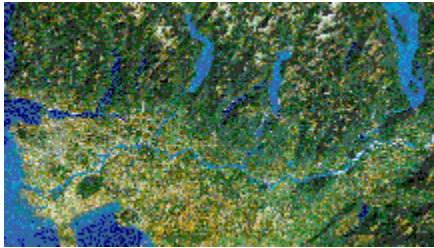


Background

How healthy is the Lower Fraser Basin ecosystem?

by *Michael Healey*, project coordinator for the Lower Fraser Basin Eco-Research Project



I think everyone who lives in the Fraser Valley would agree that it is a beautiful place. From space, the valley appears as a tranquil green prairie wedged between the rugged coastal mountains and the restless sea. The Fraser River is white with rapids where it is in the grip of the mountains, but relaxes as it enters the valley and wanders in a leisurely way across the lowland plain. From the ground the view is no less compelling. We have a vibrant and diverse urban economy in a pastoral wilderness setting. And we enjoy a mild, invigorating maritime climate. It is no wonder that people are flocking here from all over the world.

Yet, there are signs of trouble in paradise.

The Fraser Valley is exhibiting all the signs of what David Rapport calls the Ecosystem Distress Syndrome (EDS). EDS is a collection of symptoms signaling that an ecosystem is being pushed to its limits. EDS presages the transformation of an ecosystem into something different, usually something less productive, something less useful to humans. EDS was discovered about the same time as AIDS. Like AIDS, the ecosystem distress syndrome has the potential to devastate our society.

What are the signs of EDS in the Fraser valley?

One symptom of ecosystem distress is overloaded air. Just as the river moves in a leisurely way across the valley, so our air takes a leisurely trip through the valley. It lingers over the city and then moves slowly eastward, collecting ozone and other chemicals along the way. On nice summer and winter days we are likely to get a temperature inversion in the atmosphere that traps the air within the valley. We can all see, feel, taste and smell the effects. After a few hours of sunshine our beautiful mountains literally disappear in the mist. The chemicals in the air prickle our skins,

make our eyes water and irritate our noses. This is not just an aesthetic problem. Ozone and other pollutants in smog are linked to respiratory illness. They also reduce plant growth and affect the health of wildlife.

A few years ago we all used to shake our heads and tut-tut over air pollution in Los Angeles. How could the intelligent people of Los Angeles inflict that insult on themselves and their environment, we asked? Well, now we have duplicated Los Angeles' air right here in the Fraser Valley.

A second symptom of ecosystem distress is overloaded soils. The soils of our valley are the envy of Canada. They are among the most productive in the world. The productivity of the soils helped attract the first settlers to the valley and the development of farming led to the pastoral landscape that we find so attractive today.

Prior to the 1850's our valley was a dense forest of mixed hard and softwood trees. A century later we had cleared, diked and drained the landscape, transforming it into something resembling a proper British countryside. Our farmers are justly proud of their ability to make this land produce. But the uncertainties of agricultural economics and the demands of an exploding population have pushed our soils to the limit. As Hans Schreier and his students have shown, the remaining farm lands in our valley are overtaxed. The present density of grazing animals (cows, horses and sheep) is about 2.6/ha. These animals produce waste, virtually all of which is spread back onto the land as fertilizer. Our soils are capable of absorbing, transforming and recycling the waste from about 2.0 animals/ha. Thus, we are stocking about 30% more grazing animals than our soils can withstand. When you add to the grazing animals about 9 million chickens and 155,000 hogs, which also produce manure that is spread on the land, it is clear that we have a massive animal waste problem.

Our soils can't deal with the waste and so excess nutrients and other chemicals leak into streams and underground aquifers, polluting them. Nor are agricultural wastes the only excessive demand that we make on our soils. Many rural communities depend on septic tanks for domestic waste management. Few of these systems are adequately maintained and they, too, pass pollutants on to the soil, our rivers and our aquifers.

Lands not protected by the Agricultural Land Reserve, particularly those in the western parts of the Valley, are rapidly being paved over to provide for housing, industry and retail space to support our exploding population. Paved lands do not provide any of the services of absorption, transformation and recycling that open soils do. Materials that fall on streets and parking lots are flushed directly and immediately into local streams and rivers. As Ken Hall and his students have shown, pollutant concentrations in urban streams can increase more than 200 times when it rains.

Although the exact numbers are not known, our storm sewers probably flush as many nutrients and chemical pollutants into the Fraser River as are produced from domestic and industrial sewage that goes to our treatment plants. Furthermore, the urban transformation of the land is virtually irreversible. Abandoned farm fields can recover their ecological integrity. Abandoned parking lots probably never will.

The consequences of transforming and overloading the land are pervasive. Farms produce many products used directly by humans. But farms are also less productive biologically than natural ecosystems. In converting our valley to farms, therefore, we sacrificed a part of its ecological capability. If we think in terms of the amount of organic carbon produced per square metre of land, then the effect is obvious. The wetlands, marshes and swamps that we have drained, filled and leveled to increase farmlands and to provide building sites naturally produced about 1200 grams of carbon per m² each year. The mixed forests that covered much of our present day farm and urban lands naturally produced about 550 grams of carbon per m² each year. In contrast to these figures, farm pastures and row crops produce about 250-300 grams of carbon per m² each year. Urban lands, even those as well treed and grassed as ours, probably produce no more than 30-50 grams of carbon per m² each year. In transforming the valley from a forest to a garden, therefore, we lost as much as half the biological productivity of our ecosystem. In transforming the valley from farm to city we stand to lose a further 35-40% of its productivity.

Just as the pollution of the air we breathe affects our health, so does the pollution of the land and the groundwater. The aquifers that we are polluting in the Fraser Valley provide the drinking water for many rural homes. Recent testing of well water in the Valley confirms the presence of domestic and agricultural waste. Although the contamination is presently at very low levels, it will only get worse if we continue to abuse the land.

Loss of biological productivity is an almost universal characteristic of degraded ecosystems. Furthermore, the urban expansion in the valley is making us ever more dependent on goods and services produced elsewhere. Calculations done by Bill Rees and his students indicate how great this dependence is. Our valley community co-opts territory more than 20 times its size from elsewhere to provide the commodities we demand. We blandly assume that other provinces and other nations will gladly continue to devote their lands to providing goods and services to us. But every other populated region throughout the world is making similar demands and attempting to co-opt similar amounts of extra-territorial lands. Our room to maneuver in this ever growing world of demand is getting rapidly smaller. Estimates made in 1988 showed that humans had already co-opted about 40% of the land's green plant production for

the exclusive use of humans. As our population and the world's population continues to grow, our own security of supply will become ever more tenuous.

A third symptom of ecosystem distress is overloaded and straight-jacketed rivers. We have changed the waterscapes of the Fraser Valley as much as we have changed the landscapes. Before European colonization of the valley, the separation of landscape and waterscape was often not very obvious. Marshes and bogs were a prominent feature of the landscape. Sumas Prairie was Sumas Lake. Richmond was a great bog. Pitt Polder was Pitt Marsh. Every spring with the melting of the interior snows the Fraser would swell and spill over its banks to inundate large tracts of low lying land and drop sediment there. Then it would recede again, drawing into its channel organic material produced and stored on the land during the summer and autumn. This was like a great annual indrawing and exhaling of breath that nourished the river and the land. Meanwhile, the tributary streams expanded and contracted to a different rhythm. Their floods came in winter with the drenching rains. But the effect was the same, the river and the land traded places and the organic production of the land fed the river.

These were events that helped make the Fraser the greatest salmon producing river in the world as well as a haven for countless flocks of waterfowl and other kinds of wildlife.

This organic and unpredictable relationship between the water and the land offended our sense of the rightful separation of land and water. We diked and dammed the waters to ensure they kept to their assigned place and could no longer interfere with our uses of the land. And we have, both deliberately and inadvertently, transformed the river into a waste dump. We pride ourselves that we have not destroyed our salmon runs by building dams and pumping water for irrigation, as our friends in Washington, Oregon and California have done. Yet, we have converted more than 20 salmon streams into storm sewers in metropolitan Vancouver. The Allouette and the Stave Rivers had runs of sockeye salmon before we dammed them. In virtually every tributary of the lower Fraser River, salmon must find their way over dikes, past giant pumps, and through culverts. The fact that many of these streams still produce salmon is much more a tribute to the ingenuity and tenacity of the fish than it is to our stewardship.

The problems created for the wild inhabitants of the river by diking and damming are exacerbated by declining water quality. Historically, the lower Fraser was muddy but clean. Now it is muddy and dirty. Tributaries also carry a significant load of contaminants. Everything ultimately finds its way into the river. Contaminants in the air come down in the rain. Contaminants on the land are washed directly into the

rivers or seep in through the soil. As we have overloaded the atmosphere and the land so have we overloaded the river. The consequences are seen in the signs that say "Don't swim here", "Don't Drink This Water". They are also seen in the abnormal livers, kidneys, spleens, intestines, skin, gills and fins of fishes that live in the river. More than 80% of the fish that live in the Fraser River have abnormal livers.

Many of us find the changes we have wrought in the valley disturbing. But do they mean that the valley is "sick"? Or are they simply the inevitable consequences of the valley adjusting to the presence of humankind? David Rapport's Ecosystem Distress Syndrome suggests that the valley ecosystem is certainly in distress if not actually sick.

But what does it mean for an ecosystem to be sick? There is certainly no consensus in the scientific community about whether ecosystems can be sick. And having decided that an ecosystem is, indeed, sick does not tell us what the consequences will be for the ecosystem or for ourselves. Yet, speaking of ecosystems as sick or healthy has become quite fashionable in environmental and resource management circles and ecosystem health is touted as a legitimate field of study. Is this just loose and colourful talk, or is there a real issue here that we should be concerned about?

The phrase ecosystem health implies a metaphorical relationship with human health. The use of the word "health" evokes a powerful imagery. We associate health with vigour and life and sickness with decay and death. Consequently, branding an ecosystem as sick evokes the possibility of a host of dire consequences. Describing ecosystems as sick, however also raises the prospect that we can cure them in the same way that we cure human disease by a military-like assault on the causes of the disease.

An early definition of health, and one that is still commonplace, is "the absence of disease". More than a century ago we discovered that many diseases were caused by microbes or "foreign agents". Our approach to curing sickness from that point on became one of waging war on microbes. This approach proved tremendously successful in eliminating or greatly reducing many chronic, recurrent human diseases. In the case of human sickness, making war on the microbes was a very successful strategy.

Yet, in the case of sick ecosystems, if there is a metaphorical counterpart to the microbe, it is us. In combatting ecosystem "disease" are we to make war on ourselves? Is a healthy ecosystem an ecosystem that is devoid of humans and human influence? Neither of these prospects is either attractive or practical.

Fortunately our concepts of disease and health have evolved somewhat since we first began to wage war on microbes. A more recent definition of health is "having the capability to achieve one's fullest potential". Or "having the capability to achieve one's goals and aspirations". This definition acknowledges the fact that complete absence of disease is an unachievable ideal. It also recognizes that elimination of microbial disease may still not render a patient healthy. This definition provides a much better analogy for ecosystem health. We can at least envision the possibility of defining goals for a healthy ecosystem in the Fraser Valley that include ourselves.

A possible starting point is to take the concept of sustainable development as the basis for defining a healthy ecosystem for the Fraser Valley. By sustainable development I mean development that meets our needs without compromising the ability of our children and grandchildren to meet their needs. This is the definition put forward by the World Commission on Environment and Development in their 1987 report "Our Common Future". The substance of this report, in particular the concept of sustainable development, has become firmly entrenched in our political rhetoric. Having the goal of sustainable development should, therefore, be an acceptable starting point for many decision makers.

A word about development is in order, however. Our society has, for some time, equated development with increasing the extent of our economic activity. That is, we equate development with economic growth. This has led many to equate sustainable development with sustainable growth. Growth must, however, sooner or later, come up against the limits of the earth's resources. Growth is, by definition, not sustainable and the phrase "sustainable growth" is an oxymoron.

Development was originally defined, however, to mean a qualitative change in the economy so as to provide more, or more desirable, goods and services. Defined in this way, development can proceed within the limits imposed by the environment. For example, substituting renewable biomass energy for non-renewable fossil fuels would be considered development if it contributed to the general well being. Increasing the pumping of oil wells, although it might generate economic growth, would not be considered development. I raise this issue of development to underline the fact that many traditional economic activities, even if regarded as good and desirable by our society, are not sustainable. We have been conditioned to believe that virtually all economic activity has positive spin-offs for society. When viewed from the longer term perspective of sustainable development, this is not the case. We need to train ourselves to distinguish sustainable from unsustainable economic activities.

Sustainable development does not involve just the economy, however. Sustainable development, and ecosystem health, embody environmental and social as well as economic dimensions. A healthy ecosystem implies a productive and biologically diverse environment. A healthy ecosystem implies a vigorous and diverse economy. And a healthy ecosystem implies a vibrant and caring society. A healthy ecosystem does not mean that the environment is unaltered by humans. Such a situation is impossible as long as humans are present. It does mean that human activities do not overload the adaptive and self-correcting capabilities of the environment.

Since the days of Adam Smith, humankind's focus has been primarily on the economy. And, in recent years, that focus has been almost exclusively on expanding the physical extent of the economy. As a consequence, the economy is doing rather well. The environmental and social dimensions of a healthy ecosystem have been much less well nurtured. In fact, we have tended to trade-off environmental well being, and even social well being, for economic well being. Our experiments with social and environmental reform have been rather clumsy. They have also been very much in tension with our perceived need to expand our economy. It is time to redress the balance.

How could we accomplish this? Perhaps the first and most important thing is to accept responsibility. If our valley or our province are transformed in ways we don't like, it will be us who did it. Not some vague and mysterious "they", but you and I, the architects of our own fortune or misfortune.

To illustrate what I mean by responsibility, consider again the comparison of ecosystem health and human health. As the AIDS virus develops within its host it is probably unaware that it is killing the source of its sustenance. Its only concerns are to expand its economy by taking over more and more of its hosts resources and to increase its numbers within the host. These have been exactly our concerns for the past few hundred years as a dominant species here on earth. In these objectives we have been unimaginably successful. We now cover the earth and have command of the majority of its natural products.

The AIDS virus protects itself from the natural restraints that its host tries to impose by shutting down the host's immune system. We have used technology in exactly this way, to insulate ourselves from the defensive and distress signals of our environment.

The AIDS virus does not consider whether killing its host is a good strategy. It can get away with this because there are lots of alternate hosts near by to which it can jump. This is where the analogy breaks down. If we make this planet so ill it cannot sustain us, there is no where for us to jump. Only by recognizing that we are responsible for

the well being of our environment and ourselves can we avoid the ultimate devastation of an ecosystem collapse.

Repeated polls suggest that most Canadians do accept responsibility for environmental problems and are deeply concerned about their environment. But we also despair that anything we do as individuals will make a difference. Historical precedent also shows, however, that the power of individuals pursuing a collective purpose is virtually limitless. We can restore the health of our valley if that is what we really want.

We probably have a better opportunity to pursue social and environmental change now than ever before. Governments at all levels are promoting community based initiatives. Local empowerment is the rallying cry. This means that all of us have a unique opportunity as well as the responsibility and the authority to integrate our economy into our society and our society into the environment in ways that are much more sustainable. Experiments already under way in Richmond by the Sustainable Systems Component of our eco-research project, in Langley by the Salmon River Watershed Management Partnership and in Sumas by the River and River Margins Component are at the forefront of this change.

It would be wrong to imagine that the transition to sustainable development and healthy ecosystems will be easy or straightforward. The paradigm of endless economic growth and endless consumerism is strongly entrenched. We have been conditioned to believe that our self interest lies in promoting economic expansion to the exclusion of virtually everything else. However, we have made some important progress in other ways of thinking about our future and individual communities within the valley are showing that they have the courage to try new approaches to integrating environment, economy and society. Whether the many experiments now being tried will open the path to sustainability remains to be seen. But if we are successful, the signs will be evident to all of us. On sunny days the mountains will stand clear and sharp against the sky and the signs along the river that say "Don't Drink This Water" and "Don't Swim Here" will be taken down.

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