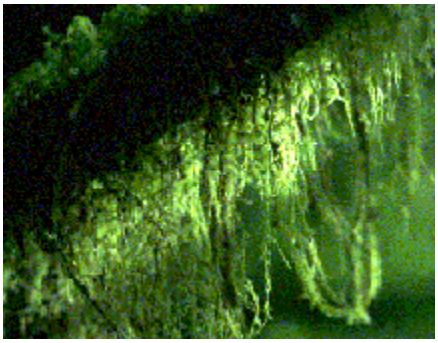
Ecosystem Health of the Lower Fraser Basin

If we consider the Basin as one ecosystem, we can try to find indicators of the health of the system. The development and use of such indicators are important since maintaining healthy ecosystems is an essential part of sustainability. Some of the posssible indicators include the level of pollution in air and water, the diversity of plant and animal species, and the level of potentially harmful human activities.

Following on this page are some examples of ecosystem health indicators which are being used in the LFB Eco-Research project. For a more elaborate essay on the health of the Lower Fraser Basin ecosystem, please see How healthy is our ecosystem? by project coordinator Michael Healey.



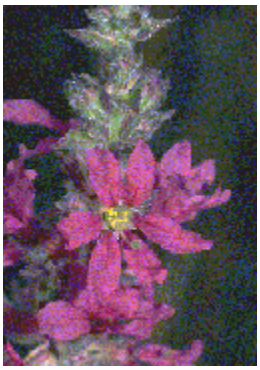
Atmospheric heavy metal pollution

Transport, fossil fuel burning and industrial processes are the main sources for air pollution in the basin. Some common air pollutants are carbon monoxide, sulfur dioxide, nitrous oxide, ground-level ozone, particulates and heavy metals. Atmospheric heavy metal pollution can be measured by measuring contamination levels in mosses which completely depend on the air for their nutrients. The moss *Isothecium stoloniferum* was used to determine levels of lead, cadmium, chromium, nickel, zinc and manganese. Contrary to most other air pollution, heavy metals do not move up the valley and deposit closer to the sources. Although lead levels have been steadily decreasing, they are still significant. Levels are similar to other regions with high population density, traffic volume and industrial activity.

Sources and sinks of nitrogen

The nitrogen cycle is significantly affected by human activities. An investigation of the sources and sinks of nitrogen in the Basin reveals that application of animal manure and fertilizer exceed the crop uptake of nitrogen, which presents a high risk of

groundwater contamination.



Plant biodiversity

Of the hundreds of plant species native to the Basin some 32 have gone extinct in the last century, mainly as a result of habitat destruction. Many others, however, have been introduced by human activities. The greatest change in plant biodiversity has been in the replacement of native vegetation by introduced weeds common to disturbed habitats. One of the most unwelcome weeds is *purple loosestrife* or Lythrum salicaria: it invades wetlands and elimiates native species.

Fish abundance, diversity and health

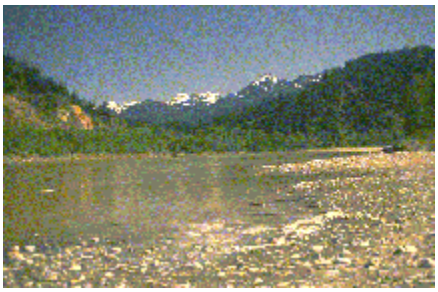
Fish form the upper parts of the aquatic foodchain and can therefore be a good indicator for the integrated effects of human activities. The Fraser River and its tributaries are home to a great diversity of fish species. Several salmonid species spend some of their life in these waters as well, and these have received a great deal of attention in both scientific research as well as in public discussions. But since their life-cycle goes far beyond the Lower Fraser Basin, they may not be the best indicator species for this region in particular. Research has therefore focussed on other species, both their abundance and diversity across the basin as well as the health of individual specimens. Results indicate some changes in the spatial pattern of abundance and diversity, but no very strong trends. A visual assessment of the the fish health, however, has demonstrated a remarkably high level of abnormalities.

One of the 14 fish-sampling locations on the Lower Fraser. Results indicate no dramatic changes in fish assemblages compared to 1973-74. A more detailed discussion of fish health and fish habitat assessment can be found under the biophysical analysis of the Lower Fraser

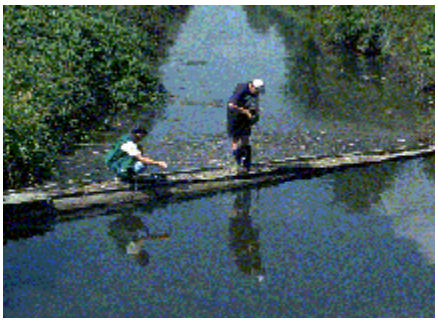
Water quality and watersheds

Water is a vital component of any ecosystem and essential for life. Water quality therefore is a key indicator for the health of the ecosystems. One of the ways in which

we can look at the impacts of human activities on the quality of our aquatic resources is in the study of watersheds. Watersheds are the logical unit for analysis in an ecosystem-based approach, since water is the integrator of human activities. Everything that is going on in the watershed can ultimately be felt in the watercourses. Analysis of watersheds is particularly relevant to explore land-use/water quality interactions. Research in three watershed case-studies is trying to address these interactions in both agricultural and urban settings. Results indicate strong spatial and temporal variations in water quality parameters, stressing the need to understand the dynamic nature of these waterheds.



The main stem of the Lower Fraser River. The river drains nearly a quarter of the province of British Columbia and is characterized by a spring freshet and high levels of turbidity throughout the year; it is one of the last remaining large salmon bearing river basins of the continent.



Water quality sampling in the Brunette River, one of the tributary streams of the Lower Fraser River. Typical water quality parameters include pH, dissolved oxygen, temperature, nitrogen, and phosphorous. This research is discussed in more detail under the Brunette River Watershed section.

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