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**ENVIRONMENTAL STEWARDSHIP ON CANADIAN MILITARY
TRAINING AREAS: RHETORIC OR REALITY**

By

Philip J. Anido

A thesis submitted to the Faculty of Graduate Studies and
Research in Partial fulfillment of the requirements for the
degree of

Master of Arts

Department of Geography

Carleton University

Ottawa

September 1998

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**"Environmental Stewardship on Canadian Military Training Areas:
Rhetoric or Reality"**

Submitted by Philip Anido, C.D., B.A., Dip. Ed.

In partial fulfilment of the requirements for
The degree of Master of Arts

A handwritten signature in black ink, appearing to be "S. D. L.", written over a horizontal line.

Thesis Supervisor

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Chair, Department of Geography

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17 September, 1998

Abstract

The military establishment in Canada manages over \$16 billion in assets, comprising over 10,000 individual facilities and 42 bases and stations on over 20,000 square kilometres of land. Added to this is a larger area of training ranges, leased from the crown, which all told, equates to an area approximately the size of the province of Nova Scotia. If air space and sea-lanes are included, the territory that is exposed to navy, army, and air force training, covers virtually every landscape and ecosystem which Canadian geography has to offer. Military manpower includes 60,000 regular troops, 30,000 reserves and 20,000 civilians. They operate a fleet of 30,000 land vehicles, some 40 ships and hundreds of aircraft. Given the nature of military activity, the potential impact on the natural and human environments is enormous and destructive. A growing volume of literature provides valuable data on the state of land use and the preservation of precious biodiversity in training areas. My contribution to the research will be to find linkages between the 'rhetoric' of Canadian military environmental policy, and real, sustainable environmental stewardship practices in the field on the training areas. I will show, through three case studies of military sites, and selected other sites, that there is substance to the concept of due diligence in sustainable land use. Moreover, I will show that there is concrete evidence of real improvement in the military establishment's efforts to remedy past abuse of the environment and to preserve bio-diversity.

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INTRODUCTION

The demolition of the Berlin Wall in 1989 signalled the disintegration of Soviet domination of Eastern Europe and hastened an end to the military threat that hung over the West and NATO Powers. The Cold War, which characterized the relationships between the military blocks of the Warsaw Pact and NATO during the four decades prior to 1989, is considered by some students of military history¹ to be the third and longest war between major powers of the embattled 20th century. Since that historic moment, the nature of international conflict and the threats to Canadian and western security have changed significantly. Across Europe, East and West, and North America, the threat of interstate or inter-pact war has evaporated allowing social and (until the past few weeks) economic stability to greatly improve in these regions. The tense and high states of military readiness that characterized the 1960's, 70's and 80's have slowed in the past eight years, and defence budgets, infrastructure and personnel strengths in Canada and across the NATO alliance have been reduced accordingly. Strategic priorities have been revised, to reflect a variety of new and emerging threats of the post-Cold War era such as international terrorism, drug cartels and information technology saboteurs.

¹ Mason, T. *Air Power, A Centennial Appraisal*. London, Brassey's, 1994, p. 103.

The changes to traditional strategic military policy that are required to meet the new threats are as fundamental as redefining what constitutes national security. Conflict undeniably continues to be frequent and devastating, in less developed regions of the world such as the Balkans and parts of Africa. However it no longer threatens the social and economic ties that are gradually building between the two former power structures, the US-led NATO and the Soviet-led Warsaw pact.² In the absence of this traditional bi-polar threat to global peace and security, hitherto fringe security issues and threats to peace have risen to the top of the main stream defence planning agenda.³ Some of the most prominent of these issues stem from natural causes such as devastating floods and famine. In themselves, these events cause major national and international military planning and response. One needs only to consider the great floods on the North American prairies in the spring of 1997, and the winter ice storm of January 1998 in eastern Canada which threw communities into disarray, to realize how close to home disruption of the normal patterns of life brought on by nature can be. Both these environmental crises demanded massive military intervention to shore up against the threats, and to restore order to power lines, transportation systems, distribution of food, medical supplies

² Sens, A. *Somalia and the Changing Nature of Peacekeeping*, "Commission of Inquiry into the deployment of the CF into Somalia". Public Works and Government Services Canada, Ottawa, 1997, pp. 25-44.

³ Mason, T. *Changing Defence Priorities*, Paper delivered to the Air Power Conference, Winnipeg, July 1997.

and fire wood, evacuation of casualties and other vital humanitarian and system support.

More combative, but requiring equally strong military intervention, are the social and political upheavals in various parts of the globe that have emerged since the Berlin Wall came down. Canadian military participation in the United Nations peacemaking (as opposed to peacekeeping) missions to Somalia in 1995 and Rwanda in 1996, represent a significant adjustment to traditional strategic military security and policy.⁴ For the Canadian Forces, most peacekeeping/peacemaking missions of this decade, including those in Africa and Haiti, have required our intervention as part of international force between warring political factions. In so doing, humanitarian aid and some semblance of order and peace has been brought to the innocent victims of unrest. In parts of Africa, where land reform and redistribution is a major political issue, and in Haiti where the hills have been totally denuded and lie exposed, eroded and unproductive, arguments can be made linking social discontent and unrest to environmental degradation and scarcity of food and resources.⁵

⁴ The Gulf War of 1991 was for all intents and purposes a war over the supply of vital western oil supply and not one to save a small, oppressed state from an aggressor.

⁵ Homer-Dixon, Thomas. "Environmental Scarcities and Violent Conflict: Evidence from Cases," *International Security* 19(1), 1994, pp. 5-40.

An opening for the environmental conscience

While Canadian military strategists still plan within the constructs and the inertia of traditional treaty obligations such as NATO and NORAD, a vital new balance has emerged between the need to remain vigilant against traditional 'enemies' to western democracy, and other vital national priorities. One of these priorities which has made its mark on Canada's defence policy agenda is, the state of the environment.⁶ The shift to include environmental security in defence policy is relatively recent, but the importance of responsible stewardship of the natural resources on military training areas is as fundamental as preserving our environment for future generations. The environmental policies, which the Canadian military imposes on itself, have been developed within the framework of federal environmental legislation. We have recognized for some time now the potential for grave consequences to our training abilities and to surrounding communities, if vigorous environmental stewardship programs were not imposed on national military training areas.⁷

It is this principle and practice of environmental stewardship of the complex natural resources inherent in Canada's military training areas that are the focus of my thesis. Among the issues I will examine will be the growth and

⁶ Kennedy, Paul. *Preparing for the Twenty-first Century*, Harper Perennial, New York, 1994, pp. 102-3, 129.

progress of the environmental movement within the Canadian military establishment. I will look at how stewardship policies and codes have evolved from federal legislation. I will investigate the level to which these policies have been turned into practice at three important and bio-diverse training sites: Canadian Forces Base Suffield, Alberta; CFB Shilo, Manitoba; and CFB Gagetown, New Brunswick. I will discuss programs of mitigation and will refer specifically to the cleanup activities at the DEW (Distant Early Warning) sites. I will define the relationship between the requirement for military training, and the obligation to the care for the natural resources where military training takes place. Finally, I will draw conclusions about the state of military environmental stewardship by examining specific practices, be they environmental training for the troops, validating their stewardship practices, or physically protecting a resource. The contribution of my research will be to demonstrate that tangible progress has been achieved in translating the rhetoric inherent in DND policy and military command statements, into practice.

In Appendix 1, I will refer to initiatives taken by our allies in their environmental stewardship programs, in order to establish certain comparisons and benchmarks for the state of the Canadian military

⁷ Downs, A. Director General Environment, National Defence, Interview, 15 November, 1997.

stewardship program. This is appropriate to my thesis, given that a number of our allies conduct large-scale training on Canadian military bases. It will also be valuable to my conclusions to inquire into the involvement of the public in the communities that surround the case study bases. If the linkages from noise, contaminated surface and ground water, destruction of bio-diversity, emissions into the atmosphere etc., do not have a trail to the peripheral land uses and communities, then the unsustainable activity could very well carry on unabated.

Chapter One

Theoretical Setting

Imagine that a Canadian poll asked the question, "What effect does military activity, be it training or actual battle, have on the environment in Canada or around the world?" It is reasonable to assume that the overwhelming response would focus on images of the destructive impact. The Gulf War, recent attacks on terrorist targets in the Sudan and Afghanistan, brutal civil war in Rwanda and the Balkans, have left indelible images burning oil fields, massacres, and ravaged buildings and communities. Some responses might reflect on the positive images of peacekeepers delivering humanitarian supplies and troops shoring up flood dykes with sandbags or helping ice storm victims. Fewer still might mention that the military, at least in Canada, are becoming progressively effective stewards of the ecosystems in their training grounds. No one would reflect on the progress in research and development in infrared or global positioning technology which have transfer benefits for environmental protection.

In this Titanic Century, as Kenneth Hewitt characterizes the 20th Century, humanity's exploitation of natural resources, military action and natural disasters have pounded human societies and ecosystems in every corner of

the world.⁸ By grouping together what he describes as 'novel' dangers to society, such as global environmental deterioration, toxic pollutants, rapid urbanization, and violent social change, Hewitt makes the argument for a strong link between the security of a nation and these other pervasive risks. 'Novel' threats or dangers, and others that Hewitt does not address such as international terrorism and drug trade, frequently make the headlines and place military intervention in the spotlight for Canadian and world-wide audiences.

Conventional western military strategies that were poised until recently to counter traditional Cold War threats have themselves recently become blurred by the emergence of novel risks. In this context Hewitt raises the issue of society's expectations for state control of disasters and threats to security.⁹ But the public expects appropriate action on many other social fronts and their governments set agendas and priorities on a great variety of issues. The same is true within Canada's military and there are definite limitations as to what money and manpower can be expended on environmental risks. To quote Hewitt, "by design or default, their (public issues and concerns) relative importance ... will be prescribed by the ongoing pattern of life."¹⁰

⁸ Hewitt, K. *Regions of Risk; A Geographical Introduction to Disasters*. Longman Ltd., New York, 1997, pp. 5-8.

⁹ *Ibid.*, pp. 9-10.

While the main question in this thesis concerns the state of environmental stewardship in the Canadian Forces, it is useful to understand and conceptualize environmental risks and the appropriate responses that take place at local and national levels, in the larger context of the global setting. In so doing, as progress is achieved in the DND/CF setting, the concepts can be shared and applied as appropriate by other armed forces and by resource based industries. Mechanisms for this exchange are increasingly more efficient as environment and security themes are included in academic and military forums, while environment themes are discussed in professional, government and industrial forums.

The potential impact and influence of the innovations and practices which are developed within DND/CF cannot go unchallenged as the ideal solutions. Hewitt asserts that the transfer of (stereotyped) knowledge and assistance between ...'worlds' can create more problems than they solve unless adaptations are made to recognize local complexities in other countries.¹¹ Basically, solutions which are appropriate for Canadian sites may not be workable or applicable in another part of the world either because of different priorities or a lack of technological or financial resources, and above all because of the local perception of the risks and dangers.¹²

¹⁰ Ibid., p. 12.

¹¹ Ibid., pp. 14-15.

¹² Ibid., pp. 170-171.

Other scholars¹³ have entered into the debate as to where environmental degradation and natural resource depletion interface with the post-Cold War security policy agenda. They ask "do states go to war as a direct result of environmental degradation?" or "is the destruction of vital ecosystems only one symptom in the struggle for power and political supremacy which leads to conflict?" The question has been asked, "who and what are being secured."¹⁴ Prof. Dalby discusses the global concerns of the environmental threat in North-South terms. He recognizes that the military powers of the North, including Canada, use and consume vast resources to protect their vital interest and in so doing cause the lion's share of resource depletion and pollution. The poorer South states with less developed infrastructure suffer the worst human and social consequences of the resource depletion and global environmental degradation.

'States going to war' in today's post Cold War Canadian context can be interpreted as referring to other remote states. Homer-Dixon has used case studies of conflict in Pakistan, Rwanda, Mexico and other nation states to illustrate the relationship between environmental degradation and conflict.

¹³ Homer-Dixon, Thomas. *Environmental Scarcities and Violent Conflict: Evidence from Cases*. Op. Cit., pp. 5-40; Keller, Kenneth. *Environmentalism and Security*. Massachusetts Institute of Technology, Security Studies Program, 1996; Dalby, Simon. *Canadian National Security and Global Environmental Change*. Canadian Institute of Strategic Studies Seminar. Toronto, 1996.

¹⁴ Dalby, Simon. *Culture, Identity and Global Security: Notes on the Theme of (Post) Modernity and the "Pogo Syndrome"*. Paper, York University Centre for International and Strategic Studies. February, 1997.

Robert Kaplan¹⁵ has argued that defence strategists should batten down the hatches because of possible anarchy and population migration as the global environmental situation worsens.

Scholars gathered at an environmental conference in Monterey, California in 1996, discussed how environmental threats affect national and international security.¹⁶ One question they debated concerned whether all environmental degradation issues should come under the rubric of security. They concluded that some should, but not all. They recognized that scarcity and environmental deterioration fuel old hatreds and class differences which lead to conflict. They also concluded that linking environment to security assists in conceptualizing the threat which in turn leads to setting priorities and finding solutions and responses. This conclusion comes more clearly into focus from military and spatial perspectives if one considers that members of the NATO alliance routinely cooperate on international missions and training, including conferences on the environment. As military associations develop with Eastern Europe and Latin American nations, with the distinct purpose of increasing co-operation and mutual understanding,¹⁷ broader based progress

¹⁵ Kaplan, Robert. "The Coming Anarchy," *The Atlantic Monthly*, 273(2), 1994, pp. 44-76.

¹⁶ Chrzanowski et.al. *Environmental Threats and National Security: An International Challenge to Science and Technology*, Environmental Studies Workshop proceedings. Monterey, California. December 1996, pp. 2-4.

¹⁷ Partnership for Peace exercises between NATO and former Warsaw Pact nations and the System of Cooperation among the Armed Forces of the Americas conferences occur several times each year. Environmental presentations and discussions have been included in agendas.

may be expected with respect to environmental stewardship over time. At the least, the military provides an important forum in which to exchange knowledge, develop initiatives and find solutions to complex security issues.

Others see the danger of identifying threats to the environment too closely with national security for two reasons.¹⁸ First, it could lead to placing all threats to survival under security, which would be meaningless, and second, only those environmental concerns which were perceived to impact directly on national security would be addressed. By spreading the environmental problems throughout separate agencies, there would be a more broadly based effort in finding appropriate solutions.

In the Canadian context strategies for sustainable development, which is the 'counter offensive' to environmental exploitation and degradation, have gained in structure and strength. The agencies, to which Keller refers, can be interpreted to be the federal government departments and agencies, all of which are required by law – the Auditor General Act – to prepare and maintain sustainable development strategies.¹⁹ The purpose of the

¹⁸ Keller, Op. Cit.

¹⁹ *Greening the Government of Canada – Strategies for Sustainable Development*. Report of the Commissioner of the Environment and Sustainable Development. 1998. Internet, www.oag-bvg.gc.ca. Of the 28 departmental strategies (including four government agencies) the Department of National Defence/Canadian Forces was singled out as having done the most comprehensive job in developing concrete targets and mechanisms for reporting performance.

strategies is to strengthen (the Government of Canada's) performance in protecting the environment and promoting sustainable development.

Parallel to the discussion of crippled environments and devastated ecosystems which, in certain parts of the world, ends in human suffering and sometimes conflict, are strategies for sustainable development. The potential to apply such strategies on a global scale is more theoretical than practicable. But within the wider debate there are questions relating to environmental stewardship on the Canadian home front. It is the state of changing attitudes towards environmental stewardship in Canada's military that I will investigate in my thesis.

Conceptual Overview

I have used a pragmatic approach to examine the scope and depth of the Canadian Armed Forces' environmental stewardship on military training grounds. Many elements of human and physical geography appear throughout the thesis in discussions of spatial landscapes, land use, human activities past and present, transportation and neighbourhoods. I have considered both general and site specific issues and threats in order to situate, compare and draw conclusions about national environmental stewardship objectives and trends in three ecologically diverse military training areas. I have also looked into environmental progress in other nations for comparison, and to demonstrate the interrelationships which one

hopes will influence more broadly based trends in other parts of the globe. In my research, at the three training grounds I selected to study, no recent scholarly literature on land use or environmental issues was available. That said, the media have focused some attention on defence and the environment issues notably as it relates to contaminated legacy sites. Both the lack of academic literature and the increased media attention are a reflection of the closed security attitude from which the military has only recently emerged. This new openness, together with the growth of environmental specialists at the national and base levels should help to foster an interest among geographers, botanists, biologists, archaeologists, historians and others from universities and colleges in adjacent communities.

Chapter Two

The Rhetoric: The Law and the Policy

The image of a combat ready battle group of 1000 soldiers training at CFB Suffield, while at the same time demonstrating responsible management of natural resources, may appear to be an irreconcilable thesis. How possibly can environmental stewardship be practised amidst hurling live-munitions across the landscape, digging trenches, ripping out native prairie grasses for camouflage, driving tracked vehicles over prairie flora and ground-bird nesting areas, repairing oily engines in the field, and advancing to contact where Prong Horned deer are grazing? How can a community, which studies and practices the art of war, possibly care about bio-diversity and the ecosystems that are contained in the battle-training environment?

A Question of Perception

We live in a world of perceptions and preconceived ideas, especially about the military. While the military persona may appear to be different from his or her civilian neighbour, it is in fact nurtured in the same communities. Soldiers, sailors and airmen come from the very communities where 'blue box' recycling and high school environmental projects are, and have been, the norm for 10 or more years. Military people often live in non-military communities for the duration of their military service, and certainly retire into them at the conclusion of their careers. These individuals are a product of

the generation for which one of the pre-eminent paradigms has been environmentalism. They share the exposure to and interest in profound issues such as sustainable development, water purity, global warming,²⁰ natural resource depletion, protecting bio-diversity and a desire to leave a healthy environment for the future generations.

Different Exposure

What their civilian neighbours do not often share with them, is the intimate exposure to the devastating effects to humankind and nature, of floods at home and famine around the world.²¹ Moreover, unlike their neighbours, the military individual is part of a community that operates in teams or 'companies' on vast, resource-rich tracts of crown land that is highly controlled by increasingly strict federal legislation and DND environmental

²⁰ The international conference on global warming took place in Kyoto, Japan (December 1997) and received headline coverage across Canada in all media including the Internet. In the absence of a poll, it is logical to assume that a cross-section of military personnel, as well as the Canadian population in general, listened to broadcasts criticising the weakness of Canada's position, from an environmentalist perspective. It is also reasonable to assume that military personnel hold strong opinions about global warming and other environmental degradation issues that affect their children's future.

²¹ In April - May 1997, the Canadian military responded to the worst floods of the century which flooded Manitoba's Red River valley. It was the largest domestic military mission in Canadian history. Over 8,600 sailors, soldiers and airmen were involved in Operation Assistance (Defence Matters, Spring 1997, pp. 1-3, 32-34). In 1991, over 1400 Canadian troops and 147 flights by CC-130 Hercules transport aircraft brought food and medical relief to Ethiopia to help relieve massive suffering brought on by civil strife, crop failure, drought and the ensuing famine (Air Transport Group Operation Relief files, unclassified, 1991). In 1996, Canadian military personnel

Table 1

Code of Environmental Stewardship
<i>The Canadian Forces and the Department of National Defence commit to:</i>
Integrate environmental concerns with operational, financial, safety, health, economic development and other relevant concerns in decision-making;
Meet or exceed the letter and spirit of all applicable federal environmental laws and, where appropriate, to be compatible with provincial and international standards;
Improve the level of awareness throughout the Canadian Forces and the Department of National Defence of the environmental and health benefits and risks of operational decisions, and to encourage and recognize the actions of personnel;
Apply environmentally responsible management practices to hazardous substances used in operations, including biological products, specifically with regard to the acquisition, handling, storage, safety in use, transportation and disposal of such substances;
Ensure that the environmental considerations are integrated into procurement policies and practices;
Seek cost-effective ways of reducing the consumption of raw materials, toxic substances, energy, water and other resources, and of reducing the generation of waste and noise associated with day-to-day operations; and
Acquire, manage and dispose of lands in a manner that is environmentally sound, including the protection of ecologically significant areas.

policy. Added to this, are the public expectation for excellence and a critical media watchdog, which demand a sound and vibrant environmental program.

Definitions

The definition and objective of the DND/CF environmental stewardship program reads as follows:

"To protect, conserve and enhance our ecosystems and provide environmental strategies on specific defence activities which may affect them."²²

If such a goal were to be achieved, every element of each defence activity, whether an operational manoeuvre or building site or an infrastructure development project, would have to be studied for its potentially negative environmental impact. Every element of the ecosystem on and in which these activities take place would have to be identified and its sensitivities to various human activities understood. To achieve these conditions, the Canadian Forces code of environmental stewardship has been developed which contains seven key elements (see Table 1). Each element, whether it is reducing wasteful consumption, the protection of ecologically significant

played a major role on the ground and in the air bringing food, medical aid and a semblance of peace and security during the devastation in Rwanda.

areas, education and training, applying the law and meeting standards, managing hazardous substances or placing environmental concerns at the decision-makers table, dwells on the basic principle of the sustainable use and development of military lands. The seven point code is amplified by a comprehensive list of 62 goals and activities which, if they continue to be rigorously applied during the five year period, from 1997 to 2002, are intended to satisfy the overall environmental targets of the Canadian military in several significant areas.

These goals and activities include specific targets and tasks, which range from the reduction of emissions of noxious chemicals that damage the atmosphere and contribute to the depletion of the ozone layer, to environmental leadership in the international defence community.²³ As well, they include environmental assessment before projects and exercises are carried out, consultation with local authorities, and internal communication of environmental awareness to foster 'positive environmental behaviour among military personnel.'²⁴

²² *National Defence and the Environment 1997-2002*, DND document 96GA-0452.

²³ Downs, Op.Cit. Since 1982 when an embryonic environment office was first funded, considerable research and numerous programs have been applied to issues ranging from aircraft noise pollution, to containing and recycling aircraft de-icing fluid, to mitigating degradation on army training grounds. The research and applied programs have been presented at NATO and bilateral conferences. The staff specializing in these matters were traditionally drawn from the military engineer community as opposed to combat officers whose main task is to train for battle.

²⁴ Ibid.

The Legislation

Before links can be made between intent and good practice, it is important to identify the principal legislation from which DND/CF environmental policies flow. The Department of National Defence and the Canadian Forces, which I will refer to from now on as DND/CF, like all other departments, are bound by the federal, provincial, and sometimes municipal environmental legislation. Virtually every CF program is affected by the national Green Plan, which requires that environment issues be considered actively when planning and undertaking every operation or mission.²⁵ The Green Plan states that the Government of Canada "is committed to providing accurate, timely and accessible environmental information to Canadians."²⁶ This provides the framework for the government to define sustainable development as "an essential goal of public policy"²⁷ for all departments including DND.

Three major federal government Acts²⁸ directly affect military activity vis à vis environmental stewardship. The Canadian Environmental Protection

²⁵ Numerous documents highlight these acts: *The Commander's Guide on Environmental Protection*. National Defence document, NDID: A-EN-007-002/AG-001, 1997; *National Defence Annual Performance Report to Parliament*, DND Document, Catalogue No. BT 31-4/50, March 1997, p. 27.

²⁶ *Canada's Green Plan*, Government of Canada. Ministry of Supply and Services, Ottawa, 1990, p. 141.

²⁷ *A Guide to Green Government*, Minister of Supply and Service, Ottawa, 1995, pp. 1-2.

²⁸ *The Commander's Guide on Environmental Protection*, Op.Cit., pp. 5-9.

Act (CEPA) regulates the use of toxic substances to protect both human health and that of the environment. The CF is a major user of a broad variety of chemicals ranging from fuels, to battery acid, to explosives, and pesticides and herbicides.

Under the Fisheries Act, all individuals are expected to avoid releasing damaging substances or conducting 'deleterious' activities that would harm fish and other marine life in federally controlled bodies of water. The principles of this act are supported by provincial and local legislation requiring special care to be taken to avoid clearing brush near streams, building structures in or near water or damaging streams with vehicle crossings. Each of the case study bases contains important water sources and I will investigate specific stewardship activities relating to them with a view to understanding the level of positive progress.

Finally, the Canadian Environmental Assessment Act (CEAA) "entrenches the obligation to conduct environmental assessments in law."²⁹ The implications of this act for the Canadian military are widespread because its activity, whether related to construction, operations and training, modifications to training areas, decommissioning or abandonment of sites

²⁹ Ibid., p. 8.

and bases such as the DEW line, is all "subject to environmental assessment before any action is taken."³⁰

The CEAA highlights for DND/CF four key areas of concern which have a major impact on resource management practices. The four areas are:

- Carefully consider environmental effects before taking action
- Promote and train for sustainable development to achieve and maintain a healthy environment;
- Involve neighbouring jurisdictions and communities to avert adverse effects of activities; and
- Encourage public participation in the assessment process.³¹

Added to these federal laws are provincial, territorial and municipal standards that DND/CF has elected to observe at their bases and training areas across the country.³² The array of all these regulations is well documented in the environmental baseline studies or assessments that have been prepared for each base. These studies result from an internal DND/CF program that commenced in 1991, requiring environmental audits

³⁰ Ibid., p. 9.

³¹ Ibid., p.8.

³² Tony Downs, Director General Environment, DND, Ottawa, *Interview*, November 1997.

of the bio-diversity and human activity on all DND bases and sites.³³ They are, in fact, State of the Environment Reports. This marked an important beginning of a steady accumulation of scientific data on which sound, knowledge-based decisions can be made with regard to training on military ranges and management of the natural resources.

The Policies

The environmental policies that guide the DND/CF approach to sustainable development and protection of bio-diversity emanate from the federal, provincial and sometimes municipal legislation. Two key departmental policy documents are the Policy Directive P5/92 and the Canadian Defence Policy, both of which were issued in 1992.³⁴ In these documents, the commitment to ensuring that training activities are consistent with safeguarding the environment, "while maintaining operational readiness,"³⁵ is clearly affirmed. Additional emphasis is provided in the declaration that

³³ The original Baseline Studies are maintained and updated on a regular basis by base environmental officers. They provide an important data base from which to build an effective environmental stewardship program, known as an Environmental Action Plan (EAP). The bases selected for study in this thesis each have recently updated assessments from which Natural Resource Management Plans are derived.

³⁴ *Canadian Defence Policy*, Department of National Defence document, April 1992. DND P5/92 was endorsed and distributed in December 1992 by the Chief of the Defence Staff and the Deputy Minister of National Defence, the highest authorities in Canada's defence ministry, under the Minister of National Defence.

"green considerations will be given equal weight along with operational, logistical, financial and human concerns in the decision making process."³⁶

The targets for the policy remain unchanged five years later, today. They cover everything from energy conservation, green office practices, training and awareness, incident reporting, handling of hazardous materials, the elimination of the release of ozone depleting substances, and the 'remediation' of contaminated sites.³⁷ But, while the policy undertakes to commit to 'responsiveness and responsibility for the environment,'³⁸ it formally recognizes the fundamental problems posed by limited manpower and financial resources. These inherent shortfalls, and the unique training and readiness requirements of a military force, impose difficulties in achieving targets and accomplishing environmental stewardship activities to the letter of the law.³⁹

From DND P5/92, each command, the navy, the army, and the air force, has developed its own specific environmental management strategies. These strategies identify measures to mitigate unsound practices such as

³⁵ *NDHQ Policy Directive P5/92*, Department of National Defence/Canadian Forces Policy on the Environment, Document 1262-0 (DM/CDS), November 1992.

³⁶ Canadian Defence Policy, Op.Cit., pp. 19-20.

³⁷ Ibid., p. 4/7.

³⁸ Ibid., p. 2/7.

³⁹ Ibid., p. 3/7.

dumping waste and cleaning out oily bilge in harbour and at sea,⁴⁰ flying fighter aircraft at low-level with little respect for remote human settlement or wildlife below,⁴¹ or conducting battle group training without respect for the surrounding ecology.⁴² A review of the Air Force documents on the state of the environment and on stewardship practices, for example, shows good intent. The comprehensive business plan document for the years 1997-2002, directs that environmental concerns be integrated into all decision-making, and singles out the importance of "ensuring that projects and activities are conducted in a manner that protects and conserves the environment."⁴³ It emphasizes the goal to meet and exceed the standards set by the guiding legislation, through clear and achievable initiatives.

In order to implement this rhetoric across the air force, data-collecting Baseline Studies, and environmental assessment for all new projects and operations, are recognized as the best methods for avoiding the costly clean up and legal challenges associates with past practices.⁴⁴ Baseline Studies have been conducted at all Air Force wings and as a result it is

⁴⁰ "National Defence Mobilizes for a Healthy Environment", *Achieving a Healthy Environment*. O'Brien Publishing, Summer 1995, p. 21.

⁴¹ *Environmental Mitigation Program - 1998*, Military Flying Activity, Goose Bay, Labrador, draft DND Report. September 1997.

⁴² "CFB Gagetown is Fighting a Battle to Overcome Decades of Environmental Degradation," *The Ottawa Citizen*, 26 July 1997, p. B2.

⁴³ Lieutenant-General A. DeQuetteville, *Commander's Vision: Air Command Level 1 Business Plan, 1997-2002*. Internal document, May 1997, p. A2-1/3.

⁴⁴ *Air Command Environmental Management Strategy for the 1990's*. Unnumbered DND/CF document, 1996, pp. 4-6.

acknowledged that a number of contaminated sites across the Air Force require cleanup action.⁴⁵ These sites, which include underground fuel storage tanks and abandoned dumps, are reminders of past practices when no attention was paid to environmental standards and guidelines.

Mainstream Security Agenda

There is no shortage of references that define the security agenda in post-Cold War era and shine the political and rhetorical spotlight on environmental management. For example, in the 1998 Canadian Forces Defence Planning Guidance,⁴⁶ environmental pressures are considered among the prominent issues that present significant security challenges to Canadian defence. Responding to environmental disasters and minimizing environmental damage are core defence objectives⁴⁷. The priority placed on them was so significant that, in 1996, a new high-ranking position was created to watch over environmental issues.

⁴⁵ *Air Command and the Environment*. Unnumbered pamphlet, Senior Staff Officer Environment, Air Command, 1997.

⁴⁶ *Defence Planning Guidance 1998*, DND/CF internal document, 1998. This document provides the senior management of DND/CF with strategic level guidance and commitments for 1998 and beyond.

⁴⁷ Under the title of 'defence objectives related to defending Canada' humanitarian assistance and disaster relief are responded to in order to minimize loss of life, suffering, property, and environmental damage.

At the pinnacle of the decision making process, the Minister of National Defence has recognized that the activities of the Canadian Forces and DND directly "affect the lives and environment of Canadians... it is in our interest to encourage sustainable development."⁴⁸ This intent is endorsed by the senior general in the CF, the Chief of the Defence Staff, who states that,

"Our aim is to demonstrate responsiveness to and responsibility for protecting the environment while ensuring environmental stewardship and protection of the national and corporate assets entrusted to DND/CF."⁴⁹

One significant dimension of these high level commitments⁵⁰ is that the decision-makers have become accountable for the environmental policy. They have put their names to the faceless rhetoric of such statements as "defence-wide Environmental Management Systems which are consistent with international ISO 14000 standards and guidelines."⁵¹ It is important for political and military leaders to acknowledge the scope of the DND/CF's potential to affect the environment, whether in the form of negative impacts

⁴⁸ Taken from the MND's covering letter to the most recent DND/CF document defining its environmental strategy for the future - '*A Sustainable Development Strategy (SDS) for National Defence*', DND document, Associate Deputy Minister for Infrastructure and Environment, December 1997. All government departments are required to produce such an SDS document by the end of 1997.

⁴⁹ Ibid., p. ii.

⁵⁰ *National Defence Annual Performance Report*, Op. Cit., p.1. The Minister of National Defence included 'environmental protection' as one of the leading 'complex and demanding operations' of DND/CF.

⁵¹ Ibid. p. 9

or constructive sustainable use, and endorse remedial action plans. Until recently, social and economic instability brought on in part by a weakened environment was considered to be a problem for third world states and the military solution was to 'send in the peacekeepers'. But, now in our own back yard, the dramatic floods in the Saguenay Valley of Quebec and the Manitoba floods of 1997, and the devastating ice storm in Eastern Canada and Northern New England of January 1998, each demanded a strong military intervention. These events and the subsequent response clearly demonstrate the political recognition that the military, with all its manpower, leadership and logistical capabilities, and materiel resources, has an increasingly prominent role to play in the management of environmental issues. No longer can military operations, wherever they have a presence, be disconnected from environmental, social and economic impacts.⁵²

By underscoring the priority of environmental protection, and by committing significant massive military resources to shore up other levels of

⁵² It is interesting to note that even in classical military combat, reference to avoiding collateral damage, which includes both non-military infrastructure as well as the natural resources of the surrounding environment, is creeping into strategic thinking and operations. The Chief of the United States Air Force, General Michael Ryan, who commanded the NATO strikes against the Bosnian Serbs in Operation Deliberate Force in November 1995, is quoted as saying "Minimizing collateral damage but also carnage was first and foremost in my mind." Tirpak, John A., "Deliberate Force," *Air Force Magazine*, October 1997, p. 43. In deliberate Force, over 60% of the bombs dropped by NATO were precision guided. This is a far cry from area bombing of World War II, the napalming of the Vietnam War, where two-tenths of one percent of the bombs were precision guided and the Gulf War where only 9% were precision guided. Tirpak, p. 39-40.

government, and society itself, during environmental disasters, DND/CF clearly legitimizes environmental stewardship as a main stream defence and security priority. The endorsement of sustainable practices by top leadership links Canadian military goals directly to the global principles and concerns raised by distinguished scientists and respected world leaders in the widely publicised 1987 Brundtland Commission report⁵³ on environment and development.⁵⁴ It also connects environmental stewardship activities required of the Canadian soldier as he carries out his local training to international standards and objectives.

⁵³ Brundtland, G.H. et.al. *Our Common Future*. The World Commission on Environment and Development. Oxford University Press, 1987.

⁵⁴ *A Sustainable Development Strategy for National Defence*, Op. Cit., p.2.

Chapter Three

Turning Rhetoric into Practice:

Some considerations before issues are tackled in the field

There are three aspects of the development of the DND/CF environmental program that point to a strong commitment to comply with the letter and spirit of the law and to exceed expectations where possible. These points are: the expansion of skilled staff; the increased budget; and the progressive complexity of the stewardship and remediation projects which have occurred over the past decade.

A brief review of the history⁵⁵ of the DND/CF environment division demonstrates a progressive commitment to creating a professional approach to the military stewardship program. In 1973, five individuals formed the Environmental Protection Directorate. Their main task was to implement an effluent clean-up program over five years, which met new federal sewage discharge standards. In 1978, with their work only partially completed, they were disbanded because of a lack of funds.

In 1982, there was renewed interest in environmental issues and a new section of five was formed, entitled Works, Conservation and Environment.

⁵⁵ Downs, Op.Cit.

The group was formed from individuals experienced in base engineering infrastructure and practice. The group grew to 13 in 1985 with more engineers being appointed to the team. Over the next eight years, until the present, the directorate grew in numbers to 50 people and broadened its influence to include environmental officers at all major bases across Canada.

The dedicated budget (see Figure 1) also indicates how commitment has progressed over a period of 16 years from \$200,000. in 1982 to a high of \$68 million in 1993-94. The 1997-98 value stands at \$49.5 million. The peak in '93-'94 indicates major spending on clean-up projects, especially those being carried out (slowly) along the DEW line. Part of the 1997-8 budget includes \$7.5 million set aside for the Incremental Environment Program. This fund can be drawn on for clean-up, or other unforecast projects, as for example the recently completed multi-million dollar cleanup of lead contaminated soil at the Long Point Barracks in residential east-end Montreal. The decline in the budget after 1994 reflects both the federal government's budget restraint as well as the progress that is being made in cleaning up the legacy of past practices.⁵⁶ Figure 2 is provided as an example of additional command funds for their own environmental program. It is interesting to note that the cleanup of legacy sites consumed 80% of the

⁵⁶ Ibid.

Figure 1

Figure 2

air force budget in 1993 and 50% in 1997. Monitoring, mitigation and training consume the balance. The navy and army have similar forecasts.

The environmental programs should be seen as the framework around which practical projects are carried out in the field. The number and comprehensive nature of these programs has increased steadily, especially in the '80's and '90's. For example, Baseline Studies were first instituted in 1983 with three main environmental objectives in mind: assessing all activities on the base; identifying problem areas; and establishing a priority list for mitigation. Studies have been completed for every base in Canada, and the process to update them with new and comparative data has begun. The research is carried out by independent private agencies "with no stake in preserving the *Status Quo*."⁵⁷ Elizabeth May, a well-respected critic for the environmental movement, and the director of the Sierra Club of Canada, acknowledges that these studies "have showed the way ahead for industrial environmental audits."⁵⁸ BLS's were expanded in 1993 to include the army training areas, such as Suffield, Shilo and Gagetown, as well as Canada's naval vessels.

Again in 1983, in concert with the BLS, Environmental Studies on Decommissioning and Clean up were instituted, independent of any

⁵⁷ Ibid.

⁵⁸ May, Elizabeth. Environmental lawyer and spokesperson for the Sierra Club of Canada, Ottawa. Interview, December 1997.

legislation or government direction. According to Downs, DND was five years ahead of industry and Environment Canada and the initiative helped to move the national program forward. The program established a priority of sites to be 'remediated' and has led to a number of major and thorough cleanups. Once again DND/CF led the way with the destruction of PCB's at the Goose Bay training facility. There, in 1991, a portable incinerator, which was the first of its kind in Canada, was brought in to carry out the year-long project of destroying PCB waste from many sites. The environmental assessments for all major exercises and infrastructure development, the integrated pest management program, the new Code of Environmental Stewardship (Table 1),⁵⁹ and the individual Navy, Army and Air Force command environmental programs, all signal a clear trend and desire to achieve a healthy, sustainable environment on military properties.

Where Rhetoric Meets Reality

The heart of this thesis is to determine if the good intentions presented in the long list of political and policy endorsements are being converted into practical applications in the field, applications that avoid the degradation of natural resources. Environmentally friendly practices in the field are key to any diligent environmental program and one that must pass public scrutiny.

⁵⁹ *National Defence and the Environment, 1997-2002, Code of Environmental Stewardship Guidelines*, December 1996.

The litmus test to gauge the quality and depth of the environmental stewardship programs at selected DND/CF sites is found in the projects and activities where military personnel come into direct contact with the precious natural resources and bio-diversity that are present in the training areas.

For the Canadian military community, any program or activity, whether a training exercise, construction project, or a decommissioning, is subject to the environmental assessment (EA) process.⁶⁰ While the process is self-directed assessment, based on a principle of due diligence, individual offices of primary interest (OPI's), who are the decision-makers for the conduct of a given activity, are required to conduct EA's.⁶¹ The DND Environmental Assessment Manual provides the information gathering tool to integrate environmental considerations into the planning and approval stages before proposed activity takes place.⁶² In the case of army training exercises, which can impact on the natural resources and other elements of the local environment in many ways, the EA, in conjunction with adherence to other environmental rules and regulations, is a valuable mechanism to reduce potentially adverse effects.⁶³

⁶⁰ DND Environmental Assessment Manual. Department of National Defence publication, Ottawa, updated July 1996, p.1.

⁶¹ Leclair, D. Senior Environmental Advisor, Canadian Army Staff, Ottawa, Interview, December 1997.

⁶² DND Environmental Assessment Manual, Op. Cit. pp.2-3.

⁶³ Ibid. p. 4.

With limited human and financial resources there are challenges as to what can be accomplished in terms of remedial practice to improve the condition of the environment. One environmental officer for a major training area questioned his ability to implement the new code with its 62 specific targets with all due diligence.⁶⁴ Solutions to some of the goals can be achieved by simple but costly technical controls. For example, reducing the consumption of water in buildings by the year 2001 can be achieved by installing modern cisterns. Reducing oil and gas used to heat buildings by 15% can be achieved by installing efficient furnaces and insulation. Ozone depleting emissions from engines and incinerators can be reduced by the year 2004, if alternative fuels are used and modern, efficient systems are installed. Toxic and high impact ammunition will begin to be replaced by 1999.

Uncontrolled consumption of water, fuel and other forms of energy has always been a drain on military resources. Considering the array of land vehicles, ships, aircraft and buildings which emit waste in various forms, the effect the military alone has on air quality is significant. Certainly the new code indicates that time and effort has been dedicated to careful planning, but there are the inevitable exclusions or 'opting out' catch phrases. For example, the first activity identified in the process to arrest atmospheric

⁶⁴ In conversation with Sheldon Downe, the environmental officer for CFB Gagetown, home of the Canadian Combat Arms School. His one-man

change pollutants reads: "Reduce and/or eliminate the use of Ozone Depleting Substances in National Defence." The following proviso is added softening the intent of the action: "Where appropriate alternatives are available." The second activity under the atmospheric change category states that alternative fuels will be used in all automobiles, vans and light trucks by the year 2004, "where cost effective and operationally feasible."

In addition to energy consumption, the use of toxins and other hazardous materials is widespread throughout the military.⁶⁵ Substances such as Polychlorinated biphenyl (PCB's) are used in batteries and electrical transformers, and pesticides and herbicides are used extensively to control insects and vegetation in training areas such as CFB Gagetown. The stewardship plan calls for an inventory of all contaminated transformers and sites on DND property. The removal and destruction of the PCB wastes must wait until the equipment is retired from service. By the year 2000, the target is set to reduce the use of persistent bio-accumulative toxins (PBTs) which find their way into the food chain, by 90%, and by 2004, pesticides use will be reduced to 50% of 1995 levels. Although these new standards are a positive indication, neither the net effect on the environment nor the

operation and budget would have to grow ten fold to accommodate the demands of the new stewardship plan.

⁶⁵ The accumulation over the years of toxic substances and waste combined with the unwitting disrespect for responsible environmental stewardship practices has left a diverse and very costly clean-up problem for DND throughout the Canadian map. The DEW line cleanup, which is

ability to achieve the targets can be taken as a given. DND experts readily admit that the scientific knowledge available to them does not confirm whether 50% or 90% reductions are appropriate or effective enough to cause real amelioration to the ecosystems.⁶⁶

The views of a long-time expert in engineering and programming for the DND/CF environmental stewardship initiatives, Forest Smith, provide an astute position on where 'the test for success' of DND/CF environmental efforts lies. In his view, progress can only be measured by knowing and controlling the exact quantities of every noxious elements that are emitted into the environment. Reducing levels of pesticides or energy by percentages, he believes, indicates that you only damage the "food chain threefold, instead of five."⁶⁷

Training areas and the role of due diligence

Each of the goals mentioned above, and the related technical innovations, contribute to the overall intent to reduce the waste of materials, the consumption of energy, and the emission of destructive substances into the

addressed in this chapter, is but one example of the legacy the previous generation has left to us to remediate.

⁶⁶ In an interview, Mr Forest Smith, the recently-retired director of the environmental stewardship program and Deputy Director of Environment for DND, noted that for all the good intentions of remedial targets, science does not have the answers to the effectiveness of reduced use of toxins. December, 1997.

atmosphere. They are fundamental to the diverse DND/CF environmental stewardship program, but they do not demand individual effort beyond recycling, turning off switches, and managing more efficient engines and systems.

Where real effort is demanded, if institutionalized sustainable development is to be more than rhetorical promises without substance, it is 'in the field' by the individual soldier and the company he operates with. To discover the soldier where he interacts with the delicate and diverse elements of ecosystems, and to draw conclusions about his understanding of personal 'due diligence' with respect to the bio-diversity, research must go to where he trains. If the case can be built for sound, progressive and long term management and treatment of bio-diversity and natural resources at geographically diverse military bases, the main position of this thesis, that legislated and political ideals are being translated into good practice, will be defensible.

It is self-evident, and undeniable, that military training comes with an environmental cost. The accumulation of the detrimental effects has taken its toll across the Canadian Forces system. There are many records that challenge the whole concept of successful military environmental stewardship. In 1993, a warning letter from Environment Canada was sent

⁶⁷ Ibid.

to the Minister of National Defence describing a major underwater fuel line leak near the Canadian Forces Station at Shelburne, NS. The letter revealed a total of 156 fuel spills in the three previous years, one involving an estimated seven million litres. It was also revealed that DND/CF personnel were reluctant "to take responsibility and implement immediately mitigative measures for incidents of this type."⁶⁸

The response to this accusation is considered to be a turning point in the DND/CF approach to the concept of 'due diligence' and to its ability to 'remediate' environmental damage. Within two months, the military reaffirmed its commitment to making "sound environmental behaviour fundamental to all its operations and activities."⁶⁹ As well, it dispatched a high level team of environmental specialists on a cross-country mission to visit regional Environment Canada offices to forge closer ties.

More recently, in February 1998 the Halifax Chronicle-Herald exposed another apparent setback in the national media.⁷⁰ The headlines read "Base cleanup too secret". The old chestnut of hazardous chemical contamination left over from decades of unregulated waste disposal,

⁶⁸ Letter to the Director General Environment, DND/CF, from the Director, Conservation and Protection Division, Atlantic Region, Environment Canada. 26 May 1993.

⁶⁹ Letter to the Director, Conservation and Protection Division, Atlantic Region, Environment Canada from the DG Environment, DND/CF. 30 July 1993.

pesticide spraying, and unsatisfactory containment of petrol, oils and lubricants had reared its ugly head. Two sites at CFB Shearwater in Halifax and CFB Greenwood in the Annapolis Valley were highlighted for their "cocktail of toxic chemicals." Investigation revealed that story in fact came from a DND/CF report that identified all known contaminated sites on its active properties across Canada. The program has located and assessed some 542 sites for clean up and assigned a priority to the list for 'remediation' based on the potential risk to human health.⁷¹

All the sites are remnants of an era that predates the environmental consciousness of the nineties. In the words of Tony Downs, 'as we sanitize each site and restore the land to its natural order, the list and the problems will disappear and not recur. The former practices that led to the contamination have been eliminated and replaced with environmentally sound and sustainable ones.'⁷²

However, it is also evident that varying levels of public pressure are often required to cause appropriate action. In 1995, for example, officials at the

⁷⁰ Brewster, Murray. "Base Cleanup too Secret," *Halifax-Chronicle Herald*, 23 February, 1998, p. A9.

⁷¹ 'The DND Contaminated Sites Remediation Framework' was an internal report made public in July 1997 through Access to Information. The information was part of a program, begun in 1992, to identify and assess each site for extent of contamination and the threat beyond the military property to neighbouring communities. According to Tony Downs, Op.Cit. the document was a database of the problems at each site and was the foundation of the cleanup and management priority program.

air force wing in Trenton, Ontario agreed to hasten the clean up of a known but long-disused, remote, six-acre dumpsite. For several years, local farmers had waged a battle over oily tasting well water which they has used for drinking and other domestic purposes as well as for watering crops. The contaminants had seeped out of the site and down stream through the water table to the adjacent land. When the 45 gallon drums containing decades old roofing waste and used gasoline products were removed by a professional environmental company, over half a million dollars had been spent on this legacy site.⁷³

The positive side of the cleanup program is that the technology for testing, excavating and disposing of toxic waste is proven and is considered to be appropriate for all potential environmental impacts at Trenton and by extension on other bases.⁷⁴ The negative side relates more to timing and decision making. Dave Rider commenting about the clean up of DND/CF sites in the Ottawa Sun writes:

Notes from the 1995 internal audit show the department's plans to upgrade and replace more than 2,000 storage tanks is fraught with missed

⁷² Downs, Op.Cit.

⁷³ Malette, C. "Landfill Leaching Chemicals," *Belleville Intelligencer*, 17 May, 1995, pp. 1, 10; White, C. "Toxic Drums Buried on Base," *Belleville Intelligencer*, 13 September, 1995, pp. 1.

⁷⁴ Danahy, R. Base Environmental Officer, CFB Trenton, Interview, November 1997.

deadlines, shifting jurisdictions and the resulting increased likelihood of fuel spills.⁷⁵

The audit was prepared by DND/CF environmental specialists and was intended to be a thorough account of underground and outdated storage tanks. The tanks were categorized according to risk.⁷⁶ All tanks that posed a potential danger of leaking were drained, removed and where necessary replaced with modern above ground tanks. The program to replace or eliminate the remaining tanks is underway within the constraints of available funding. It is expected that it will take another 24 months to complete the project. Perhaps typically, the media did not seek expert clarification which would have provided a more balanced commentary.

More than Battlegrounds

What is often overlooked in the public domain, in part because it appears on the surface to be so incongruous and in part because it is little publicized, is that the military training areas are much more than 'battle grounds'. Many are expansive preserves where robust and rare fauna and flora, archaeological sites, and economically viable mixed forests coexist with military training. The case study sites that will be examined are good examples of this. Not surprisingly, it is the very dangerous nature of the

⁷⁵ Rider, D. "DND falls short in plan to clean up fuel tanks," *Ottawa Sun*, 29 August 1996, p. 4.

activities that take place on military preserves that has caused them to be marked off from general public use since the 1930's and 40's. Consequently, the land has been spared the ravages of uncontrolled industrial and resource development, farming and cattle grazing, and general human settlement. The rare natural prairie grasses, the buffalo jumps, the early settler's house, the aboriginal camping and hunting ground, the natural water system, the rare wildlife species, have survived and in some cases thrived because of historic benign neglect. With the relatively recent advent of environmental awareness and responsibility, this pleasant legacy has been identified and is in the process of being defined, studied and protected from military activity.

The stewardship practices at military training sites come under two basic categories or challenges. First, there is the cleanup of past activities, which stem from an era when environmental considerations played no part in military thinking or practice. Cleanup in effect means restoring the land or site to its natural setting by removing buildings and material and all toxic waste. Any waste that may damage the surrounding natural and human communities, or contaminate the food chain, is removed or contained according to established standards. The cost of cleanup is the most costly and resource dependent part of the entire DND/CF environment program. Second, is the challenge of ensuring that sustainable use and management

⁷⁶ Downs, Interview, July 1998.

of training lands, and the indigenous natural resources, are incorporated 'when planning and undertaking every activity', so that costly clean ups will not be a feature of the future landscape.⁷⁷

The department readily admits that financial and human resources for a monitoring program are limited, and measurement, analysis and performance reporting are in their early stages. Moreover further research is required to produce a model that provides effective monitoring for ecologically sustainable military operations.⁷⁸ However, a review of the case study bases does show examples of responsible stewardship practices that have occurred over the past decade. These practices are intended to relieve some of the pressures that have been forced on the environment. The environmental officers responsible for the environmental program are subject to national programs such as the Total Land Management Program that requires that environmental considerations must be integrated into all training and infrastructure developments. However they each have their own special problems and achievements which help to build a factual picture of stewardship practice in the Canadian military.

Research into sound environmental stewardship practices is based on data contained in recent Environmental Assessment and Natural Resource

⁷⁷ Adams, J.L. *The Commander's Guide on Environmental Protection*. Unnumbered document, Department of National Defence, Ottawa. 1997.

⁷⁸ *A Sustainable Development Strategy for National Defence*, Op.Cit., p. 23.

Management Plan documents that are available for each of the case study bases. These detailed resource documents were commissioned by DND/CF and prepared by independent environmental science engineering firms.⁷⁹ Further information on the state of natural resources and environmental training and practice was gathered during recent interviews with the environmental officers at each site.⁸⁰

Involving the Public

One significant limiting element with the military's environmental stewardship program, or the Total Land Management Program⁸¹ as it is referred to, is the level of participation and constructive input from 'third party' stakeholders. An interview with one base commander at a major training base indicated that he was not well disposed "to debate with 'environmentalists' how his troops trained or how military land was used." This poses the question of how resource management should be conducted on self-contained training area and who should monitor the activity. The conclusion can be drawn that the public consultation process will likely be

⁷⁹ These studies date from 1993 for CFB Gagetown, 1996 for CFB Shilo, and 1997 for CFB Suffield.

⁸⁰ These interviews were conducted in December 1997.

⁸¹ The program is designed to encourage and enforce the integration of environmental considerations into military training programs and infrastructure development plans. Fundamental to the program are thorough environmental assessments (EA's) of all significant activities on military property.

minimal, or perceived to be unnecessary, if environmental effects are shown not to migrate beyond military boundaries into neighbouring communities.⁸²

However, by legislation, public involvement in the environmental protection equation is an important element of the federal government's policy. The CEAA has instituted a Public Registry whereby the public is given the opportunity to take an active role in the environmental assessment (EA) process. All EA's conducted by the military for major exercises and site developments are publicly registered, in fulfilment of the intent of the legislation.⁸³ In addition, special Advisory Committees have been established at several bases across the country which should be seen as a major cultural leap forward. These groups, made up of concerned citizens from universities, industry and other public and private institutions help the military plan and meet achievable standards.⁸⁴ The members are not all specialists in botany, biology, soils and hydrology, but they represent a more holistic point of view that should contribute to better land management and sustainability.

As a result of the questions posed to the base environmental officers about community involvement, it becomes evident that some bases do better than others when it comes to public consultation. The case study of CFB Shilo

⁸² Mr Downs, Op.Cit.

⁸³ *DND Environmental Assessment Manual*, Op.Cit. pp. 4-5.

(see Chapter 3) offers a positive illustration of a progressive program which, given time, money and manpower, could serve as the model for other sites. What the authorities at Shilo have recognized, is that the public is far better disposed to supporting military activity, if they feel they have access to that once closed community. There is open recognition that military activity does cause problems for the environment, but communal interest in assessing and mitigating against the risks, enhances the efforts to end practices which lead to costly remediation.⁸⁵

The Cost of Cleanup

The high cost of the cleanup of legacy contaminated sites is recognized as one of the primary, practical constraints facing the environmental program. One could argue that an annual budget of \$ 49.5 million for 1997 is far from adequate to meet the demands of clean up and program management plans. However, it is unrealistic to believe that limitless resources are available.⁸⁶ The solution is to identify those sites that are assessed to pose the greatest risk to human health on base, or to a neighbouring community or valued ecosystem and to tackle them first.⁸⁷

⁸⁴ Shearer, G. Base Environmental Officer, CFB Shilo, Interview, December 1997.

⁸⁵ Downs, Op.Cit.

⁸⁶ Ibid.

⁸⁷ *Air Command and the Environment*, Unnumbered pamphlet, Op.Cit.

A diminishing budget and the planned elimination by the year 2002⁸⁸ of the Incremental Environment Program (IEP), on which many military site remediation and other environmental projects depend, does, however, cause critical questions to be raised about the future of environmental contingency programs. For instance, it will result in environmental projects being funded out of existing budgets, for which increases are unlikely to be forthcoming under the present fiscal climate and focus by military leadership on expensive upgrades to ships and aircraft and purchases of new helicopters and submarines. Moreover, projects now funded by the IEP, such as environmental assessment or the less rigorous screening process of major exercises and new projects may well be relegated to the level of superficial and bureaucratic paper exercises without dedicated funding. So too will the current training programs in environmental regulations and procedures; R & D and demonstration projects such as vegetation and training area management studies; environmental audits; and updated baseline studies.⁸⁹ All of these stewardship programs, which require reliable funding at the local site level, stand to become orphans without a sponsor if adequate funding is reduced or withdrawn. It can easily be

⁸⁸ *Air Command Environmental Management Strategy*, Op. Cit., p. 9. The IEP, which is funded by the national defence budget, is seen by the commands (navy, army and air force) as a vital source of financial support for local projects and programs. Its elimination will put considerable pressure on subordinate level budgets which have less flexibility than the DND/CF budget to find funds for non-operational commitments – comments by the Air Command Chief Environmental Officer, November 1997.

inferred that senior leadership pays lip service to environmental stewardship, but is not prepared to back up the rhetoric with adequate funding.

The DEW Line Clean-up

The example that serves best as the model for restoration of legacy sites, is the Dew Line.⁹⁰ The 42 sites stretched at 160 kilometre intervals from Alaska to Greenland. Since 1954, when construction began, the wastes generated have posed significant dangers for human and environmental health over roughly 5,000 kilometres along the Arctic shoreline. The US military, with some Canadian participation, constructed this north warning

⁸⁹ Ibid., p. 9-10.

⁹⁰ Many other prominent clean-up sites where Canadian and American military activities took place remain to be tackled. Funding, compensation and liability are complex issues which delay sound solutions. On 18 Dec. 1997, the CBC National TV News covered the environmental legacy of the American military in Canada. From Stephenville, Nfld., which was the largest World War II air base outside the US, to the giant naval base at Argentia, Nfld., and north to the DEW Line, the Americans are accused of dumping everything everywhere, with no regard for the environment. Tony Downs admits in the program that half a billion dollars would be required to restore the DEW line sites to pristine conditions, twice the amount now allocated. This he asserts is not even expected for landfill sites near southern population centres like Toronto. 'Experts' interviewed on the program pose the questions, "is money driving the quality of cleanup?" or "is the legacy a small price to pay for freedom and protection?" Without American power and protection the question is asked, "would Canada have spent 10 times more for defence during the period than we did?" These questions are hypothetical today because the attack never came. But the costly legacy remains. And furthermore all citizens, no matter how remote their communities are, deserve good health and a safe and clean environment.

system as the Cold War tensions heightened, to protect North America from the threat of a Soviet missile invasion. Since 1985, some sites have been incorporated into the North Warning System, but many lie abandoned as rusty and polluted sirens of a bygone era.⁹¹

Typically, during that 1950's and '60's Cold War era, no consideration was given to protecting the environment. War and effective defence against it dominated military thinking and security policy and any effective counterbalance to this attitude had not yet developed. The threat of Soviet attack over the Canadian Arctic was an all-encompassing preoccupation and spurred the US to build the DEW Line. Research into the sensitivities of the arctic ecosystems and the linkages between waste and the food chain had not yet appeared on the radar screen.

Today, scientific environmental site assessment⁹² confirms that the careless accumulation of years of common garbage, sewage, PCB's and other chemicals and used petrol, oil and lubricants, has produced a toxic cocktail that has caused widespread damage to the land, the lakes and streams and the near-by ocean areas. There is a vital and direct link between this thoughtless activity both to human health and to the health of the bio-diverse ecosystems through the food chain. The Arctic hare, the

⁹¹ Dr. Reimer, K. et.al., *DEW Line Cleanup: Scientific and Engineering Summary Report*. Environmental Sciences Group and UMA Engineering Ltd., Department of National Defence Report, 1995, p. 11, 1-3.

Willow ptarmigan, and the caribou graze on the vegetation on and near the closed sites, and the sea bottom-dwelling mussels and clams, which are food for fish and sea mammals, which in turn provide the local Inuit communities with 70% of their food supply. Traces of chemicals in the bodies of these animals cause considerable potential risk to human health.⁹³

Dr Kenneth Reimer, the head of Environmental Sciences at Royal Military College in Kingston, Ontario, has studied the impact of the DEW Line and its wastes on the Arctic environment. He notes that prior to 1972 common and toxic waste was simply gathered and abandoned in dumps. Reimer's team has identified eroding landfill sites at Nicholson Peninsula along ravines leading to the ocean and eroding dumps along the shore at Hall Beach. At most sites, there was direct ocean dumping of common garbage barrels and toxic waste.⁹⁴ Since that time, those disposing waste have been progressively more sensitive to the negative effect on the environment, though discarded batteries in eroding landfill sites and soil contaminated with PCB's and petroleum residues still litter the sites. Tony Downs claims that in today's world, the DEW Line cleanup would not be necessary.⁹⁵ It is

⁹² Ibid., p. 7-9.

⁹³ Moon, P. "The Arctic," *The Globe and Mail*, Toronto. 20 March 1997, p. A-8; and Reimer, K. et.al., *The Environmental Impact of the DEW Line on the Canadian Arctic*, Royal Rhodes Military College, Environmental Sciences Group, DND, 1993, p. 57, 70.

⁹⁴ Reimer, K., et.al., Ibid., p. 32-33.

⁹⁵ Tony Downs, Op. Cit.

a reflection of the pre-Rachael Carson,⁹⁶ Cold War practices when military defence and research was, for all intents and purposes, oblivious to environmental stewardship. Each of the remaining North Warning sites now have Environmental Action Plans and any new developments will undergo Environmental Assessments before any projects are approved.

Of the original 42 DEW Line sites, 21 have been identified as the responsibility of DND to remediate. The others are the concern of the Department of Indian Affairs and Northern Development. In 1994, the cleanup bill for DND was estimated to be approximately \$150 million.⁹⁷ By 1996, the estimate had inflated to \$250 million to be spent over the next decade.⁹⁸ To date, over \$100 million has been spent on environmental assessment; facility demolition; excavation and evacuation of contaminated soil; collection and approved disposal of dispersed debris and barrels; re-shaping and re-grading of landfill sites, etc.⁹⁹ Given the enormity of the problem of cleaning up abandoned military sites, it would be irresponsible not to question the adequacy of this funding. In response, Mr Downs points to the determination by DND/CF to continue the process within the constraints of available budgets. He sees the DEW Line cleanup as a model for such complex projects and a positive indication of real

⁹⁶ Rachael Carson wrote the landmark book *Silent Spring* in 1961. In popular terms her research awoke global interest to the disastrous effects of the unrestricted use of toxic chemical pesticides

⁹⁷ Reimer, *DEW Line Cleanup*, Op.Cit., p. V1-1 – V1-5.

⁹⁸ Downs, Op.Cit.

commitment to responsible environmental stewardship and natural resource sustainability. The reality is that additional government funds are not available for cleanup.

Many remedial activities have been undertaken in strict compliance with modern environmental standards, as the studies by Dr. Reimer's team at the radar sites now incorporated into the North Warning System indicate. The process of shoring up heavily eroded dump sites is near completion, and other sites located too close to streams have been moved and secured well away from human and wildlife contact on properly prepared and landscaped sites. Any building conversions or new developments are planned and carried out according to impact assessments and environmental protection plans, and regular soil and water samples are taken. Perhaps most importantly, daily operations, including waste disposal, are conducted in an environmentally responsible fashion, ensuring that costly cleanups will not occur in the future.¹⁰⁰

Winisk on the Hudson's Bay, however, is another well-publicised example of the complexity awaiting those who must plan and carry out the cleanup of remote sites, located in sparsely populated areas. This abandoned radar site lies some 1300km north of Toronto in the midst of prime hunting, trapping and fishing territory for the Cree. Winisk has remained abandoned

⁹⁹ Reimer, *DEW Line Cleanup*, Op. Cit., pp. V-3, V-4.

for more than three decades. It stands out in the middle of the pristine wilderness. In addition to the derelict, asbestos-filled buildings there are found 10,000 corroding 45-gallon drums containing used fuel, grease, sludge and unidentified chemicals. Spent PCB-laden batteries, garbage, rusted out vehicles, and pipelines with residue of fuel still in them, all leach their specific hazardous contaminants into the soil and water.¹⁰¹

For the Cree whose children explore the abandoned buildings, and who rely so heavily on local wildlife for their daily food, the delayed cleanup has become a serious health issue. They are the direct target for the hazards of environmental degradation. However since a 1990 assessment¹⁰² which determined that it would cost \$8.1 million to return the site to its natural state, the decision has become a bouncing ball between the federal and provincial governments. The federal defence department handed over the Winisk and other similar sites to the provincial government, at the latter's request,¹⁰³ when they were abandoned in 1965. At that time, the medical hazards of PCB's and asbestos were not suspected and were therefore not a public concern.

¹⁰⁰ Reimer, Op.Cit, and Downs, Ibid.

¹⁰¹ Moon, P. "Abandoned Bases Ooze Pollutants," *The Globe and Mail*, Toronto, 14 March, 1997, p. A-1.

¹⁰² Ibid.

¹⁰³ Downs, Op. Cit.

Winisk highlights a clear example of the gap that still remains between strong political rhetoric and concrete action. It demonstrates a short circuit in the military code of environmental stewardship, which clearly states that the letter and spirit of federal law will be met or exceeded and that action will be compatible with provincial standards. Commenting on the legacy of the former military sites now the property of provincial governments, Tony Downs affirms that DND has no legal obligation to cleanup the northern Ontario or any other sites.

In his investigation, Peter Moon also discovered that, while there is recognition of a problem and willingness on the part of the Ontario Department of Natural Resources to carry out a cleanup, the root cause for indecision was the lack of funds. He also discovered unexpected complications that no political rhetoric could correct, that the commercial scrap contractor who intended to remove metal for smelting abandoned the project as unprofitable.

The two main casualties in this huge problem of cleaning up the Mid-Canada, Pine Tree and DEW line sites are, first, the aboriginal and other communities who depend on the land for their life and sustenance, and second, the delicate and complex Arctic and Sub-Arctic ecosystems. The hazards cannot be overlooked because of remoteness or regarded as local site-specific problems, because the animals, birds and fish, which are part

of the food chain, migrate over vast regions. Moreover, the contaminated runoff water from decaying dumps finds its way into streams, rivers, the Hudson's Bay and the adjacent ocean waters.

Chapter Four

Sustainable Use of Training Areas: Case Studies

In order to understand the relationship between the modern Canadian soldier and the resource-rich environment in which he/she operates, the best evidence is found where the soldier trains. Three intensive training areas, CFB's Suffield, Alberta, Shilo, Manitoba, and Gagetown, New Brunswick, have been selected out of many possibilities for two reasons. First, because they are geographically diverse in terms of space and physical properties, and second, because at each site a heavy concentration of military training activity has been conducted on top of precious and sometimes fragile ecosystems and wildlife communities. It is here where training area and natural resource management plans are being implemented and where realistic performance measures are being collected and analysed.¹⁰⁴

¹⁰⁴ Performance measures are a recent addition to the sustainable development program. They are, in effect, a series of indicators used to verify to what extent the pressures placed on the environment are being relieved. Performance measures are to be:

- meaningful and comparable from one period to the next and from one location to another
- credible and scientifically sound
- simple and affordable; and
- easy to collect and analyse

A Sustainable Development Strategy for National Defence, Op.Cit., p. 23.

CASE STUDY SITES

Each site will first be situated in its distinctive geographical setting. An analysis will then be presented of the interaction of military activities and the local environment to determine what, if any, positive conclusions can be drawn in terms of environmental stewardship.

CFB Suffield, Alberta

The headlines of the Edmonton Journal reads:

Diamond in the Rough: Suffield contains the largest undisturbed short-grass prairie ecosystem remaining in Canada; the unlikely guardian of this land is the military.¹⁰⁵

On 11 March 1992, Prince Philip, in his position as Head of the World-Wide Fund for Nature, presided over a ceremony setting aside a 420 square kilometres area of Suffield (about one eighth the size of Prince Edward Island) as the CFB Suffield National Wildlife Area (NWA).¹⁰⁶ The area has long been recognized as ecologically fragile, and in 1971, three special areas along the eastern boundary of the South Saskatchewan River – the Middle Sand Hills, the Mixed Grasslands, and the Riverbank Zone - which

¹⁰⁵ Struzik, E. "Diamond in the Rough," *Edmonton Journal*, 29 September 1991, p. B-1.

¹⁰⁶ MacDowall, S. "Preserving the Prairie," *Sentinel Magazine*, 1992, Third edition, pp. 12-13.

now comprise the NWA, were marked off from military activity.¹⁰⁷ Both DND and Environment Canada signed the agreement which further protects the preserve under the Canada Wildlife Act.

Today, the Canada Wildlife Service scientists from Environment Canada, in co-operation with DND/CF officials, are close to completing a detailed natural resources inventory of the area. This is a significant step towards producing a scientifically based management plan.¹⁰⁸ A similar study, commissioned by DND, but researched and prepared by a non-partisan, commercial scientific group, is being prepared for the entire base which will complement a detailed Environmental Assessment study, to be endorsed by DND in 1998. The EA characterizes every aspect of military training, from battle group manoeuvres to the effects of exploding shells, and assesses their impact on the environment. It includes recommendations for mitigating adverse impacts and sets out monitoring strategies. The Natural Resources Management Plan focuses on the natural resources – fauna, flora and cultural history – and recommends appropriate land management in order to preserve bio-diversity without obstructing the objectives of military training.¹⁰⁹

¹⁰⁷ *CFB Suffield: A Military Base and Wildlife Preserve*, Department of National Defence, Ottawa, Background document, March 1992.

¹⁰⁸ Richmond, W. Base Environmental Officer, CFB Suffield, Interview, December 1997.

CFB Suffield is an important example of a military training area that has had to synchronize military activity with environmental stewardship. The base was acquired for military use in 1941 as a joint British-Canadian experimental station conducting live trials of biological and chemical warfare defence. Since that time, a complex and continuous array of military activity has taken place on the ranges by Canadian and British regiments. Chemical warheads were tested in the 1940's, resulting in such toxic elements as mustard gas, choking chemicals, smoke compounds and tear gas being dispersed into the environment. Ground and aerial spraying of biological warfare agents added to this toxic cocktail. Even the most massive non-nuclear high explosive test ever, simulating atomic blasts, was carried out in the 1960's.¹¹⁰ Today, the largest armoured, artillery and infantry live-firing manoeuvres in NATO, which began in 1971, find their home on the Suffield ranges amidst the complex natural prairie bio-diversity, including great varieties of fauna and flora that are native to the prairie habitat.

CFB Suffield is located in south eastern Alberta (see map) 50 kilometres north west of the city of Medicine Hat, which has a population of over

¹⁰⁹ Barnes, N.E. et.al. Dillon Consulting Ltd. *CFB Suffield – Environmental Assessment*, preliminary draft, November 7, 1997.

¹¹⁰ Barnes, Ibid., p. 4-1 – 4-2, 4-39 – 4-31. CFB Suffield has been the home of defence research and experimentation since 1947. Today, the Defence Research Establishment Suffield continues a variety of defence related research including military equipment trials.

46,800.¹¹¹ The economic vitality of the city draws heavily from the volume and diversity of expenditures of the military community. The payroll of the base staff is approximately \$50 million, and since 1992, another \$50 million has been spent on infrastructure construction.¹¹² Given this close relationship, activities and issues on the base, including those relating to the environment, are of considerable importance to their neighbours.

The base encompasses an area of 2,690 square kilometres, primarily of dry, short mixed-grass prairie. This is an eco-region that is found over nearly 10% of Alberta. The climate is dry (semi-arid continental) and the environment is susceptible to droughts, large mean temperature shifts typically ranging from 19.4°C in July to -11°C in January, and strong winds.¹¹³ The area has an annual precipitation of 272 millimetres, the lowest in the province.¹¹⁴ The most familiar historic effect this climate has had on the natural resources is wind erosion and limits to vegetation growth, for which the dust bowl of the 1930's is the most obvious example.

Military activity and its linkage to the eco-system

The British Army has conducted army training on 1554 km² of the vast ranges at Suffield since 1972. Their units are the prime user of the ranges

¹¹¹ Internet search, www.city.medicine-hat.ab.ca, 1998.

¹¹² Barnes, Op.Cit., p. 5-18.

¹¹³ Ibid., p. 3-1.

¹¹⁴ Marty, S. "Where the Deer and the Antelope Play," *Canadian Geographic*, March/April 1993, pp. 32-42.

and consequently cause the greatest impact on the natural resources. Each year, from May to November, seven battle groups made up of up to 1400 troops and a full array of tracked and wheeled combat and support vehicles undertake their 18-day manoeuvres. Suffield offers the British troops, as does CFB Shilo the Germans, expansive training ranges, unencumbered by settlements, roads and fences, which they cannot find in Europe. The British training culminates in the main 7-day Medicine Man Exercise which incorporates all operations of a land battle. Thirty eight 62 tonne Challenger and Chieftain tanks, fully armed soldiers, and over 135 other combat and reconnaissance vehicles and mechanized artillery guns advance over a wide section of land. There is live firing of small arms, mortars and heavy calibre machine guns. 155 mm high explosive rounds, smoke and volatile illumination rounds bombard targets and concentrated impact zones. Many small troop slit trenches measuring 2.0m in length, 1m wide and 1.2m deep, and larger armoured vehicle protective scrapes are dug throughout the area. And the armoured engineers practice heavy engineering work such as bridge laying and demolition, mine clearing, road construction and bulldozing.¹¹⁵

Despite this extraordinary intensity of activity, numerous researchers quoted in the comprehensive 1997 Environmental Assessment, have come to the

¹¹⁵ Ibid., pp. 4-1 to 4-30.

same conclusion.¹¹⁶ The negative impacts to the ranges are localized rather than regional and are deemed reparable, if recommended management techniques such as rotation of target areas, routes and general manoeuvre areas continue to be practiced. Barnes's findings are based on data collected on the following elements:

Figure 3.

Generic military activity (tracked vehicle manoeuvre)→valued ecosystem component (seasonal bird nesting)→significant impact (heavy vehicle activity)→mitigation (avoidance).

His team of researchers used several methods of data collection to produce an up-to-date natural resources inventory. The methods including detailed examination at selected research sites in all sectors of the base, satellite imagery, thermal imagery and regular observation of military activities. They recorded details about the state of vegetation, biomass, species distribution, plant communities, disturbances, noxious weeds which threaten natural prairie grasses and indigenous wildlife habitats, as well as mammals, birds, amphibians, and reptiles. Based on the evidence, Barnes was able to conclude:

¹¹⁶ Barnes, Op.Cit. pp. 35.

... it is clear that CFB Suffield contains robust and diverse natural resources. Many species and their respective habitats persist largely due to the presence of the military base and the land management that DND has provided for their preservation. Without the presence of CFB Suffield, much of the wildlife and habitat would have been lost to agricultural practices or other forms of land use.¹¹⁷

Suffield contains a number of examples of sensitive bio-diversity. These Valued Ecosystem Components (VEC), some of which have been identified as endangered by the Canada Wildlife Service as their habitat outside the base shrinks or is destroyed, coexist successfully with military activity. The list includes large ungulates such as the pronghorn antelope, birds such as the burrowing owl, the golden eagle, and the prairie falcon, and other animals such as the Great Plains toad, the Ord's kangaroo rat, the tiger salamander and the western hog-nosed snake.¹¹⁸

The existence of these and many other species at CFB Suffield, as well as some of the most extensive tracts of unbroken, natural prairie, attests to two factors. First, the military activity is not an all encompassing destructive enterprise. Granted there is no evidence that protecting the environment was calculated into the annual training cycle in the early years, apart from the area now designated as the wildlife area.¹¹⁹ And second, the base now has a controlled and progressive environmental management program that

¹¹⁷ Ibid., p. 5-12.

¹¹⁸ Barnes, Ibid. pp. 19-20; Marty, Op.Cit. p. 38.

is supported by the base's leadership. The survival of natural systems, which disappeared from adjacent regions, where human settlement, agriculture and industry took over the landscape, indicates that military activity and natural resources have a level of tolerance for each other.

With the gradual advent of environmental awareness over the past decade, and the increasingly sophisticated resource management programs, the extent of this tolerance is being measured. There are significant and sustainable land use trends in these programs. For example, knowledge is being acquired about the capacity of the native prairie to regenerate itself, and the ability to monitor the overall health of the natural resources is increasingly based on scientific research. Furthermore, the process of educating and sensitizing the troops in environmental awareness and their own stewardship responsibilities has increasingly become part of the training process. It is evident that the political rhetoric has spread its roots down through the system to those who use the land. Today, every soldier who goes onto the ranges is briefed on environmental issues as they affect his/her activities before manoeuvres. This practice minimizes long-term impacts and avoids costly cleanups and damage repair afterwards.¹²⁰ The training includes a new video of the manoeuvre area and shows appropriate handling of tracked vehicles, recycling of waste from manoeuvres, how to report an accidental oil spill etc. Range Standing Orders direct specific

¹¹⁹ Richmond, Op.Cit.

treatment of natural resources such as saving topsoil when digging trenches and filling them in carefully following the training. With the regular monitoring that is carried out during and after exercises, the expectation is that there is little room for the troops to wander back to careless practices.

A Natural Resources Inventory

At Suffield, the data that is gathered for the environmental assessment process becomes part of a Natural Resources Inventory for the base which is required under the CEAA. The data covers everything from fauna and flora to soil type and the ground water systems that are equally susceptible to damage from military and human activity. Study has indicated that the coarse-textured, sandy soils that are found in the north east of the training area, are very susceptible to erosion from vehicle movement, whether tracked or wheeled. In the words of Wes Richmond,

“Having recognized this, we have declared these sensitive soil areas off-limits to training, and have moved the activity to the more durable soils in the west ranges.”

So too has the significance to the ecosystems of the main aquifer under the Suffield Range resulted in greater sensitivity with regard to training practices. In some low-lying areas where the water table meets the surface,

¹²⁰ Ibid.

wildlife gather at these watering points.¹²¹ Open stream areas and other water courses are protected from any training activity, and other once routine activities, such as changing oil or repairing engines in the field are now highly controlled activities at designated locations.¹²² Even the slightest oil spill must be reported to the base environmental officer and cleaned up immediately by the troops in order to protect the environment and the water table, and potential down stream and off-base effects. In the past, petrol, oil and lubricant spills were routinely ignored or covered up.

An unexpected dividend that results directly from the fact that Suffield was selected as a military training base over 50 years ago, is the base's cultural and archaeological inheritance. The territory was once the backyard of First Nation bands who lived and hunted there for thousands of years. More recently, European homesteaders left their mark on the land. Over 1,680 archaeological sites have been identified, including buffalo killing jumps and related weapons such as arrow heads and scrapers. Prehistoric and Blackfoot camp sites, medicine wheels, homesteader cemeteries and the remains of the foundations of farm houses and out buildings are all found.¹²³ Most known historic sites that are considered to have cultural significance

¹²¹ Barnes, Op. Cit., p. 3-5.

¹²² Richmond, Op.Cit.

¹²³ Barnes, Op.Cit., p. 4-1, 5-18, 5-20 - 5-21; Marty, Op.Cit. p. 41. Marty describes the excitement of discovering the remains and artefacts of his grandparents homestead in a hitherto unrecorded and unprotected area of Suffield. The site was abandoned in 1933 and would, in his opinion, have been eradicated if the land had not become a military training area.

have been marked off against military manoeuvres, but there remains the possibility of discovering new sites. There has been little scholarly interest, though there is great scope for archaeological research at some point in the future.¹²⁴ No federal or provincial legislation exists to preserve archaeological treasures on government land, but the base and DND/CF have taken the initiative to produce and apply their own Environmental Protection Guidelines for assessing and preserving historic resources found on their land.¹²⁵

Other Impact Activities

Over the years, DND has agreed to allow controlled cattle grazing and oil and gas extraction on the ranges. The cattle grazing privilege began in 1961 to provide a drought reserve, and today, 5,000 head of cattle graze in three confined areas each year. The oil development began in 1975 and there are now approximately 3,500 oil and gas wells and 3,250 km of pipeline cross the base. The Alberta Energy Company has been characterized as the villain of the environmental peace at Suffield,¹²⁶ but Richmond describes its activity as benign, apart from some maintenance and vehicular activity on the sites. Both the grazing and oil development are carefully controlled and monitored by the Suffield Grazing Advisory

¹²⁴ Richmond, Op.Cit.

¹²⁵ Richmond, Op.Cit. The guideline document is CF Administrative Order (CFAO) 36-50.

¹²⁶ Struzik, E. "Marathon Mammal," *Equinox Magazine*, Fall Edition 1992, pp. 43-44.

Committee and the Suffield Environmental Advisory Committee to make sure the range is not overgrazed or otherwise damaged.¹²⁷ The committees are made up of specialists from agriculture, parks, academics, amateur naturalists, the base environmental officer and operations officer.¹²⁸

For the past two decades, there has been a strong record of awareness within the local military community that the ranges of Suffield are full of valued ecosystem components. Progressively, over the years until today, the scientific analysis of the relationship between the military activities and the natural and cultural resources, has improved and expanded. The sustainable management of these resources is based on data produced by field study and such sources as aerial photographs, satellite (Landsat) imagery and remote sensing. The environmental office at Suffield will soon acquire the technology to apply Geographic Information Systems (GIS) technology to their land management/stewardship program, based on a program already well established at CFB Shilo.¹²⁹ This all points to a greater capability to manage and predict serious impacts and to take appropriate mitigating action before local damage increases to a more

¹²⁷ Barnes, Op.Cit. p. 3-6.

¹²⁸ Richmond, Op.Cit. Their role is to ensure that the natural resources are protected, that public concerns are heard, that military activities are not hindered, that the ranges are protected from overgrazing, and that valuable non-renewable resource development respects valued ecosystem components.

¹²⁹ Richmond, Op.Cit. The GIS application for natural resource management at CFB Shilo is discussed in the next section.

regional level. The data has been made available to university scientists at the University of Alberta, and is available to improve research and stewardship practices beyond Suffield's boundaries.¹³⁰ It is an interesting anecdote to note that much of the technology used to enhance data collection and analysis of the many elements of the ecosystem was first developed by defence industries to gather military intelligence and improve battlefield capability.

There are three encouraging aspects that are evident on the Suffield ranges that support the thesis that the environmental stewardship program is contributing to sustainable use of the natural resources. First, is the commitment by the military to monitor and analyse the impacts of its activities in an effort to understand the vital linkages between them and nature. Second, there is a commitment, both in rhetoric and in practice, to take creative measures, such as range rotation and designating areas off bounds to troop activity. And, third, the health of natural prairie habitats and the animals that exist in them has been demonstrated. Take for example the prong horned antelope. Once they were comparable in numbers to the 40 million bison which roamed the same grass land from northern Alberta to Mexico.¹³¹ By 1909, 40,000 were left, and a mere 1000 were reported to be in the southern Alberta and Saskatchewan area. The herds at Suffield were estimated to have been reduced to a low point of 600. Today they

¹³⁰ Ibid.

number nearly 5,000 on base, out of some 50,000 in the total population. As Des Richmond explains,

As if by telepathy, they move far away from the line of fire when the shells fly and the air strikes start, and move back to within 50 ft of the battle groups when the activity dies down. We have no hunters, no ranchers, no fences and no highways to box them in and even where there has been a range fire, you see them in the burned patch nibbling on the softened cacti. The average life expectancy of our antelope is 10 to 12 years, compared to the five-year life expectancy of those who roam off base.

Other species such as salamanders gravitate to the ruts left by heavy vehicles, looking for water. Grouse and hawks are found everywhere in significant numbers on the ranges. Where there are known nesting sites, the ranges are marked off for seasonal protection. And high traffic areas are identified and in most cases are left to rest for natural recovery of the grasses. Increasingly, the troops are reporting nesting or damaged areas and are taking avoidance action themselves.¹³²

The physical size of the Suffield ranges is an important factor for natural resource stability. It allows training activities to be rotated, thereby allowing locally disturbed areas to recover naturally, before environmental problems

¹³¹ Strusik, Op. Cit. pp. 43-44.

affect a wider region. On the ranges, a number of responsible training practices have been instituted such as requiring tanks to be separated by at least 100 metres and up to 1000, depending on the manoeuvre. The overall battlefronts are kept as wide as possible and, for the major exercises, are kept at least 10km wide. Over unstable sandy hills tank commanders are allowed to climb the hill to observe the terrain, but must back down and drive around the hill to the next objective.¹³³ The artillery and the engineers whose activities are known to cause significant local impacts now practice similar avoidance and rotation techniques. The 1997 post training season ecological assessment, which was the most thorough to date, using onsite observation, aerial photography and satellite imagery, found the impacts to the terrain were almost negligible.¹³⁴ Where impacts were noted at live firing targets and in target convergence zones, all trenches and disturbed ground will be filled in and graded, while most of these sites will not be used in 1998.

At Suffield, all landfill sites have been re-graded and landscaped with proper surrounding ditches. A land farm site was constructed for soil contaminated with hydrocarbons such as petrol, oil and glycol from radiators. Normal farm nitrate and phosphate fertilizers are added to enhance the biodegrading process which takes up to two years before the

¹³² Richmond, Op.Cit.

¹³³ Barnes, Op.Cit., pp. 7-23 and 7-26.

¹³⁴ Richmond, Op.Cit., Barnes, Ibid., p. 7-59.

soil is remediated. Then in 1995 the main vehicle refuelling point was rebuilt with sloping concrete, sealed joints and runoff collection lagoons. In 1996, the legacy test sites, left from the 1940's and 50's when the Defence Research Establishment Suffield was actively testing defences for biological and chemical agents, have been excavated, plastic liners have been installed, and the soil replaced. Drill wells surround the sites for regular testing for water and vapour, and results show no transmission of toxins.¹³⁵

Today, everything the soldier takes with him into the field, he must bring out. No longer is garbage buried, used batteries hidden or human waste covered up. At the end of every exercise the route back to barracks is via the waste collection and separation area. Similar to domestic recycling there are containers for all types of waste. Last year, because of special bins for recycling hazardous materials such as batteries, the British Army was saved \$180,000 in costly disposal.

¹³⁵ Richmond, W. Ibid. The life of the buried plastic liners is expected to be several centuries if the soil is left undisturbed.

CFB Shilo, Manitoba

CFB Shilo is a busy, year-round training base for units of both the Canadian and the German Armies. Before these modern mechanized brigades came, the tens of thousands of soldiers preparing for World War 1 and 11 ran roughshod over the land, in the shadow of the European homesteaders who originally turned the sod. And before them, it had once been the centuries-old domain of the nomadic aboriginal communities.

Shilo encompasses some 40,000 hectares in south west Manitoba, and is situated approximately 200km west of the capital city of Winnipeg. The region comprises four major ecosystems:¹³⁶ the natural prairie, deciduous forest, mixed forest and tamarack-black spruce swamp. Of these bio-diverse areas, the prairie ecosystem is considered to be the most environmentally sensitive by base officials¹³⁷ because it is rare in North America. Shilo holds one of the few large natural prairie areas left on the continent. This same limited grassland supports an array of valued fauna and flora, and contains primary water sources which supply the needs of surrounding communities and farms. It is also prized by the military as ideal terrain for mechanized warfare training, unencumbered by forests and brush.

¹³⁶ Barnes, N.E. and Clark, D.J. *Natural Resources Management Plan, CFB Shilo, Manitoba*, Dillon Environmental Scientists Ltd. DND Report. June 1996, p. 5.

Most of Shilo sits on the outwash plain of glacial Lake Agassiz, whose waters once covered the region. The lake left a large, highly porous sandy basin, beneath which lies a vast unconfined aquifer – the Assiniboine Delta Aquifer¹³⁸ for which there is no natural barrier, such as clay, to stop pollutants like diesel fuel or engine oil from leaching into the underground lake. The purity of the aquifer is essential as it is the main water supply for the base and for the neighbouring communities and farmers who, according to an Environment Canada study published in 1994, are the largest single users of the aquifer water for the irrigation of their crops.¹³⁹ If the projection that farm irrigation will triple from 6 million cubic metres of water per year (1996) to 16 m cubed by 2005, given the present pattern of economic growth in the agricultural sector,¹⁴⁰ the importance of maintaining high standards of water resource management on base is self-evident.¹⁴¹ The research carried out by Barnes and Clark, confirmed that the majority of parameters were consistent with historical data and were well within the established standards for human consumption. Only in two criteria, manganese and zinc, were levels found to exceed standards in untreated

¹³⁷ Ibid. p. 4.

¹³⁸ Barnes, N.E. and Clark, D.J. "Final Report," *Environmental Assessment and Natural Resources Inventory, CFB Shilo*, DND Report. June 1996, pp. 55-57.

¹³⁹ Barnes and Clark, *Natural Resource Management Plan, CFB Shilo*. Op.Cit., p. 42.

¹⁴⁰ Ibid., p. 43.

¹⁴¹ The methodology used by Barnes and Clark test the quality of both ground and surface water was by taking samples from water well stations used by the provincial government. They tested a wide range of

water from three wells. Whether these resulted from military activity, natural sources or from adjacent agricultural practices will require further research.¹⁴² What is clear is that significant negative changes in water quality would have adverse effects on the regional economy.¹⁴³

Protecting the quality of the surface water also requires special attention since it is directly susceptible to contamination by any careless military activity. Not only is healthy surface water important for aquatic life but also the aquifer is almost exclusively replenished through the percolation of precipitation and surface water. Given that 95% of the precipitation evaporates, the quality of the remaining 5% must be protected.¹⁴⁴ Two significant streams are prominent features of the base. The Assiniboine River runs along the south and south eastern boundary, and its tributary, the seasonally intermittent Epinette Creek runs through the north eastern quarter. Ten years ago, troop activity paid little attention to the integrity of these resources, but today, they are delineated by a protective buffer zones¹⁴⁵ and manoeuvres or any spraying for pest control are prohibited in the vicinity. Before these restrictions were established, pollutants found their way into the river and erosion of the banks because the trees and shrubs

parameters, including nitrates, oil and grease and metals and compared them to historical data.

¹⁴² Ibid., pp. 43-47.

¹⁴³ Ibid., p. 47.

¹⁴⁴ Ibid., p. 44.

¹⁴⁵ Garnet Shearer, CFB Shilo Environmental Officer, Interview and questionnaire, December 1997.

had been broken down, led to silting up the river beds, resulting in some levels of contamination downstream.

Historical setting

For the early homesteaders who marked out this part of the prairie for farming prior to 1855, the land proved to be good for agriculture. Consequently the natural mixed-grass habitat and the indigenous wildlife that thrived in it, were destroyed over much of the range. The area of the present base itself, including the parts that were farmed, reverted to Crown land in 1895 allowing the prairie grasses to recover and the wildlife to re-establish their communities. The fallow period was short lived and fifteen years later, in 1910, military activity began in the area and has continued without interruption since then.¹⁴⁶ During World War 1, more than 30,000 troops exercised on the ranges before embarking to the western front in Europe. In 1933, the Canadian Forces, or more accurately, the Department of National Defence, requested and were granted large tracts of provincially owned land to extend the manoeuvre area. In fact, the Province of Manitoba owns 85% of the land on which the tank corps have marked out their battleruns and manoeuvre corridors, where the artillery regiments dig in their protective positions and fire their high explosive rounds, and where the infantry amass for their intensive training.

Since 1946, artillery training and the accompanying high explosive bombardment of the ranges has been a constant threat to the natural environment. This pressure intensified in 1974 when Canada and the then-Federal Republic of Germany signed an agreement for German troops to conduct intensive mechanized training on the base. Today, there is considerably more German training than Canadian. The majority of the Canadian activity is carried out by Militia units on weekends and in the summer, and by regular artillery units year round. Unlike the Germans, Canadian units do not conduct heavy armoured training at Shilo.¹⁴⁷ The Germans, on the other hand, fly in 700 troops every 21 days from May to October. During these months there are eight troop rotations accounting for 5,600 new soldiers each summer. Awaiting them are 33 multi-tonne Leopard 2 tanks, 39 tracked troop carrier Marders, eight self-propelled M109 artillery howitzers, and scores of tracked and wheeled support vehicles.

How can Shilo's delicate bio-diversity stand up to this array of potentially lethal troops and weapons? How has the environment fared over the years? How can a small team of environmental specialists conduct a viable program of sustainable natural resource management?

¹⁴⁶ Barnes and Clark, *Final Report, CFB Shilo Environmental Assessment and Natural Resources Inventory*, Op.Cit., 1996, pp. 9-13.

¹⁴⁷ Ibid., p. 27.

The Army Green Base

CFB Shilo has been under the environmental microscope, so to speak, for much of the '90's. In 1994, as part of a major new DND/CF environmental initiative, it was designated the Army's 'Green Base.'¹⁴⁸ In that role, a number of applied stewardship projects have been introduced that are expected to have positive results both for continued military training, and for the protection and enhancement of the natural resources. The principal thrust of the program is to improve the techniques for gathering data on what is being 'injected' into the environment, where it is being injected, and what natural resources are being affected. Then, based on the data and a better understanding of the interaction between the soldier and nature, effective mitigating activities are being planned and implemented.

In the words of Tony Downs:

"The Green Base initiatives provide the backbone for our environmental programs which are gradually being implemented at all military bases. The main restriction we are encountering is money and manpower. Due diligence and good intent are not at issue here."¹⁴⁹

Two main studies that have been carried out under the Green base program, form the basis for identifying environmental problems and for

¹⁴⁸ Halifax and Winnipeg have been designated green bases for the navy and the air force respectively.

¹⁴⁹ Downs, Op. Cit.

developing appropriate mitigating activity. Both were completed in 1996 by the Winnipeg-based research team of Barnes & Clark.¹⁵⁰ Their research details military training activity and records the specific problems they cause to various elements of the ecosystem.¹⁵¹ Data has been gathered on virtually every military and human activity, together with time (season) of the activity and its location on the base.¹⁵² As well, the comprehensive natural resources inventory has been compiled for the entire territory, so that the interaction between military activity and the impact on the varied elements of environment under foot and track is actively being observed and quantified. This research has built on earlier studies, such as the 1991 baseline study, and is part of an ongoing program that will continue to enlarge the database of Shilo's human activities and bio-diversity.

By way of example, Barnes and Clark observed heavy tracked vehicles such as the Leopard tanks manoeuvring in squadrons from position to

¹⁵⁰ Barnes and Clark, *CFB Shilo Environmental Assessment and Natural Resources Inventory, and Natural Resources Management Plan*, Final Report, Op.Cit. They are Winnipeg-based scientists, with M.M. Dillon Consultants Ltd., who were contracted by DND/CF to conduct independent research into the military training/environmental stewardship equation at CFB Shilo. Their research resulted in the two substantial documents that defined and assessed the environmental impacts, and described the significance of the various impacts, for each type of military training at CFB Shilo. This included troop movement, vehicle movement, impact from explosive shells etc. In addition they documented proposals for the protection and enhancement of every conceivable natural resources within the training area.

¹⁵¹ *Green Base - 2001*, Internal DND document, Ottawa, 1997, pp 67- 68, 147-150.

¹⁵² Shearer, Op.Cit.

position throughout the ranges, causing some of the worst degradation of the land. Especially where the tanks converge on an objective across open ground, as opposed to moving along prepared routes, the vegetation and soil are heavily disturbed. On the Cologne battlerun, the second largest on the ranges, the Germans conduct armour company training, live-fire exercises and dismounted troop training. Using detailed transect sampling they determined that 10.3 percent of the land was laid bare of vegetation. At the time of the study, the invasive noxious weed, Leafy Spurge, a widespread pest in Shilo, has not taken hold of this range. However, based on observations collected over the past five years, the extent of degradation of the natural prairie and the invasion by the spurge, was gradually increasing.¹⁵³ Similar degradation on other runs, based on a comparison of data recorded in 1991 and that collected in 1995, is directly proportional to increased training activity. On the smaller Essen battlerun, where the soil is loose and sandy and therefore less durable than the Cologne soil, German armoured infantry and live fire training has caused very heavy impact. Here, 18.2 percent of the soil is bare of vegetation and Leafy Spurge has become one of the most abundant species at the expense of the natural prairie grasses.

Except for the most heavily damaged sections of the Essen run, the corrective measures Barnes and Clark recommend are based on low cost,

¹⁵³ Barnes and Clark, *Environmental Assessment*. Op.Cit., p. 130.

benign neglect and rotation of the training areas. They estimate that natural vegetation will re-establish itself within two seasons in most areas if the natural cycle of flowering and seeding is encouraged. The worst hit areas on the Essen range would require some costly re-grading, weed control and active seeding and up to five years of rest to return the ecology to a pristine state.¹⁵⁴ In 1995, the results of a rest period from June to late July in a test area demonstrated that the native grasses flowered and set seed with the result that this period is now calculated into the management cycle for range use rotation.

The significance of this quantitative research for the environmental stewardship program is threefold. First, it has added to the bank of knowledge regarding the balance or imbalance between military training and the elements of the environment. Second, it demonstrates the commitment of the military establishment to integrate sustainable use of their lands and the natural resources into the training program. And most importantly, it offers practical mitigating solutions that consider both the requirements for training and the needs of the ecosystem.

An effective method of visualizing the evolutionary processes of the Defence and the Environment equation is to model the inputs and the interactions among them. Figure 4 can serve as a model for the CF

¹⁵⁴ Ibid. p. 127

Environmental Stewardship Strategy. Its design is based on the variety of inputs that influence military activity nationally as well as on specific training ranges. The inputs can be grouped into four categories – data, threats, objectives, and evolution – which must all be addressed, if a careful balance is to be achieved between sustainable land use and effective military training. For planners, the accumulation of sound data on all elements of the model will lead to the selection of the most appropriate mitigating activities and training practices. In theory, if one centre of the model comes under pressure, concentrated effort can be focused there to bolster its performance. Naturally, the inputs will vary depending on the particular site and activity, but the basic elements of the model can be followed in most cases.

Problems and innovations

Prairie vegetation on the loose sand, hilly terrain which abounds in the Shilo training area is also very susceptible to breakdown when numbers of vehicles manoeuvre over it in a tactical formation. This exposure leads to the rapid colonisation of the non-native, but now pervasive, weed called 'leafy spurge.'

Leafy Spurge is considered to be a major environmental problem for Shilo because it threatens the natural prairie bio-diversity. It is a native grass of Eurasia that was first identified in the Shilo area in 1911. It crept into North America in the early 1800's in ships' ballast and mixed with grain seed. It

thrives in sandy soil and has successfully encroached over substantial areas of native prairie grass that have in turn been weakened and exposed by military activity. Currently the principal controls are chemical spray and controlled burning, however, as part of the innovative Green program, a number of test sites have been established where plant-specific beetles eat the weed's roots.

Garnet Shearer, the base environmental officer and a trained environmental engineer, describes the elements of the bio-control counteroffensive:

There are 130 bio-control sites where we are studying the success of the Leafy Spurge beetles, in conjunction with Agriculture Canada scientists. Spraying has been eliminated from the test area, but controlled burns prior to June and after September seem to help the beetles by reducing litter and heating the ground. It is significant that DND is taking these measures to manage the spread of leafy spurge and we expect our findings and management controls to provide benefit to the entire prairie region.¹⁵⁵

The detailed matrix that is used at the bio-control sites, and the continuous seasonal changes at these sites, pose management problems for the part-time nature of the observation and research. An innovative application of a Global Positioning System (GPS) is being used in trials to record their location. The benefits of GPS are demonstrated in the time saved in locating field sites which allows for more to be set up. It stands to reason, that the more control sites there are to study, the more reliable the data

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analysis will be, and the mitigating action will be proportionately more appropriate.¹⁵⁶ Furthermore, as personnel change through postings, the GPS record provides continuity which might otherwise be lost. At the present time, the error in the GPS of plus or minus 10 to 100 metres is a weakness, but the artillery regiment which uses GPS for military purposes, is supporting the development of a more accurate system.¹⁵⁷

Another perceived problem being studied, which occurs mainly in the dry summers, is the grass fires started by artillery explosions. Historically, it is recognized that prairie fires, whether set by lightening, by natives' camp fires or by hunting parties, or by early settlers were instrumental in maintaining the open native prairie by holding back the encroaching aspen forests.¹⁵⁸ The vegetation and wildlife evidently adapted to what is termed the "fire return frequency." It has been recognized that major changes resulting from unintentional but nonetheless damaging grass fires, can upset the established environmental equilibrium by suppressing bio-diversity and abundance.¹⁵⁹

¹⁵⁵ Shearer, Op.Cit.

¹⁵⁶ *Green Base – 2001*, Op. Cit., pp. 97-98.

¹⁵⁷ Shearer, Op.Cit.

¹⁵⁸ Barnes and Clark, *Natural Resources Management Plan*, Op.Cit., p. 49. Barnes and Clark cite a number of references that have studied the beneficial effects of grass fires on the ecosystem.

¹⁵⁹ *Ibid.*, p. 50.

A direct result of this research into range fires and the relationship to natural resources, is the institution of burn maps for the entire base. The data is applied to a Geographic Information System (Calyx GIS) range management program that has proven to be a very useful tool for improving the stewardship of the ranges.¹⁶⁰ The GIS is used increasingly for mapping a broad range of environmental impacts and other activities at Shilo. For example, by processing data on artillery firing plans or scenarios and data on the natural resources in the target area, the GIS can determine potential impacts and create visual reports. As decisions and results are applied into the GIS, its database continues to provide more refined results.¹⁶¹ The major benefit of this new computer generated system is the readily accessed historical record that provides reference points about the environment from year to year, and leads knowledgeable decisions.

The special elements of the Shilo green plan are scarcely broadcast or reviewed critically beyond the military environment community.¹⁶² But some scholarly research has been carried out by a local naturalist and amateur archaeologist, Errol Bredin, a member of the Manitoba Natural History Society. He has spent many years researching and commenting on the Shilo's wildlife and natural history legacy and his work has been quoted

¹⁶⁰ Shearer, Op.Cit.

¹⁶¹ The Calyx GIS software is being applied to range management at CFB Gagetown and is planned for use at all army training bases in the near future.

in the Barnes and Clark analysis of endangered amphibians and reptiles and archaeological sites on the base¹⁶³.

Bredin's¹⁶⁴ research and analysis of the natural resource of CFB Shilo and the surrounding region, provides an independent perspective on the state of the environment on the military ranges. He applauds the military community for providing a habitat in which a complex natural and cultural heritage continues to exist, which, he asserts is rapidly disappearing from adjacent land outside the base. Because of "effective management practices" the military is preserving what Bredin calls "one of the best examples of a large expanse of native mixed-grass prairie in the world". By way of comparison, he singles out the neighbouring Spruce Woods Provincial Park that shares the sandy Carberry Hills with the base. He asserts that the park should be a haven for the same varieties of endangered amphibians, and other wildlife. But, to his regret five years ago, park officials actively encouraged the succession of native prairie to Scotch pine forest with a major planting program. This leaves the base as the only place where communities of all indigenous reptiles and amphibians species exist in relative abundance.¹⁶⁵

¹⁶² Internet scans and comments on available research by Downs, Op.Cit., and Bob Woods, Manager of Forest and Natural Resources, DND, 1997-98.

¹⁶³ Barnes and Clark, *Natural Resources Management Plan*, Op.Cit., pp. 131-147, 153-159.

¹⁶⁴ Bredin, E. Amateur naturalist and archaeologist, Carberry, Manitoba, interview and correspondence, January 1998. He began studying the fauna and flora in the Carberry Hills of southwest Manitoba in the early 1960's.

¹⁶⁵ Bredin, E. *A Brief Outline of Natural Resources at CFB Shilo*, 1995, unpublished paper and personal interview, January 1998.

In a significant way, Bredin has provided an independent perspective about the nature of mechanized military training and its impact on the land. Using a somewhat unconventional metaphor to describe the fast, heavy tanks and mechanized artillery guns which trundle over the ranges, he has likened "the tracked vehicles ... (to the) thundering herds of bison that pounded and grazed the prairie into dust." He does not consider the tanks to be intrinsic tools of destruction. Nor does he consider the occasional range fires that are set off in dry seasons by artillery shell-fire to be deterrents to a healthy ecosystem. Based on his research, Bredin has concluded that, as the tanks keep the aspen park land at bay, so too the fires mimic the massive historic burns set off by lightening or indigenous people that "purged the prairie from the Red River to the Rockies."¹⁶⁶

This view that the number of accidental fires on the Shilo ranges is important for a viable and healthy prairie is supported by other ecologists.¹⁶⁷ There is a marked variation between the open undulating grassland of the active ranges and the thick aspen groves outside the base. A number of big game such as the elk, moose and white tailed deer and rare fauna and flora that are native to the prairies flourish on the military training area

¹⁶⁶ Ibid. p. 4.

¹⁶⁷ Bredin, E. *The Carberry Sandhills of Southwestern Manitoba; the Need for Active Management*, Proceedings of the Third Prairie Conservation and Endangered Species Workshop, Natural History Occasional Paper No. 19, Edited by: G.L. Holroyd et. al., the Provincial Museum of Alberta, 1993, p. 303.

grassland, while they are threatened or have become extinct because of loss of habitat elsewhere on their natural range.¹⁶⁸

For Bredin, the barometer of the health of the fragile natural prairie ecosystem is found in a rare and obscure Northern Prairie Skink lizard, and other amphibians and reptiles, some of which he has recorded in abundance in the training areas. The 30 cm long skink is only found in the Carberry Sandhills of south west Manitoba, a large section of which is located on the military ranges. It is considered to be a relic of a similar species found in North Dakota that was cut off thousands of years ago.¹⁶⁹ Protected under the Manitoba Wildlife Act, this skink is listed as 'vulnerable' by the Committee on the Status of Endangered Wildlife in Canada. Another secretive animal, the Western Hognose snake is also found at Shilo in the Carberry Sandhill area. Although there are no estimates to its numbers, Bredin has observed these creatures, most often on the heavily used battleruns. Other snakes and turtles, frogs and toads were observed to occur abundantly at a number of sampling sites established for the Barnes and Clark management plan and their numbers are considered to be secure.

¹⁶⁸ Ibid.

¹⁶⁹ Zeilig, M. "Rare Creatures," *Winnipeg Free Press*, June 30, 1996, p. B1-B2.

As part of the base's respect for the interests of another 'stakeholder,' Bredin has been allowed to establish and maintain study sites on the Skink and other reptile and amphibian species throughout the ranges. The habitat that supports the Skink is the native mixed grass prairie, but where leafy spurge has replaced the grasses in widespread areas, and where the aspen trees have encroached at a rapid rate, he has observed that the skink has become threatened or vanished entirely.¹⁷⁰ Bredin's research has been carried out both on the active battleruns and impact zones, and in the fringe areas. Surprisingly, he concludes that the most threatened habitats for reptiles are not the heavily used training zones, as one might expect, but at the inactive sites where the sandy soil has become entangled with aspen roots and an increasing density of vegetation including leafy spurge.¹⁷¹

The importance of the research that Bredin and Barnes and Clark have carried out into the health of the fauna at CFB Shilo is that it has resulted in a detailed management plan for the territory based on sound knowledge. The plan does not advocate reductions in training, rather it spotlights the diverse treasures that have survived in a relatively healthy and natural state, originally, by chance, but to a large degree, because of the presence of the military. Having accomplished that, it recommends sound mitigation measures or adjustments based on the principle of sustainable use. The measures include a regular monitoring and data gathering regime for all

¹⁷⁰ Bredin, *The Carberry Sandhills*. Op. Cit. p. 301.

activity and impacts on natural resources, rotating training ranges, avoiding sensitive areas in the season where birds animals are known to be nesting or breeding and so on.

Despite the claim in the 1994-95 Environmental Assessment and Natural Resources Inventory that confirmed that populations of rare species are much greater within Shilo than similar areas outside the base,¹⁷² it would be misleading to accept that all is right and that military training can carry on without more diligent consideration for the environment. In fact, comparisons with the findings of a 1991 study indicate a slight decline in the condition of the ranges and a possible decline in wildlife and bird populations.¹⁷³ The base environment officer, Garnet Shearer, is determined that the comprehensive and aggressive management program that is now practiced and well-supported from the soldier level up to top management, will improve the quality of the natural environment throughout the ranges.¹⁷⁴ Many areas on the ranges are already protected from military activity. For example, the Epinnette Creek wetland and the Douglas Marsh, which make up part of the southern-most Boreal bog in North America, now provide healthy habitats for such rare orchids as white lady's slipper and white snowy slipper that are found in abundance.

¹⁷¹ Ibid., p. 2

¹⁷² Barnes and Clark, *Natural Resources Management Plan, CFB Shilo*, Executive Summary, June, 1996, p. 16.

¹⁷³ Ibid.

¹⁷⁴ Shearer, Op.Cit.

While there is evidence to support the conclusion that the military establishment is progressing with an appropriate environmental stewardship program, several questions remain for which the answers are not understood. For naturalists like Bredin, the portion of the Carberry Sandhills which are situated in the midst of the active training area are the only area left that resembles the pre-settlement natural order of the prairies.¹⁷⁵ Does the military now attempt to restore more 'lost' prairie through controlled burns? Does it simply manage the aspen park land succession as it is progressively occurring? Does it have the means to put in place all the necessary activities to preserve and enhance the current diversity? These are the challenges that still require solutions.

Outside the military training area, farming and various human settlement activities have all but eliminated the wetlands and the natural prairie habitats leaving many species threatened, endangered or extinct. The Plains Spadefoot toad, the Northern Prairie Skink lizard, the Western Hog-nosed snake, the Yellow Rail, Kangaroo mice and numerous other amphibian, mammal and bird species which are often observed on the base, are all registered on the Endangered Wildlife in Canada list.¹⁷⁶

¹⁷⁵ Bredin, *A Brief outline of Natural Resources*, Op.Cit., p.4 and interview, 1998.

¹⁷⁶ Ibid.

The Cultural Heritage

In addition to the fauna and flora, the military presence at CFB Shilo has also preserved a rich archaeological heritage on the ranges. The higher ground of the Bald Head Hills feature and the Carberry Sandhills provided native hunters with a good vista over the prairie. These areas have been marked off from troop activity for the past decade, initially because the natural vegetation had been eroded away and the sandy hills had become unstable. According to Shearer it was generally known that there was cultural heritage in the area, but there was no funding and little professional archaeological interest in unearthing it. Bredin, is the one exception and has lectured and written about his collection of native artefacts for three decades.¹⁷⁷ He has revealed a complex pre-European history that dates back, he concludes, from 400 to 12,000 years.

As a result of Bredin's work, there are 35 recorded historic resource sites located by grid reference, mainly on the open fireguard scrapes. Each of the sites contains bison bone, fire-cracked rocks, and stone chips and flakes indicative of hunters' campsites and killing grounds. Some of the sites, such as one tagged as 'Grid Reference 697099', are major prehistoric sites and what appear to be 'workshops,' indicating a great deal of early human activity. This site extends continuously over 1 km and was probably a

¹⁷⁷ Bredin, E. *Historical Resources Sites on the CFB Shilo Ranges*, Report prepared for Dillon Environmental Scientists Ltd., 1994.

seasonal band campground.¹⁷⁸ In 1994, Bredin and Brandon University archaeologist, Dr Nicholson, examined several larger sites and uncovered 28 projectile points from arrows and spears, bi-face knives, scrapers, a large hammer stone, possible petroforms or ancient trail markers, and some ceramic material.

Each of these treasures, as well as the fragments of obsidian possibly brought in from the region around Yellowknife and other pottery fragments similar to ones found in Alaska, paints a vivid picture of the past that has been turned for ever into the soil on the ranches and farms that border the military base. Surprisingly, all the grid sites are located on the fireguards that are periodically shallow-disked with a farm implement to prevent the vegetation from closing in. Contrary to the reasonable conclusion that this disturbance would ruin the archaeological evidence, Bredin has found the opposite to be the case. In fact, if the openings were not maintained, much of what hides on the ranges would never be discovered. The fireguard discoveries are only the tip of the iceberg for what is predicted to lie in the adjacent root-entangled grasses and aspen parkland.

Soldier Training

The key to success and sustainability of the environmental stewardship program rests with the young soldiers who are the ones who use the land.

¹⁷⁸ Ibid., p.4.

An innovative four-hour awareness training course, including a 12-minute video, is provided to all troops who go onto the ranges. 100% indoctrination into local natural habitats, rules, personal responsibilities and accident reporting procedures is achieved.¹⁷⁹ For the German troops who fly into Shilo six times a year for their battle group manoeuvres, the stewardship video (with a German language sound-track) is required in-flight viewing. In the field, all troop training, both Canadian and German, is carefully governed by strict range regulations and is closely monitored by the range officers for good practice. Once common, but destructive practices such as 360-degree stationary turns in tanks and other tracked vehicles or driving tanks off authorized areas are forbidden. As well unforecast accidents such as engine oil spills are now routinely reported and cleaned up before the water table or any other part of the ecosystem can be contaminated.¹⁸⁰

Outside Watchdogs

As part of the Green Base initiative and because of the lease agreement of land from the province; a 10-member Shilo Environmental Advisory Committee, was created.

¹⁷⁹ Shearer, Op. Cit. The course is compulsory and requires a signed report card before a soldier can proceed to the practical phase of training on the ranges. The responsibility for measuring this statistic rests with the course supervisor and platoon leaders.

¹⁸⁰ An interesting anecdote concerns oil changes in the field. The Germans tend to fill their vehicles at base-side fuelling points. The Canadians on the other hand use fuel trucks to fill the hundreds of light and heavy vehicles that are deployed on week- or month-long manoeuvres. In the past little

Twice a year, the members gather to provide active community consultation and make recommendations on natural resource and land use issues. The representatives have varying backgrounds in a number of environmental fields. The military training community is represented by the Environmental Officer and the Operations Officer who is the primary manager of the training area. As well, there is a Canada Wildlife Service biologist, two botanists, one from the University of Manitoba and the other from the Museum of Man and Nature, the Spruce Woods Provincial Park manager, and specialists from the provincial agriculture and environment departments.

A review of the minutes of the committee meeting held at the University of Manitoba, on 28 August 1997, confirms Garnet Shearer's assertion that the mixture of highly dedicated and specialist peers, contributes greatly to effective decision-making on many issues. The members discussed progress with the establishment of two planned climate-testing stations and they confirmed the continuation of the leafy spurge bio-control program. They proposed the use of satellite imagery to delimit the spurge and also supported a three-year contract with Errol Bredin to continue long-term monitoring of herptiles. They proposed the creation of a soldier awareness brochure on how to report findings of significant wildlife on the range and

care was taken to contain the dirty oil. Today, special plastic pans with collectable and disposable sealed pads are used.

agreed to protect an ancient medicine wheel in the training area with a simulated mine field. Monitoring forests, fire management and prescribed burns, surveying small mammals and arthropods, and using GIS to classify vegetation communities and demarcate weeds, were each discussed and considered for future action.¹⁸¹

The Shilo committee is touted as a viable model for other bases to copy for their own outreach program.¹⁸² The expertise and level of influence of the committee members is a strong signal that the military is placing increasing importance on active due-diligence and consultation. Even the press finds itself in a position to report that the policies and guidelines being practiced at Shilo are having a positive effect on the local ecology.¹⁸³

Throughout the base and the intensely used ranges, there is considerable evidence that controlled and environmentally friendly practices have fostered the preservation of rare prairie grasses, the quality of the water sources, and endangered wildlife species. Shilo is one of the few Canadian military bases that welcomes naturalist groups and special research projects, and has marked out trails for snowmobiles, cross-country skiing and other recreational uses. These are demonstrations of a willingness to

¹⁸¹ Minutes, Shilo Environmental Advisory Committee Ad Hoc Meeting, Botany Department, University of Manitoba, 28 August 1997.

¹⁸² Downs, Op.Cit.

¹⁸³ Robertson, B. "War Games with a Conscience," *Winnipeg Free Press*, September 15, 1997, p. A8.

respect the natural environment and to share its special resources with the outside community. On the technical side of the stewardship program, all contaminated sites have been cleared from the base including underground fuel storage and waste tanks, which have been replaced by above ground storage. The landfill sites that remain are regularly monitored through a series of sample wells and found to be well-sealed.¹⁸⁴

The problems that face the environmental stewardship program at CFB Shilo principally concern budget, lack of manpower and constant downsizing.¹⁸⁵ While the training and awareness program is considered to be comprehensive, very few individuals are in fact available to monitor all activities in the field. This leaves a great deal of responsibility for due diligence to the soldiers and their leadership. Perhaps the best test for the health of the environment is the strong evidence of thriving bio-diversity, which attests to the unexpected historic benefits of the military presence and its increasing ability to contain the environmental stresses from its otherwise violent activity.

¹⁸⁴ Shearer, Op.Cit.

¹⁸⁵ Ibid.

CFB Gagetown, New Brunswick

CFB Gagetown, though not the largest base in geographic size, contains the largest army training area in Canada. It is located on 110,000 hectares in southern New Brunswick beside the St. John River Valley and just north of the city of St. John. Forty-seven ranges on 12,000 hectares of land are dedicated to concentrated troop manoeuvres, making it is one of the most extensive land forces training areas in NATO.¹⁸⁶ It also boasts the dubious title of 'the most heavily used army base' in the country, because of the year-round training takes place there without respite.¹⁸⁷

Unlike its sister bases, Suffield and Shilo, which accommodate large concentrations of NATO troops, it is principally Canadian Army infantry, artillery, armour (tanks) and engineer units, who account for the concentration of activity at Gagetown.¹⁸⁸ Training began there some 44 years ago in 1954, soon after the federal government expropriated the farms and woods that had been settled in the early 1700's. More than 3,000 landowners were displaced,¹⁸⁹

¹⁸⁶ Downe, S. Base Environmental Officer, CFB Gagetown. Interview, December 1997.

¹⁸⁷ Ibid.

¹⁸⁸ Each year, approximately 3,000 American troops use the ranges for short-duration summer and winter training.

¹⁸⁹ Lee, P. "Ground Zero," *The Ottawa Citizen*, 26 July 1997, p. B2.

leaving behind their cemeteries, their roads, taverns, churches, homes¹⁹⁰ and the once-renowned woodcock hunting grounds.¹⁹¹

Over the next three years, an unprecedented expansion program and intensification in the use of the training area is planned to meet the needs of Canada's continuing support to UN peacekeeping missions. At the time of writing, 4,500 hectares (approximately 9,000 football fields) of a potential 15,000 hectares of virgin territory is being clear-cut.¹⁹² This new land is being carved out beside the General Manoeuvre Area (GMA), which was cleared in the 1950's and '60's. The land in this vast territory (24,000 football fields) is 95% denuded, scarred, rutted, eroded and compacted.

Officials at CFB Gagetown are bound to comply with federal environmental legislation and are required by DND/CF policy to apply Total Land Management strategies¹⁹³. However the challenges in applying sound, sustainable land use practices for the health of the natural resources are enormous. By admission, Sheldon Downe, the base environmental officer says:

¹⁹⁰ Washburn and Gillis Associates, *Natural Resources Management in the CFB Gagetown Training Area*, Draft Study, 1993, p. 3-62.

¹⁹¹ Lee, Op.Cit.

¹⁹² Ibid; and Downe, Op.Cit.

¹⁹³ Tony Downs, Op. Cit.

"Bio-diversity has sadly not been a priority within our jurisdiction and the legacy we have inherited from the '50's and '60's is one of indifference to ecological issues. Added to this is a heavy concentration of training all over the General Manoeuvre Area where 10 different exercises may be going on at any given time. This leaves no room to rotate ranges and allow nature time to recover. Our challenge today is threefold: to stem the deterioration process; to institute sound environmental stewardship training and practices at the troop level; and to identify ways that will favour environmental recovery without hindering the obligations of military training."

The legacy, to which Downe refers, includes many environmentally devastating activities that occurred over the decades before responsible stewardship raised awareness of the fundamental value maintaining a healthy, sustainable environment. Even though the territory was of marginal value for forest-based industry and agriculture before it was turned over to military,¹⁹⁴ it was an important link in the ecological chain of the region. The clear cut deforestation, the widespread grubbing and burning of the laid-waste ground to prevent re-growth, the chemical defoliation and other pesticide use to control brush from re-establishing itself, have continued unabated for four decades. The 'downstream' effect of sedimented rivers, eroded river banks and contaminated surface water are only now being addressed under the guidance and control of national and provincial legislation and responsible DND policies.

¹⁹⁴ Washburn and Gillis, Op. Cit. P. 3-46.

Much of the construction over the years has been carried out by engineers-in-training, and the result has been silting of waterways, removal of river bank vegetation, and the loss of habitat for many wildlife species. Siltation is considered to be one of the most serious environmental problems on the base¹⁹⁵ because of the damage it causes to fish stock and because it come into direct conflicts with a number of federal and provincial water quality laws.¹⁹⁶ Of the waterways, there are over 250 streams and 65 lakes which feed into two main tributaries of the St John River, the Oromocto and the Nerepis. The environmental damage that has occurred on base because of the lack of due diligence is therefore of direct concern to many neighbouring communities and stakeholders.¹⁹⁷

An era of enlightenment

While the devastation remains on the land and in the waterways of the General Manoeuvre Area, and, by deduction, downstream, the new manoeuvre area is destined for better treatment, based on a new generation

¹⁹⁵ Lee, Op.Cit. p. B-2.

¹⁹⁶ Washburn and Gillis Associates, *Initial Environmental Evaluation of the Military Training Activities in the CFB Gagetown Training Area*, Document prepared for the Department of National Defence, 1993, pp. 2-4 to 2-23. They list the main laws and regulations which base authorities must now abide by: The (federal) Fisheries Act; The Canada Water Act; the (federal) Water Quality Regulation; the Federal Policy on Wetlands Conservation; the Migratory Birds Convention Act; the New Brunswick Clean Water Act; the N.B. Watercourse Alteration Regulation; and the N.B Fish and Wildlife Act, all have direct impact on base activities.

¹⁹⁷ Numerous communities surround Gagetown, including the Oromocto Indian Nation, whose land has been exposed to the downstream effect of

of attitudes and experience. Only 60% of the forest will be harvested, and, to protect the fish habitat in the streams and rivers, riparian zones varying in width from 100 to 2,400 metres will be left untouched. This Fisheries Habitat Improvement Project is designed to enhance the quality of the water and to foster rebirth in the trout and salmon stocks.¹⁹⁸ It is also expected that the corridors of trees and natural vegetation will encourage bird-life and other mammals which rely on the forest resources to remain in the area. In some areas, where vegetation has been removed or depleted, a tree-planting program has begun and the natural re-vegetation of shrubs and grasses to encouraged a return to the natural ecosystem.

The buffer zones are part of a series of innovations which will secure the banks against erosion and thereby reduce the problems of sedimentation. They are complemented by other controls including the building of bridges and, where necessary, concrete based fords. One such bridge was recently completed, at a cost of \$1 million, at the busiest crossing of the Nerepis River. Prior to the construction of the bridge, vehicles had crossed the unprotected riverbed, causing serious disfigurement and damage. Elsewhere, fences restricting access to known VEC areas, strict range orders, proper signage, restricted firing, and prevention of vehicular and

contamination emanating from a large petrol and coal storage site. The cleanup bill is approximately \$1 million; Downe, Op.Cit.

¹⁹⁸ Downe, Lee, Op.Cit., Washburn and Gillis, *Natural Resource Management*, Op.Cit., P. 5-1 to 5-23.

other troop movements on or near waterways are all part of the environmental stewardship project.¹⁹⁹

The waterways will still be dredged periodically to remove some of the fine clays that flow naturally from small creeks and adjacent open areas. The deeper courses and freer flowing water have encouraged a relatively healthy environment for fish. A positive indication of the ability of wildlife to the coexistence with military activity is the apparent health of the moose and white tailed deer herds, wolves, birds and other fauna which are traditional species of the region. None of the species known to inhabit the training area are exclusive to the ranges alone and none are listed as threatened or endangered.²⁰⁰

The necessity for training

At Gagetown, as for all other bases, progress with environmental stewardship can be regulated and enforced under the banner of 'compliance with environmental legislation.' However, if responsibility for minimizing damage to the environment does not take hold at the soldier level, soil loss, water pollution, destruction of vegetation and habitats, and hazardous substance spills will continue. One advantage of Gagetown is that it is a training base for recruits and other army units. Their curriculum includes a

¹⁹⁹ Downe, Op.Cit.

²⁰⁰ Washburn and Gillis, *Natural Resources Management*, Op.Cit. pp. 6-1 to 6-10.

review of the legislation and individual obligations to care for the environment on the ranges. As in Shilo, environmental protection literature and an introductory video covering general and specific sensitivities and management practices is shown to every soldier.²⁰¹

The interesting question for future research, is what difference will soldier awareness make for the quality of the environment? One significant illustration that Downe cites is the immense decline in oil spills since he began to gather data in 1994. Spills have been reduced over the four year period from 350 to 23 in 1997. He credits this to four recent innovations: the thorough awareness training program; support tools – drip pans – that have been supplied for all vehicles; strict range regulations which control fuelling and oil change points; and the requirement for immediate reporting of unintentional spills.

Beyond the scope of the individual soldier, all future development of the natural resources and the bio-diversity at Gagetown will be treated under the forces-wide Total Land Management Plan which is guided and controlled by federal law and defence policy. The evidence to date, based on broad comparison with CFB Shilo and Suffield,²⁰² is that environmental

²⁰¹ Downe, O.Cit., and Washburn and Gillis, Ibid., pp 7-4 to 7-11.

²⁰² My research has included a questionnaire in which pointed and comparative questions were asked of base environmental officers about the main problems each of the study bases face with regard to a progressive

practitioners at Gagetown are facing a much greater challenge than the others. Many issues point to this conclusion. By way of illustration, Gagetown officials have chosen not to proceed with selecting a strong environmental advisory committee similar to Shilo's, despite the constructive input such a committee might have. Furthermore, there is no intent to find alternatives to the long-standing practice of widespread clear-cutting of the natural forest so that the troops can continue to train without impediment. While the benefits for soldier training are self-evident, the consequences of the loss of this habitat is destructive for the wildlife, bio-diversity and future generations. Even the officer in charge of Gagetown's forest resources was quoted recently as saying that the General Manoeuvre Area has been destroyed forever.²⁰³ In light of the environmental policy rhetoric and range rotation programs that are practiced on other bases such as Shilo, these are not encouraging words.

Is Gagetown on the right track?

The new openness of CFB Gagetown officials to public scrutiny and criticism should be recognized as progress, but at the same time, their commitment to a substantial, applied environmental stewardship program

environmental stewardship program; the quality and input of community advisory groups; main success projects etc.

²⁰³ Lee, Op.Cit. quoting Jim Johnston, the CFB Gagetown Forestry Officer, who is part of the Total Land Management Team.

must be questioned.²⁰⁴ The invitation to the media to investigate and report on the state of their environment as in the case of the reporter, Philip Lee,²⁰⁵ demonstrates a willingness to engage in public debate. However, other decisions cannot be considered to be as enlightened. For instance, a reported operational decision, based on the intensity of range use, has been taken not to apply the recognized technique of range rotation²⁰⁶ to allow the land to recover its natural order. As well, little thought has been given to the establishment of a CFB Shilo-style advisory committee of outside specialists which appears to reflect an unenlightened position. Finally, the claim by a key member of the environmental protection team – the Total Land Management Team - that a major part of the military training area is relegated to an unrecoverable wasteland, hearkens back to the decisions of an earlier generation.

Questions must still be raised about the health of the Gagetown environment. While there is no obvious public outcry that the vestiges of the

²⁰⁴ There is still an attitude in some circles which authorizes the military right to conduct its training on its dedicated land as it sees fit. It is tantamount to a hold over of the Cold War defence posture. These same individuals will not recognize the value of outside specialists providing advice and guidance as it pertains to the protection of wildlife habitats and bio-diversity.

²⁰⁵ Lee's lengthy feature article in the Ottawa Citizen (26 July 1997) Op.Cit. also appeared in the Fredericton Gleaner and may have been reprinted by other newspapers that subscribe to Canadian Press. Lee was given a full tour of the base and had access to all areas regardless of the state of their environment. Lee's is the first recorded article to appear on Gagetown's environmental condition, and military reaction to it, as reported by the base environmental officer, Sheldon Downs, was positive.

²⁰⁶ Downe, Op.Cit.

great Eastern soft and hardwood forests are endangered, the long-standing clear-cutting; the grubbing of roots to discourage re-growth; the use of chemical pesticides to defoliate and eradicate shrubs; and the use of pesticide to control insects;²⁰⁷ are all diametrically opposed to the principles of sustainable use of natural resources. These activities are carried out routinely on the base and are, by their very nature, destructive to many natural habitats which support important fauna and flora. One of these activities in particular, the routine use of toxic pesticides, is publicly perceived to be far more pervasive and damaging in the long-term. Moreover, given the considerable public debate about the relationship between public health and the use of government registered and approved pesticides by the military, as well as by other agencies such as forest companies, power companies, and individual homeowners,²⁰⁸ it is relevant to comment on the public health issues.

²⁰⁷ Robert Cretian, pesticide management specialist with the DND Director General Environment. He emphasized that the chemicals in used, are approved by the Department of Agriculture and they are the same pesticides sprayed on farm crops and in urban areas across Canada. A glance at the DOW Chemical Web Site – DOW is one of the principal suppliers of pesticides to the military - indicates an industry commitment to meet or exceed national standards for protecting the environment and enhancing health and safety. It is recognized that any industry will post only positive information, but given that is exposed to the world-wide audience, misinformation would have a negative affect on the companies reputation. DOW has its own Environmental, Health and Safety management system that acts as a watchdog to ensure compliance to currently accepted standards.

The pesticide program

The justification, from the position of the Army's training program at CFB Gagetown, for defoliation, the removal of shrubs, and the harvesting of trees,²⁰⁹ is that the cleared areas allow for unimpeded troop and tank training. The control of insect pests at the base is intended to improve the comfort of the troops as they train in the outdoors. Although this thesis will not attempt to delve deeply into the properties of toxins and their direct affect on the ecosystems, it is pertinent to investigate how the military uses pesticides and the progress that is being made towards mitigating their environmentally detrimental effects.

In the early 1960's defoliation experiments with many agents, including the infamous 'agent orange', were renowned at Gagetown, and it is still hard for the base to shake the image of a chemical wasteland.²¹⁰ The herbicide, 2, 4-D and 2, 45T were major components of agent orange and today, 2, 4D is still a primary product used to control broad leaf weeds. Poor practices not only affect the base environment but adjacent areas as well. In the fall of 1984, wide-spread off-site drift destroyed tomato and potato crops on neighbouring farms. DND had to pay considerable compensation to the farmers.

²⁰⁸ *Campaign for Pesticide Reduction*, Sierra Club of Canada pamphlet, Ottawa, 1997. Commonly used 'registered' chemicals such as 2,4-D, which is applied extensively at CFB Gagetown, is considered to be carcinogenic.

²⁰⁹ There is a small scale forestry program at CFB Gagetown in which the tree harvest is sold off to local forest product industries.

However, a number of things have changed since the careless decades of the '60's, '70's and '80's. The spraying program to limit the growth of trees and shrubs, and to eliminate insect pests, is now governed by a national plan known as the Integrated Pest Management Program (IPM). The managers of the program recognize that pesticide use is more cost and time effective compared to culling, but they also acknowledge the environmental implications.²¹¹ The core element of this IPM effort is for DND to achieve significant reductions in pesticide use at Gagetown and throughout other military properties. The Code of Environmental Stewardship, previously referred to, has identified reductions of 50% of pesticide use from 1995 levels by the year 2003. What can reasonably be deduced from this statistic is that substantial reduction of chemical emission into the atmosphere demonstrates a positive trend. However it must be accompanied by a rigorous program of further reductions, measurement and control of inputs, and research into alternative natural controls.

Several substantive developments are being practiced at Gagetown, in conjunction with the reductions, which point to more focused, research-based concern for sustainable land use and respect for the biodiversity. These include the use of only those agents that are approved by federal and provincial regulations. They are the same as those used by municipal

²¹⁰ Downe, Op.Cit.

²¹¹ Cretien, Op. Cit.

authorities and power companies.²¹² At Gagetown an independent monitor conducts routine tests to ensure that application standards are being met. Careful selection and measurement of areas designated for spraying is another improvement, and a significant departure from the old program of general spraying. Spraying is now avoided on windy days to avoid undesirable dispersal over adjacent areas and communities.

Wide buffer zones have been marked off near rivers and other water sources, and long-term persistent herbicides are being replaced with benign, fast decaying glyco phosphates and natural organic controls.²¹³ Application rates are being reduced from multiple times to once and sometimes twice a year, with concentrations being reduced as well. All these changes are being carefully measured to learn more about their effect on military training. In a 'real world' modern battle situation, vegetation control and defoliation, as practised at Gagetown, would not necessarily be carried out. It therefore stands to reason that it is more realistic to train in a natural setting.²¹⁴ The new generation of highly qualified pest managers, like Rob Cretien, recognize that former training practices did not take the natural resources into account. But he is spearheading a drive, backed up by new federal bio-diversity protection standards, to convince the

²¹² Ibid.

²¹³ One initiative involves a 90% reduction in chemical control of mosquito and black flies. The alternative is the use of pest specific biological agents known as *bacillus thuringiensis* to destroy the larvae. Non-chemical pest control trials have been practiced at Gagetown since 1994; Ibid.

establishment that training practices will have adjust in order to benefit the ecosystem.²¹⁵

An example of the progress being made is the research program with McGill University to find natural herbicides for poison ivy. Other research with scientists from Agriculture Canada is looking at ways of replacing the toxic chemical sprays with biological solutions, such as a beetle that eats leafy spurge roots.²¹⁶ Similar steps are being taken to manage the destructive pests which infest Gagetown and other military training areas such as spruce bud worm and gypsy moth.

It is encouraging to record that Elizabeth May, a lawyer specializing in environmental law and a leading spokesperson for the Sierra Club of Canada, is prepared to endorse the military environmental stewardship initiatives and achievements. "We have criticized the negative environmental activities at CFB Gagetown and other military sites for many years, but I will go on record as saying that the initiatives and accomplishments of the DND environmental program are filled with good intent and are certainly leading well ahead of industry practices"²¹⁷ May adds that when the Environmental Assessment Act was proclaimed in 1984,

²¹⁴ Ibid.

²¹⁵ Ibid.

²¹⁶ The bio-control program on leafy spurge at CFB Shilo began in 1986 and to date more than \$500,000 have been invested in the research. Shearer, Op. Cit.

it is her conclusion that DND took the act seriously and has implemented it more rigorously than other government departments.

Presented with the military position that herbicides and pesticides being used at Gagetown and other training areas break down quickly and cause minimal harm to the food chain,²¹⁸ May raises several cautions. According to her research, while the chemicals being used by the military are approved by the federal and provincial departments of agriculture and are used routinely by forest and power companies and in soybean fields to defoliate leaves before the harvest, there is indeed some 'bio-accumulation'. Moreover, with regard to the military program, the whole intent of spraying is to change the structure of the habitat for the exigencies of soldier training. Perhaps in ideal conditions the chemicals break down, but in the many 'non-ideal' conditions such as dark cold places, they can remain active for long periods. Because the Gagetown environment, and most military training areas for that matter, has been subject to spraying for many years, May concludes that the accumulation of toxins must be significant.

May points to the negative side-effects of the registered pesticides on human health and notes that there is still an outstanding law suit by former workers at Gagetown in the New Brunswick court. A number of references highlight the risks to humans and the links to cancer in pets from the most

²¹⁷ Elizabeth May, Op.Cit.

common weed killer, 2,4-D. That herbicide was banned in Sweden in 1989. In Quebec alone in 1996, 1650 cases of poisoning were reported, 35% of which followed garden pesticide application. Children under five were the largest group affected.²¹⁹ Although children do not play where the soldiers train, the implication for wildlife and their place in the food chain emphasizes the necessity to pursue a rigorous program of pesticide reduction.

The direct impact of military training on erosion and degradation of natural resources is indisputable, but former practices of letting nature fend for itself have been replaced by land and pest programs previously mentioned. They provide formal direction to incorporate stewardship activities and projects into our land use practices.²²⁰ Everything that is now put into the environment or sprayed over it is measured and accounted for. The resilience of the natural vegetation, including the shrubbery and saplings, to regenerate rapidly, if left at peace, is encouraging and points to measurable progress in the base environmental stewardship efforts. This has occurred on the once-denuded river and stream banks, and basic data collected to date indicates that local fauna has gravitated easily into these recovering regions.

²¹⁸ Cretain, Op.Cit.

²¹⁹ Sierra Club of Canada pamphlet, Op.Cit.

²²⁰ Downe, Op.Cit.

There is substantial evidence that the concepts of 'good intent' and 'due diligence' are now finding a foothold. However, research indicates that there are several constraints that the Integrated Pest Management Program faces. While the chemical inputs into the environment are being measured and reduced, the process of gathering and reporting data is severely impeded by the lack of funding and manpower.²²¹ Without the data, effective analysis and validation that should determine the level to which the performance objectives are being met cannot be carried out effectively. In scientific terms, the anecdotal evidence of apparently healthy or recovering fauna and flora is an inadequate measure of a healthy environment. But the efforts that are being made at Shilo, Suffield, and to a lesser extent at Gagetown, in measuring the pressures on the environment is a valid indicator of progress in the military environmental stewardship program.²²²

²²¹ Sheldon Downe alone oversees a base environmental budget of \$2.5 million, which, he says, could be reduced because of spending restraint in the near future. Given the choice between spending limited funds on the environmental stewardship program or on military training, he concedes that decision-makers will favour the latter. Downe has a staff of one but expects to have six to ten summer students, contracted by Fisheries and Oceans Canada, who will test and monitor progress in the fisheries' restoration.

²²² Forest Smith, Op.Cit.

Chapter Five

Conclusions and Synopsis

Given the steady growth in the various elements of the CF environmental program - the budget, the small but permanent staff dedicated to the program at most bases across the country, and the number of programs and projects - it is clear that there is substantial support for the environmental stewardship program throughout the Canadian military community. There is also solid evidence that the connections between rhetoric and reality are strengthening in a number of significant ways: endorsement by leadership, understanding of the concept of individual and collective due diligence, and a willingness to apply it, and practical regulations and controls in the field, to mention a few.

Historically, there can be no denying that the Canadian military has been a major polluter and will continue to be a major consumer of fossil fuels, chemicals and explosives and heavy equipment. It is also undeniable that the military is capable of demonstrating both violence to mankind and the environment, as Deudney would have it,²²³ and of demonstrating life-saving and caring support to governments and communities which face disaster, as the victims of floods, ice storms and famine would have it. The gender mix

²²³ Matthew, R. *Environmental Security; Demystifying the Concept, Clarifying the Stakes*, Environment and Security Debates, Environmental

and the hometown origins of those individuals who make up Canada's military community are little different from those who make up any other make up other social or industrial group, and are no less well-disposed to be educated and influenced to achieve the goals of sustainable use of our training areas. Some scholars question the assumption that military forces will automatically support policies of sustainable development or act with due respect to nature.²²⁴ But it is accountable public servants who make the modern policies under the influence of public scrutiny and well conceived popular trends. In times of future conflict, it is safe to say that basic survival and victory will be the primary preoccupation of military and civilian neighbours alike. But today, there are exciting developments in conservation, mitigation and training, both within the Canadian military community and among our allies, which indicate support and favour for environmental protection.

In the past, Canadian military bases, such as CFB Shilo, Suffield and Gagetown have inadvertently inherited many natural treasures, which might come as a surprise to those who believe that tank and artillery ranges have been relegated to a moonscape. Today, this legacy appears to be in a much better position to survive because of a number of calculated, progressive interventions: knowledge-based environmental awareness,

stewardship training, an increasingly well-documented natural resource data base, and a professional, legislated environmental stewardship program.

The programs such as Total Land Management and Integrated Pest Management, were conceived by defence department environmental specialists, and can reasonably be interpreted as having started a positive trend in military environmental stewardship. There are also programs which could well be adapted by other major land holders and consumers of natural resources such as power companies and the mining industry. An analogy of the trend might be found in the development of the internet, which in fact was developed by the United States military as a secure communications command and control system. The internet set a direction and has seen rapid and continual improvement and universal application, because it 'caught on' and served a critical need. There are exciting indications that environmental stewardship has taken hold in the Canadian military psyche, and time, and research into the health of the environment, will tell if it follows the popularity of the internet.

In practical terms, the initiatives which DND has undertaken to provide 'value-added' quality to the environment, are sound, durable and linked to broadly accountable contracts. The DND/CF commitment to phasing-out

²²⁴ S. Dalby, *Canadian National Security and Global Environmental Change*, *Canadian Institute for Strategic Studies*, Annual Seminar, 1997, p. 29.

the use of ozone-depleting substances such as halon is but one example.²²⁵

The deliverable dates for finding replacement, non ozone-depleting substances, are recorded in the amplification to the Code of Environmental Stewardship.²²⁶

At the grass roots level, in the training areas, the troops, through strict rules and regulations on the ranges, and though individual initiative, are practicing sound sustainable development practices. This is not to deny that military activities have the potential to wreck great havoc, but we have seen that the achievements of the environmental stewardship program are being recognized by independent journalists and other commentators. With only half of DND land being actively used for training, the rest of the territory remains in forest, bush and grasslands.²²⁷ The natural resource management programs described in this thesis, demonstrate that DND/CF is succeeding in providing a healthy and sustainable environment where rare flora, endangered and vibrant species, and our cultural heritage can and will coexist for present and future generations.

²²⁵ *National Defence Mobilizes for the Environment*, Op. Cit., p. 21. Halon is used as a fire suppressant on ships, in aircraft, and in buildings. "Other proven suppressants require larger storage containers which poses problems for aircraft where fire prevention systems are contained in tight compartments and engines. Since R & D in this technical area is costly, and effective solutions are not yet available, certain exclusions from the program are necessary for reasons of air crew safety." Interview with Mr R. Cretain, a specialist in toxic substances, Director General Environment, DND, December 1997.

²²⁶ *National Defence and the Environment 1997-2002*, Op. Cit.

²²⁷ *Ibid.*, p. 21.

On the other side of the report card, there can be no denying that military activity, since its earliest days when the still-active Citadel was constructed in Quebec City in the early 17th century, has left behind a legacy of contaminated waste which will require continued attention and funding. The tremendous legacy of the DEW line and other north warning sites, require astronomical cost to restore the environment to health. Traditionally soldiers driving tanks, changing oil and firing high explosive rounds, do what they are told to do, and on the environmental score card, experts like Downs, Sheldon and Shearer advise that environmental awareness among the troops cannot be taken for granted. Downs notes that the 'system' may impose standards and regulations, but for the soldier in the field, constant emphasis and reminders of the concept of due diligence are required. Progress is dependent in large part on how well individuals accept their responsibility, and is therefore personality dependent. Merely to meet the letter of the law, to avoid personal prosecution, may accomplish the goals of military training, but the protection of precious biodiversity on training areas requires extra effort from those who wield the arsenal. With the large number of fresh troops, both Canadian and NATO, and the potential for increasing NATO and European military training exchange programs in Canada, the necessity for constant training in and adherence to high standards is increasingly more important.

With a small defence budget that is focussed principally on operational capabilities, the funds available to pay for the cleanup of past damage and the future protection of the natural resources and the bio-diversity on military training areas, are severely limited. The same can to be said for manpower and the process of communicating the stewardship achievements and trends. By comparison, the US and British environmental programs are well-funded and well-staffed which allows for greater regulation, more thorough monitoring, and consequently a more scientific approach to environmental stewardship. Canadian high-level rhetoric is as strong as theirs, but the Canadian military does not possess its own version of their high quality national publications 'Today' (US) and 'Sanctuary' (UK). These magazines broadcast their projects, the challenges, and the accomplishments to a world wide audience thereby promoting and offering up for debate a wide variety of the military interactions with the environment. Until a dedicated publication is made available in Canada, the occasional media foray into the subject will be the only exposure the Canadian military will have.

Summary

What then is the correlation between the rhetoric and the reality of environmental stewardship for Canadian military training areas? It is evident that the top management of DND/CF has taken note of the negative

impact and the consequences to the health of the environment of military training activity, past and present. It is also clear that strongly worded policies have been created and are applied by a small team of dedicated and qualified environmental specialists. Regular training of the troops has been established, public consultation is practiced in some cases, and innovative mitigating activities are being applied. The case studies of CFB's Shilo and Suffield provide evidence that sound methodology is applied for analysing the causes of environmental degradation, the effects of the impacts, and the technical solutions.

Yet questions remain about the extent to which environmental stewardship practices can be applied before they impinge upon the quality of military training. There are sensational arguments on both sides of the issue. At Gagetown, we have seen a strong reluctance to apply a creative environmental program beyond what is required by law. At Shilo, a far more comprehensive and progressive approach to finding a balance between training and the environment has taken hold. From the perspective of some scholars and segments of the public and the media, buoyed by such celebrated cases as the American legacy left on Canadian territory, any attempt to link the military to environmental stewardship, borders on heresy.

Our case studies demonstrate the problems caused by the concentration and intensity of training in specific areas, the tragedy of the legacy sites and

the downfall of budget constraints. But they also show that environmental stewardship rhetoric can be turned into action which protects habitats and contributes to the long-term preservation of natural resources, alongside military training without compromising its objectives.

Certainly, the damage inflicted on the environment at Gagetown, and the apparent reluctance to adjust training schedules to allow the ecosystem time to recover, is an indication of the tension in the relationship between army training priorities and environmental imperatives. What the case of Gagetown really points to is a reluctance to change, in the absence of pressure from public and internal sources. Without that influence, innovation and imagination will be slow to come. Public pressure may come from academic groups interested in such fields as environmental studies, botany and zoology, archaeology etc. It may come from neighbouring communities because of possible concerns about chemical content in water supplies or siltation in recreational streams. Influence will certainly come from the increase in sharing the growing knowledge about the linkages between training and sustainable land use from other bases like Shilo and Suffield, whose stewardship programs are setting a standard that stands up to public scrutiny. As data on bio-diversity increases, using advanced technology, and management and mitigation practices become institutionalized, the quality and extent of environmental stewardship, it is hoped, will widen across the forces.

At Shilo and Suffield and at national headquarters, there is an expectation for change of old attitudes towards the environment and improvement in local base and national programs. This expectation is bolstered by federal and provincial legislation and by departmental policy. In the field, there are encouraging signs that environmental awareness training is popular among the troops who use the ranges²²⁸ and that the natural resources, having stood up to military training in an unfriendly era, now stand a better chance of flourishing in an increasingly wise and knowledgeable setting.

The Benchmark Code

The important test by which the Canadian military establishment will be judged in its efforts to improve on its environmental record is its adherence to the Code of Environmental Stewardship (see p. 16a). Using the evidence discovered at the case study bases for this thesis, general comparisons from site to site and some highlights of the achievements and shortfalls can be made. The seven main demands of the code are as follows: integrate environmental concerns into all aspects of operations and decision-making (Codes 1 and 5); meet and exceed the letter and spirit of the law (Code 2); train and foster diligent action (Code 3); acquire, handle and use hazardous substances responsibly (Code 4); reduce consumption

²²⁸ Shearer, Op.Cit.

and waste (Code 6); and manage lands soundly and protect sensitive areas (Code 7).

In four areas of the code, there is evidence that all three bases are applying the provisions effectively and gradually improving on their application. The comprehensive environmental training package (Code 3) which is given routinely to all troops using the ranges has been discussed and is reported to contribute to soldier awareness and due diligence in the field. There is evidence that each base is implementing practices which manage and protect ecologically sensitive areas (Code 7). This is evident in Shilo where the Carberry Sandhills and other special sites have been excluded from training; in Suffield where archaeological sites and the National Wildlife Area have been marked off; and in Gagetown where wide buffer zones are being left along the rivers and streams in the new training area. With regard to the handling and use of hazardous substances (Code 4), each base is reducing use of pesticides and looking for alternatives methods. Application is becoming increasingly better controlled and more sensitive to environmental concerns. This is evident in restrictions as to where spraying is carried out, avoidance of known nesting areas and adjacent agricultural areas, concern to avoid spraying in windy conditions and at times when flowers and grasses are pollinating and seeding. With respect to Code 6, each base has programs in effect to reduce the consumption of natural resources. Though statistics were not researched for this study,

each base is applying such controls as standard technical devices on water cisterns and providing proper containers for sorting and recycling waste from field training and buildings.

With regard to the application of the provisions contained in Codes 1, 2 and 5, there is constructive evidence in this research to confirm that environmental the federal and subordinate environmental laws, as well as environmental concerns are influencing the decision-making process on the three bases. Of the three bases, CFB Shilo appears to be managing the most active and progressive environmental stewardship program. There is close cooperation with the range officers who are responsible for activity in the field and the environmental officer has direct access to the base commander whose commitment to a sound environmental program is vital. As well, outside voices have a respected influence on the decision-making process with regard to sustainable use of the natural resources. There is clear intent to exceed the letter and spirit of the law and to integrate environmental considerations with military activities.

CFB Suffield officials have taken progressive steps with remedial activities to repair the damage of past practices on the ranges and have imposed strict regulations on the troop procedures to preserve and protect the biodiversity. These include re-grading the more severely scarred ranges, range rotation, and replacing top soil where trenches and tank scrapes have

been dug and protecting valued ecological areas. Close cooperation has been established with the oil drillers and the ranchers who graze their cattle on the ranges to ensure that sound environmental practices are carried out. Each of these cases illustrate good intent to meet and exceed the law and to adhere to the code.

Of the environmental programs at the three sites, CFB Gagetown's faces the greatest challenges, based on the research in this thesis. Like all bases, there is a requirement to apply the environmental code as thoroughly as possible and to integrate environmental concerns with military training requirements. Clearly the intensity of military activity and the spatial limits of the original manoeuvre area have left widespread damage to the ranges. However, experience from Suffield and Shilo with range rotation, re-grading and other progressive activities, would, over time allow the land to recover. Remedies have been applied to improve the quality of rivers and streams with dredging and reseeding banks and the result is the return of fish and bird life. To maintain this momentum in all areas of the ranges, strong support from base leadership and participation from outside specialists, would benefit the quality of the sustainable use of land and natural resources at the Gagetown training area.

Undoubtedly the pace of progress will be too slow for some and too fast for others. It is encouraging to find the progress of stewardship and the diversity and health of the natural resources on the prairie at Shilo and Suffield and in the eastern forest at Gagetown. No doubt, limits to budgets and lack of trained experts, will constrain action, but strong and enforceable policy and careful monitoring and mitigation must continue to be the goal. It will take a vision and commitment by those in command to

"Meet the obligation we have to each other, and to future generations."²²⁹

Lessons Learned

The case studies I have examined have demonstrated that the Canadian Armed Forces possess four principal characteristics in its relationship to the environment. First, the military forces can be destroyers of natural ecosystems and man-made communities. Second, they can be 'mitigators' where communities and man-made infrastructure are damaged or threatened by natural disasters. We saw this most recently last winter where several thousand military personnel came to the aid of ice storm victims and civil authorities.

²²⁹ Al Gore, "Respect the Land," *Time Magazine*, Special Edition, 10 November 1997, p. 8.

Thirdly, the military is a steward of the land and ecosystems where it trains and operates. This novel, yet increasingly significant role incorporates two main aspects: one is pollution prevention; and the other cleanup of legacy sites. And fourthly, I have demonstrated that DND/CF are at the leading edge of research and development in the use of satellite imagery, global positioning systems, infrared technology and bio-chemical warfare suits and gas masks for fuel spills and other noxious cleanups. As such, the armed forces are agents of technological transfer to other agencies and industry which are involved in environmental pursuits.

My contribution to geography studies rests between a pragmatic and analytical approach and an ethical approach, within the realm of human geography. I consider the spatial dimension and the use of empirical evidence to be central to my study of defence and the environment, if the role of scholarship is to grow out of the wider political geography theory and into practical, substantial and progressive activity.

It is undeniable that military activity will continue to encompass the four characteristics, and it is realistic to concede that the military, "the steward," is not its pre-eminent personification. However I have demonstrated that there are definite and positive trends and achievements in this area, despite public and scholastic indifference and the constraints of traditional military attitudes to operational and training activities.

There are several lessons that can be drawn from my research. First, that public pressure and involvement in defence-environment issues does positively influence the DND/CF decision making process. We have seen a strong new direction taken recently with the appointment of an ombudsman to examine and remedy a perceived breakdown in military ethics. It is less likely that similar pressure will be brought to bear in the near future on how the military applies sound environmental stewardship practices, due in part to a lack of scholarship and debate. However, the influence of the Commissioner of the Environment and Sustainable Development within the Auditor General Office, and other public and private groups, as well as internal momentum, will encourage continued progress. This dearth of knowledge is due partly to the remote location of military bases and partly due to public indifference and lack of understanding in what goes on behind the gates and fences. Perhaps the main lesson learned is that there is great scope for academic investigation by geographers and others into the environmental challenges on military training grounds and into the larger field of the defence and environmental security debate.

Synopsis

I have in this thesis demonstrated that there is clear intent, both at the policy level and in the field, to apply sound stewardship methods in order to improve the state of the environment. I have contributed to the awareness that the Canadian military is the guardian of an irreplaceable, endangered and complex heritage of natural and cultural resources. I have contributed to understanding the linkages between military training activities, past and present, and the sustainability of this inheritance. Military training ranges are directly connected to adjacent communities and resources and any degradation of the environment on military land has a great potential to negatively affect broadly based food chains and water resources.

Military decision makers must recognize the high priority the public places of environmental protection, and respect the intrinsic value of protecting a healthy and robust ecosystem for future generations. The policies they create, to cover all aspects of military training at home and during overseas missions, whether peacekeeping or training manoeuvres, must incorporate a high standard for sound environmental stewardship. The examples and standards our military establishes may well influence good practice in poorer regions of the globe, where our troops have witnessed, first hand, the famine and discontent worsened

Appendix 1

Comparisons and other Commentary

A number of commentaries recognise that the new threats to security and stability, such as, ethnic mistrust and friction, religious groupings and drug trafficking, are now more dominant than bi-polar military threats. Environmental degradation which has evolved from years of exploitation of natural resources, is readily included in these new threats.²³⁰ As NATO, of which Canada is a founding member, refines its defence strategies to meet the challenges of expansion into the former Warsaw Pact nations of Eastern Europe,²³¹ old and potential new threats to the environment that will inevitably result from modernization and expansion, will continue to be a primary concern for environmental research . The new risks are trans-boundary in nature and therefore the consequences cannot be isolated to one country.

An important element of the research for this thesis has been to establish points of reference for the Canadian military record on environmental stewardship. We have found that there is anecdotal evidence that the

²³⁰ Peterson, Niels. "Towards a European Security Model for the 21st Century," *NATO Review*, Nov-Dec 1997, pp 4-6; Jill Sinclair, *Canada's Role in International Security*, Air Power Conference, Winnipeg. Symposium Paper un-published, July 1997; Prof. Tony Mason, *Air Power in Transition*, Air Power Conference, un-published, July 1997. Warren Christopher, "A Force for Positive Change," *Today Magazine*, September 1996, p. 5.

DND/CF programs can be more effective and progressive than those of industry, who are bound by federal standards, but not by government policy.²³² And, in the cases of Suffield and Shilo, military training ranges may provide a more stable habitat than adjacent parks, because parks are designed to welcome many visitors, while training ranges have disciplined and controlled use, and restricted access.²³³ But it is interesting to look beyond the local context, to our NATO allies with whom we train, and to the global environment in which we operate. The questions should be asked, how are the forces doing compared to the environmental standards of our NATO allies? What knowledge and example can we share both with our traditional allies and with the newly acquired partners who were once our Cold War foes? We have seen in our own contaminated sites the consequences of inaction and to study environmental stewardship activity solely on the Canadian military front, isolated from the international context, leaves our programs unchallenged. Since our military institution interacts with so many national and international activities, an understanding of allied views and approaches helps to validate Canadian progress and to find common ground.

One of the foundation commitments for DND/CF environmental policy reads:

²³¹ Central and Eastern European countries are making great progress in furthering cooperation and closer ties with each other.

²³² May and Downs, Op.Cit.

"To meet or exceed the letter and spirit of all applicable federal environmental laws and, where appropriate, to be compatible with provincial and international standards."²³⁴

There are unwritten visions encompassed by this statement. First, that the military establishment in Canada, and for that matter in any country in the world, is the user of vast tracts of land that border on municipalities, farms and industries (forestry, oil, mining etc.). By acting in an environmentally responsible manner, the military sector is in a position to exert significant influence on other sectors of society to do likewise.²³⁵ Furthermore as a purchaser and consumer of a great variety and volume of products, the Canadian military can influence the market place through such practices as replacing or reducing the use of such ozone depleting substances as halon in fire extinguishers on land, in ships at sea, and in aircraft.²³⁶ Beyond our borders, as an influential member of multi-national alliances such as NATO and its new Partnership for Peace²³⁷ initiative, NORAD and the Air Forces of the Americas, and globally with the UN, this influence can be world wide.

²³³ Bredin and Struzik, Op.Cit.

²³⁴ NDHQ Policy Directive p 5/92, Op.Cit., p., 2-7.

²³⁵ *Environmental Guidelines for the Military Sector*, A joint Sweden-US project sponsored by the NATO Committee on the Challenges of Modern Society, NATO Document, June 1996, p. 9-10.

²³⁶ The Code of Environmental Stewardship calls for the reduction and replacement of halon and other toxic substances by the year 2002 with environmentally sustainable alternatives, Code of Environmental Stewardship, DND Document, 1997.

²³⁷ Partnership for Peace is a NATO initiative designed to extend democracy and peaceful co-operation to former East Block nations, once our arch

The commitment by Canada and its military, and NATO to apply international standards and environmental stewardship protocols, is evident in the international standards to which DND/CF subscribe.²³⁸ The Rio Declaration on Sustainable Development and the Convention on Biological Diversity which were both signed in Rio in 1992, and the 1987 Montreal Protocol which set targets to protect the ozone layer are well known. Another set of standards that are being implemented by DND/CF and the allies is known as ISO 14000.²³⁹ It has blended together tested practices into guidelines which identify the ideal structure for an Environmental Management System (EMS). It is not only useful for armed forces but also for industry and governments as well. DND/CF already have the basic elements of the ISO model in place; the policy, the plans, the range orders and restrictions, the monitoring and mitigation activity, the auditing, and the commitment to continual improvement.²⁴⁰ But the level of achievement in the crucial area of 'top management commitment'²⁴¹ should be challenged on three accounts: budget, manpower and communications. Each authority

rivals. Canada is a regular participant in the frequent annual military exercises and exchanges. Search and Rescue, Peacekeeping and humanitarian operations and standards, emergency planning, and disaster relief are all exercise themes to which the CF has contributed.

²³⁸ A Sustainable Development Strategy for National Defence, Op.Cit., p. 13; National Defence Performance Report, Op.Cit., p. 9.

²³⁹ "The ISO 14000 Essentials," A Practical Guide, Canadian Standards Association, 1996.

²⁴⁰ Ibid., pp. 8 and 23-24.

²⁴¹ Ibid., p. 18.

who has been consulted in the research for this thesis identifies these areas as the Achilles heel of their respective environmental programs.²⁴²

By comparison, US army and British military programs appear to be well-funded, effectively staffed. The lack of adequate funding and staffing where it is most needed, in the field where the legacy sites remain and the battle group training takes place, has been discussed in the case studies. On the communications front, however, the British and Americans are well ahead of the Canadian armed forces. Despite the progress that DND/CF has been made over the past decade with the creation of constructive policies and the conservation the natural resources on defence land, no attempt has been made to broadcast the trends and achievements through learned papers or popular articles nor to create a 'defence and the environment' magazine or feature column in the style of other nations.

The Ministry of Defence in the UK produce a high quality annual conservation magazine, Sanctuary, which includes 'forwards' by such influential personalities as the Chief of the Defence Staff (1995) and Prince Charles (1996). Articles with first class photographic content, cover an array of subjects written by serving military personnel and non-military specialists that are appropriate reading for interest groups ranging from students to professional biologists, planners and archaeologists. The list

²⁴² Downs, Richmond, Downe, Shearer, Cretian Op.Cit., interviews.

from only two issues, 1995 and 1996, recognizes a legitimate place for military environmental stewardship in the Post Cold War national security debate.²⁴³ *Observations on the Impact of the Gulf War on the Kuwait/Iraq Border Region*, by LCdr N. Huxtable, 1995; *The Birds of Stanford Training Area*, by P. Holness; *The Prehistoric and Romano-British Settlement of Salisbury Plain*, by Dr R. Entwistle, 1995; *Extinct is Forever – Unless You Happen to be Lucky*, Dr T. Rich, 1995; *Sennelager Training Area, A Refuge for Rare Flora and Fauna*, by P. French, 1996; *Foxglove Conservation Area, Catterick Garrison*, by Major A. Crease, 1996; and *Archaeological Evaluation at Otterburn Ranges*, by S. Rushton, 1996.

These wide ranging articles indicate a broadly based interest on natural resource conservation and management on military ranges in the UK.²⁴⁴ To

²⁴³ D. Deudney, *The Case Against Linking Environmental Degradation and National Security*, Millennium 19, 1990, quoted by G. and D. Dabelko, *Environmental Security: Issues of Conflict and Redefinition*, Environmental Change and Security Project Report, The Woodrow Wilson Centre, Spring 1995, p. 7. Deudney maintained the position that making environmental degradation a main line defence and security policy issue demeaned the environmental movement. There is an ongoing debate as to where environmental deterioration fits as a threat to national security and whether it should become a main line defence policy. Perhaps it is a question of timing, location and national perception. In states where environmental degradation has negatively influenced life style and national stability it can be argued that environmental security has become a *de facto* defence policy issue. In Canada, however, and by extension in other modern western 'North' nations, it is likely to remain as an adjunct to traditional military threats and activity.

²⁴⁴ Despite the apparent wealth of research and information which appears in Sanctuary, there is considered to be a shortage of management plans and little sound ecological advice for MOD UK. Moreover, no formal budgets are allocated specifically for conservation work. Coulson, M., "The

them are added in each edition of *Sanctuary* as many as 45 additional briefs on conservation and stewardship initiatives from a great variety of military bases and units. As well, the annual Sanctuary Award, which celebrates an example of a project of 'benefit to wildlife on the Defence Estate' is announced.²⁴⁵

The US Department of Defence publishes a similar annual environmental stewardship magazine, *Today*. The magazine does not contain the same variety and detail as the articles in *Sanctuary*. However, it is a progressive step in that it describes US military projects dealing with cleanup, conservation and pollution prevention. For example, a contaminated soil bio-remediation project at Seymour Johnson Air Force Base in North Carolina, and the watchdog duties of the Army National Guard's Environmental Minutemen describe the link between military activity and stewardship.²⁴⁶ *Today*, also publishes a lengthy 'Environmental Success Index' which highlights a great variety of local base initiatives.

Geography of Defence – Developing Themes of Study," *GeoJournal*, 36.4, 1995, p. 374.

²⁴⁵ In 1996, the award went to the Farnborough Conservation Group which studied the grazing habits of a Mongolian Pony in the hope that it would control invasive vegetation in an ecologically sensitive marsh. "The Sanctuary Award, Project Przewalski," *Sanctuary*, The MOD Conservation Magazine, Number 25, 1996, pp. 35-37.

A Vital Role for Technology

The volume of entries in the American environmental success index and the numerous briefs from virtually every British military installation are two of many indicators of a rapidly increasing volume of data on natural resource management and military activity. This inventory has become a visible part of a commitment by NATO and its military members to participate in the international obligations to preserve biodiversity. The Rio Biodiversity Convention called on all signatories to create national laws to protect the environment.²⁴⁷ One of the original studies into the application of information technology for recording and interpreting data on natural resources on military training areas, was carried out in the UK by Professor M.G. Coulson in 1990.²⁴⁸ In his study into the value of using Geographic Information System technology, he noted, at that time, that there was 'little existing published literature' on the subject of environmental awareness or an ability to interpret and understand the state or health of the environment.²⁴⁹ However, he noted that the US Army applied GIS to assist land managers plan training intensity by calculating the erosion tolerance of

²⁴⁶ "Bio-remediation: Nature's Solution," *Today magazine*, DOD Publication, 1995, pp. 22-23; and "Environmental Minutemen," *Today magazine*, 1996, pp. 22-23.

²⁴⁷ New Laws, Protect Canada's Biodiversity, Western Canada Wilderness Committee, Vol. 14, No. 4 – Spring 1995. Canada has yet to pass a law to protect endangered species and their habitats, and only in March 1998 did DND/CF begin to consider a plan to create a forces wide biodiversity program.

²⁴⁸ M.G. Coulson, *The Potential of Geographical Information Systems for Assisting in the Management of Military Training Land*, NATO Committee on the Challenges of Modern Society, 1990, pp. 34-37.

training land. He also pointed out the value of the GIS data for providing continuity for military installations where staff rotations are commonplace.²⁵⁰ Since 1990, over the past eight years, GIS has flourished as a tool, as we noted in the Suffield and Shilo studies, for mapping topography, road systems, drainage and water supplies, habitat research sites, waste disposal sites, archaeology, training zones and many more generic features.

Coulson continues to influence the academic investigation into the linkages between defence and the environment . In 1995, he convened a symposium at the University of Wales where he is a professor of geography. He admitted that a few years before 'he would not have had the nerve to ask the NATO Committee on the Challenges of Modern Society, nor the UK MOD to support such a meeting.²⁵¹ The landmark conference included academics and defence environmental specialists from Canada,²⁵² the US, the UK, Germany, Norway, the Slovak Republic, Latvia, Lithuania, and the Czech Republic. Many of the discussion themes mirror issues and initiatives being taken in Canadian training areas – pollution prevention strategies for NATO bases; contaminated site remediation; the implications of the Montreal Protocol for the military; noise control on military ranges;

²⁴⁹ Ibid. P. 5.

²⁵⁰ Ibid., p. 14.

²⁵¹ Coulson et al, Covering letter to the Final Program and Abstracts, International Symposium on the Environment and Defence, University of Wales, 13-15 September, 1995.

land management and the application of GIS and remote sensing; military archaeology; and conservation projects on military sites. In all these areas, DND/CF is equal to other nations in concept and intent, but the lack of funding and manpower significantly restrict their universal application.

Perhaps the central theme for the symposium, one which should appeal to environmentalists, is the recognition that national legislation and international convention impinge more and more on defence activities.²⁵³ Advanced methodologies and models are being demanded both by law and by public pressure to balance the needs of military training with the obligation to manage lands in a sustainable manner. Whatever the land management models may be, troop awareness and training in appropriate use of the environment, is crucial. With NATO troops training in Canada and the likelihood of expanded training in Eastern Europe, where environmental standards are not well developed, the current trend in NATO is for harmonization of training standards. The expectation is that troops who are sensitized to environmental protection will have sufficient skills and incentive to avoid environmental impact.²⁵⁴ There are sound and structured training developments at the NATO school in Oberammergau,

²⁵² Bosch, H. DND/CF specialist in the remediation of contaminated sites, presented a paper and Tony Downs, the head of the environmental branch, chaired a session of the conference.

²⁵³ Stuart, J. Ministry of Defence, UK, *Balancing Army Training and Environmental Impact*, International Symposium on the Environment and Defence, University of Wales, 13-15 September, 1995, pp. 103-110.

Germany that Canadians attend, where environmental courses are now part of the curriculum.²⁵⁵ An active program within the US forces to encourage military and civilian personnel to enrol for degrees in the environmental sciences, is a strong indication of the priority placed on environmental stewardship programs.²⁵⁶ And in the UK, an instructional video which contains Disney quality animation, demonstrating good and poor environmental practices, is shown to all recruits and on other courses throughout the British forces. The film won a best category prize at the Rome Military Film Festival.²⁵⁷

Traditionally, the NATO has conducted its business co-operatively, and Canada has a strong presence at environment working groups.²⁵⁸ In his paper presented to the 1995 Symposium at the University of Wales,²⁵⁹

²⁵⁴ Coulson, M. *Environmental Training in the Armed Forces of the NATO Nations*, Ibid. pp.41-44.

²⁵⁵ Winning, M. *Environmental Courses at the NATO School*, Ibid. pp. 51-53.

²⁵⁶ Walsh, P. *New Directions in US Defence Environmental Security Training*, Ibid. pp. 58-60.

²⁵⁷ Coulson, *Train Green – Environmental Awareness Training for Recruits to the British Army*, Ibid. pp. 72-77.

²⁵⁸ Downs, T. Op.Cit.

²⁵⁹ This landmark symposium which was attended by representatives of all NATO nations, was the brainchild of Professor Martin Coulson of the University of Wales who has researched into military environmental issues since the mid-'80's. His early research focussed on data collection, GIS and the management of military training areas, *The Potential of Geographical Information Systems for Assisting in the Management of Military Training Land*, Report for the Pilot Study on Promotion of Environmental Awareness in the Armed Forces, U of Wales, April 1990. Coulson lamented in his editorial to the Symposium proceedings that prior to this international gathering of experts, defence environment issues "had not achieved

Canadian specialist, Hans Borch, addressed the widespread issue of cleanup of sites contaminated by hydrocarbons, chemicals and heavy metals. He highlighted the essential Canadian problem of budget constraint and the resulting requirement to 'prioritize' sites based on public sensitivity and potential impact of the contaminants on human health and neighbouring ecosystems.²⁶⁰

What knowledge can we share?

The sharing of information and techniques is a foundation of NATO's environmental program. It is part of the principle of cooperation, which is considered essential to enhancing European security and social stability in the 21st Century.²⁶¹ In 1997, NATO announced a new umbrella program known as Science for Peace.²⁶² Its first objective is "to support applied science and technology projects relative to industrial, environmental and security related problems." It is an example of the recognition that the former Warsaw Pact countries, who are seeking close ties with NATO, bring to the new Europe numerous and destabilising environmental contamination problems. The type of research and development projects, which Science

academic recognition," nor provided "a literature of any substance" for researchers.

²⁶⁰ Borch, H. *Canadian Department of National Defence Contaminated Sites Remediation Framework*, Proceedings of the International Symposium on the Environment and Defence, Report No. 211, ISBN 0 95073484 3 3, 13-15 September, 1995, pp. 45-52.

²⁶¹ N. Peterson, *Op.Cit.*, pp. 4-7.

²⁶² This program is headed by the Assistant Secretary General for Scientific and Environmental Affairs.

for Peace is encouraging, is a new water supply system which has cleaned a major river which passes through several military manoeuvre areas and is a source of urban water supply in Portugal. The techniques and research developed by Portuguese know-how is being offered to Moldova to improve water quality and quantity in two of its main rivers, and to the Ukraine and Romania where trans-boundary pollution in the Prut and Dniester Rivers is both a health concern and a politically destabilising issue.²⁶³

These examples directly concern natural resources shared by military sites, and the side-effects for NATO, which is principally a military and security alliance between Europe to North America, are significant. The Prut and Dniester Rivers are part of the Black Sea basin. They contribute heavily to the 'catastrophic degradation' of the Sea's natural resources from plummeting fish stocks to contaminated drinking water and beaches.²⁶⁴ The cost and challenge of restoring environmental health to the basin and the once-vital body of water are obviously enormous, but the consequences of inaction and the social instability among the 17 countries, 13 capital cities and 160 million citizens of the new Europe are even costlier.

Granted, it is a long way from the training fields of Suffield and Shilo to the Black Sea. But with British and German army training in Canada, our

²⁶³ Cadiou, Jean-Marie. "Science for Peace: NATO's New Co-operative Program with Partners," *NATO Review*, Nov-Dec 1997, pp. 30-33.

²⁶⁴ *Ibid.*, p. 32.

central role in NATO Partnership for Peace and Science for Peace meetings²⁶⁵, and a leadership role in NATO, there is a linkage between the DND/CF and the various NATO and national environmental programs. If we are recognized as good stewards at home, by example we can be in a position to instruct other militaries on how to protect and preserve their land, sea and air spaces from the negative effects of inappropriate military training activity.

Closer to home, in 1992, the US Army published their research into the deficiencies in the levels of environmental awareness training.²⁶⁶ They have concluded that,

"the vast majority of environmental degradation during training exercises can be directly attributed to a lack of knowledge or understanding about the environment in which they are training."²⁶⁷

To address the inadequacies, the US Army has instituted a comprehensive environmental awareness program aimed at low and mid-level personnel.

Their focus is on generic as well as site-specific issues. The training

²⁶⁵ Canada is a participant in Partnership for Peace program which is an cooperative initiative between NATO and Eastern Europe. Training and exchanges are carried under the program from joint army exercises to search and rescue. Military representatives from most of the countries surrounding the Black Sea came to Canada for a week-long search and rescue exercise in 1997. This writer was in charge of public affairs for the event.

²⁶⁶ Environmental Awareness Training in the US Army, US Army Construction Engineering Research Laboratory, Study Report Summary, 1992.

²⁶⁷ Ibid., p, 54.

includes the use of multi-media activities, such as videos to demonstrate inappropriate and appropriate activities, handbooks on local issues and regulations, an interactive software package, and quick reference cards to take into the field highlighting sensitivities and appropriate safeguard actions. This *curriculum* is presented regularly at briefings, prior to range use and as part of a soldier's annual training program. The level of environmental awareness training at the CF case study bases is similar in its approach to the US program.

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