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• THE CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS •
• SOCIÉTÉ CANADIENNE DES BIOLOGISTES DE L'ENVIRONNEMENT •

THE CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS Newsletter / Bulletin

In this Issue:

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Cover Photos:

Front Cover: Adult wolf strolling along the road, near exit from Jasper Park Lodge, Jasper, AB., Sunday, Dec. 16th, 2012. Photo by Peter G. Wells, Halifax, NS.

Back Cover: Abandoned canoe on edge of frozen Talbot Lake, along Highway 16, north of Jasper, Jasper National Park, AB., Monday, Dec. 17th, 2012. Photo by Peter G. Wells, Halifax, NS.

Photo Credits: Peter G. Wells, CSEB Member

CSEB NEWSLETTER 2013

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The Canadian Society of Environmental Biologists Newsletter is a quarterly publication. The Newsletter keeps members informed of the Society's activities and updates members on the current affairs and advances in the field of environmental biology. This publication draws together the widely diverse group of Canadian environmental biologists through a national exchange of ideas. Members are invited to contribute papers, photos or announcements that are of a national biological and environmental interest. Letters to the editor are welcome. This is a volunteer non-profit organization and we rely on your participation to make the newsletter a productive forum for ideas and discussion.

All business correspondence, changes of address, undeliverable copies and membership applications should be sent to: CSEB National Office, P.O. Box 962, Station F, Toronto, ON., M4Y 2N9. **Editorial correspondence: Gary Ash, Editor, e-mail:** gash@golder.com

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LE BULLETIN de la SCBE 2013

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Le Bulletin de la SCBE est une publication trimestriel de la Société Canadienne des Biologistes de l'Environnement. Le Bulletin informe les membres des activité de la Société sur événements courant ainsi que les progrès qui font en sciences de l'environnement. Par un échange d'idées au niveau national, cette publication intéresse un groupe très diverssifié d'environnementalistes Canadien. Les membres sont invités a contribuer des articles, photos (noir et blanc) ou des messages qui sont d'intérêt nationale en sciences biologiques et environnementales. Les lettres à l'editeur sont bienvenues.

Tout la correspondence d'affaires, y compris les abonnements, les changements d'adresse, les exemplaires retournés et les formulaires: CSEB National Office, P.O.Box 962, Station F, Toronto, ON, M4Y 2N9. **Les lettres à l'editeur: Gary Ash, Editor, courriel:** gash@golder.com

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The Canadian Society of Environmental Biologists

CSEB OBJECTIVES

The Canadian Society of Environmental Biologists (CSEB) is a national non-profit organization. Its primary objectives are:

- to further the conservation of Canadian natural resources.
- to ensure the prudent management of these resources so as to minimize environmental effects.
- to maintain high professional standards in education, research and management related to natural resources and the environment.

OBJECTIFS de la SOCIÉTÉ

La Société Canadienne des Biologistes de l'Environnement (SCBE) est une organisation nationale sans but lucratif. Ses objectifs premiers sont:

- de conserver les ressources naturelles canadiennes.
- d'assurer l'aménagement rationnel de ces ressources tout en minimisant les effets sur l'environnement.
- de maintenir des normes professionnels élevés en enseignement, recherche, et aménagement en relation avec la notion de durabilité des ressources naturelles et de l'environnement, et cela pour le bénéfice de la communauté.

NATIONAL News

PRESIDENT'S Report

By Robert Stedwill, CSEB President

The current climate change talks going on in Warsaw, Poland as I write, have revealed personal aspects of national leaders and negotiators heretofore unheard of. They bring an emotional element to the talks, publicly displayed. Why now?

The Philippines have been struck numerous times over the last twelve months by storms, typhoons and all sorts of natural disasters, but none have struck home as violently as super typhoon Haiyan did. When one reviews the damage, one can only imagine what the severity of the storm was during its height. It is no wonder that the Philippine representative was moved to tears, and at this point, has started a hunger strike, demanding action. With only a few days left in the talks, all of the environmental representatives have walked out of the venue, citing "lack of ambition" on the part of governments. What will it take?

The Rio Conference of 1992 seems like a long time ago. It was where Agenda 21 was established, in which Section II addresses Conservation and Management of Resources for Development, including atmospheric protection, combatting deforestation, protecting fragile environments, conservation of biological diversity, control of pollution, and the management of biotechnology and radioactive wastes. With respect to atmospheric protection, the 350 ppm level of carbon dioxide has long been passed, and now sits at 393.1 as of 2012, with some global stations reporting levels in excess of 400 ppm. As levels continue to climb (the 2013 level being 2.2 ppm above that reported in 2011), the global 400 mark is expected to be surpassed by 2016. Remember that carbon dioxide levels sat at 280 ppm prior to the industrial revolution. What should we expect at these new levels?

My personal opinion is that we may have crossed the threshold, the proverbial "tipping point". I look to the melting ice cap in the Arctic, the decline in permafrost levels upon which much of northern Canada depends, and rising sea levels around the world. We will have our work cut out for us, as biologists, to monitor the changes around us in Canada, not only of the impacts of our developments and projects, but the changes in our natural environment due to climate change linked to our developments and projects.

The impacts to Canada will be significant. This knowledge needs to be conveyed clearly and succinctly to our governments, and other governments around the world at the negotiating table. Much depends on their drive and ability for action, both mitigation and adaptation, to this most urgent issue.

REGIONAL News

BRITISH COLUMBIA News

The Imperceptible Solid Waste that Alters British Columbia's Shoreline and Ecosystems

By Loys Maingon, B.C. Regional Director

Sometimes all it takes to put things into perspective is a short article describing and discussing the results of a simple set of experiments. Early December 2013 saw the publication of two such pieces of research.[1] One is readily available online: "*Microplastic Moves Pollutants and Additives to Worms, Reducing Functions linked to Health and Biodiversity*".[2] This kind of work is of particular interest because it bridges problems of scale, and in doing so it reiterates the truth of a phrase that E.O. Wilson frequently repeats throughout his publications and lectures: "It is the little things that run the world." I hasten to add: the little unseen and commercially unimportant things we do not research sufficiently.

In British Columbia, as in most of Canada, when we think of environments we tend to fixate on big things. As a consequence, we generally miss the real context and drivers of the world about us. It is a form of environmental myopia. Thus, the Canadian media's environmental reporting has recently been limited by our politicians' focus on resolving economic problems associated with the long-distance transportation of Athabasca Oil Sands heavy oil by rail, pipeline or tanker. It is ironic to hear commentators repeat that tanker traffic threatens the "pristine waters of the West Coast," if one stops to consider the ongoing impacts of unseen fossil fuel waste products known as microplastics and their long-term implications.

Figure 1: Miles of plastic PVC debris associated with geoduck farming and shellfish aquaculture in the Salish Sea.

While it is true that tanker traffic poses a major (and undesirable) risk to coastal marine ecosystems, it is only one of a series of ongoing anthropogenic impacts that are transforming — albeit often imperceptibly — and irreversibly degrading coastal waters and ecosystems.

Charles J. Moore discovered the great Pacific garbage patch in 1997.[3] He subsequently showed that there was six times more plastic in the Pacific gyre than zooplankton. A 2002 study showed that even off the coast of California, plastic outweighed zooplankton by a factor of 5:2. Although work was done by Dr. Hideshige Takada on micro-pellets as of 2000,[4] it was only in 2008 that microplastics — degraded plastic particles and industrially-produced microscopic abrasives ("nurdles") and their potential impact on the food chain — really came to attention of the scientific environmental community.[5]

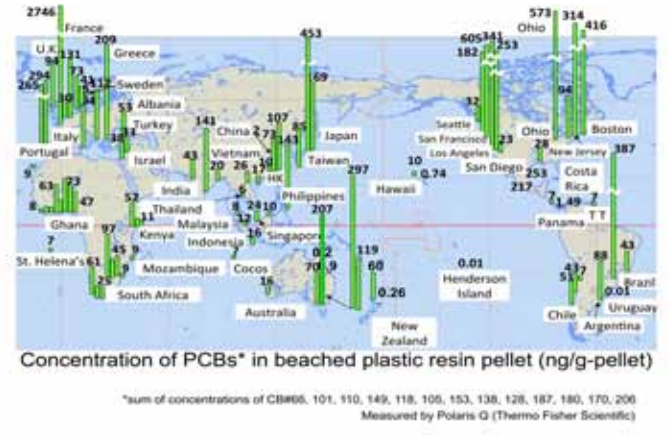

Figure 2: Results of Dr. Takada`s research on beached microplastics and associated POP`s http://www.oceanhealthindex.org/News/Microplastics

Microplastics come in two main forms[2]: degraded plastics and as resin pellets used as both as feedstock for plastics and as exfoliants in beauty products. As microscopic lipophilic particles, microplastics bind with POPs (persistent organic pollutants), which are themselves a product of the petrochemical industry. Like the celebrated photos associated with macro-plastic debris of albatross carcasses lined with oceanic macroplastic debris, microplastics readily enter the foodchain with hitherto undetermined physiological effects.[6] As Takada's International Pellet Watch data have shown, microplastics are now ubiquitous in all oceans and Great Lakes (**Figure 2**). These data show that there is very little that is "pristine" in the state of today's oceans.

While work has been done demonstrating the ingestion of microplastics by filter feeders at the tissue level, toxicological and ecological implications have remained unclear.

The official position at NOAA is: "*We know it's possible they could be accumulating in the food chain,"* says Arthur, one of the authors of the 1998 study on microplastic debris[5]. *"The entire spectrum of marine life, from lugworms and mussels to fish and marine mammals, has the potential to take in these small particles. But at this point, it's hard to say if these particles are bioaccumulating in food webs and how much harm is being caused by chemicals in the plastic.*"[6]

Thus, until now our understanding of microplastics was limited to the accumulation of debris with possibly no ecophysiological impact on keystone organisms which shape our ecosystems. This position was well articulated by Dr. Joel Baker, professor at the University of Washington and Science Director of the Center for Urban Waters in Tacoma: "*While we don't yet understand the impacts of microplastics to aquatic organisms, we do know that releasing persistent materials into the ocean will result in ever increasing concentrations of marine debris.*"[7]

One of the recent studies noted above, by Mark Browne et al.,[2] have changed all this by addressing the question of the ecological and physiological roles that microplastics play as pollution vectors. Using microplastic PVC, a common by-product of sewerage, industry and coastal shellfish aquaculture, with common POP additives (nonylphenol, phenanthrene, Triclosan and PBDE-47), they were able to show that microplastics not only settled in lugworm tissues, but like treated sand, microplastics facilitated POP absorption through the gut. Pollutants sorbed on microplastics bio-accumulated in lugworm tissues at concentrations 326% -3,770% larger than experimental sediments. "**This is the first controlled evidence showing that eating of plastics can move pollutants and additives into the tissues of animals**."[2]

Not only did absorption of microplastic mediated pollutants increase lugworm mortality by 55%, it also lowered activity, reduced coelomocyte ability to remove pathogenic bacteria by 60% and increased oxidative stress by 30%. This research showed that "*worms eating microplastic accumulated large enough concentrations of pollutants or additives to reduce survival (Triclosan), feeding (Triclosan and PBDE), immunity (nonylphenol) and antioxidant capacity (PVC)*"[2]. The numbers become impressive when they are considered in terms of the important ecological function of the humble lugworms.

Lugworms are important ecosystem engineers in coastal tidal ecosystems. They affect the stability and resuspension of sediments and biogenic nutrient fluxes which can shape entire ecological communities.[8] The seemingly unabated and expanding spread of microplastics therefore has the potential to alter the species composition of existing biological communities, and the associated resilience of these systems.

This is particularly so when we stop to consider that lugworms play an important role in the recovery of sites affected by oil spills. The Pacific coastal species *Abarenicola pacifica* is tolerant of direct contact with sediments containing 1,000 ppm crude oil. As Augenfeld showed in 1980: "*A. pacifica* can continue to turn over the equivalent of its own body weight in sediment, but high concentrations of oil may reduce the sediment working rate of surviving worms by as much as 70%, which would substantially retard movement of sediments to the surface and recovery of polluted systems."[9]

Lugworms are only one of a large number of species involved in sedimentary processing chains. As Browne et al. conclude, polyethylene, polystyrene and polypropylene micro-debris have much larger concentrations of pollutants

than PVC, therefore their research is preliminary and requires further research into the impact on more taxa – in a largely underfunded research environment.

Nevertheless, this research is an important breakthrough. In 1959, BC banned deep sea oil exploration to protect salmon fisheries and the ecosystems that supported them. In 1972, the provincial government passed legislation banning tanker traffic in order to further protect these ecosystems. Meanwhile, microplastics have become a growing silent killer.

Today, 50 years after Rachel Carson published her 1962 landmark classic on the silent implications of the pesticides and the petrochemical industry, we seem not to have heeded the message sufficiently. The public has remained addicted to an economy reliant on industrial chemicals, particularly petroleum and its by-product, plastics. As in 1962, industrial petrochemical pollutants have found a silent petroleum-derived micro-carrier that has the potential to unravel nutrient processing chains that have made our ecosystems resilient to large scale anthropogenic insults.

Biological processing chains are our real life-jacket and ultimate safety. Tanker traffic safeguards to ecosystems and our natural environment along the coast of British Columbia should not be taken as just a means to "business as usual" in order to continue "sustainable business." We cannot ship oil that produces microplastics and petrochemical pollutants, and claim that all this is really safe. Browne et al.'s simple research points to the Achilles heel of an economy based on fossil fuels. Any economy that results in the dismantling of the same life-sustaining processes that have made it possible at both micro and macro scales, and thereby makes the ecosystems that support it unresilient, is itself completely unsustainable and simply unsafe.

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ALBERTA News

Submitted by J. Hnatiuk, Alberta Regional Director

Scientists Begin Critical Research Aimed at Protecting Canada's At-Risk Caribou and Grizzly Bear Populations

By Sustainable Forestry Initiative

OTTAWA and WASHINGTON, Nov. 25, 2013

As grizzly bear populations in western Canada make their way into winter hibernation this month, scientists in Alberta are embarking on their next phase of field research, the results of which will go a long way towards protecting the province's at-risk grizzly and caribou populations. The research will also have implications on grizzly and caribou habitats in boreal forest regions nation-wide.

"We're pleased to be able to assist this important project with a $100,000 Sustainable Forestry Initiative ® (SFI®) Conservation and Community Partnerships grant," says Kathy Abusow, SFI President and CEO. "The grant will allow researchers at the University of Saskatchewan to investigate the response of threatened species to linear features and landscape changes in a managed forest ecosystem."

"We're incredibly excited to start on the analysis phase of this project and produce tangible results that land managers can use to protect and restore habitats while maintaining key economic activity in our forests," says Gordon Stenhouse, wildlife biologist and grizzly bear expert. "Our goal is to ensure the important information we're gathering will be used by the Government of Alberta and other leaders, as well as land managers, to help inform sustainable resource development within Canada's boreal forest."

During the first year of this three-year project, researchers are focusing on preparing LiDAR maps, highly detailed remote sensing satellite imagery, which will help them understand the movement of both species. Analysis of detailed animal movements will begin shortly while preparations for the caribou winter field data collections are also well underway.

"The collaborative nature of this project demonstrates the continued commitment of the forestry sector to maintain species at-risk on a shared working landscape," says Andrew de Vries, SFI Vice-President, Conservation and Indigenous Relations. "This project is absolutely in line with SFI's important conservation and research requirements, which are aimed at promoting biological diversity, protecting wildlife habitat and helping SFI participants manage special forest sites."

Note: CSEB by including the information on Sustainable Forestry Initiative, does not endorse or disclaim the activities of SFI.

One of the biggest issues facing both caribou and grizzlies is habitat change brought on by human activity. By combining previous data sets and maps of habitat disturbances with new technology of LiDAR imagery to aid in understanding habitat recovery, the University of Saskatchewan, in collaboration with Weyerhaeuser and West Fraser Ltd., is hoping to gain greater insights on how caribou and their predators perceive and respond to the dynamic forest landscape across space and time.

In addition, the Foothills Research Institute is playing an instrumental role in this project, not only contributing long-term telemetry data sets on caribou and grizzly bears that have made this research possible, but also providing a base in Hinton, Alberta, for researchers to prepare their LiDAR maps during the first year.

About Sustainable Forestry Initiative SFI Inc. is an independent, nonprofit organization that is solely responsible for maintaining, overseeing and improving the internationally recognized Sustainable Forestry Initiative® (SFI®) program. Across Canada and the United States, more than 100 million hectares (more than 240 million acres) are certified to the SFI forest management standard. In addition, the SFI program's unique fiber sourcing requirements promote responsible forest management on all suppliers' lands. SFI chain-of-custody (COC) certification tracks the percentage of fiber from certified forests, certified sourcing and post-consumer recycled content. SFI on-product labels identify both certified sourcing and COC claims to help consumers make responsible purchasing decisions. SFI Inc. is governed by a three-chamber board of directors representing environmental, social and economic sectors equally. Learn more at http://www.sfiprogram.org/ and http://sfiprogram.org/Buy-SFI.

SOURCE: PRNewswire, USNewswire

Good News in Sage Grouse Conservation Efforts

Some of you may remember that a couple years ago Alberta Conservation Association purchased the Silver Sage property near Manyberries in the SE corner of the province. We undertook some restoration work in the area in hopes that the property would provide good upland game bird habitat (sage grouse were the target species). This past week one of our bios identified 15 sage grouse on the property in two different flocks. To me this is really exciting news. I don't in any way think that we grew those sage grouse on the property, but obviously the land that we have conserved is providing habitat for these birds for at least part of the winter.

We always undertake these purchases with the intent of providing habitat for wildlife, but when you hear a story like this it really reinforces the fact that the habitat conservation that ACA and our member groups are involved in can have a direct impact on species. We might even be able to say "we are making a difference"!

Todd Zimmerling, M.Sc., PhD, P.Biol.
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Phone 780-410-1990 Cell 780-903-3377

SASKATCHEWAN News

Submitted by Robert Stedwill, CSEB President

Saskatchewan Report – Winter 2013

Not that 2013 is a new year anymore, as it is the 22nd of November already, but there certainly are new developments going on in the province. Not only physical ones such as the K + 1 Potash mine currently under development just northwest of Regina, or the increased oil activity in the southeast, creating housing problems for the City of Estevan, but also in the area of environmental legislative reform.

Saskatchewan's new "Environmental Code" is "expected to be presented in the spring as the province adopts a new, results or outcome-based model for environmental regulation that will improve protection of the environment while fostering innovation and supporting sustainable economic development.

The Saskatchewan Environmental Code will provide directions for projects, allowing operators in many situations to proceed in an environmentally-friendly manner without unnecessary permits from the ministry, while holding proponents accountable for achieving important environmental outcomes."

Of some concern is the statement – "allowing operators in many situations to proceed in an environmentally-friendly manner without unnecessary permits from the ministry". Having worked in industry before, the thought of not having to deal with "unnecessary permits" is not unlike manna from heaven for hard driving, profit–driven proponents. My personal experience is that operators tend to forge ahead to get the job done, and ask for forgiveness later if things go south. The actual process of getting necessary permits allows proponents, and proponents' in-house environmental councel an opportunity to provide sobering second thoughts on a project.

Time will tell.

Another new development, which I believe is long overdue, is the development of island forest management plans. The Forest Service of the Ministry of the Environment has been working to establish a 20-year forest management plan (FMP) for the Island Forests in north-central Saskatchewan. These forest areas, Fort a La Corne, Nesbit, Canwood and Torch River, are unique in the sense that they are not part of a license area, but rather consist of a number of smaller detached parcels of provincial forest in and around Prince Albert. Forest operations in the Island Forests are undertaken by six term-supply license holders and small independent operators who acquire forest products permits. Details of annual forestry operations are contained within the Island Forests Operating Plan, which is prepared by the Saskatchewan Research Council.

The new management plans will develop long-term management for these smaller parcels and their unique "island forest environments". Public consultation is occurring as of this writing, so we will look forward to seeing the outcome of the management plans having considered the public's input.

MANITOBA News

The On-Going Saga of Sewage Lagoons in Manitoba

Submitted by Bill Paton, Manitoba CSEB Regional Director

Manitoba does not have a stellar record of successful sewage treatment. This is further endorsed by a recent Environment Canada July 2012 report that indicated that BC had 12 at risk sewage lagoons, Alberta 35, Saskatchewan 30 and Manitoba 81.

The recent dismissal by the Manitoba cabinet of an appeal to relocate a sewage lagoon that is to be built on the site of an old dynamite plant in East Selkirk calls for the history of this issue in the province to be revisited. Local residents and the Lake Winnipeg Foundation were denied Clean Environment Committee Hearings as well as their appeal based on evidence that inadequately treated effluent would be discharged into the Red River and hence Lake Winnipeg. In addition, they raised concerns with the assistance of a USEPA scientist about residual chemicals (e.g. dinitrotoluene) in the old factory site that are carcinogenic and could poison fish stocks. The lagoon site is less than a kilometre from the riverbank.

Conservation and Water Stewardship Minister Gord Mackintosh's statement was "Our job was to ensure the environmental integrity of what is happening here. Our scientists are saying that has been done" (Winnipeg Free Press, 2013).

Save Lake Winnipeg spokeswoman Vicki Burns called the cabinet dismissal of the appeal "maddening". "This is a good example of government talking up 'saving Lake Winnipeg' but not following through with concrete actions that need to happen. There are good ways to deal with sewage treatment that would minimize the contribution to the problem" (Winnipeg Free Press, 2013).

My interest in stabilization ponds was raised by the observation when I came to the Prairies in the mid-1970s that many communities used this type of treatment facility. We had looked at these systems in Scotland but decided that for all year round use it was too cold. They are used in summer resorts in some parts of Europe. The system depends on motile algae oxygenating the water column and a diverse microbial flora to break down the organic waste. These microbes do not function effectively at temperatures below 10 degrees celsius, which means that for about six months of the Canadian winter, activity stops. Further research indicated that these systems were also overloaded with organic matter in Manitoba and very quickly in the late fall became anaerobic with associated odour issues in the spring and summer. Assessing a number of these systems in Manitoba indicated that none of those examined could meet license requirements, which were and still are pretty minimal by international standards. It was also evident that rather than motile algae, these ponds were wonderful propagating systems for cyanobacteria (blue-green algae). One attempt to remove phosphates from the effluent using alum in the Whiteshell Provincial Park was unsuccessful and discontinued.

Continuing research on lagoon performance led to my writing a major review of the world literature on these systems, which was entitled "Sewage Lagoons: Do/Can They Work Efficiently in the Manitoban Climate?" I concluded the following:

At most sewage treatment facilities, there are great variations throughout the day, even in dry weather, in volume and strength of the sewage received. Such variations can cause difficulties in the operating of waste stabilization ponds, and the position is often aggravated by the fact that quite often peak flows coincide with peak strengths of sewage. Highly varied inorganic and organic chemistry loads in different locations can also have profound effects on pond functioning and effluent quality.

On the basis of the literature reviewed (to date), it is my opinion that facultative sewage treatment ponds cannot operate to efficiently treat sewage in the Manitoba climate as presently constructed and loaded. Since these are so widely used throughout the province, the effluents from these lagoons have to be implicated in the very sad state of our streams, rivers, and lakes.

In 1992, I presented my findings to a Manitoba Clean Environment Commission Hearing in Portage La Prairie. The proposed lagoon license was denied by the Commission. However, unusually the Commission also made a series of general observations:

"Representations were made to the Commission that information appears to be lacking on sewage lagoon design, construction, and operation in Manitoba. Concerns were also expressed regarding the longevity of biological organisms in cold climate lagoons. The commission suggests that this issue might be appropriately addressed by a study on the design, construction and operational guidelines for sewage lagoons. Any such study might best be guided by an advisory steering body made up of appropriate representatives from the scientific community, the public at large, consultants or association representatives, and by representatives of both the provincial and the federal governments. The intent would be to ensure that design requirements and operational guidelines adequately protect the quality of surface and groundwater resources in the province. The Commission feels that some urgency is attached to this need and it should receive prompt attention."

Following this advice to government, we awaited some action. When none was forthcoming, Dr. Eva Pipp, a biologist at the University of Winnipeg, and I asked the Province to identify three lagoons that they considered functioned effectively. We still await a reply and many new lagoons have been commissioned. Members of the public have from time to time raised the CEC recommendation with both politicians and government officials. One response shared with me was the following written statements made by Larry Strachan, Director, Environment Act.

"In response to your general concerns about wastewater treatment lagoons. I would like to advise you about the following activities undertaken by the department:

1. Staff of the Environmental Approvals Branch assisted in the organization of and presentations at a two day seminar on Sewage Lagoon Processes held in Winnipeg on February 2 and 3, 1994. This seminar was sponsored by the Western Canada Water and Wastewater Association, an association whose prime objective is to provide opportunities to exchange knowledge, information and experience on water and wastewater issues.

2. The department will continue to examine the performance of wastewater treatment lagoons in Manitoba and will review its guidelines for the construction of wastewater treatment lagoons.

3. A detailed data search will be undertaken to assess the compliance record of sewage lagoons currently operating. As well, a detailed study of approximately 10 lagoons will be undertaken this spring and fall to assess any changes in effluent quality through-out a discharge event."

On becoming aware of this correspondence, in December 1995 I requested from Mr. Strachan copies of the department review and data from data search and the detailed discharge study. I still await a reply.

In the meantime, we have carried out research on the sewage lagoon system that operated until recently at Riding Mountain National Park, Wasagaming, Manitoba. This research demonstrated that these structures with the right biology and loading rates could meet effluent requirements that exceeded those of the mechanical plants in the province (Champagne et al. 2006).

It should be noted that these lagoon systems will be required to meet nutrient discharge limits in the near future.

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TERRITORIES News

Nunavut Winter 2013 Update

Submitted by Paula Smith, CSEB Regional Director

After elections this fall, Peter Taptuna has been chosen as the premier of Nunavut and Johnny Mike is the new Minister of Environment. Taptuna represents the western Nunavut riding of Kugluktuk and has stated that resource development will be a priority for the Nunavut government and "Economic development has to come from exploration and mining". On that note, the review of Baffinland's Mary River Project (iron ore) Early Revenue Phase continues as does the review of Agnico-Eagle's Meliadine Project (gold), on north Baffin Island and near Rankin Inlet, respectively.

Parks Canada has been continuing their consultations and feasibility assessment for the proposed Lancaster Sound National Marine Conservation Area. The area is home to more than a million birds seasonally, Canada's largest polar bear subpopulation and an estimated 75 percent of the world's narwhal. Other species of note found in the area include significant populations of beluga. If the conservation area is approved, it would protect the area from oil and gas drilling, as the seabed is estimated to contain significant reserves, comparable to the Hibernia oil field off Newfoundland.

Polar bear continue to make the news with the 40th anniversary of the landmark Agreement on the Conservation of Polar Bears, signed in 1973 by Canada, the United States, Russian, Greenland, and Norway. Discussions regarding the involvement of Inuit, incorporating Inuit knowledge, and respecting traditional livelihoods were factored into the International Forum on Conservation of Polar Bears, which was organized by the World Wildlife Fund and held in Moscow in December.

Finally, it's been a cold fall so far and the ice is quickly forming on the bay, although the only regular species seen here are redpolls and ravens. Don't forget to report your winter bird sightings on ebird at http://ebird.org/content/canada!
Happy holidays.

NWT Winter 2013 Update

Submitted by Anne Wilson, 2nd Vice President

This comes from Yellowknife, as I travel for meetings. The North still feels like home to me, so I am very grateful for opportunities to be north of 60, whether in winter or summer.

As I flew over Great Slave Lake in early Dec., I was surprised how much open water remained in the main body of the lake. The commercial fishermen will not be able to get out into the fishing areas for a while. Similarly, most winter sampling work is on hold for any of the deeper lakes, until ice depths will support safe access. Temperatures in both territories are seasonally frigid, enhanced by stiff wind chills! As we move towards the winter solstice, being outside in the dark becomes more the norm, and surely it is hibernation instinct that is tugging me to curl up at home with a good book. None-the-less, things are not slowing down in the NWT and NU!

One item of concern entails a large spill from an Alberta coal mine tailings pond. A slug of poor quality water is making its way to the NWT (see article below). This will be tracked with water quality monitoring, and has been the subject of a heated forum in Yellowknife.

Mining and other development news

Although the financial situation is difficult for junior mining companies seeking to develop projects, there has been movement in the environmental assessment and permitting processes. Several NWT mining projects have moved from environmental assessment (EA) to the regulatory stage. Fortune Minerals' NICO project (cobalt/gold) is moving to water licence hearings in the new year. Canadian Zinc Corp.'s Prairie Creek Project was issued a water licence in September and the company is seeking financing to proceed. DeBeers Canada Inc's. Gahcho Kue Diamond Project and Avalon Rare Metals have both received environmental assessment approvals, and are proceeding to the water licensing stage. Giant Mine Remediation project is still awaiting finalization of the environmental assessment report.

For new EAs, the Dominion Diamond Corp. has filed applications to develop three new pits, two of which require assessment. Lynx is a small pit, and will involve similar activities to what is currently regulated under existing permits (so no EA). Development of two other new pipes (Jay and Cardinal) has been referred to environmental assessment recently. These are inconveniently situated underneath a large, pristine lake, and plans to access and mine these pits, and ultimately reclaim them, must be assessed.

Another EA underway in the NWT is the Mackenzie Valley Highway – an all weather gravel highway up the Mackenzie Valley from Wrigley to the Dempster Highway near Inuvik. There will be a lot of stream crossings, and some sensitive wildlife habitat to traverse – the key lines of inquiry are socio-economic, caribou, moose and harvesting.

The Tyhee Yellowknife Gold Project EA is still listed as active, but effectively has been shelved, and would need considerable work by the company on information submissions to re-initiate. Tyhee is looking for partnerships on the financing in order to proceed.

Considerable oil and gas activity is taking place in the Sahtu region, with lots of controversy around fracking. Offshore, the Beaufort Sea Exploration Joint Venture is moving to EA.

Full details for current environmental assessments are available on the Board's web site at http://www.reviewboard.ca/registry/ and regulatory files at http://www.mvlwb.ca/Boards/mv/SitePages/registry.aspx.

Closing:

If you are doing work north of 60 that you would like to highlight in the newsletter, or running some seminars or other training opportunities, please let us know. The CSEB provides a valuable networking and communication forum, and a voice for biologists if there are any issues to be raised. There is also the option of instigating other CSEB activities – both of the fun and/or of the educational variety - with colleagues in the North. Please email your thoughts to anne.wilson@ec.gc.ca or paula.c.smith@ec.gc.ca.

Alberta Coal Spill Plume Slowly Moving North

CBC News Posted: Nov 24, 2013 2:40 PM CT Last Updated: Nov 24, 2013 2:40 PM CT

A plume of contaminated wastewater spilled from the Obed Mountain Mine near Hinton, Alta. is making its way north at a rate of two to five km/h. (CBC)

One group says the clean-up of what is believed to be Canada's largest ever coal slurry spill is going to be a massive task.

About 670 million litres of waste spilled from a coal mine in Alberta on Oct. 31 (the original estimate was 1 billion litres) in what is believed to be Canada's largest ever coal slurry spill. The government of Alberta has ordered Coal Valley Resources and Sherritt International to clean it up.

"We're talking about contaminants that have been spread out over 150 plus kilometres of the river," says Ramsey Hart of Mining Watch. "There may be hot spots that can be cleaned up from the most heavily polluted areas, but it's going to be impossible to remove all the contaminants that have now been released."

According to a new website established by Sherritt International, the plume of wastewater is now moving north at an estimated two to five km/h.

Hart says the Alberta government talks about sucking up or dredging some of the sediments, but getting all of it will be a complicated process.

Sherritt monitoring the spill

Sherritt International says it's still evaluating the cost of cleaning up the massive spill... and determining what caused it.

The company says a team of Sherritt employees and independent fish and other experts were dispersed along the creek system that travels down to the Athabasca and along the Athabasca River. They say they have been doing visual inspections on the land, in boats and in the air to assess the impact on any sediment and fish habitat.

However, according to the Obed Mountain Mine's website, visual inspection could not be done Thursday since the river had started to freeze.

Sean McCaughen is the senior vice president of Sherritt Coal. "What we have done already, we have installed some monitoring stations along the river. The government also has ones as well and we are sharing data back and forth. Those stations are examples of how we are going to measure things like turbidity and sediment throughout the winter period."

McCaughen says that work will continue into the winter.

McCaughen says operations at the Obed mine were suspended in late 2012, with the intention to reopen the mine if prices recovered. He says containment ponds aren't normally remediated right away.

The company says it's also keeping a close eye on fish habitat, and plans to carry out more assessments in the spring. Both the company and the province's test results show there are no immediate health concerns.

Plume moving downstream

The town of Fort Smith, N.W.T., which is on the Slave River, is getting new water monitoring equipment in the wake of the spill.

According to the Northwest Territories government, the majority of water in the Slave River is from the Peace River, not the Athabasca, so it is assumed there would be even more chemical dilution once the water reaches the N.W.T. The Alberta government says the more the pollution moves downstream, the more diluted it gets.

Fort Smith Mayor Brad Brake is not worried. "With our sophisticated third class water plant, there is no real concern at this time."

The N.W.T. government and Aboriginal Affairs and Northern Development Canada were shipping water monitoring equipment out of Yellowknife to Fort Smith Thursday, to test water before and after the plume reaches the area.

Mountain Recreation and Environmental Conservation – A Passionate Perspective[1]

Submitted by Peter G. Wells, CSEB Member
Dalhousie University[2], Halifax, Nova Scotia.

Abstract
A perspective on mountain recreation and environmental conservation is presented that reflects a life long interest in alpine recreation, i.e., hiking and climbing, together with photography and the prolific mountain literature. Such recreational experiences may contribute to thinking about mountains in new and important ways. Several questions can be posed: How can experience in mountain recreation contribute to the formal discussion of the interdisciplinary dimensions of "thinking mountains"? What messages emerge from a lifetime interest in mountain spaces, and concern for the urgent need to care for these special places and their ecologies, habitats and biota? How can recreationists contribute to innovative future research aimed at understanding the place of mountains in our human experience? Can the recreationist work with others to foster greater public awareness and education of mountain needs, especially those of water, habitat and wildlife conservation? The questions are explored to generate others and stimulate further interdisciplinary research and conservation initiatives that include citizen science.

Keywords: citizen science, environmental conservation, environmental ethics, interdisciplinary dimensions, management, mountains, place, protection, recreation.

1. Introduction

This essay is built upon the personal experiences, memories, records (photographs), lessons learned, and perspectives from a life-long interest in mountain hiking and exploring, primarily in Canada and the United States, and in the study and care, i.e., conservation and protection, of such places. My career in aquatic science focussed on environmental protection, conservation and management in Canada, and as such was based on conservation principles and interdisciplinarity (Primack 2006). As a concerned citizen and recreationist, I am more than ever aware of the need for new initiatives in mountain science, conservation and protection, environmental management, and responsible recreation. Considering the environmental and conservation challenges of the day such as climate change, it is unrealistic for professionals to draw a line starkly between their working lives and their personal ones – in this context, the stakes are too great not to have them merge in the rocky mountain terrain of Alberta, British Columbia, and other high places. In the essay, recreation is discussed and explored for its linkages to conservation and management needs in these environments.

2. "Give Me the Hills[3]" or the origin of mountain passion?

A description of one experience and passion for mountains follows, in the spirit of Underhill (1956), and "a brief anatomy of one of those who takes to the hills" (Slesser 2004), another fine mountain book.

I was raised and schooled in south-west Calgary within sight of the Rocky Mountains. Our family was very outdoor oriented. We spent much time as family and children camping and exploring in the foothills and mountains of southern Alberta (Banff, Jasper and Waterton Lakes National Parks), as well as in the countryside of Idaho, Wyoming and Washington State. A deep personal attachment to the mountains probably developed over this time period, not consciously but certainly it happened – I enjoyed being in and experiencing the scenery, fresh air, wildlife, and the freedom[4] of the mountains. A linkage or bonding[5] was formed, along with the kernel of an ethic that these were special places with special animals, plants and ecologies[6] that inspired appreciation and that needed respect and protection. Due to its proximity to Calgary, we spent many enjoyable trips to Banff and vicinity, becoming familiar with the western National Parks during the early days of Calgary's expansion, increased tourism, and construction of the Trans-Canada highway. The "mountain bond" was definitely laid during those days.

As a university student in Montreal, I "discovered" the Adirondack Mountains of NY state, the Green Mountains of Vermont, and the White Mountains of NH. As a member of the McGill and University of Toronto Outing Clubs, a lot of weekends were spent in these places in all seasons. The summer of 1966 was spent working in Banff, with almost five months in the mountain environment, camping, hiking and climbing every week. The mountain experience was solely for recreation, largely unencumbered with the later questions and observations of the concerned scientist. Later, while working and then as a graduate student in zoology and aquatic toxicology, there were trips to the western States (most time being spent climbing), hikes on the Gaspe Peninsula or Gaspesie (in the Chic-Choc mountains, including Mt. Jacques Cartier), and hikes and climbs in Maine (Katahdin in Baxter Park, Acadia National Park on Mt. Desert Island). Eventually, I settled in Halifax. Although Nova Scotia lacks big hills, it has spectacular coastal scenery with many trails

1. This paper is adapted from the talk given at the Thinking Mountains Conference, University of Alberta, Edmonton, AB, Dec. 2012.
2. School for Resource and Environmental Studies, and Marine Affairs Program, Faculty of Management, and International Ocean Institute. Email oceans2@ns.sympatico.ca
3. This was the title of a book by Myriam Underhill (Underhill 1956), and is an underlying philosophy of the passion for mountains – big and little "hills" being places for physical, mental and spiritual renewal, some of many dimensions of the meaning of mountains.
4. One of the seminal mountaineering guidebooks, published by the Mountaineers of Seattle, is called "Mountaineering. The Freedom of the Hills" (Ferber 1974). The sense of freedom, an enhanced mental state of well-being, is a dimension of the meaning of mountains worth discussing in depth and possible researching further (if not done so already!).
5. The idea or indeed phenomenon of humans bonding to a landscape or seascape could be further researched by this interdisciplinary program. It is supported by a history of conservation writings over two or more centuries in modern times, and it is real for those who have experienced it. Also see Parker (2008) on the spiritual significance of mountains.
6. The term ecology was not in my lexicon until I read Rachel Carson's Silent Spring (Carson 1962; Wells 2012) in my first ecology course in university. There was simply a sense of the interconnectedness of different parts of the landscape, probably imbued by having spent much of my youth outside, in the city, woods and on the farm.

and the fabulous highlands of Cape Breton Island (Haynes 1999, 2002). Fortunately, it is not too far to drive to access mountains in northern NB, southern Quebec, Newfoundland and New England. A wide variety of mountain landscapes exists in the regions of eastern North America, from the Appalachian Mountains to the coastal mountains of Gros Morne National Park in western Newfoundland, to the Mealy Mountains[7] and Torngats of Labrador. These ranges are high (though lower than the western mountains), rugged, challenging (in all seasons and weather) and beautiful, and offer the same opportunities, from environmental science to recreation, as other regions of the continent. They are much in need of conservation and wise management (Jones and Wiley 2012), in the context of a strong land conservation ethic[8] .

3. Some mountain organizations - their missions and philosophies

Recreation and conservation in various mountain regions in North America are supported by many organizations, founded over the past 135+ years. The missions and philosophies of five of these are briefly described. Three are located in eastern North America - the Appalachian Mountain Club (AMC) of Boston, the Adirondack Mountain Club (ADK) of New York State, and the Friends of Baxter State Park in Maine. One is a western mountain club, the Federation of Mountain Clubs of BC, and one is representative of Canada as a whole, the Alpine Club of Canada (ACC)[9] . Reflecting upon their missions and philosophies contributes to discussing some core questions on the role of the mountain recreationist and thinking about conservation of mountain environments in new ways.

The AMC, founded in 1876, has the mission of "promoting the protection, enjoyment and understanding of the mountains, forests, waters, and trails of the Appalachian region" (www.outdoors.org/about/mission.cfm; www.amcboston.org). The organization believes that "these resources have intrinsic worth and also provide recreational opportunities, spiritual renewal, and ecological and economic health for the region". As an example of their environmental work, the AMC in 1996 "began monitoring ozone levels in the White Mountains" and restoring endangered plants (www.outdoors.org/).

The Adirondack Mountain Club was founded in 1922 and is headquartered in Lake George, NY, with its primary lodge just outside of Lake Placid, NY. The ADK mission is described as "protecting natural resources and promoting responsible recreation", and includes conservation, advocacy, recreation information, and stewardship (www.adk.org). The ADK is "dedicated to the protection and responsible recreational use of the New York State Forest Preserve and other parks, wild lands, and waters vital to our members and chapters".

The environmental group, The Friends of Baxter State Park, Maine, relates particularly well with the theme of this paper. The park is a famous hiking and climbing destination because of the magnificent mountain called Katahdin. The park's founder, Percival P. Baxter, considered that "the resources – the land and the animals - were primary, and people secondary. The guiding philosophy of the park management today is to live up to this important resource-first, and people-second, requirement" (www.friendsofbaxter.org). In the group's brochure, amongst several memorable quotes, there is one by the dedicated American conservationist and writer, Justice W.O. Douglas - "if we are to survive, we must….multiply the Baxter Parks a thousand-fold" (Douglas 1961, p. 290).

The Federation of Mountain Clubs of BC is a "group of groups" involved with trails and access, and recreation and conservation issues. The current issues include "trail management; backcountry access; off-road vehicles; recreation zoning; mountain caribou protection; and protection of interior rainforest" (www.mountainclubs.org). Hence, they cover activities from land management to wildlife conservation, seamlessly linking recreation to conservation initiatives.

The ACC, founded in 1906, is headquartered in Canmore, AB. The website describes the ACC as offering "mountain adventures, publishing related to mountain culture, and providing support for access and environmental issues, climbing, grants for a variety of mountaineering-related projects, and more" (www.alpineclubofcanada.ca). In the main Canmore lodge, a poster entitled "Sic itur ad astra" or "The Way to the Stars", identifies seven focal points of the ACC – mountain adventure, geography and map making, the advancement of science, appreciating art and photography, land use and conservation, mountain literature and creating a history. As stated in the poster (ACC 2012), "right from its inception, the ACC announced that one of its principal roles was to champion the expansion of the national park system and to promote appropriate use in mountain regions throughout the country. The ACC influenced developing policy with respect to how national parks should be managed and was also instrumental in the formation of several provincial parks. The ACC later fought bitter battles to prevent inappropriate development inside, and surrounding mountain national parks"[10]. The ACC is "the leading organization in Canada devoted to climbing, mountain culture, and issues related to alpine pursuits and ecology" (www.alpineclubofcanada.ca), again clearly linking recreation with the science and conservation of mountain areas.

4. Enhancing the role of the mountain recreationist in conservation initiatives - some key questions and opportunities.

4.1 Mountain recreation and the various dimensions of "thinking mountains"

How can experience in mountain recreation contribute to the formal discussion of the interdisciplinary dimensions of "thinking mountains" and the Canadian Mountain Studies Initiative (www.mountains.ualberta.ca)? There are clearly many dimensions to being in and being interested in the mountains. Recreationists are in the mountains frequently, primarily for sport (e.g., climbing, hiking, skiing, cycling). As they experience mountain environments

7. Note the newly formed Mealy Mountains National Park in Newfoundland and Labrador (www.naturecanada.ca/parks_creating_current_mealy.asp) , and the wonderful new book by Jones and Willey (2012).
8. See The Sand County Almanac by Aldo Leopold (1949)
9. I have belonged to some of these organizations at various times and gained much from them.
10. The importance of our National Park system and the need to combat threats, political and economic, to its sustainability cannot be overstated.

directly throughout the seasons, they may have insights about and/or develop new ways of looking at mountains, their benefits and their needs (e.g., Chavaz et al. 1993; Wilson and Hamilton 2005; Stoddart 2012). The challenge is to capture these insights and compile, study and act upon them through interdisciplinary collaboration.

People often seek the mountains for solitude and solace, sometimes but not always in combination with recreation. "There could be further consideration and research into why people in this modern era seek solace in the mountains; this could include re-considering the writings of early conservationists such as Henry Thoreau (Bode 1965), teasing apart the spiritual and intellectual aspects of thinking about mountains such as Katahdin" (Elizabeth De Santo, pers.comm.). For many people and cultures, mountains have a profound spiritual meaning (e.g., Matthiessen 1978; Parker 2008; Thomson 2004; Thubron 2012). Thubron's walk to the holy mountain, Mount Kailas near the Indian-Tibetan border, was part tour and part spiritual pilgrimage, and offers deep insight of one facet of mountains in human culture – the holy and truly aesthetic. As well, mountains for many people can offer an escape from the pressures and tensions of today's modern life style and issues, and such rejuvenation has value, such as "lifting the human spirit" (see Parker 2008), perhaps one explanation for the mountain passion experienced by many people. This multi-faceted significance of mountains to many people and different cultures surely deserves further study, such as Parker (2008).

Other dimensions and research could also include topics such as: greater public and tourist information and engagement about mountain landscapes and ecology; long term research and monitoring of the environmental quality of mountain habitats, in an era of climate change (IPCC 2011); and engagement of visitors and recreationists in assisting with and promoting conservation of both species and spaces at a time where there are many threats to the country's biodiversity (Burnett et al. 1989; COSEWIC 2012). In this context, recreation and the recreationist are an important element of the future of mountains, their watersheds, wildlife and ecologies, and linkages to other landscapes and economies of Canada e.g., water source for the Prairies and agriculture; the health of estuaries and coastal waters where the mountains meet the sea; and others.

4.2 Messages and insights on the meaning of mountain places, spaces and species

Consider the meaning of mountains and their ecologies, habitats and biota. Mountains attract people seeking adventure, artists seeking a beautiful landscape and wildlife to draw and paint (Christensen 1996; Perry 2006; Locke 2012), writers to seek inspiration, climbers to "conquer" new peaks, photographers to record the country as it was and as it changed over time and with development. This activity has produced a record of change in the mountains that should be captured as much as possible e.g., see the ongoing exhibition " The Gateway to the Rockies" at the Whyte Museum of the Canadian Rockies, Banff. Mountains are significant places, for humans (native/aboriginal and recent/European colonists), as well as for watersheds, wildlife and their ecologies. They are part of what can be considered our "Home Place" (Rowe, 1990), part of the greater ecosphere, and as such should be revered, studied, protected, and conserved. In western Canada, they will continue to be vital sources of water, habitats for endangered species and places for much needed recreation.

A passion[11] for mountains, the fuel for new initiatives, comes from a combination of a sense of freedom, enjoyment of the scenery, enjoyment of exploration and discovery, all attributes of the mountains that brought the earliest tourists to places such as Banff, Lake Louise, Lake O'Hara, and Jasper, in the Canadian Rockies. The passion produces, above all else, a sense of well being (it is healthy, by definition), a better state of mind and body, and that occurs only when physically in the mountain landscape. This passion can also be felt, perhaps to a lesser degree, by "the armchair mountaineer" (Smith and Smith 1968). As well, mountain scenery and landscapes inspire, and by so doing, they are a place for visitors to visit, relax, and recover from the turmoil of day to day life. This has been described countless times before (e.g., Mills 1915; Russell and Kraulis 1979; Gadd 1995; MacDonald 2000), and was one of the reasons for the growth of tourism in the Rocky Mountain parks after the cross-Canada CPR railroad was completed late in the 19th century (Fraser1969). As more visitors come, there are more opportunities for citizen science (see below).

The social and health benefits of the mountain environment are immense, a part of the overall "value" of protecting and conserving such places. This is a very westernized, anthropogenic viewpoint, as the mountains are not really owned by us, just leased for our duration. They equally belong to the other inhabitants, the wildlife, as well as to the original human settlers. But valuable observations can be made over a lifetime of observing mountains, through direct observation, photography, and art, e.g., reduction in glaciers, the deterioration of over-used trails, the impact of disease or lack of fires on forest trees and other vegetation; the increased pollution – litter, air quality, traffic noise and fumes; the reduced numbers of animals e.g., black bears in BNP. These changes should be objectively chronicled and archived (see discussion of citizen science below).

4.3 Linking mountain recreation and conservation – revisiting the contributions of recreationists

How can recreationists contribute to innovative future research aimed at understanding the place of mountains in our human experience, and conserving these places for future generations? Reflecting upon the missions, philosophies and current activities of various mountain clubs and associations could contribute to identifying new questions and an enhanced conservation oriented role for the mountain recreationist. This would require a thorough comparative study of the organization's mandates, activities and successes, as well as a survey of memberships and their capacity to contribute to a new initiative.

Enhancing the role of the recreationist in citizen science[12] could be a first step in recruiting a new set of protectors of mountain species

11. Passion – an intense enthusiasm for something (Compact Oxford English Dictionary)
12. Citizen science – there are many definitions on various websites. One of the best related to this paper's theme is on the Waterton Lakes National Park website – "citizen science involves professional scientists and everyday people engaged in activities such as biological inventories, long-term monitoring, and scientific research". The Canadian Museum of Nature describes citizen science as "involving people as volunteers who help scientists by collecting information about the environment". The Citizen Science Journal describes the activity as "linking people with science to understand and protect ecosystems" (www.citizenscientists.com). Citizen science is not new, the first visible effort being the Christmas bird count started more than 100 years ago.

and spaces, in an era of climate change, rapid development, demand for natural resources, etc. A good example is Mountain Watch, a monitoring program focussed on flowers run by the AMC (see www.outdoors.org/conservation/mountainwatch/index.cfm). Scholarship on climate change, the status of wildlife populations (Soule and Orians 2001), land use, changes in lakes e.g., the growth of alluvial plains in glacier-fed lakes, etc., could be informed by the use of travel diaries; collections of photos, print and digital; writings describing community observations and viewpoints; information archives in various places e.g., the ACC, the Whyte Museum of the Canadian Rockies; and the use of new technologies such as smart phones. That way, citizens are aiding and informing the various government officials and scientists who are responsible for understanding the mountain environment and the significance of the various changes. It also continues the view of Arthur Wheeler, founder of the ACC – "it was the duty of all mountaineers to know everything they could about the landscapes through which they travelled" (ACC poster, Alpine Club of Canada, Canmore, AB).

On the other hand, officials could enhance communication to the public about what they are seeing and measuring, through the various visitor centres, through signage and brochures, through information alerts on smart phones, and requests for sending in photos with documentation. The histories of mountain communities and their citizens where recreational activities take place should continue to be recorded, as in two recent books - A Century of Parks Canada (Campbell 2011); Mountain Voices (Mayer and Oreskes 2012).

4.4 Working with others – joining the "mountain voices"[13]

Can the recreationist work with others to foster greater public awareness and education of mountain needs, especially those of water, habitat and wildlife conservation? The various mountain clubs could be engaged in bringing forth suggestions about greater engagement and assistance looking after the mountain environment. New ideas could lead to student honors and graduate theses, e.g., the excellent one by Mosedale (2003). Likewise, individuals and organizations could advocate on behalf of agencies such as Parks Canada that have been severely cut back in 2012-13, and widely distribute information on the impact that this is having on park use, protection, and research. Professional environmental scientists, biologists and environmentalists should be engaged wherever possible in these and other initiatives, in mountain science, conservation and protection, environmental management, and responsible recreation. Collectively, we owe it to society and to the new and highly innovative mountain initiative at the University of Alberta (the Canadian Mountain Studies Initiative or CMSI) to be more engaged and proactive. There is an important role for CSEB members.

5. Summary

This paper is a personal perspective about the role of the mountain recreationist in a new era, one of greater pressures directly on the mountain landscapes, and one of anticipating and adapting to the new realities of global climate change. The challenges require scholarly discussion and new research especially engaging young scholars, mountain organizations and recreationists alike, and especially professional scientific organizations such as CSEB. The identification of important, interdisciplinary research questions will not be an easy task, nor will the research be easy to fund and conduct. But the future of our mountain landscapes and their inhabitants and ecologies demand the attempt to link the recreationist with citizen science and professionals dedicated to the environment. All of society will benefit from the effort.

13. Based on this title: Mountain Voices, Stories of Life and Adventure in the White Mountains and Beyond. D.Mayer and R. Oreskes. 2012. Appalachian Mountain Club Books, Boston, MA. 226p.

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