

BioLine

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Potential Impacts of Climate Change in Southern British Columbia

Bill Taylor

Global temperatures are on the rise, and many scientists believe humans bear some responsibility for that. How will Earth's climate change if heat-trapping greenhouse gases continue to build in the atmosphere at their present rate of accumulation? What impact will a change in climate have on natural and managed resources in British Columbia? When are these impacts likely to occur?

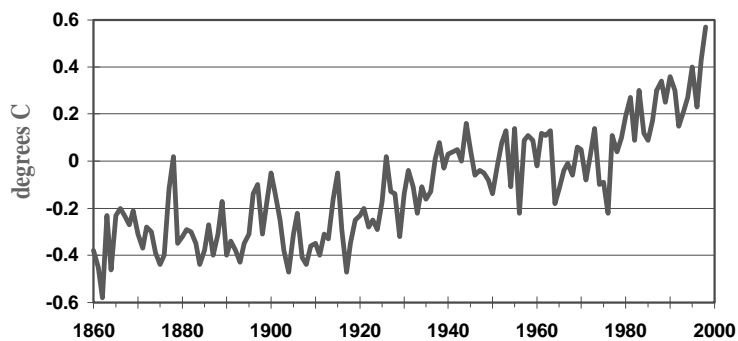
The Earth's average temperature is maintained at a relatively constant value over the long term by a balance between incoming solar

radiation and outgoing terrestrial radiation. If either side of the equation changes, the Earth's temperature adjusts in response to this increase or decrease in energy. Changes in solar output, land cover, oceanic and atmospheric circulation, volcanic activity, and atmospheric composition including concentrations of aerosols and greenhouse gases all influence this energy balance.

Since the industrial revolution, the concentration of greenhouse gases (carbon dioxide, methane, nitrous oxide, water vapour, ozone and others) in the atmosphere has risen significantly.

Although they constitute only a minute fraction of the atmosphere – less than one-tenth of one percent – greenhouse gases play a powerful role in regulating the temperature of the planet.

While a portion of incoming radiation from the sun is reflected to space by clouds and bright surfaces like ice and snow, about 70 percent of solar energy is absorbed by the atmosphere and the Earth's surface. The Earth, in turn, radiates its own energy, but at longer wavelengths than the sun. Greenhouse gases are especially efficient at absorbing these wavelengths. Were it not for the natural occurrence of greenhouse gases, the average temperature of the planet would be some 33 degrees Celsius colder than it is otherwise. What has scientists concerned is the enhanced greenhouse effect resulting from the rapid build-up of greenhouse gases since pre-industrial times. Most of the increase in greenhouse gases can be attributed to human activity, particularly our reliance on fossil fuels.



Global temperature change – 1860 to 1998

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Editorial

Steve Jasper

Well, better late than never. In this fast-paced, technological world its somehow comforting to think that some things take as long (or longer) to accomplish as they ever did. This issue includes articles from both the 2000 and 2001 Annual General Meetings. Thanks go out to the authors included

in this issue of BioLine, some of whom submitted articles over a year and a half ago and had to revise them recently to "bring them up-to-date".

On a different topic - Scientists in the U.S. recently concluded that there are probably fewer planets in the Universe than previously thought. This

leads to the obvious conclusion that there are probably fewer Biologists as well! We are even more special than we had previously thought. A point we need to impress upon our newly elected politicians as we continue our quest for professional recognition.

Cheers.

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The Earth's climate has always changed. We know from proxy records such as ice cores, tree rings, and pollen samples found in lake sediment that the Earth has undergone many changes in climate. During the past million years, the Earth has witnessed a succession of ice ages lasting perhaps 100,000 years which were interrupted by relatively brief warm periods called inter-glacials. These long-term shifts in climate associated with the cycle of glaciations and inter-glacials are thought to be the result of changes in the orbit of the Earth and its orientation to the sun.

At the peak of the last ice age, some 15 to 20 thousand years ago, much of North America was covered by a sheet of ice several kilometres thick. With this large volume of water locked up as ice, sea levels were correspondingly tens of metres below their present levels. During this period, the temperature of the Earth was about 4 to 6 degrees Celsius cooler than today. The warmest period of the present inter-glacial occurred about 6,000 years ago during a time known as the Holocene maximum when temperatures were about two degrees warmer than present. In other words, the range of temperatures between the coldest part of the last ice age and the warmest part of this inter-glacial is on the order of 6 to 8 degrees Celsius.

Is the Earth getting warmer?

Based on a combination of proxy records and more recent instrumental records, this century has been the warmest of the past millennium. The 1990's will easily be the warmest decade of the twentieth century, and it appears 1998 will be the warmest of the past 100 years. Glaciers all over the world have been retreating since the late 1800's and sea levels have risen approximately 25 centimetres this century. There are other indicators that climate is changing, such as a decline in snow cover and ice pack, as well as an earlier onset of spring as evidenced by changes in river ice breakup and the timing of peak runoff.

Changes in the Earth's climate over the past century have not been uniform in time or space. For example, temperatures rose steadily from the turn of the century to about 1940 and then declined slightly through to the early 1970's. Temperatures rose sharply again during the 1980's and 90's (see page 1). Records show most of the warming of the 1980's and 90's occurred at night, over land, and at higher latitudes in the Northern Hemisphere. The Intergovernmental Panel on Climate Change (IPCC) concluded the warming trend and spatial patterns were unlikely to occur by chance, nor were they readily explained by the natural variability of the climate system. In 1995, the IPCC stated "The balance of

evidence suggests a discernible human influence on global climate."

What do we know about the future climate? To make projections about the future climate, scientists rely on climate models run on powerful, high speed super-computers. A global climate model (GCM) is a mathematical representation of the global climate system and all of its components. For example, the model must be able to simulate the circulation of the atmosphere and oceans, the hydrologic cycle of evaporation-precipitation-runoff, and the global energy balance. A perfect global climate model, given enough information about the climate 100 years ago, should be able to accurately reproduce the climate of the present. Climate models are far from perfect, but this is the method used to test the validity of GCM simulations. A typical GCM experiment involves running the model over a simulated period of 100 or so years with greenhouse gases held constant to establish a baseline or control. The model is then re-run with concentrations of greenhouse gases increasing at a rate, for example, of one percent per year. This second run of the model is then compared to the control run to determine the difference in climate elements under varying 'radiative forcings' by greenhouse gases.

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Based on the results of a number of GCMs, the IPCC predicts a global rise in temperatures between 1.0 and 3.5 degrees Celsius over the next century, and an average rise in sea level of 50 centimetres during the same period. The warming will be greater over land than oceans, greater at higher latitudes, and greatest in winter. This spatial temperature pattern is remarkably similar to recent observed changes in our climate. What is especially disturbing, is the projected rise in temperature over the next 100 years is approaching the magnitude of the change in temperature between the last ice age and the present inter-glacial period. If these projections are accurate, the Earth will be warmer at the end of the twenty-first century than at any other time in the past 100 thousand years!

Other projected changes to global climate include a more vigorous

portion of precipitation falling as rain will increase with a corresponding decrease in the fraction of snow. Rivers and streams will experience earlier peak flows and lower summer low flows in response to changes in temperature and precipitation patterns. Many of the glaciers in southern British Columbia could disappear in the next thirty to fifty years. In the short term, melting glaciers will contribute to an increase in stream discharge, but eventually, river flows will be reduced as the source of ice-melt disappears.

On the coast, sea level rise, combined with an increase in storm activity, could result in an increase in erosion of vulnerable shorelines. Also, where dikes prevent beaches from migrating inland as the sea rises, valuable marshlands will be caught in a 'coastal squeeze' thus reducing habitat for marine life and migrating birds.

Agriculture is one sector that may stand to benefit from climate change. A



ary between grassland and forests will shift northward and upward. For instance, the Bunchgrass and Ponderosa Pine biogeoclimatic zone will expand into the area now occupied by Interior Douglas Fir. There may be an increase in the frequency of forest fires as well as an increase in pests and diseases that affect forests.

In summary, human kind may unwittingly be embarking on a large scale experiment to alter the climate of the Earth by drastically increasing atmospheric concentrations of greenhouse gases. The effects of climate change will be felt differently in different parts of the world. While there may be benefits to some sectors in some regions, the impacts of climate change are generally expected to be negative. Given the likely consequences, it would seem prudent to proceed cautiously with this global climate experiment. Efforts are currently underway, both domestically and internationally, to curb emissions of greenhouse gases. These programs may slow the rate of climate change, however, some amount of adaptation will still be necessary because climate change is now inevitable.

Bill Taylor,
Climatologist,
Environment Canada



“In southern British Columbia, a number of natural and managed resources could be affected by climate change. Winters are likely to be warmer and wetter, whereas summers could be warmer and drier.”

hydrologic cycle (an increase in both evaporation and precipitation), an increase in floods in some areas and drought conditions in others, and a northward shift in ecosystem boundaries. Forests may be hit hard because the rate of climate change will likely be greater than the ability of trees to adapt.

In southern British Columbia, a number of natural and managed resources could be affected by climate change. Winters are likely to be warmer and wetter, whereas summers could be warmer and drier. In winter, the pro-

warmer climate means a longer growing season and the potential for growing more valuable crops. However, in the interior, water supply is already an issue. As the population expands, so will the demand for water. Since agriculture is dependent on irrigation, the benefits of climate change to this sector will be moderated by a likely reduction in water supply. Further, an increase in temperature will likely mean an increase in potentially harmful pests and diseases.

In the forestry sector, the bound-

To Whom is the Biologist Accountable?

A.D. de Leeuw

INTRODUCTION.

To be accountable to someone is to have a responsibility to, or a sense of duty to that person. As members of a professional association, like members of other professional associations, biologists are accountable to their employers, other professionals and the public. As biologists, we take others' interests into account in our actions when dealing with them. Although our constitution does an excellent job of protecting the interests of persons, and of our association members in particular, it has very little to say about the interests of nature. This omission is curious, since incorporating greater respect for nature into the moral codes, laws and constitutions of our culture is by many thought to be the primary mechanism whereby environmental degradation/destruction can be averted.

In this short essay, I shall argue that biologists, more than any other professionals, or other persons for that matter, ought to be accountable to nature. Such accountability, furthermore, has general implications with respect to biologists as advocates for nature, and more specifically, to the contents of our constitution.

The arguments I present here are intended to initiate and generate discussion on this topic. They are not a formal application to change our constitution at this time, although that is my intent for some time in the future.

ACCOUNTABILITY TO NATURE

Accountability to nature can logically be derived from at least three sources: i) the interests of living organisms, ii) our own, or the biologist's interest in the living world, and iii) parallel accountability in other associations.

i. Interests of Living Organisms.

To treat something ethically is to take its interests into positive consideration when dealing with them. I use the term "interests" here to mean a requirement, or need, that when frustrated is detrimental to the organism, while when furthered is to the advantage of the organism. If you are hungry, then depriving you of food will frustrate your interest in satisfying your

hunger, while taking you out for dinner at a good restaurant would satisfy your interest in being fed. (Who pays of course is quite another matter). Consideration of others' interests then, is a basic tenet for ethical treatment.

However, not all organisms are able to recognize the interests of others. Generally, mature persons such as ourselves (moral agents), can recognize interests of other moral agents and of those who are unable to recognize those interests in others, or even in themselves (moral patients). Clearly all living organisms have interests such as nutritional, habitat, social and other requirements necessary for their continued participation in the natural world. Our ability, as moral agents, to recognize interests of others, including the interests of nature, or the interests of individual components of nature, binds us to treat bearers of those interests with respect. All persons, therefore,

have an obligation to (to be accountable to) treat nature with respect, because all individual members of the natural world (all its component organisms) have interests that can be furthered or frustrated. Since all biologists are persons, biologists cannot escape this obligation.

ii. Biologists' Interests in the Living World.

Undoubtedly the most personal and perhaps also the strongest reason why, as biologists, we ought to be accountable to the natural world is because taking an interest in nature is why we became biologists in the first place. Apparently when I was just able to stand on two feet, family walks with me were impossible, so my mother

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tells me, because I continually picked up and inspected bugs. I suspect all biologists are not much different in this respect. Moreover, as qualified and experienced biologists we have a “special” knowledge about the living world. No doubt many others have this understanding as well, but we must have it in order to accomplish the work we do. It is a requirement of our profession. Additionally, therefore, we work with the living world. Many of us do so administratively, but nonetheless, our everyday work in some way deals with plants, animals, ecosystems and so on. Lastly, because as biologists we work with nature (or some component of it), our employers, clients and the public generally expect us to assist in making responsible decisions about nature. Therefore, for biologists to be accountable to nature is, in a very real sense, to be accountable to the very things that define our identity.

iii. Parallel Accountability in Other Associations.

As members of our association what we all have in common is our work on nature. We deal with its individual or collective components. We work on individual organisms, species, ecosystems and the biosphere. Now, in my estimation, this involvement is no different from veterinarians or physicians who work on animals and persons. Both these professions have a “code” to respect, to varying degrees, the interests of the animals and persons they work on. There is, therefore, a precedent to respect the interests of the living things we work on.

ADVOCACY FOR NATURE.

My suggestion that we biologists formalize our respect for the interests of all living things by incorporating such respect into our constitution could be faulted on at least two accounts. A critic might claim that i) as biologists we are in effect already advocates for nature so why make this advocacy redundant by placing it in the constitution, and also ii) such a move changes the intent of our association away from responsible science and towards advocacy for nature, a form of bias.

i. Redundant Advocacy.

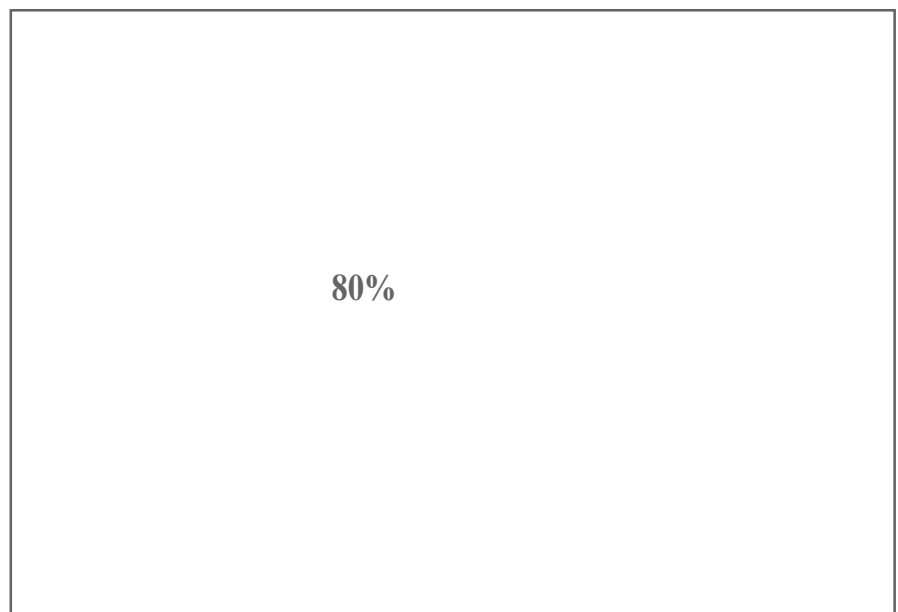
First, it could be claimed that the content of our work is, in essence, already a form of advocacy. As biologists much of our work has, as its primary focus, the welfare of living things, if not of individuals then at least of species and ecosystems. Why, therefore, should we advocate the interests

of nature in our constitution, when these interests are already accounted for in the very work we do?

This line of reasoning suggests that because many of us already do certain actions (i.e. protecting the interests of nature by practicing biology), there is no reason to re-affirm those actions in our constitution. This argument is inconsistent with the whole idea of having a constitution in the first place. The reason any constitution exists at all is to reaffirm and to formally identify the ideas and interests common to all individuals within the specific group, in our case our association. That many of us already protect the interests of nature in the work that we do entirely corroborates, rather than detracts from, incorporating that protection in our constitution.

ii. Biased Advocacy.

Second, and this is a considerably more forceful claim, one could suggest that advocating for the interests of nature in our constitution would sacrifice objectivity for subjectivity, ultimately



Dionys de Leeuw debates the finer points of the Biologists Act with representatives from the Jurassic world.

resulting in a decline in credibility of the entire profession. Although I agree with the premise that we would become an advocacy group (advocates for nature), I disagree with the conclusion that, consequently, subjectivity will be sacrificed causing an erosion of our credibility.

Our constitution already instructs us to be advocates for good science, for fair and ethical treatment of each other, and for the improvement of persons and society generally. None of these instructions are construed as eroding our professional credibility. Indeed they do very much the opposite, they improve our credibility as biologists. That is why we have a code of ethics in the first place. Similarly, being an advocate for treating organisms respectfully is not inconsistent with the science of biology. On the contrary, it is entirely consistent with and encourages being a good biologist. After all, many great advocates for nature have been biologists.

What I mean by advocacy, then, is not to promote preservation of an ecosystem or protection of a species, or, alternatively, to impede implementation of hydropower projects or expansion of urban/industrial areas. Advocacy of this sort belongs to the individual and lies outside the realm of the association. What I am suggesting, is that we actively take the interests of nature into account when working with these complex biological and social issues. To be a professional biologist then, at least if my argument is accepted, is to be a general advocate for nature.

SUGGESTED CHANGES.

If my arguments are sound, then there are at least three good reasons to incorporate respect for nature into our constitution:

- i) all living organisms have inter-

ests worthy of our respect,

- ii) as biologists we have a special interest and knowledge of the living world, and

- iii) parallel professional associations, such as veterinarians and physicians respect interests of the organisms with which they work. Their associations have that respect included in their code of conduct. Furthermore, although including respect for nature into our constitution would make the association into an advocacy organization, such advocacy would not detract from the credibility of our profession. On the contrary, it would enhance it.

Here are my suggested changes to our constitution and its by-laws; quotes are in *italics*, omissions are in [square brackets] and additions are underlined.

1) **The first change is to Constitution 2. The purposes of the Association are:**

g. To promote the integrity of the environment and encourage respect for all living organisms.

This additional purpose flows in part from the APB 5 year strategic plan, *promotion of environmental integrity.*

2) **The second change is to the by-laws, Part 3 (Code of Ethics...) 16.**

A Professional Biologist recognizes that their professional ethics are founded upon integrity, competence, respect for the environment, and a responsibility to protect the public interest....A professional Biologist must not engage in dishonorable, [or] questionable, or disrespectful conduct that reflects adversely on the integrity of the biological profession.

These changes flow from the APB 5 year strategic plan through change g. (above), to more accurately reflect changes further down.

3) **The third suggested change is also in Part 3 (code of ethics) 16. and is the inclusion of**

16.(d) Relations With Living Organisms and Their Environment.

This is an entirely new section and relates directly to how I perceive members of our association ought to treat nature. I have organized these suggested changes as: general, 16.(d)(i) and 16.(d)(ii); and relating to specific actions by the Professional Biologist, 16.(d)(iii), 16.(d)(iv) and 16.(d)(v).

16.(d)(i) The Professional Biologist will encourage the principle of respect for nature.

Biologists are encouraged to inform others of a general respect for all living organisms and their environment.

16.(d)(ii) The Professional Biologist will promote activities that minimize or reverse negative impacts to the environment or are environmentally benign.

The intent here is to advocate activities that are benign to nature. For example, when doing environmental impact assessments on industrial or similar projects, environmentally benign alternatives will be considered as part of the assessment. Frequently proponents request project assessments that exclude a thorough search for alternatives having less environmental impacts.

16.(d)(iii) The Professional Biologist will endeavor to use sampling and assessment strategies that minimize impacts to organisms and ecosystems.

When developing sampling and assessment strategies, the biologist will use the most effective methods possible to obtain the required information

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and ensure that sampling is not excessive or needless. The intent here is to a) minimize sampling overlap with other studies in the area, i.e. biologists should consult other investigations/inventories, and b) use the most up-to-date sampling strategies and statistical procedures to minimize both sampling requirements and incidental (by-catch) sampling.

16.(d)(iv) The Professional Biologist will endeavor to minimize negative impacts resulting from execution of their duties.

This relates to minimizing impacts to the environment caused by work done by biologists such as construction of access roads, establishment of camps and their location, disposal of camp sewage and refuse, use of chemicals, disposal of sampled and dead animals and plants, noise of helicopters and its negative effects on wildlife, and so on.

16.(d)(v) The Professional Biologist will take precautions not to cause unnecessary harm to individual organisms being investigated.

The intent here is for biologists to consider the interests of individual organisms during the sampling of them. I include here, for instance, humane trapping techniques, minimal impact catching methods, judicious use of anesthetics, benign experimentation and tagging procedures, and other "least harmful" animal and plant manipulation methods.

CONCLUDING REMARKS.

Many of us may agree that increased environmental degradation could be averted by instilling an ethic of respect for nature into our culture. However, despite my arguments pre-

sented here, there may also be very good reasons to believe that this ethic ought not to be formally included in our constitution. On the other hand, we may all agree that respect for and accountability to nature should be reflected in our constitution, but disagree on the form (content, wording etc.) such a change should take. An additional thorny question that will require clarification is how one recognizes when one of my suggested changes has been transgressed? But, more importantly, how should the association respond to a transgression of this type? Clearly, if one of our existing codes of ethics has been transgressed, the interests of a person have been negatively affected. That person, or a person on his/her behalf, can then report that transgression to the association to seek jus-

tice. Other than persons, nature cannot of itself report wrongful acts against it to us.

Perhaps, with continued discussion, these problems can be resolved and some form of respect for nature, as I am advocating, built into our constitution; thus affirming our collective support for a better environment for all.

Acknowledgments.

Editorial suggestions by Len Vanderstar and valuable comments from Don McLennan are greatly appreciated. I am also grateful to Mary. Like usual, she assisted throughout the writing of this essay.

*A.D. deLeeuw R.P.Bio.
Terrace, B.C.* □



The Victoria Natural History Society (VNHS) have produced a new birdlist for Victoria and Southeastern Vancouver Island. Copies can be purchased from the Swan Lake Nature Centre, at VNHS meetings, or from VNHS at P.O. Box 5220, Stn B, Victoria, V8R 6N4.

Marine Protected Areas in BC

Robert Wilson

The network of Marine Protected Area (MPAs) in BC is largely the responsibility of three government agencies. Canada's Constitution splits jurisdiction over the seabed and its resources (provincial) from the responsibility for the water column, fish, and a number of other areas (federal) in internal marine waters.

Parks Canada is responsible for the National Marine Conservation Area (NMCA) program, which protects a representative range of Canada's marine ecosystems. Parks Canada has invested considerable effort in ecosystem mapping, leading to their recognition of five marine ecosystems in BC. The NMCAs established by Parks to date tend to be large, incorporating a range of conservation and recreational goals. There is only one NMCA in BC, Gwaii Haanas, but planning is advanced for another in the Southern Gulf Islands. NMCA legislation is still pending.

Fisheries and Oceans Canada manages a Marine Protected Areas program, which provides for conservation of marine resources and habitat on a case-by-case basis in accordance with certain criteria. The legislative framework allows for a wide range of activities within designated areas, implying that use zoning in the management plans will be critical to achieving conservation objectives. Three areas have been proposed as pilot Marine Protected Areas in BC - one in the Georgia Basin and two offshore - and one site, Race Rocks, has been fully designated as an MPA. Formal management plans are still under development.

The Ministry of Environment, Lands and Parks is responsible for the Ecological Reserves program. Ecological Reserves are strictly oriented to-

wards conservation, with the only uses allowed being for research and education. Fifteen of BC's Ecological Reserves have a marine component, and in general the adjacent coastal lands are also protected.

One of the complications of MPA programs is that areas worth protecting generally have strong commercial or

A successful network of MPAs depends in no small measure on cooperation between Parks Canada, Fisheries and Oceans Canada, and the BC Ministry of Environment, Lands and Parks. These and other agencies in BC have established a joint consultative process for MPAs, to facilitate implementation of a joint strategy for area

“Three areas have been proposed as pilot Marine Protected Areas in BC - one in the Georgia Basin and two offshore - and one site, Race Rocks, has been fully designated as an MPA.”

non-commercial values for other groups. First Nations, non-governmental organisations, and industry groups play an important role in establishment and management of MPAs. Positions are increasingly important in establishing the objectives for individual MPAs, and the consultation process has become lengthy and difficult. While rapid action to expand BC's MPA network has been urged on government agencies for several years, the range of interests of other parties, the resources available to government agencies, and the needs for careful planning and negotiation all indicate that new areas will be established slowly.

creation and management.

People with an interest in coastal area management can play an important role in the MPA process. The enabling legislation of the three government players embodies long-term commitments to conserving and protecting special places and living resources. From the policy level downwards, biologists can help to see that these commitments are not compromised by other values.

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Ecological Integrity and Public Use: Incompatible Objectives?

Murray Peterson

A Review in Mount Revelstoke and Glacier National Parks

“The Parks Canada Agency will protect and present nationally significant examples of Canada’s natural and cultural heritage, and foster public understanding, appreciation and enjoyment in ways that ensure their ecological and commemorative integrity for present and future generations.”

Recent events in Parks Canada have shaped our approach to both the maintenance of ecological integrity, and public use and enjoyment. In December 1998 Parks Canada, a branch of the Department of Canadian Heritage, became the Parks Canada Agency reporting to the Minister of Canadian Heritage. Another watershed event was the release of the report “Unimpaired for Future Generations?” by the Panel on the Ecological Integrity of Canada’s National Parks, in March 2000. Interested persons can find the Panel report as well as information on the new Parks Canada Agency at our

web site ,
<http://www.parksCanada.pch.gc.ca>.

National Parks encompass almost a quarter of a million square kilometres, or about 2% of Canada’s land mass, with over 14 million visitors per year, primarily supported by a few southern parks. To help manage national parks there are staff specialists trained in the fields of forestry, biology, geography, statistics, law enforcement, public safety and education.

Visitor attendance has remained relatively stable over the past five years, at 14.5 to 15.5 million per year, with the provinces of BC and Alberta accounting for over 60% of all visitors. Banff National Park alone is visited by

approximately 6.5 million people each year, over 40% of all national park visitation. To deal with the many ecological implications of this, the Banff Bow Valley Task Force (1996) listed six principles for human use management:

- maintaining ecological integrity in the entire park is paramount,
- use the principles of precaution in all decision making,
- maintain visitor satisfaction in all designated management zones,
- equality of access by all Canadians, and
- public involvement in decision making is crucial.

“In order to protect ecological integrity, human use in national parks must be based on the principle of responsible experience: use without abuse. Human use must also pass the dual tests of allowability and appropriateness.”

(Panel on the Ecological Integrity of Canada’s National Parks)

The panel report on ecological integrity listed four measures of appropriate activity for national parks:

- to meet basic and essential services

- compatible with local environmental, social, and economic conditions,
- appropriate for the numbers of visitors and timing, and
- scaled to demand for long-term use.

Mount Revelstoke and Glacier National Parks are good examples of the stresses faced by many southern national parks:

- nearly 600,000 visitors per year,
- surrounded by lands managed primarily for resource extraction,
- fragmented by national transportation corridors,
- loss of wetlands and spawning grounds due to dams and flooding,
- exotic vegetation,
- park management practices to support infrastructure and transportation, and
- pollution by toxaphenes and other long distance atmospheric particles.

To address these issues the park relies on staff who specialize in the



Ecological Integrity in Canada's National Parks & The Role of the Professional Biologist

Rick Searle

Canada's national parks are dying ecologically. This is not sensationalism; rather it is an objective appraisal of current reality. Throughout the system of 39 national parks, species are being lost and habitat is being fragmented or destroyed by what amounts to "death by a thousand cuts." Rapidly escalating levels of use associated with tourism and recreation threaten to overwhelm ecological integrity of the parks from within while intensifying adjacent land use and mounting global changes (acid rain, climate change, long-range transportation of pollutants) eat away ecological integrity from without. Meanwhile, budget cuts, office politics and ideological splits hamper effective responses from the government and from Parks Canada.

If the loss of ecological integrity is not halted and reversed very quickly, the crown jewels of Canada's protected area system will become phantom parks. They will still look beautiful, but they will be devoid of the vital characteristic that sets them apart from the rest of the landscape, that is wilderness. Alarming, the biggest challenge to maintaining the ecological integrity of the national parks is perceptual. The general public simply doesn't see a problem. For example, they don't see the grizzlies that are no longer found in the lower Bow Valley of Banff National Park nor do they see the devastating effects of mercury on the loons of Kejimikujik National Park. If a problem is perceived, the common response is to see it as a mild case of acne rather than the signs of a festering cancer.

In November 1998, the federal government made good on an election promise and appointed a panel of eleven

scientists to examine Parks Canada's approach to maintaining ecological integrity and to provide recommendations for improvement. After a year and a half of investigations, the panel released its report in March 2000 which, among other things, warned that Parks Canada's science capacity was insufficient to support its mandate. The panel noted that the organization has only "11 Ph.D.-level ecologists and 40 staff with Master's degrees out of a total work force of 2100." Among the agency's executive, there is very little understanding of ecological science. Not surprisingly, science rarely is incorporated in decision-making, especially at the more senior levels. In addition, the panel also criticized the agency of not submitting its research findings to peer review.

All this and more could change for the better. The Honourable Sheila Copps, Minister of Canadian Heritage

accepted all 127 recommendations of the panel and has given her word to see them implemented. However, the acid test will come over the next few months. Talking the talk and walking the walk too often fail to coincide. It is absolutely crucial that a larger public constituency in support of ecological integrity be mobilized. Without the public will, there will be very little or no political will to ensure that panel's recommendations are implemented. Equally important, the public must also come to understand the consequences of their personal and collective choices on the ecological integrity of the national parks.

As the panel so aptly put it:

"Maintaining ecological integrity must become everyone's responsibility."

Rick Searle



fields of biology, ecology, and communications and education. We need more than our own staff, and rely heavily on contractors and partnerships with local government agencies to fund important ecosystem based research.

Mount Revelstoke and Glacier National Park uses a holistic management approach, recognizing ecosystem issues do not recognize political boundaries. By 2002 MRGNP will have a new park management plan based on the princi-

ple of holistic management. The public is invited to participate in this planning process to ensure their concerns are heard.

Murray Peterson



APBBC Annual General Meeting

Thursday, May 3 2001 at the Dunsmuir Lodge, Victoria, B.C.

Biologists in the Real World, or Biologists and Policymakers: Mutualism or Parasitism?

0800-0900	Coffee, registration
0900-0915	Welcome (<i>Mel Kotyk</i>)
0915-0930	Federal Welcome (<i>Richard McKelvey, Canadian Wildlife Service</i>)
0930-0940	Provincial Welcome (<i>Derek Thompson, BC Ministry of Environment, Lands and Parks</i>)
0940-1030	Continuing Professional Development (<i>Ed Britton & Joyce Boon</i>)
1030-1100	Coffee Break
1100-1200	Business meeting
1200-1230	Ethics and the Professional Biologist (<i>Rick Crozier and others</i>)
1230-1400	Lunch
1400-1430	Grizzly Bears (<i>Bruce McLellan</i>)
1430-1500	Water Quality and Treatment (<i>Rick Nordin</i>)
1500-1530	Coffee Break
1530-1600	Professional Biologists and Policy Development (<i>Don Eastman</i>)
1600-1630	Professional Biologists and Policy Development - Salmon Aquaculture Review (<i>Daphne Stancil</i>)



Some of the "Association Players" contemplate their new careers in show business (l to r): Joyce Boon, Maureen Ketcheson, Andy MacKinnon, Ed Britton.

Provincial Welcome

"I am sorry that the pressures of management during this election period do not permit me to attend your annual general meeting.

I do, however, wish to extend my welcome to you and state our commitment to working with your members to ensure high professional standards of environmental stewardship in this province.

As you are well aware we are moving continuously forward to a model of environmental management which will depend on professional accountability to deliver on implementation of policy and plans developed by ministries.

This will also result in preparation for performance audits undertaken by ministries as part of a compliance and enforcement approach. For this approach to succeed we require, among other things, a well developed and accountable professional association and members - yourselves. We strongly support this group and its endeavours and look forward to strengthening our working relationships over the next months and years."

Derek Thompson
Deputy Minister, BC Ministry of
Environment, Lands and Parks

Bill Young Award presented to Mark Angelo

The founder of BC Rivers Day and a long-time advocate for the protection of rivers around the province was recognized for his leadership in promoting cooperation between forest management and fish and wildlife management.



Mark Angelo (centre) receives the Bill Young Award from Mel Kotyk (left), President of the APBBC, and Mike Larock, President of the ABCPF.

Mark Angelo receives the prestigious award – jointly sponsored by the Association of Professional Biologists of BC and the Association of BC Professional Foresters – at the Annual General meeting of the APBBC in North Saanich on May 3, 2001. The joint award promotes cooperation between forest, fish and wildlife management as well as forest leadership in integrated resource management.

“We are very pleased to be presenting this award to Mark,” says Mel Kotyk, president of the Association of Professional Biologists of BC. *“Mark has consistently been an open and honest communicator, dedicated to exploring solutions through discussion and consultation and always looking for the right balance.”*

“Mark is most deserving of this recognition,” adds Mike Larock, presi-

dent of the Association of BC Professional Foresters. *“In the forest sector, he has earned considerable respect from all parties for his balanced approach to complex resource management issues. Very rarely does such a person come along who has the ability to see all sides and work with all interest groups.”*

Mark is the head of the fish, wildlife and recreation program at the British Columbia Institute of Technology and chair of the 120,000-member Outdoor Recreation Council. Among his many accomplishments, he is the founder of BC Rivers Day – first started in 1980 as a celebration of BC’s rivers – that now attracts up to 45,000 participants each year.

Mark is also the current chair of the BC Heritage Rivers Program, the Theodosia River Coalition and the BC

Park Legacy Project, and the past chair and BC representative for the Canadian Heritage Rivers System.

Over the past five years, many organizations have recognized Mark’s leadership abilities and his achievements in river conservation. Most notably, he was the inaugural recipient of the 10 Year National River Conservation Award, a 2001 recipient of the Order of Canada, and a 1998 recipient of the Order of British Columbia.

“In his many roles as educator, river conservationist, writer, volunteer and outdoor enthusiast, Mark has shown tremendous leadership skills and shared his love and passion for the environment and its sustainable use,” adds Kotyk.

Mark Angelo is the 15th person to be honoured with the Bill Young Award since it was created in 1985. □

Biologists and Water Quality

Rick Nordin

Biologists are typically seen as being involved with management of larger forms of organisms (trees, moose) but there is a small group of biologists that deal with biology on a smaller scale – bacteria and algae - that have particular relevance to management of drinking water.

Clean water is an issue that has quite a high profile largely due to Walkerton, but freshwater biologists, microbiologists and public health engineers have been concerned for many years about the risks of biological pathogens in water supplies. British Columbia differs in many ways from other parts of Canada and the US.

1. *BC is much more dependent on surface water (versus ground water) for drinking water supply. For municipalities, 88% use surface water and overall about 60% of source drinking water in BC is from lakes, reservoirs, streams and rivers. Half the BC population is on small systems which are very vulnerable.*

2. *BC has a much higher level of enteric water borne disease than other provinces. A number of factors are involved in this.*

3. *BC has a much lower level of water treatment than other jurisdictions. In most other provinces, treatment consists of at least filtration before disinfection. In BC, there are 38 filtration plants – 27 of which serve small populations on first nations reserves. There are about 3500 public and community water systems in BC and disinfection is usually the only treatment provided.*

The recently proclaimed Drinking Water Protection Act and the revisions to the Safe Drinking Water Regu-

lations, came about partially as the result of an Auditor General's report on drinking water source protection which was published in 1999, increased awareness of drinking water issues due to Walkerton and a general consensus among all professionals (inside and outside government), for its need. It will provide a basis for considerable opportunity for needed additional protection for drinking water.

Because of the complexities of the issue of drinking water protection, it is one which biologists have a role to play among a variety of other professionals – in medicine, engineering, geologists (and economists, politicians etc). It is also necessary to interact with foresters and agronomists to deal with some problems – forest harvesting and agriculture are two activities which can affect drinking water supplies. There

seems to have been an acceptance that watershed management and influencing the quality of the raw water that enters a water system has an important role in the safety and public perception of drinking water. Public Health officials support the multi-barrier approach to ensuring that drinking water is safe. Watershed management is the first barrier followed by appropriate treatment, a good distribution system and monitoring. The economic savings in not having to build treatment plants to treat water degraded unnecessarily, (estimated to be 1-2 billion dollars) is a large incentive to protect watersheds.

Rick Nordin
Provincial Limnologist,
Water Management Branch,
BC Ministry of Environment, Lands
and Parks. □

60%

William Schouwenburg, RPBio. (centre) receives the APBBC President's Award, on the occasion of his retirement as Chair of the Board of Examiners. Presenting the award is Mel Kotyk, President (l) and Chris Clement, Past President.

The Role of Technical Experts in Policy Development

Daphne Stancil

One Perspective from the Salmon Aquaculture Review

An analysis of the role that technical experts played in providing advice to the Environmental Assessment Office when conducting a review of salmon aquaculture may be of assistance to the Association of Professional Biologists in discussing a role for the membership in policy development. Policy in this context is understood to be the principles, substantive or operational, by which the government is guided in managing its business. Policy in this context is established by elected members of government.

The province, represented by the Minister of Environment, Lands and Parks and the Minister of Agriculture, Fisheries and Food, requested that the Environmental Assessment Office (EAO) undertake a review under the *Environmental Assessment Act* (section 40), to evaluate the procedures and measures by which the province manages the salmon farming industry. The ministers established terms of reference for the assessment and identified five key technical issues to be taken into account when evaluating the management schemes. The ministers also requested that the evaluation consider the broader social and economic context for the industry.

These issues had been identified by members of the public, environmental non-government organizations, salmon aquaculture industry and government agencies, as the significant ones for the assessment. Ordinarily the EAO would rely on the expertise within government, but in this case the practices and procedures of the line agencies were the subject of the assess-

ment. The ministers and the EAO determined that independent technical advisors with expertise relating to the key issues would be well positioned to provide impartial advice.

The review terms of reference distinguished between technical or biophysical issues and socio-economic ones. The terms of reference for the five key biophysical issues established the type of expertise required by experts to provide credible and reliable advice. A team of economists and social scientists was required to undertake the socio-economic assessment.

In order to ensure credibility and acceptance of the technical advisors, the experts were subject to an open selection process and were required to provide their qualifications and to demonstrate independence from government, industry and other interests. On certain issues candidates required direct experience with industry. The EAO took care to ensure that in these cases only candidates with mixed experiences were "short listed" for further consideration. The candidates were also screened for their ability to deal with members of the public in interactive sessions on issues and to work in a team context.

In formulating findings, the technical advisors working in a team context, reviewed all available pertinent information, identified significant data gaps in the existing information, undertook risk assessments, and worked interactively with members of a review committee, members of the public and third party experts. They followed a similar process to evaluate their find-

ings. They then drew conclusions from the findings and based recommendations for changes to the government procedures in place for the management of salmon farming from these conclusions.

The EAO drew from the recommendations of the technical advisors in formulating recommendations to the ministers. The review process, beginning with the development of draft terms of reference and ending with the EAO's referral of recommendations to ministers, took almost two years. The government responded to the recommendations after considering them for just over two years. BC Fisheries is reporting on the implementation of recommendations.

Conclusions

The EAO retained experts on biophysical issues and experts on socio-economic issues to provide advice to the Salmon Aquaculture Review as a basis for policy advice to government. In selecting the experts, the EAO took into account the candidates' qualifications (education and experience) and pertinence to the study issues, the candidates' degree of impartiality to the existing public policy regime, their independence from identified interests, and their ability to and interest in working in a public process. The experts followed a methodology established with the study terms of reference to develop their recommendations to the government.

Daphne Stancil, M.Sc., LL.B. □

An Ethical Development

The Association Players

The Scene: Monday Morning.....high in a glass office tower in downtown Vicky Harbour.... a meeting is underway between Frank Furter (Mel Kotyk), CEO of Armpit Deep Powder, Austria's well known ski resort developer, and representatives of some of this country's major investors. Also at the meeting is Armpit's senior professional biologist, Willard Thrush (Don Benn), and Rebecca Rigid (Joy Boon), head of the company's engineering subsidiary, Straight Ahead Inc.

Other cast members joining us shortly include:

Investors – Maureen Ketchison, Ed Britton

The lugubrious biologist – Vinnie Viagara

Armpit Deep Powder (Armpit) CEO Frank Furter: **Thank you for coming everyone. I am joined today by Willard Thrush a registered professional biologist and Rebecca Rigid, the head of our engineering subsidiary LIGHT APPLAUSE**

I am pleased to inform you that Armpit's marketing research indicates there is a huge opportunity in this province for another major ski development in the Rolling Mountain Trench. The European market continues to grow and the low value of the Canadian dollar makes this area very attractive around the world. The existing developments are near capacity and the market is looking for something new. If you will invest in this development I can assure you that there are huge profits to be made. Our professional scouting team has identified Mount Dismount near Golden as having the best snow conditions in North America.

Willard Thrush: **Mr Furter, I have looked at existing wildlife maps for the Mount Dismount site and I noticed it may contain key winter habitat for the spotted mountain caribou, an endangered species in BC. I am not an expert on this species so I**

consulted Andy Antlers, a qualified wildlife biologist, who said it was necessary to gather habitat information for at least three years before we can make a decision on whether to develop this area. She said this was consistent with the Dirt Ministry's draft policy for this species.

Rebecca Rigid: **I wouldn't worry about the caribou Willard. I have walked those mountains many a time have never seen them in that area. Besides that kind of delay will play havoc with our construction schedule.**

Frank Furter: **Yes, Rebecca is right Willard. We need cash flow as soon as possible. We cannot possibly ask our investors here to put their hard earned money into this development while we spend three years looking at caribou habitat. I'm sure the caribou will, in time, become accustomed to the development and will be a real draw for our clients.....they love looking at wildlife up close!**

Investor: **Yes, Yes, we can't possibly tie up our money without a**

return for that long a period

Frank Furter: **(BECOMING MORE AGITATED) Look Willard, you're a biologist, why don't you do a study for something more reasonable...say 6 months... and see how much impact we're going to have. I'm sure you will be able to find some way to mitigate the impacts even if there are some. If you can't do it I'm sure I can find someone who can. Besides you are a bright person, if we can get this development off the ground I'm sure there will be a well paying senior position for you in the company. A chance to travel the world and earn much more than you do now. What do yuh say Willard?**

Willard Thrush : **Mr Furter, I must advise you that if the development seriously disrupts the spotted caribou's habitat that it may spell the end for this species. That in turn would have significant impact on the ecology of the whole area. This is a serious matter sir and although I can't find a current provincial policy on this species I'm sure the people of this Province would not look kindly upon the loss of this species.**

Frank Furter: Willard, we'll jump through the hoops and we'll minimize the impacts as much as is practical but this development will proceed....there is a lot of money to be made here. I was afraid that you might not agree with our plans Willard so I have taken the initiative of calling in a second biologist to get another opinion on this matter.

Frank Furter (calls out to secretary supposedly in the wings) Betty, would send in the other Biologist please.

The door opens and in slinks a man in dressed in a rather interesting fashion. He walks across the room and takes a seat beside Frank Furter's desk.

Vinnie Viagara: Hellooo everyone.....what can I do for you?

Frank Furter: Vinnie, thanks for coming in. Now I understand you are a biologist, is that correct?

Vinnie Viagara: Oh absolutely Mr. Furter.

Frank Furter: And are you a registered professional biologist?

Vinnie Viagara: Ohhhhh.. I'm registered all right..... I just don't like rules very much. wink wink, nudge nudge

Frank Furter: Oh yes, I understand. Willard here is worried about our development's impact on spotted caribou. He has some expert advice that we need to study their habitat for 3 years before we can make a

decision on whether to go ahead with this project.

Vinnie Viagara: Mr Furter.....may I be Frank?

Frank Furter: Why no Vinnie....I'm Frank....

Vinnie Viagara: Well Frank, Willard has always been one for over-kill in the length and complexity of his studies. Although I personally specialize in small mammals and not caribou, I think I can find enough information from other studies to get us through this hoop more quickly and get this project approval process on the way.

Frank Furter: That sounds more like it Vinnie! Willard why can't you learn to be more like Vinnie here. He is a lot more practical and will go far in this company....which is more than I can say for you.

Willard Thrush: Mr Furter, I must inform you that I am very concerned about the direction you are going here. The approach Vinnie has recommended does not meet the Dirt Ministry guideline and I strongly believe it will be profoundly detrimental to the sound management and conservation of this species. If you continue in this way, I will be obliged to try and find someone in the government to audit this project.

Frank Furter: (NOW EVEN MORE AGITATED) That could be a career limiting move Willard!

Willard Thrush: Mr Furter, I

am obligated under my profession's code of ethics to take this action and I will fight any attempt to dismiss me for doing what is ethically correct. In addition sir.....if you persist, I will be obligated to report this incident to my professional association!!

Investors: Oooooo..... Auh.....

Willard Thrush: And for you Vinnie.... Your behavior is very un-professional. You have attacked me personally rather than disagreeing with me on the basis of facts and competent interpretation of data. In addition you are not qualified to act in the area of caribou biology. These are serious violations of the code of ethics of the Association of Professional Biologists! Mr. Furter, you would be well advised to ensure that this study is carried out by a registered professional who is bound by a code of ethics, because if you don't there is a strong likelihood that any environmental review process will result in delays and perhaps ultimate rejection of your development

Vinnie Viagara: Oh, this is just so typical of you Willard!...this is just so typical! You want to talk about discipline actions?! Just because you spoke to a spotted caribou specialist doesn't make you one yourself! If you had your way, nothing would ever happen in this province!

Willard Thrush: No, but the specialist I spoke with said we needed significant studies here and if you want this project rejected by the Dirt

...continued on page 18

New Environmental Regulations Create Opportunities and Challenges for Qualified Professionals

Eric McGreer, Lloyd Erickson, Chris Jenkins

Over the past several years, the Ministry of Water, Land and Air Protection (formerly the Ministry of Environment, Lands and Parks) has moved from traditional end-of-the-pipe, and command-and-control prescriptive systems to governance also emphasizing environmental stewardship, performance-based regulations, and pollution prevention to protect natural ecosystems and human health. Biologists, engineers and other qualified professionals have an important role to play in the continued development and implementation of these new regulatory and stewardship tools.

To achieve desirable environmental protection goals (i.e. cleaner land, water, and air), the ministry's role is to develop realistic environmental standards and requirements which it does in consultation with industry, the public, non-government organizations, consultants, and other levels of government. Compliance and enforcement are key components of our environmental protection strategy. One element of the

new approach is that new environmental legislation regularly makes reference to "...the use of *Qualified Professionals*" to assist industry in planning strategies and in designing control measures and treatment works which meet the new standards, and to undertake follow-up monitoring and evaluations to ensure that on-going activities continue to meet legal requirements.

Regular in-plant and field moni-

toring of on-going operations is particularly important for performance-based regulations which rely on measures of environmental parameters to ensure a high degree of environmental protection. Examples of several new regulations include the *Mushroom Composting Regulation*, the *Contaminated Sites Regulation*, and the *Municipal Sewage Regulation*. Proposed



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Ministry, you keep on going the way you are!

Investors: We don't want that! A bit of a delay is better than a rejection of the development and a loss of all our money!

Frank Furter: Well I suppose you are right Willard. We can't afford to have the project derailed once we are in the middle of the development. What do you think Rebecca?

Rebecca Rigid: As a professional myself, although I don't like the delay, I am bound by a code of

ethics too, and I don't like the idea of not having a sound environmental plan done by a registered professional.

Frank Furter: I guess we won't be needing your help Mr. Viagra. Perhaps we could find another role for you to play in our organization (giving him an appreciative and knowing look over his glasses)

FADE TO LUNCH – following discussion!!

Discussion Questions

What are the infractions that have been committed here?

Are either of the biologists in the clear?

What actions should a professional biologist take in this situation?

How else could this situation have been handled?

If the company decides to continue with the development, what is their next step?

regulations such as the *Organic Matter Recycling Regulation*, a forthcoming *Industrial Pollution Prevention Regulation*, and anticipated amendments to the *Aquaculture Waste Control Regulation* will rely on the concept that operators must hire suitably qualified professionals to address highly technical/scientific regulatory requirements. These types of regulations and their accompanying guidelines, policies and procedures define qualified professionals and outline expected professional standards. For example, with respect to compliance measurement, the *Municipal Sewage Regulation* requires dischargers to hire qualified professionals to:

- design sewage facilities that include suitable sampling facilities
- develop operating plans that include suitable sampling and monitoring procedures
- design receiving environment monitoring programs
- analyze annual effluent and receiving environment monitoring data

This approach to environmental regulation provides a tremendous business opportunity for qualified professionals and brings with it elevated challenges and responsibilities. It incorporates the principle of professional accountability and conduct by relying upon the professional to carry out their work objectively to the highest technical standards within their area of practice, and to do so in a timely manner. Failure to meet these objectives can have serious implications for the professional's client.

Qualified professionals are expected to follow the precautionary principle in exercising their responsibilities regarding situations that may adversely affect the environment. They are also expected, consistent with their

professional code of ethics, to bring to the attention of their clients and the ministry any situations or circumstances within their area of expertise that are not adequately protective of human health or the environment, and to recommend protective measures.

Who is a Qualified Professional?

The term *qualified professional* has been adopted to describe individuals capable of fulfilling the new roles and responsibilities that the ministry and the public require from the professional community. Depending on the nature of the activity to be regulated, there can be a range of different professions who must work together (biologists, engineers, oceanographers, geoscientists, foresters, technologists, agrologists, lawyers, accountants, and public health experts) on any single project or within a given industrial sector.

For reference, the *Municipal Sewage Regulation* uses the following definition:

“Qualified professional” means an applied scientist or technologist specializing in a particular applied science or technology including, but not necessarily limited to agrology, biology, chemistry, engineering, geology, or hydrogeology and:

- who is registered in British Columbia with their appropriate professional organization, acting under that association's Code of Ethics and subject to disciplinary action by that association, and
- who, through suitable education, experience, accreditation and knowledge, may be reasonably relied on to provide advice within their area of expertise.

The regulation then uses the term qualified professional in a manner that further refines which type of qualified

professional is expected to provide the advice in which area by using terms such as “*has expertise with respect to*” and “*has expertise in the particular aspect of..*”. Future environmental regulations may require regulated parties to seek advice from ever more specialized biologists who have recognized expertise in areas such as fish health, introduced exotic species, parasitology, ecosystem interactions, assimilative capacity, underwater video habitat interpretation, and marine ecosystem health.

The ministry welcomes the opportunity to work in partnership with the Association of Professional Biologists of British Columbia to receive feedback on our initiatives, and to provide educational opportunities for professional biologists in environmental regulation in BC. Additional information on environmental protection can be found on the Pollution Prevention and Remediation website at www.elp.gov.bc.ca/epd/.

Eric McGreer, RPBio., Sr. Aquaculture Biologist, Pollution Prevention and Remediation Branch, Nanaimo;

Lloyd Erickson, RPBio., Head, Environmental and Aquaculture Section, Pollution Prevention Section, Nanaimo; and

Chris Jenkins, P.Eng., Acting Head, Municipal Pollution Prevention Unit, Victoria.

The authors wish to thank Blake Medlar, PAg., Head, Municipal Section, Nanaimo; Ron Driedger, PEng., Director, Pollution Prevention and Remediation Branch, Victoria; and Harry Vogt, PEng., Manager, Pollution Prevention Section, Victoria for their inspiration and support.

For further information, please contact Lloyd Erickson at:
(250) 751-3186 □

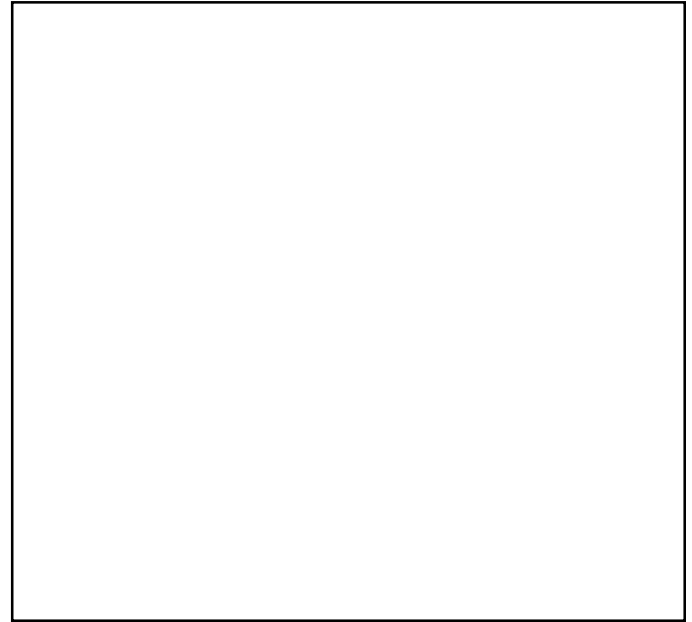
Award for Excellence in Biology presented to Neil K. Dawe

One of the authors of '**The Birds of British Columbia**' and the founder of the **Brant Festival** has been honored by the Association of Professional Biologists for his work. Neil K. Dawe, RPBio was presented with the Award for Excellence in Biology at the Annual General meeting of the APB in North Saanich on May 3, 2001.

The Birds of British Columbia series, described by some as perhaps the finest regional bird reference of its type in North America, benefited from Neil's ability to adapt and apply new technologies to the project as it evolved. His high level of computer skill allowed the project to move forward from a card-based data system used for volumes 1 and 2 to an electronic database used for volumes 3 and 4. Neil designed and wrote a comprehensive set of unique dBase programs for data analysis and summary statistics in these final volumes. This two decades long project, on which Neil was one of the senior authors, resulted in Neil producing the equivalent of over 20 scientific papers for each year of the last 20 years.

Neil's commitment to raising public awareness of the consequences of unregulated human population growth have led him to take a major role in conserving habitat for wildlife. In the 1980's Neil became very concerned about the fate of the marine foreshore habitat along the east coast of Vancouver Island, especially in the Parksville-Qualicum Beach areas where thousands of Brant stage each spring. Neil enlisted the support of the business community and ultimately founded the Brant Festival. Neil was the lead organizer of a festival which has now become one of the province's annual celebrations of wildlife. These activities resulted in the preservation of 112 ha of estuary habitat at the mouth of the Englishman River and several kilometers of foreshore habitat between Parksville and Qualicum. Many communities have now emulated the spirit of the Brant Festival and have created their own bird-related festivals.

Neil has also worked on habitat restoration on estuar-



Neil Dawe (l) receives award from Dr. Ian McTaggart-Cowan

ies along the east coast of Vancouver Island and has successfully managed the rehabilitation of several estuarine marshes, which are among the rarest and most valuable habitats on the planet. His work may lead to a new understanding about the potential negative long term consequences of human-induced degradation of estuarine marshes.

Neil works for the Canadian Wildlife Service on Vancouver Island, and has been the recipient of Environment Canada's Regional Citation of Excellence Award, and their National Citation of Excellence Award. He has also received the Federation of British Columbia Naturalist's Outstanding Service Award, and the Ina Mitchell Award from the Tourism Association of Vancouver Island, and was the recipient of Ruth Masters' Hero Spoon in 1997.

The Award for Excellence in Biology is awarded periodically to a member in good standing of the Association of Professional Biologists of B.C. in recognition of a significant contribution to the biological sciences in British Columbia. Neil is the 5th winner of the award since its inception in 1988.