation and Infrastructure
- City of Nanaimo
- Regional District of Nanaimo

Risks & Impacts

From time immemorial to just a couple of centuries ago, impacts on the Nanaimo River Estuary would have been limited to fishing and the harvesting of foodstuffs by the people who lived around the estuary. Over time, new and often competing uses have been grafted onto estuaries as their coastal location, topography, and habitat richness are seen as valuable to an ever-widening range of activities (LOTZE et al., 2009). Environmental impacts in estuaries has been much studied since the 1960s, with the general conclusion that the addition of urban, industrial, and agricultural uses in these fragile ecosystems has been environmentally detrimental (COHEN; CARLTON, 1998).

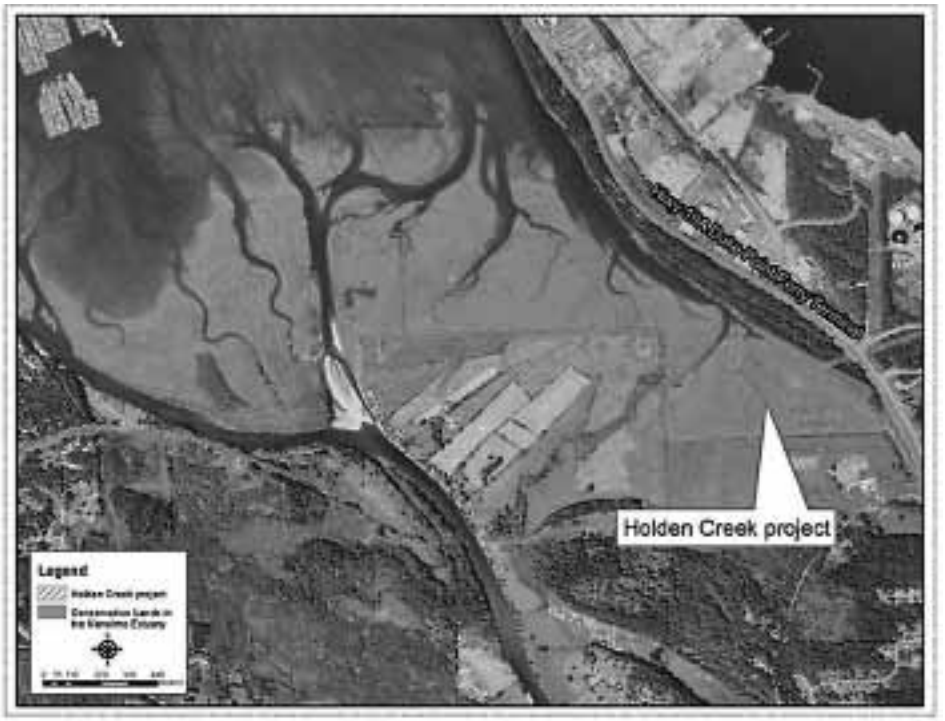
Building on research evolving from 1970s (*see suggested references at the end of this chapter*), risks for the estuary are understood to be the product of centuries of interplay between economic, political, and institutional factors and the natural environment, in highly complex iterative interactions that are currently only superficially understood (OMMER, 2007).

Further research is needed to understand how long-missing elements in local ecology can be restored and made more resilient, potentially increasing the estuary's capacity to persist and regenerate.

Opportunities

The most important action that will secure and enhance the future of the Nanaimo River Estuary is the continued efforts of all agencies and levels of government to work collaboratively for the betterment of the estuary. For example, a project moving forward in summer 2011 is the development of a plan for eelgrass planting in the estuary with a 10-15 year planning horizon. The objective behind this plan is to focus efforts and financial resources on areas with the greatest likelihood of hosting successful eelgrass replacement. This project is being funded by the Log Storage and Industry Association and the Nanaimo Port Authority, with student involvement from Vancouver Island University. All partners on the Nanaimo River Estuary Committee will be involved in this project.

Other critical works have been undertaken by project partners. In recognition of the importance of the Nanaimo River Estuary, the Pacific Estuary Conservation Program (a partnership that includes Ducks Unlimited Canada, The Nature Trust of BC, Habitat Conservation Trust Foundation, Canadian Wildlife Service, Fisheries and Oceans Canada and BC Ministry of Environment) began securing habitat in the Nanaimo Estuary in 1987. Since that time a total of 8 acquisitions have been completed covering 180ha (440acres) of habitat; intertidal marshes, farmland and riparian areas.



In 2006, conservation partners restored over 22 ha of tidal marsh by breaching the northern dike on the Holden Creek Project, restoring traditional fish channels and upgrading the southern dike to protect a private farm. The project was funded by conservation partners, the Ministry of Transportation, BC Ferries and BC Transmission Corporation.

Restoration of the estuary began in 1988 with the removal of sections of low dykes in the tidal marshlands to re-establish natural tidal flows and vegetation. The most recent restoration project was completed in 2006 where the conservation partners restored over 22ha of tidal marshlands by breaching the northern dike on Holden Creek.

A current project is the eelgrass mapping program. Cynthia Durance of Precision Identification Ltd completed an intense study on the past, current, and potential future sites within the estuary for Zostera marina, more commonly known as eelgrass, in summer 2012. As noted by Durance, "Eelgrass (*Zostera marina*) is an important component of many estuaries and provides numerous ecosystem services. Eelgrass provides critical habitat for numerous species including; outmigrating juvenile salmon, Pacific herring, and Dungeness crab. The productivity of dense eelgrass meadows rivals that of cultivated tropical agriculture (ZIEMAN; WETZEL, 1998). Research in Denmark discovered that detritus, primarily derived from eelgrass, was the basic source of nutrition for animals in coastal waters, and that the historic abundance of

fish in these waters was mainly due to eelgrass (Phillips, 1984). The leaves of eelgrass baffle currents, reducing water velocity and promoting sedimentation. The root rhizome network of eelgrass forms and interlocking matrix that binds sediment and restricts erosion." Evidence was provided through this research that the area currently colonized by eelgrass in the Nanaimo River Estuary is known to be significantly less than it was historically. The research identifies potential transplant areas and provides recommendations for future research.

A future project is the initiative of a comprehensive research program. Funding is being investigated for a major research project focused on social-ecological issues in the Nanaimo River Estuary. The research project will be divided into five stages. In Stage 1 (from time immemorial to 1700) archival records, artefacts, and in-depth interviews will record the deep history of the Snuneymuxw First Nation, while geological analysis of the area will establish a baseline for later research on coal mining. Stage 2 (to 1820) will examine the impacts of colonial expansion on the estuary. Archival records and documents will inform much of this research. Stage 3 (to 1920) will explore the founding of Nanaimo, coal mining and processing. Research into politics, governance, legal issues, and changes to fisheries will also proceed in this stage. Stage 4 (to 1980) covers new industries, tourism, and urban development. Stage 5 (the Estuary today) will focus on crossjurisdictional issues, restoration, and balance. Instead of taking a piece-meal approach to understanding issues in the estuary, a comprehensive research program will enable a holistic and layered understanding of the changes that have built over time in the Nanaimo River Estuary.

In the Future...

The research team continues to proceed with a wide range of research projects and practical actions in the Nanaimo River Estuary. In addition, outreach to those working to restore and balance uses in other estuaries along the Salish Sea is critical and is currently underway. Through sharing ideas and resources, greater success will be achieved in meeting the goals of restoration and balance in the Nanaimo River Estuary.

Resources and Literature

To find out more about the Nanaimo River Estuary, please see www.nanaimoestuary.ca

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