

Surroundings and Snow

Ecosystem services related risks and opportunities at Canadian
Mountain Holidays

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Abstract

Humanity has a complex relationship with the natural world. One aspect of this relationship is that of dependence on the services that the natural world provides. Commonly referred to as ecosystem services, these are services such as the provisioning of freshwater, timber, and medicines, the regulation of climate, and the maintenance of air quality. This relationship is especially important in the business realm, as most businesses are either directly or indirectly dependent on ecosystem service for their business offerings.

This study explores such dependence in the form of business opportunities and risks associated with ecosystem services in Canadian Mountain Holidays (CMH), a well-established heli-skiing outfit operating out of British Columbia, Canada. In addition to being embedded in the natural world, this study revealed that CMH is dependent on a number of ecosystem services in order to provide their core business offering. Based on concepts established by the Millennium Ecosystem Assessment, this study uses the Corporate Ecosystem Service Review as an analytical framework to identify priority ecosystem services and their associated risks and opportunities within CMH's main business offering. The implications of using the Corporate Ecosystem Services Review within the broader tourism context are also discussed.

Keywords: ecosystem services, corporate ecosystem service review, Canadian Mountain Holidays, natural capital, Millennium Ecosystem Assessment, tourism

Executive Summary

Humankind is inherently connected to the natural world; in particular we are connected to the services provided by the natural world (Costanza et al., 1997; Daily et al., 1997). These services, commonly referred to as ecosystem services, are held to be the benefits that humans obtain from ecosystems (MA, 2005). There is an almost endless array of ecosystems and ecosystem functions, and therefore an endless amount of context specific ecosystem services. Some such services that benefit humankind are the provisioning of timber and fibres, the cleaning of water and air, provisioning of natural medicines and pharmaceuticals, the prevention of erosion and natural disasters, carbon sequestration, and the intrinsic cultural value often associated with natural places.

Although society benefits greatly from these services, in no way are they properly valued or considered in our economic, political or social systems. If they were, there would be a much different societal perspective, beyond what can be described our current unconscious entitlement to the services provided by functioning ecosystems. Furthermore, there would be a deeper sense of stewardship and a robust conservation ethic in order to preserve these ecosystem services. In the Millennium Ecosystem Assessment's (MA) examination of twenty-four ecosystem services that are particularly relevant to human well-being, fifteen of the twenty-four were being degraded or used unsustainably.

Businesses, as important pillars of any economy and society, interact with ecosystem services in two central ways: they use and depend on ecosystem services and they contribute to ecosystem change (MA, 2005b). As the World Business Council for Sustainable Development establish, "business cannot function if ecosystems and the services they deliver – like water, biodiversity, fibre, food, and climate – are degraded or out of balance" (as cited in MA, 2005b, p.2). There is incentive for businesses to begin considering their relationship with the natural world and ecosystem service, as businesses that fail to properly acknowledge and assess their impacts and dependence on ecosystem services carry unidentified risks and may overlook potential profitable opportunities (TEEB, 2010).

On a whole, perhaps more tangible than other industries, ecosystem services are an integral part of the tourism sector. Consequently, the associated risks and opportunities are more prevalent and substantial. This is especially evident in nature-based tourism, as they are often immediately connected to the natural world for their business offering. Furthermore, they are increasingly in demand and provide considerable economic benefits to local, national and international economies (TEEB, 2010).

One such company is Canadian Mountain Holidays (CMH), a Canadian adventure travel company operating mainly in British Columbia. CMH is the central case for this study. In 1965, founder Hans Gmoser essentially invented commercial heli-skiing, and it has been the core of their business ever since. As an operator in the outdoor adventure industry, CMH is entrenched in the natural world, both literally and figuratively. The lodges they operate and the outdoor activities they offer their clients take place in a wilderness environment. In many cases, clients' expectations are rooted in a unique outdoor experience, whether it is skiing, hiking, or sitting on the deck at a mountain lodge. However, it is not simply an outdoor activity that CMH provides or that their clients' value, but it is the opportunity to interact with vast, remote wilderness and the deep sense of adventure and connectedness that these places inspire. Simply put, if the landscape didn't exist, there wouldn't be a business (D. Butler, J. Guegt, T. Guyn, R. Carswell, E. Unterberger, B. Krysak, personal communications, June/July, 2012). In this way, it is clear that CMH is reliant on the natural world for their core business offering.

Research Question

In order to provide focus for this work, the study was guided by the following research question: **How and where does consideration of ecosystem services, as they relate to the business model and daily activities of CMH, reveal risks and opportunities for the organisation?** The following research tasks were established in order to address this specific research question:

- Task 1: Review the concept of ecosystem services, their relationship to businesses, and frameworks suitable for assessing or rationalising such relationships;
- Task 2: Delineate how the concept of ecosystem services is related to, or can be related to, the business offerings and activities of CMH;
- Task 3: Assess the risks and opportunities for CMH related to ecosystem services.

Methods

This study addressed these questions by first understanding and reviewing the literature on the subject of ecosystem services, natural capital, business and tourism. This provided the author with an understanding of the past and current discussion regarding ecosystem service. The collection of data began with exploratory interviews with six CMH employees representing a variety of roles within CMH’s structure. These exploratory interviews further familiarized the author with CMH’s operations and in which areas might be of interest when considering ecosystem services, after which a review of relevant literature was conducted. The main analysis was done using the ESR, which is an analytical tool founded on the ecosystem services concepts, definition, and classification system established by the MA. The ESR methodology, presented in the diagram below, provided a systematic tool to address the practical ecosystem service related opportunities and threats within a given business.

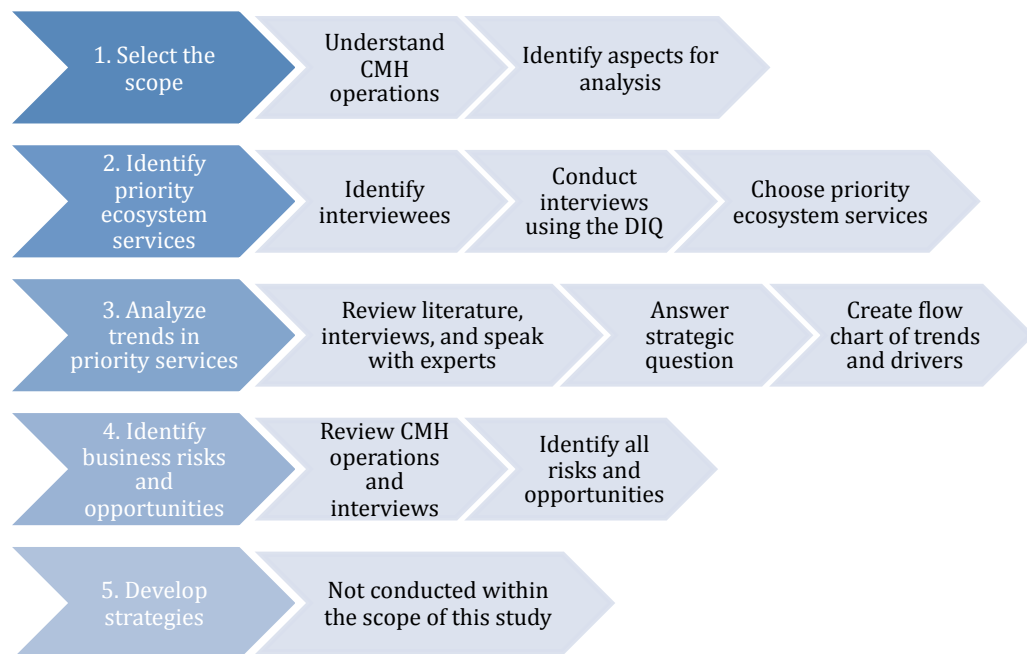


Figure: ESR expanded methodology

Source: Adapted from Corporate Ecosystem Services Review, Hanson et al. (2012)

Findings and Conclusions

It is clear throughout the literature and in practice, that ecosystem services are inherently and directly related to human well-being and development. Businesses are no exception, as an important pillar in our society, businesses are enabled, and often dependent on ecosystems and their services to provide a given product or service. This study employed the Corporate Ecosystem Service Review (ESR) and the concepts established by the Millennium Ecosystem Assessment (MA) as an analytical and conceptual framework, respectively. In this regard, these frameworks proved to be an ideal assessment tool when considering a company with an offering in the tourism industry.

This study focused primarily on the core offerings of CMH and their relationship to ecosystem services. As a company whose main offering is embedded in the natural world, it is clear that CMH has an inherent dependence on ecosystem services. Guided by the ESR, the author discovered that CMH has a multitude of dependencies on the natural world, which all present risks and opportunities to their core offering. The following were the priority ecosystem services identified as of particular importance within CMH's operations:

- Cultural Services: recreation and ecotourism, ethical and spiritual values, and educational and inspirational values
- Water: provisioning of freshwater, water regulation, and water purification and wastewater treatment
- Global climate regulation
- Local/regional climate regulation
- Erosion control
- Natural hazard mitigation

Of these priority ecosystem services, it is the cultural services that are at the core of their business. Without these cultural services and the cultural value associated with the natural world and the recreational activities, CMH would have no business. The other services have been identified as enabling to CMH's core operation and offering. Each of the aforementioned priority ecosystem services was assessed through the lens of five different aspects of CMH's business, including market & product, operational, reputational, regulatory and legal, and financial. The assessment revealed a number of relevant risks and opportunities for CMH to consider as they move forward with their operations. The identified risks and opportunities associated to various ecosystem services are varied and affect CMH's offering in a range of different ways. It is obvious from this assessment, however, that ecosystem services play an important role in their operations and even in their very existence.

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Abbreviations

BCSTC - British Columbia Sustainable Tourism Collective

BES – Biodiversity and Ecosystem Services

CBBP – Canadian Business Biodiversity Program

CDN\$ - Canadian dollars

CMH – Canadian Mountain Holidays

DIM - Ecosystem Services Dependence and Impact Matrix

DIQ – Ecosystem Services Dependence and Impact Questionnaire

EMS – Environmental Management System

ESF – Ecosystem Services Framework

ESR – Corporate Ecosystem Services Review

GRI – Global Reporting Initiative

LO – License of Occupation

MA – Millennium Ecosystem Assessment

MAB - Millennium Ecosystem Assessment Opportunities and Challenges for Business and Industry

MI – Meridian Institute

PES – Payment for Ecosystem Services

RUBICODE – Rationalising Biodiversity Conservation in Dynamic Ecosystems

SAU – Service Antagonising Units

SPU – Service Providing Unit

TEEB – The Economics of Ecosystem and Biodiversity

UN – United Nations

US\$ - American dollars

WBCSD – World Business Council for Sustainable Development

WRI – World Resource Institute

1 Introduction

In recent centuries humans have drifted away from a direct and intentional relationship with the natural world. Much of the world that we occupy today is defined by human constructs, both in terms of infrastructural and intellectual space. Nevertheless, humans are inherently connected to the natural world, in particular to the services provided by the natural world (Costanza et al., 1997; Daily et al., 1997). These services, commonly referred to as ecosystem services, are held to be the benefits that humans obtain from ecosystems (MA, 2005). An ecosystem is “a dynamic complex of plant, animal, and microorganism, communities and the nonliving environment interacting as a functional unit” (MA, 2005a, p. V). There is a vast array of ecosystems and ecosystem functions, which provide an endless amount of context specific ecosystem services. Some such services include the provisioning of timber and fibres, the cleaning of water and air, provisioning of natural medicines and pharmaceuticals, the prevention of erosion and natural disasters, carbon sequestration, and the intrinsic cultural and spiritual value of natural spaces. Although, as a human species, our inherent connection to the natural world may be clouded by culture and technology, we remain fundamentally dependent on the flow of ecosystem services. As ecosystems continue to be degraded globally the impacts on human well-being are increasing (MA, 2005a).

As a species, our well being is inherently connected to the well being of the natural world. Yet, we play such a significant role in the degradation of that which we are fundamentally dependent upon. In the Millennium Ecosystem Assessment¹'s (MA) examination of twenty-four ecosystem services that are particularly relevant to human well-being, fifteen of the twenty-four were being degraded or used unsustainably. Further evidence demonstrates that these ecosystem services are being degraded nonlinearly, which suggests that there are accelerating, abrupt or irreversible changes (MA, 2005).

Ecosystem service valuation has been particularly important in the ecosystem service discussion and has grabbed the attention of policy makers and businesses. Costanza and colleagues (1997) estimated the value of 17 ecosystem services, in 16 biomes, in the range of US\$16-54 trillion annually, with an average of US\$33 trillion. This is a staggering number, considering the entire global GNP was around US\$18 trillion² at the time. These calculations considered the values of a number of services. Some specific ecosystem service valuation examples are as follows: agricultural pollination from bee keeping generates US\$ 213 million annually in Switzerland; halving deforestation rates by 2030 will reduce global greenhouse gas (GHG) emissions, thereby avoiding an estimated US\$3.7 trillion in climate change related damages; and the ‘Greenbelt’ of Ontario³ is worth an estimated CAD\$ 2.6 billion annually in habitat, flood control, climate regulation, pollination, waste treatment, and water regulation (TEEB, 2010). These values are very significant in any economic discussion, but they reflect the value of the services that ecosystems provide. However, the services that an ecosystem provides to society and the value attached to those services remain largely invisible in the day-to-day considerations and accounts of our species (TEEB, 2010).

It is not only individual human beings that depend on ecosystem services, but all aspects of human society including political bodies, economies and businesses. The relatively recent

¹ Please see section 3.3 for a full description of the Millennium Ecosystem Assessment

² These estimates were valued in 1997's economy and currency

³ The Ontario 'Greenbelt' is a 375km protected green corridor that adjoins the greater Toronto area, where farming is the primary land use (Greenbelt, 2012)

awakening to the relationship between ecosystem services and human well-being is evident in the number of recent international reports (Millennium Ecosystem Assessment, The Economics of Ecosystems and Biodiversity), government funded studies (RUBICODE, UK National Ecosystem Assessment) and corporate consideration (Deloitte, KPMG, CBBP; see section 3.5 for more detail). Businesses, as important pillars of any economy, interact with ecosystem services in two central ways: they use and depend on ecosystem services and they contribute to ecosystem change (MA, 2005b). Some businesses are directly dependent on ecosystem services, such as a natural mineral water company, and others are indirectly dependent, such as a contractor who depends on resources like timber. Regardless of the type of business, the dependence on ecosystem services is present somewhere in the operation, if not throughout it entirely. As the World Business Council for Sustainable Development establish, “business cannot function if ecosystems and the services they deliver – like water, biodiversity, fibre, food, and climate – are degraded or out of balance” (as cited in MA, 2005b, p.2).

The consideration of ecosystem services in the business world is increasing, and with good reason. In PricewaterhouseCooper’s global CEO survey, 27% of CEOs expressed concern about biodiversity and ecosystem service loss (as cited in TEEB, 2010). This new concern is manifesting itself in corporate explorations into how businesses are impacting ecosystem service, but also in assessing dependence on ecosystem services. Traditional environmental management techniques and sustainability concerns generally ignore ecosystem health as it is often considered to fall outside a company’s scope. But in so doing, companies fail to identify the connection between ecosystem health and the bottom line (Hanson et al., 2012). Businesses that fail to properly acknowledge and assess their impacts and dependence on ecosystem services carry unidentified risks and may overlook potential profitable opportunities (TEEB, 2010).

As mentioned above, most businesses and industries have a direct or indirect relationship to ecosystem services. Additionally, there are inherent risks and opportunities related to ecosystem services. Included in the category of business and industry are the ecosystem-related connections to the tourism industry. Nature-based tourism is increasingly popular and provides considerable economic benefits to local, national and international economies (TEEB, 2010). Furthermore, many forms of recreation and tourism require natural amenities, biodiversity, and scenic beauty in order to exist in the first place (Adamowicz et al., 2011). These natural features and processes are what often attract guests and form the foundation of a large part of the tourism industry. For example, increased abundance and diversity on a bird watching trip will increase the value of the trip, while a beach is generally more attractive if it has cleaner water and natural surroundings (Adamowicz et al., 2011). On a whole, perhaps more than in other industries, ecosystem services are an integral part of the tourism sector. Consequently, the associated risks and opportunities for core business offerings can be more prevalent and tangible.

At the core of this study is Canadian Mountain Holidays (CMH), a Canadian adventure travel company operating mainly in British Columbia. In 1965, founder Hans Gmoser essentially invented commercial heli-skiing⁴, and it has been the core of their business ever since. As an operator in the outdoor adventure industry, CMH is particularly embedded in the natural world and reliant on ecosystem services for the continued success of their business offering.

⁴ Heli-skiing, also know as helicopter skiing, refers to the use of a helicopter to access terrain for alpine (downhill) skiing and snowboarding activities. The use of a helicopter allows for access of large amounts terrain that would otherwise be difficult to access.

1.1 Problem definition

CMH is entrenched in the natural world, both literally and figuratively. The lodges they operate and the outdoor activities they offer their clients take place in a wilderness environment. In many cases, clients' expectations are rooted in a unique outdoor experience, whether it is skiing, hiking, or sitting on the deck of a mountain lodge. However, it is not simply that CMH provides outdoor activities that their clients value, but in the words of the CMH staff, it is about the opportunity to interact with vast, remote wilderness and the deep sense of adventure and connectedness that these places inspire. Simply put, if the landscape did not exist, there would not be a business (D. Butler, J. Guegt, T. Guyn, R. Carswell, E. Unterberger, B. Krysak, personal communications, June/July, 2012). There is also an inherent and practical physical connection to the natural world, whether it is with precipitation, natural hazard regulation or organic beef, CMH's reliance on ecosystem processes is evident. Moreover, because of the remoteness and rugged terrain it is not an easy environment within which to conduct business, as their offering includes a wide array of support activities including transportation, lodging, services, safety and skiing itself. It is clear that CMH is deeply embedded in the natural world in order to provide their core offering, but also in the execution of all that this core offering entails.

Beyond an adventure travel company, CMH considers themselves a sustainable tourism company (D. Butler, personal communication, June 26th, 2012). This sustainable image is well represented and reflected in their history and long standing environmental ethic, but also in their industry leading sustainability reporting, efforts and commitment. This ethic was established at the birth of CMH in 1959 when founder Hans Gmoser instilled an appreciation of the sanctity of the natural world and decided to mitigate environmental impact by acknowledgement, understanding and treading lightly (CMH, 2007; CMH, 2010). Hans Gmoser's ethic evolved into a more robust sustainability profile in recent years that includes community and staff engagement and education, monitoring and establishment of objectives across several environmental aspects, and reporting through the Global Reporting Index (GRI). Though robust, industry leading and forward thinking, their environmental management and sustainability profile remains fairly traditional. As Hanson and colleagues (2012) observe, traditional environmental management systems and due diligence tools are not often attuned to the risk and opportunities involved with ecosystem services and ecosystem degradation. Traditional systems tend to deal with impacts rather than dependencies, risks instead of business opportunities, and certainly not how a changing environment will or may influence them. Therein lies the dilemma of properly considering the business risks and opportunities that are presented when taking on an ecosystem services perspective and trying to understand how a changing environment is affecting business, rather than understanding how business is changing the environment. Even beyond valuation of ecosystem services, which is by no means a precise science, it is the identification of business risks and opportunities that is likely of greatest value to companies and organisations at this stage in the ecosystem service discussion (C. Raudsepp-Hearne, personal communication, July 11th, 2012).

The ecosystem services discussion emerged slowly out of academia beginning in the late 1970s with Westman (1977) and it progressed through the 1980s and the early 1990s. However, the discussion was firmly established in the literature and put on the academic map in the late 1990's with Costanza et al. (1997) and Daily (1997) who led the way with their seminal works. These works became essential in the establishment of the Millennium Ecosystem Service Assessment and other publications such as *The Economics of Ecosystems and Biodiversity (TEEB)*. These reports, with their multi-faceted focus including that of the business perspective, began to resonate in the corporate world. The collaboration

between the World Business Council for Sustainable Development, Meridian Institute, and World Resource Institute that eventually resulted in the Corporate Ecosystem Service Review (ESR) provided a methodology for the corporate world to analyze their relationship with ecosystem services. Since the establishment of the ESR over 300 companies have used it to identify the risks and opportunities to their business associated with ecosystem services (WRI, 2012). Of the 300 companies that have conducted the ESR within their operations, not one can be categorized as being in the tourism sector, nor can they be categorized in the recreational, adventure, wilderness-based, or experiential tourism sectors (S. Ozment, personal communication, July 9th, 2012). As presented above, CMH is directly embedded in that natural world in many ways. The very existence of the company is tied to its place in nature. Whilst this is obvious in some ways, the risks and opportunities related to changing ecosystems and dynamic natural processes have yet to be studied in this context. The preliminary work for this thesis indicates that this is the case not only for CMH, but also within any company broadly considered to be part of the tourism industry. This knowledge gap presents an ideal opportunity to explore the relationship between ecosystem services and CMH, which will certainly have many implications within the broader industry. Pursuant to this, the main thrust of this study, as defined by the research question below, is to consider the opportunities and risks to CMH's business offerings through the lens of ecosystem services.

1.2 Research questions

In order to provide focus for this work, the study was guided by the following research question:

How and where does consideration of ecosystem services as they relate to the business model and daily activities of CMH reveal risks and opportunities for the organisation?

The following research tasks were established in order to address this specific research question:

- Task 1: Review the concept of ecosystem services, their relationship to businesses, and frameworks suitable for assessing or rationalising such relationships;
- Task 2: Delineate how the concept of ecosystem services is related to, or can be related to, the business offerings and activities of CMH;
- Task 3: Assess the risks and opportunities for CMH related to ecosystem services.

At the end of the thesis, the discussion shall also address the wider implications of using the ESR to consider ecosystem services within the broader tourism industry.

1.3 Scope and limitations

At its core, the focus of this study is on the relationship that companies have with the natural world. In recent decades, corporate considerations of the environment have concentrated on mitigating the impact of industry on the natural world. This study focuses on the inverse relationship, in particular how a changing natural world and ecosystem affects a company. The particular company of focus in this study is Canadian Mountain Holidays. Though they operate during both the summer and winter seasons, the core of their business is their winter heli-skiing operation. Although some of the outcomes relate to their summer operations, the primary focus of this study was their winter operations.

An organisation such as CMH, which operates across such a large geographical area, has a wide range of general and individual stakeholders who vary depending on the particular area in question. In this case, the stakeholders were considered, but were left outside the main thrust of the study, as stakeholders in the context of CMH's business are diverse and often geographically-specific. However, potential implications for stakeholders will be further discussed in section 8.2.

CMH's winter operations occur entirely in the Columbia Mountains of British Columbia, Canada. These mountain ranges are the primary geographical scope of this study, though some of the ecosystem services considered have a larger geographical scope and implication, such as global climate regulation and natural hazard mitigation. Although this study focuses on CMH's winter operations, a secondary consideration of the implications was conducted through a broader lens.

In some ways this study was enabled by the analytical framework used, namely the Corporate Ecosystem Service Review (ESR). At the same time, however, the author's capacity as an individual external researcher was limited in implementing the framework as designed. The ESR methodology was not designed for one person to carry out as an external study. Rather it was designed holistically, and intended to involve round tables and discussions from a wide range of perspectives coming from individuals or organizations such as business managers, NGOs, community groups, experts, consultants, local stakeholders, executives and much more (Hanson et al., 2012). Interviews or questionnaires are certainly a part of this process, but the central tool in carrying out the ESR is multi-stakeholder discussions, which the author did not have the time or capacity to carry out.

The large scope of this study, which covers a vast geographical area and a range of ecosystem services is limiting in that it requires a wide range of assumptions and leads to outcomes that may not be applicable to all aspects of CMH's core offering.

1.4 Audience

Due to the practical nature of this study and the focus on a particular case study, the primary intended audience is the management of Canadian Mountain Holidays. Also, due to the application of the ESR in this particular industry and in an academic context, the outcomes are relevant to those involved in the ESR, namely the World Business Council for Sustainable Development, the Meridian Institute and the World Resource Institute. Furthermore, the intended audience certainly extends into related industry associations. A study of this nature is also relevant for government decision makers, policy analysts and regulators, dealing with land use in British Columbia. This study should also have relevance to the broader tourism industry, especially those whose main offerings are embedded in the natural world.

2 Methods

This study began with the author's initial interest in the idea of ecosystem services as a new perspective on our collective relationship with the natural world. This interest provoked an initial and very general search for information regarding ecosystem services that revealed an extensive amount of literature and a relatively recent interest in ecosystem services across a range of governmental, academic and corporate bodies. Beyond further familiarisation with the topic, this provided the author with a preliminary, general understanding of the ecosystem service landscape and discussion.

With a desire to conduct a study that was applied, rather than purely theoretical, the author began brainstorming areas where ecosystem services are an obvious, but likely overlooked, factor. This eventually led to an initial exploratory email and introductory conversation with Dave Butler, Director of Sustainability at Canadian Mountain Holidays (CMH). Dave Butler was aware of the idea of ecosystem services, but it was not something that had been considered or applied within CMH, nor could they follow others who had applied these ideas in related areas. He was receptive to the idea of a study that further explored CMH's relationship with ecosystem service, and agreed to accept a proposal to further consider this study and relationship.

In light of CMH's willingness to explore these ideas, the author then began a more focused literature search in order to prepare a more informed proposal for CMH. This inspired the first targeted literature search (as detailed in section 2.1) on the topic. From this preliminary literature search, the author issued a proposal to CMH that further detailed a study. Included in this proposal was a brief background, along with an indicative focus problem, potential research questions, potential frameworks, data collection methods, anticipated results, potential benefits for CMH, and a timeline.

This proposal was accepted by Dave Butler and CMH, and the author was given the go ahead to design an appropriate study and move forward with it. CMH's supportive role throughout this study, primarily performed by Dave Butler, has included: (a) collaborating on framing and scoping the study, (b) providing background materials and information, (c) identifying appropriate internal and external interviewees, (d) hosting the author during the face-to-face exploratory interviews and, (e) answering the author's ongoing questions, queries, and fact checks throughout the process.

2.1 Phase 1: Literature search

Once the proposal was accepted, a more detailed and focused literature search was conducted. Both these literature searches covered the same initial topics, though the second was in-depth and explored the topics, authors, and precedents much further. The literature searched was primarily collected from Summon, the Lund University Library online database. Within Summon, several databases were more frequently utilised, including EBSCOhost, greenFILE (EBSCOhost), SciVerse Hub, ScienceDirect and Web of Knowledge. Searches for relevant information were performed using the following key phrases:

- 'Ecosystem services'
- 'Ecosystem services' + business
- 'Ecosystem services' + tourism
- Millennium ecosystem services assessment

- ‘Ecosystem services’ + ‘corporate sustainability’
- Ecosystem service valuation
- Ecosystem valuation
- Ecosystem valuation critique
- The economics of ecosystems and biodiversity, TEEB + business
- Ecosystem services framework
- Natural capital
- Industry + ‘ecosystem services’
- Nature’s services

This literature search revealed dozens of peer-reviewed journal articles, letters to the editor, books, book chapters, reports, book reviews, white papers, United Nations publications, and NGO publications that became the basis for the theory and ideas that informed this study. The author systematically chose relevant literature for this study by beginning with those most frequently referenced in the literature (i.e. Costanza et al., 1997; Daily, 1997; MA, 2005). From this point onwards, the literature chosen for the study was either foundational to the ecosystem service discussion, focused on ecosystem services in the business realm, or was especially relevant to one of the reviewed topics. Some of the literature originally chosen was disregarded due to its particular focus on an unrelated topic. Referenced in all the sources published post-2005 is the Millennium Ecosystem Assessment (MA), which essentially drew together existing ecosystem service concepts and established the predominant conceptual framework in regards to ecosystem services (see section 3.8 for an overview of the MA conceptual framework). Through the literature surrounding the MA, the author came across The Corporate Ecosystem Service Review (ESR) a business specific ecosystem services assessment tool with a focus on risk and opportunities. Though the ESR had never been used in an academic context, it is based on the concepts established by the MA and provides an ideal analytical framework for the assessment of an applied study such as this one. The ESR was chosen from amongst several other frameworks that addressed business risks, opportunities and strategies related to ecosystem services. The ESR was most suitable for this study due to its tested and evolved methodology that has been applied in over 300 real-world cases. The other frameworks that were initially considered were disregarded as they were less applied, more academic and had yet to be implemented in a practical setting. Furthermore, they seemed like a continuation of the on going jockeying within the relatively recent ecosystem services discussion within the academic realm. The choice of the ESR and the chronological history that motivated its existence is further discussed in section 4.1.

2.2 Phase 2: Exploratory interviews

Before engaging in the methodology established by the ESR, the author familiarized himself with CMH, their staff, their business operations, and relationship with the natural world by conducting a set of semi-structured exploratory interviews. The interviewees were chosen based predominantly on the role they played within CMH. The author was interested in interviewing individuals from different aspects of CMH’s operation. Each interview was structured according to the same questions, but each interview was unique and evolved differently as they were conducted with a variety of individuals occupying various roles within CMH’s operations. The following people were interviewed in the exploratory interview phase:

- Jori Guegt, Director of Hospitality Services
- Rick Carswell, Food and Beverage Manager

- Dave Butler, Director of Sustainability
- Todd Guyn, Mountain Safety Manager
- Bob Krysak, Retail Manager
- Erich Unterberger, Manager of Guiding Operations

2.3 Phase 3: Detailed review of the literature

Once a deeper understanding of CMH’s operations was achieved through the exploratory interviews, the author focused in on the relevant literature from the previous literature search and conducted a review of the relevant literature (as presented in section 3). This section served to understand the state of the ecosystem service discussion and review the concepts from which this work is built on. Furthermore, it helped delineate how these ideas will be applied to a new context.

2.4 Phase 4: Application of the Corporate Ecosystem Services Review

The ESR provides an analytical tool from which to conduct an analysis of the risks and opportunities of a given company’s operations based on ecosystem services. The MA conceptual framework has served as a basis for the ESR. In particular, the concepts and theories that have informed the definition of ecosystem services and the classification system conceived by the MA have been adopted throughout the ESR. The ESR methodology is broken down into five phases, which are presented and detailed further in Figure 2-1. Subsequently, each one of these phases, as conducted in this study, is further outlined below. It must be noted, however, that the fifth phase in this process was beyond the scope of this study.

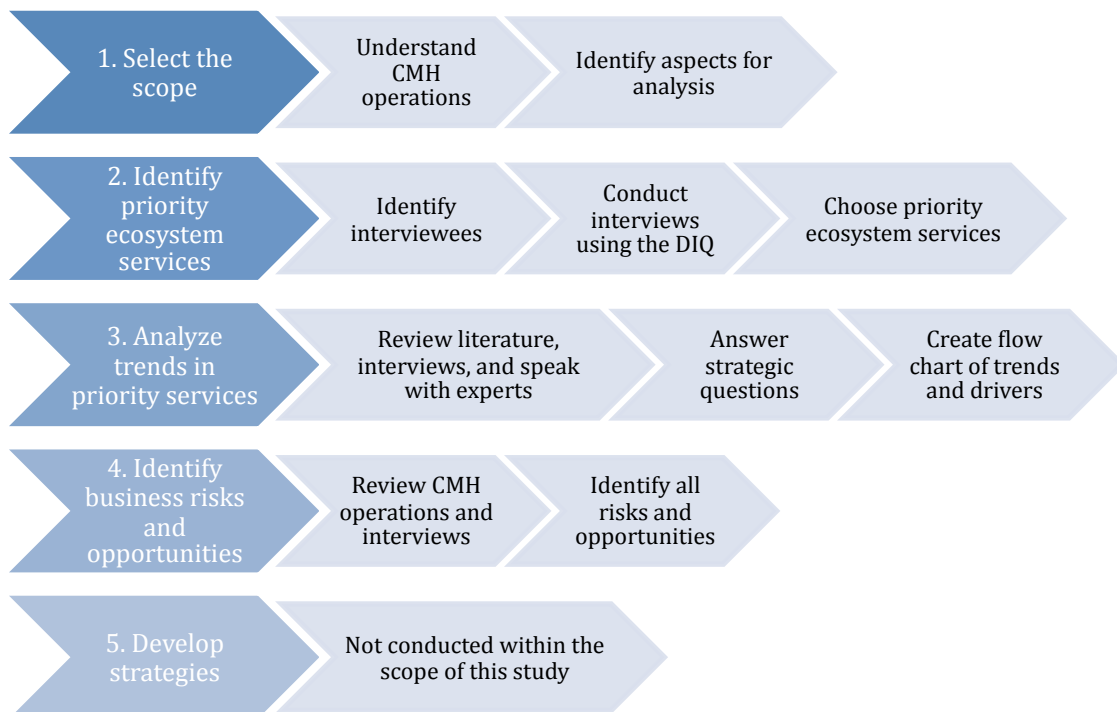


Figure 2-1 ESR expanded methodology

Source: Adapted from Corporate Ecosystem Services Review, Hanson et al. (2012)

2.4.1 Select the scope

Corporations can be large and complex entities. This stage is meant to define which part of a corporation the ESR will address in order to set the trajectory for the rest of the methodology. The scope of a corporation could consider one aspect of the operation, the entire operation, the supply chain, or the effects downstream at the customer level.

In order to identify the scope for this study it was imperative to understand CMH's supply chain, products and services, as well as all aspects of their operations. This information was revealed in the exploratory interviews and CMH's published information and reports. Ultimately, for the purposes of this study, the company's entire operation was selected as the scope for analysis within the ESR methodology. This requires further qualification and explanation, as there are some exceptions in this case. See section 1.3 for a more detailed outline of the scope.

2.4.2 Identify priority ecosystem services

This step is aided by the application of the ESR Dependencies and Impact Questionnaire (DIQ), a comprehensive tool developed specifically for the ESR (see appendix C for full DIQ). The ultimate objective of this step is the identification of 5-7 priority ecosystem services to be analyzed in the next step. This step typically addresses the entire scope of the study in one DIQ. The DIQ is a tool that can be conducted internally by managers and employees or by an external analyst, consultant, or in this case, by a researcher using an academic lens. The DIQ was designed as a set of up to five questions⁵ that get to the core of a company's dependence or impact on a given ecosystem service. These sets of questions are considered for each individual ecosystem service. Within the DIQ there is also an opportunity to provide a more narrative answer, explanation or qualification for each ecosystem service. The phases listed below were undertaken in indentifying priority ecosystem services.

The first phase involved the design of the questionnaire, which consisted of selecting interviewees and reviewing the questions and ecosystem services for potential modifications or additions. In this case the author selected five of the six interviewees from the exploratory interviews⁶ and made no significant modifications to the DIQ methodology.

The second phase consisted of conducting the DIQ. Instead of doing just one DIQ, the author chose to apply DIQ to the various aspects of CMH's operations represented by each individual interviewee. In this way the priority ecosystem services could be addressed as a part of a specific aspect of the operations, or they could be grouped to reflect the entire operation.

Built into the DIQ is the Dependencies and Impact Matrix (DIM), which essentially tabulates the results of the DIQ (See figure 6-1 for a completed and modified DIM). The DIM is a tool used to help identify priority ecosystem services, such as climate regulation or provisioning of freshwater, based on dependencies and impacts. In this case, the five DIM's were amalgamated into one DIM that presented the results side to side. From the amalgamated DIM, the author chose priority ecosystem services (see findings and

⁵ These are questions that can be answered YES, NO or ? (I don't know)

⁶ The only exclusion from the original interviewees was Bob Krysak, Retail Manager, because although retail is a part of CMH's operations, it constitutes a facet of the operation that is more focused on the upstream suppliers.

explanations in section 6) based on dependencies, as impacts were excluded from the scope of this study.

2.4.3 Analyze trends in priority ecosystem services

The third step in the ESR methodology serves to expand on the priority ecosystem services by identifying trends, direct drivers, indirect drivers, internal activities, and external activities for each of the ecosystem services. This step provides a foundation of knowledge from which to identify business risks and opportunities associated with the priority ecosystem services. The ESR lays out the following five strategic questions to help guide the analysis of trends and drivers:

- What are the conditions and trends in the supply and demand for the ecosystem service?
- What direct drivers underlie these trends?
- What is the company's contribution to these drivers?
- What is the contribution of others to these drivers?
- What indirect drivers underlie these trends?

In order to complete this step, the author reviewed relevant literature, revisited the exploratory interviews and the narrative aspects of the DIQ, and spoke to some experts in specific areas of interest. The results are presented in flow diagrams for each individual ecosystem service as presented in section 6.

2.4.4 Identify business risks and opportunities

The fourth stage of the ESR methodology is the core of the entire process as it is meant to identify business risks and opportunities related to a given offering. Evaluating the trends and drivers identified in the previous stage of the ESR completes this stage. The risks and opportunities that might arise due to these trends are broken down into five distinct categories: market and product, operational, regulatory and legal, reputational and financial (see section 4.1.3 for a more detailed description of these categories).

For the purposes of this study, this section was considered a part of the analysis (see section 7), as it addresses the core of the research questions initially posed. In order to identify risks and opportunities the author considered the trends and drivers' charts, exploratory interviews, DIQ interviews, CMH materials, and conversations with a select group of experts in various ecosystem service areas. This provided the author with a full picture of CMH's operations in order to assess the business risks and opportunities involved.

2.4.5 Develop strategies

This stage of the ESR was not completed in this study. It is not that strategies do not exist or are not important for CMH, but the development of strategies lies outside the scope of this study and are not integral to the research question guiding this work. These strategies can be completed in an auxiliary report for CMH outside this particular study.

3 The ecosystem service landscape

The following section is a review of the literature gathered using the methods presented in section 2. It provides a review of the ecosystem service discussion, as per the literature and focuses more intently on the definition and classification of ecosystem services, as well as the relationship to the business realm and tourism industry. The last section of this review focuses on the concepts established by the MA, as well as the MA conceptual framework, which serves as a basis for the analytical framework applied in this study.

3.1 Defining ecosystem services

In an attempt to define ecosystem services for their own work on this topic and to understand it in the context of decision making, Fisher et al. (2009) performed an in depth review of the literature pertaining to the definition of ecosystem services. A summary of the main points raised through their review of the literature is provided below for the purposes of this paper.

It is evident throughout the literature that the definition of ecosystem services is continually evolving and is not dominated by one widely accepted characterization. As continually mentioned, the Millennium Ecosystem Assessment (MA) established a new foundation out of which many of the academic and applied ecosystem service discussions have evolved since 2005. Wiek et al. (2011) present the MA as a peer-reviewed “classic” due to its analysis of complex systems across different domains; namely social, economic and environmental. As Fisher et al. (2009) point out, the MA is not an unwavering assessment document and was never intended to be static. Instead, it is inherently open to evolution and redefinition. This does not mean that the definitions considered in this analysis are competing or contrary, in fact many of them share the same ideas, words and general trajectory. Much of the differentiation represents a natural progression in such a youthful topic and field of study.

Fisher et al. (2009) demonstrate that the three most predominant and often cited definitions of ecosystem services come from of the Millennium Ecosystem Assessment and two of the academics who wrote some of the early scholarly works on ecosystem services, namely Costanza et al. (1997) and Daily (1997). In fact, it was these seminal works that inspired the MA definition. The three definitions offered by these various sources are as follows:

- Ecosystem services are the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life (Daily, 1997).
- Ecosystem services (which represent ecosystem goods and services) are the benefits human populations derive, directly or indirectly, from ecosystem function⁷ (Costanza et al., 1997)
- Ecosystem services are benefits people obtain from ecosystems (MA, 2005)

Though all of these definitions are pointing at the same idea, there is still a clear differentiation. The Millennium Ecosystem Assessment definition is simple, broad and overarching, and includes all the benefits that people might gain from ecosystems. In the MA

⁷ Costanza (1997) defines *ecosystem function* as refering to the habitat, biological or system properties or processes of ecosystems.

Framework for Assessment (2005) there is a more detailed definition of ecosystem services put forward, however the additions included in this definition are in fact part of the classification system, which will be reviewed later in this section. Daily (1997) and Costanza et al. (1997), on the other hand, include descriptive information in their definitions, presenting a more narrow perspective. Daily's (1997) definition centres around the 'conditions and processes' that 'sustain and fulfil human life', which alludes to the idea that it is the circumstances and actions of an ecosystem that are important to fulfil certain life-supporting functions. In this case Daily (1997) sees ecosystem services as that which helps sustain human life. Costanza et al. (1997) have a similar perspective as the MA (2005), where it is about the benefit to society, rather than that which sustains human life. Costanza is, however, more precise and presents ecosystem services as the goods and services provided by ecosystem function (Fisher et al., 2009).

The MA has essentially borrowed from these previous definitions to create a broad and simplified foundation from which to reconsider ecosystem services on a practical level. For example, in economic terms 'goods' and 'services' are commonly separate terms, whereas the MA has bundled 'goods', 'services' as well as 'cultural services' into one term called 'ecosystem services' (MA, 2003). The literature is beginning to reflect the dynamic nature of the MA and is addressing and redefining ecosystem services in various contexts and taking a closer look at what each element of the popular definitions actually mean. This has meant an analysis and comparison of terms such as *benefits vs. services* and *function vs. functioning*. One such definition comes from Boyd and Banzhaf (2007) who propose a definition that is rooted in economic principles. They maintain that ecosystem services are the components of nature directly enjoyed, consumed or used to yield human well-being. This definition excludes indirect processes and functions, as they are not directly consumed.

In some ways this reconsideration and redefining of ecosystem services is a natural progression in the academic realm, but for the purposes of this paper it would not be useful to pursue every variation on defining ecosystem services or reconceptualising what the embedded terms actually mean. Therefore, this paper will maintain the broad definition of ecosystem services provided by the MA, as it is more practical in nature and allows for a dynamic approach and wide understanding of what ecosystem services are. Furthermore, the MA has been accepted, by both those building on its definition and by the larger academic community, as a "classic" and foundational document (Wiek et al., 2011).

3.2 Classifying ecosystem services

Underlying any ecosystem service definition is an idea of how to classify these services. As with the definition, the classification of ecosystem services is an ever-expanding discussion, based on certain ideologies and contexts. It is the classification systems that actually begin to place ecosystem services into a system that then can interface with the real world.

The following section will provide an overview of ecosystem service classification schemes and critiques. As with the ecosystem service definition, there is no definitive solution. Ecosystem service classification is a difficult task, as ecosystems are dynamic, overlapping, and not necessarily fully understood systems. Yet, there has been healthy discussion and progress around the characterization and classification of ecosystem services into several practical and comprehensive schemes. As with the ecosystem services definition, there are classifications of ecosystem services that precede the MA, the MA, then the critique and reconceptualisation of the MA. This section will follow the same dynamic logic.

The MA (2003) succinctly lists various ways in which ecosystem services have been classified previous to its own classification model. The following are what the MA presents as different and preceding classification schemes:

- Functional groupings, such as regulation, carrier, habitat, production, and information services (Lobo 2001; de Groot et al., 2002);
- Organizational groupings, such as services that are associated with certain species, that regulate some exogenous input, or that are related to the organization of biotic entities (Norberg, 1999); and
- Descriptive groupings, such as renewable resource goods, non-renewable resource goods, physical structure services, biotic services, biogeochemical services, information services, and social and cultural services (MA, 2003; Moberg & Folke, 1999)

The Millennium Ecosystem Assessment classification system drew from the above works and ultimately classified the various ecosystem services by function. As demonstrated in Table 3-1, the MA classifies ecosystem services in four categories; provisioning services, regulating services, cultural services and supporting services. The first three service classifications have a direct relation to humans, whereas the supporting services are generally those necessary for the production and function of all other ecosystems and therefore do not directly impact humans (MA, 2003).

Table 3-1 MA Ecosystem service classification

Provisioning Services	Regulating Services	Cultural Services
<i>Products obtained from ecosystems</i>	<i>Benefits obtained from regulation of ecosystem processes</i>	<i>Nonmaterial benefits obtained from ecosystems</i>
Food	Climate regulation	Spiritual and religious
Fresh water	Disease regulation	Recreation and ecotourism
Fuel wood	Erosion regulation	Aesthetic
Fibre	Water regulation	Inspirational
Bio-chemicals, natural medicines, pharmaceuticals	Water purification	Educational
Genetic resources	Pollination	Sense of place
Ornamental resources	Natural hazard regulation	Cultural heritage
	Pest regulation	
Supporting Services		
Services necessary for the production of all other ecosystem services		
Soil formation	Nutrient cycling	Primary production
		Photosynthesis
		Water cycling

Source: Adapted from MA (2003), MA (2005a)

As with the ecosystem service definitions, the classification system found in the MA (year) is foundational, and has since been critiqued and built upon. Costanza (2008) articulates that the dynamic complexity of ecosystems and the innate characteristic of ecosystem services inherently require several different types of classification schemes (as cited in Fisher et al., 2009). Fisher et al. (2009) build upon Costanza (2008) by cautioning against attempts to classify ecosystem services in one overarching system.

Wallace (2007) deconstructs the MA classification system and definition. Based on the MA’s definition of ecosystem services outlined above, where ecosystem services are defined as the benefits people obtain from ecosystems, Wallace (2007) suggests that the services provided by the MA are not coherent services. Rather, the proposed services such as pollination, erosion regulation and air quality regulation are the processes involved in providing a service, not an actual service in and of themselves. For example, an ecosystem’s ability to regulate air quality is not the service; rather it is the process that will ultimately provide the service, which is effectively clean air.

Wallace (2007) then goes on to propose a more effective classification of ecosystem services, which draws from the MA (2005), but is distinctive in that Wallace’s classification system is categorized by human values and ecosystem services as goals or deliverables of the ecosystem’s processes. An annotated example of Wallace’s classification are presented in Table 3-2.

Table 3-2 Example of Wallace's classification system

Category of human values	Ecosystem services – experienced at the human level	Processes and assets that deliver the ecosystem service
Adequate resources	Food Potable water Oxygen	Biological regulation Climate regulation Pollination
Benign physical and chemical environment	Temperature Moisture Light Chemical	Production of medicines Waste regulation and supply Production of raw materials Disturbance regimes
Socio-cultural fulfilment	Spiritual/philosophical contentment Aesthetics Recreation/leisure	Nutrient regulation Sustaining ‘beauty’ of landscape Etc.

Source: Adapted from Wallace (2007)

Wallace’s problematisation of the MA classification model and proposed classification model demonstrates an attempt to clearly separate means (processes) and ends (services) when classifying ecosystem services. This approach certainly has value and is an attempt to build on the MA, but it does not come without its own critique. In two separate letters to the editor of the journal that published Wallace (2007), Costanza (2008) as well as Fisher and Turner (2008) address the flaws in Wallace’s classification system. Costanza (2008) contests Wallace’s classification system as only being relevant in a linear world with crisp boundaries, but not suited to our dynamic and messy world full of complex and adaptive systems with non-linear feedbacks. Costanza then moves on to propose two classification systems; the first is based on spatial characteristics, (e.g. – proximity, point of use, and directional flow). The second is based on excludability and rivalness, which is somewhat complex and need only to be mentioned. Fisher and Turner (2008) take the opportunity to rebut not only Wallace’s classification system (2007), but also Boyd and Banzhaf’s (2007), as well as the MA (2005), saying that none of them work hard enough for us, humans. They support Wallace’s (2007) perspective that the MA (year) confuses means and ends, but also criticize Wallace for being too focused on managing landscapes and ecosystems to deliver services. They go on to

define their own classification system, drawing heavily from Wallace (2007), Boyd & Banzhaf (2007), and the MA (2005). The ongoing academic ecosystem services discussion is attracting more and more participants, both in listening and discussing roles. There isn't, however, enough being written for those applying an ecosystem services perspective in a given area. Much of the intensification of this discussion is focused on jockeying for the proper definition or the right classification system (C. Raudsepp-Hearne, personal communication, July 11th, 2012). This paper does not intend to crown a victor in this post MA (2005) jockeying, but the author feels the need to present this due to its importance for the future of the ecosystem services discussion.

The intention of this literature review was not to detail all the proposed classification systems or definitions. Rather, it was meant to demonstrate the breadth of new thinking and the evolution of the concept of ecosystem services. What has become clear through a review of the literature is that the MA (2005), as a heuristic document (Fisher & Turner, 2007; Fisher et al., 2009), is a strong foundational document and serves the purpose of this analysis. The MA (2005) is well thought out, thoroughly peer reviewed, widely used, and as such, is a defining document. But it also provides leeway to consider ecosystem services through different lenses and has provided a venue for furthering the ecosystem service discussion and agenda.

3.3 The Millennium Ecosystem Assessment

This section will provide a background on the Millennium Ecosystem Assessment as a solid foundation for the discussions on ecosystem services that have taken place since its publication. From this conceptual foundation of assessing human well-being and its relationship to ecosystems, many ideas and frameworks for more specific explorations were developed, such as The Economics of Ecosystems and Biodiversity (TEEB) and the Corporate Ecosystem Service Review (ESR).

3.3.1 Development of the Millennium Ecosystem Assessment

In 2001, in light of the Millennium Report to the United Nations (UN) General Assembly, the UN Secretary General, Kofi Annan, called for a comprehensive global assessment of the world's ecosystems. This was the birth of the Millennium Ecosystem Assessment (MA). The MA is a study conducted by over 1300 experts from 95 countries between 2001 and 2005. The thorough and holistic approach of the MA is evidenced by the fact that it was established with the participation of governments, the private sector, nongovernmental organizations, and scientists, and conducted on multiple scales, such as local, regional, watershed, national and global scales (Layke et al., 2012; MA, 2003; MA, 2005a).

The ultimate goal of the MA was to assess the relationship between ecosystem change and human well-being⁸ in order to establish a scientific basis for the way forward regarding our interactions with ecosystems (MA, 2005a). A particular focus throughout the MA was on ecosystem services, which is further discussed and defined within the context of the MA in section 3.3. Though the MA was realized in several reports, synthesis reports, subject particular reports (i.e. – Business & Industry, Biodiversity, Health, etc.), follow-up reports, and academic papers, the following five overarching questions underpinned the entire trajectory of the MA:

- What are the current conditions and trends of ecosystems, ecosystem services, and human well-being?

⁸ The constituents of human well-being, as per the Millennium Ecosystem Assessment, can be found in Appendix A

- What are plausible future changes in ecosystems and their ecosystem services and the consequent changes in human well-being?
- What can be done to enhance well-being and conserve ecosystems? What are the strengths and weaknesses of response options that can be considered to realize or avoid specific futures?
- What are the key uncertainties that hinder effective decision-making concerning ecosystems?
- What tools and methodologies developed and used in the MA can strengthen capacity to assess ecosystems, the services they provide, their impacts on human well-being, and the strengths and weaknesses of response options? (MA, 2005a, p. viii)

These overarching questions point to the various aspects of the relationship between ecosystems and human well-being. This relationship is demonstrated in Chopra et al. (2005) who write “the MA posits that people are integral parts of ecosystems and that a dynamic interaction exists between them and other parts of ecosystems, with the changing human condition driving, both directly and indirectly, changes in ecosystems and thereby causing changes in human well-being” (p. vii). The MA (2005a) points to three main problems with our management of ecosystems that are currently causing harm to human well-being, which will continue to cause harm and diminish the long-term benefits that we gain from ecosystem function. The first is that approximately 60% of the ecosystems services examined by the MA are currently being degraded and used unsustainably. The study points to the fact that this degradation is unsustainable and escalating. Secondly, the degradation of ecosystems, and therefore ecosystem services, is potentially nonlinear, meaning that they are accelerating, abrupt and degradation may be irreversible. Thirdly, the harmful effects of ecosystem service degradation are being disproportionately borne by the world’s poor, furthering inequities (MA, 2005b). Beyond identifying the problems currently facing us in considerations of ecosystems and ecosystem services, the MA (2005) ultimately had the following four main findings:

1. Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fibre, and fuel. This has resulted in a substantial and largely irreversible loss in the diversity of life on earth. (MA, 2005a, p.1)
2. The changes that have been made to ecosystems have contributed to substantial net gains in human-well being and economic development, but these gains have been achieved at growing costs in the form of the degradation of many ecosystem services, increased risks of nonlinear changes, and the exacerbation of poverty for some groups of people. These problems, unless addressed, will substantially diminish the benefits that future generations obtain from ecosystems. (MA, 2005a, p.1)
3. The degradation of ecosystem services could become significantly worse during the first half of this century and is a barrier to achieving the Millennium Development Goals⁹. (MA, 2005a, p.1)

⁹ Millennium Development Goals are a set of goals established by all 193 UN member nations, who have agreed to achieve these by 2015. These goals are (1) eradicating extreme poverty and hunger, (2) achieving universal primary education, (3) promoting gender equality and empowering women, (4) reducing child mortality rates, (5) improving maternal health, (6) combating HIV/AIDS, malaria, and other diseases, (7) ensuring environmental sustainability and, (8) developing a global partnership for development (UN, 2012)

4. The challenge of reversing the degradation of ecosystems while meeting increasing demands for their services can be partially met under some scenarios that the MA has considered, but these involve significant changes in policies, institutions, and practices that are not currently under way. Many options exist to conserve or enhance specific ecosystem services in ways that reduce negative trade-offs or that provide positive synergies with other ecosystem services. (MA, 2005a, p.1)

As mentioned in section 3.1, the MA is a classic, dynamic and foundational document, not meant to be static, but meant to evolve and be built upon (Fisher et al., 2009; Wiek et al., 2011). Within the MA Synthesis Report (MA, 2005a) this dynamic nature is evident with the following listed intentions: identify priorities for action, benchmark future assessments, to serve as a framework and assessment tool, to gain foresight in ecosystems decision making, to identify response options to achieve human development and sustainability goals, build institutional and individual capacity for integrated ecosystem assessment and action, and to guide future research. This has indeed been representative of how the results and framework of the MA have been applied, are currently being used, and will continue to be used as tools in a variety of contexts.

3.4 Ecosystem services on the business landscape

In 1977, when Westman (1977) asked *how much are nature's services worth?* the business community began the slow process of perking its ears up to listen and contemplate these questions. Though the nature of the question might call for a monetary valuation, and this thesis will not be providing a valuation of nature's services¹⁰, the question remains relevant. This section will explore select literature regarding the ongoing relationship of business to the idea of ecosystem services and how they might play into the current business model.

Hawken (2010) believes that we, as a society, should rethink the nature of business' interaction with the natural world. He cautions that if business maintains the notion that it can draw from the natural world without any constraint in order to achieve the objectives of commerce, then it will destroy the foundation that society depends on. He asserts that although business has taught us an effective form of human organization, it does not necessarily preserve the natural world, which is essential for our well-being. With this thinking, Hawken (2010) is demonstrating our societal dependence on the natural world and the services it provides, but also how business is playing an integral part in compromising these services. He then calls for a rethinking of our economic system towards a restorative economy that does not transform human nature, but does call upon business to be an ethical act that mimics the dynamic, complex, and efficient self-sustainment of the natural world.

Although Hawken's (2010) call for a change in business may seem lofty to some, it does touch upon a fairly logical notion. Houdet et al. (2012) are more precise and applied with their analysis and discuss new business strategies and considerations when it comes to Biodiversity and Ecosystem Services (BES)¹¹. They discuss how a business' interdependencies on BES may bring about new business strategies and practices. They begin by assessing the current state of BES considerations within the business world – a world that recognizes the importance of BES, but currently engages in practices of mitigation as a strategy for no-net-loss, an approach that restricts a business' perspective on ecosystems to

¹⁰ Nature's services are now commonly referred to as ecosystem services

¹¹ It must be noted, that due to the The Economics of Ecosystems and Biodiversity (TEEB) report (2010), ecosystem services and biodiversity are often grouped together in the business and economic realms.

that of managing their perceived negative impacts. Houdet et al. (2012) challenge this perspective and practice by demonstrating that there is an increasing awareness that BES are associated with raw materials, products, and sources of new technology. They make the connection that going beyond a mitigation approach regarding ecosystem services can become an integral part of a business plan and core decision making, as well as a source of new assets, liabilities, skills, technological and organizational innovations. Further, Tallis et al. (2008) mention that a simple appreciation for ecosystem value in the present will lead to increased incentive to invest in this area to prevent payments for substitutes in the future. This is evident in the number of companies, industry groups, and organizations that are now publishing materials and promoting a strategic approach towards ecosystem services. Further evidence of this is that over 300 companies have used the Corporate Ecosystem Service Review (ESR) (Hanson et al., 2012). Selected examples of the business world's new relationship with ecosystem services are listed below:

- Deloitte, *The Ecosystem Marketplace*: Deloitte is a global professional services firm that published this white paper to present potential risks and opportunities, information on the emerging ecosystem services market, and preparation for future environmental change that relates to business (Deloitte, 2009).
- Canadian Business and Biodiversity Program: This is a partnership between government, business, NGOs, and academia in order to address biodiversity and ecosystem services in the Canadian business world (CBBP, 2010).
- KPMG, *Sustainable insight: The nature of ecosystem service risk for business*: KPMG, a global professional firm network, published this report to address the relationship between business and ecosystem services, and how to turn risks into a competitive advantage (KPMG, 2011).

Although Houdet et al. (2012) demonstrate that BES are increasingly on the radar of the business world, there still need to be standardized measurement protocols for assessing the risks and opportunities of BES within business. Similar to the defining and classifying of ecosystem services, this is a relatively recent and on-going discussion that will continue to evolve and be challenged before it is firmly established in the business world and academia.

Although the MA (2005) does indeed address the business aspects of ecosystem services and established a basis through the publication of Millennium Ecosystem Assessment Opportunities and Challenges for Business and Industry (MA, 2005b) report (MAB), it is really *The Economics of Ecosystems and Biodiversity* (TEEB, 2010) report that explores the detailed business considerations of ecosystem services. Built upon the foundation of knowledge provided by the MA (2005), TEEB (2010) specifically focuses on the relationship between business and ecosystem services. As Ring et al. (2010) point out, TEEB draws international attention to the global economic benefits of biodiversity and the impacts of ecosystem degradation. It does not necessarily provide new methods or techniques, but much like the MA (2005), it brings together ideas from the political, environmental and economic realms to synthesise the current state of knowledge and provide a foundation for evaluation and practical progress. It is also similar to the MA in that it is widely used and thoroughly peer reviewed (Ring et al., 2010).

3.5 Ecosystem services: an industry perspective

In 1997, Costanza et al. (1997) estimated that the annual value of 17 ecosystem services for 16 biomes was an average of US\$33 trillion, which represents an amount larger than annual

global gross domestic product (GDP) (as cited in Costanza et al., 2011). An exact number is difficult to assess, because as with many ecosystem services, a valuation model is context specific. Needless to say, the valuation of worldwide ecosystem services is staggering. No matter if it is more or less than Costanza et al. (1997) demonstrate, it is obvious that ecosystem services play a significant role in our economy, across all industries. Whether obvious to a specific company or not, most companies have a dependence on the natural world. This dependence can be direct, as an input for production, or it could be indirect, operating through investments, supply chain, marketing, distribution, or production (TEEB, 2010b). In order to provide some perspective, the following are some estimated values associated with ecosystem service across various industries and economies:

- The cost of inaction regarding ecosystem degradation and biodiversity loss is estimated at €50 billion annually for land-based ecosystems within Europe (Braat & ten Brink, 2008, as cited in Strobe, 2009)
- Environmental News Service (2005) published estimates that non-native invasive species cause economic losses of US\$1.4 trillion per year worldwide, \$137 billion in the USA alone and \$49 billion in Brazil (Hanson et al., 2012)
- The estimated market size for certified forest products in 2020 will be US\$15 billion and US\$50 billion in 2050 (TEEB, 2010a)
- The total annual natural capital value for British Columbia's lower mainland is estimated at CDN\$5.4 billion. The three main values are CDN\$1.7 billion for climate regulation, CDN\$1.6 billion for water supply, and CDN\$1.2 for flood protection and water regulation (Wilson, 2010)
- Deforestation and ecosystem degradation of the Brazilian Amazon reduces global carbon sequestration capacities with an annual estimated value at US\$1.5 – 3 trillion (Killeen & Portela, 2010)

Appendix B demonstrates the MA's representation of ecosystem services across a geographical spectrum. Though not specifically expressed, this figure also provides potential insight into how various industries, across the geographical landscape, may be affected or benefit from ecosystem services.

The story of Vittel water (Box 3-1) is illustrative of how ecosystem service and ecosystem degradation can directly affect a company's bottom line. This is just one of many cases that have been used to demonstrate the ecosystem-related risks and opportunities.

Box 3-1 - The Story of Vittel

In 1882, the Vittel brand was created and began bottling and selling natural mineral water from the "Grande Source" in North-Eastern France. French legislation is strict when it comes to bottled water and labels. In order to be called 'natural mineral water', the water must be stable in its composition, from a specific well-protected source, and bottled at the source. In order to maintain the Vittel label, the water must not contain any pesticides or more than 4.5 mg of nitrate without any treatment, and if the stability of these amounts changes then the company would risk the 'natural mineral water' label and therefore the well established Vittel brand and reputation.

In the 1980's, the de la Motte family, the then owners of Vittel (it has since been purchased by Nestlé Inc.) noticed that the nitrate levels in the water were rising towards the maximum limits allowed. They realized that the farmers in the catchment had transitioned from hay-based cattle ranching to maize-based farms and were increasing their animal stocks and limiting their range. The increase in nitrate was due to the leaching of fertilizer and animal waste into the source because the maize fields were barren in the winter, whereas the hay and native vegetation in the fields had previously filtered the waters.

The lack of previous ecosystem function put a century old source and business at risk. The company eventually incentivised change in the farming practices and land-use amongst the farmers, which can be categorized as a payment for ecosystem services (PES). (Perrot-Maitre, 2006; Hanson et al., 2012)

3.6 Ecosystem service: a tourism perspective

The previous section related ecosystem services to a wide array of industries and economies. It provided general examples of how these relationships are realized in monetary and practical terms. Although ecosystem-related valuations, business opportunities and risks can generally be applied to the industrial complex, it is important to present the ideas emerging from the literature under the umbrella of 'tourism': tourism, ecotourism, adventure tourism, recreational tourism, adventure travel, sustainable tourism, sport, experiential, and wilderness. CMH considers themselves a sustainable tourism company, but the literature and ideas can be applied generally across the tourism sector. This section will explore how the tourism industry relates to ecosystem services.

Recreation and tourism activities often take place outside or in a natural environment, and this is where many people directly interact with and engage with ecosystems and ecosystem services. Moreover, there is an opportunity to connect people to their ecosystems and promote ecosystem-related conservation and knowledge (Daniel et al., 2012). This interaction is generally viewed in two divergent ways. The first is that in the field of conservation biology, recreation and tourism have been considered a threat due to wildlife disruption and habitat fragmentation (Liddle, 1997; Reed & Merenlender, 2008 as cited in

Daniel et al., 2012). Furthermore, offsite impacts caused by travel and infrastructure are also associated with the negative impacts of tourism (Weaver, 2006; Krippendorf, 1989 as cited in Daniel et al., 2012). The alternate perspective is that recreation and tourism provide a vast amount of benefits, including physical health, exercise, inspiration, intellectual and spiritual stimulation, aesthetic experiences, and other contributions to physical and psychological well-being (Bowler et al., 2010; Chan et al., 2011, Dustin et al., 2010). This perspective, where tourism and recreation are beneficial in a variety of ways, is prevalent in the literature, as well as in our experiences as humans. The literature also points to the importance of natural places and spaces as an important factor in the value of an experience. Adamowicz et al. (2011) remark that environmental attributes at a tourism destination can be positively correlated with visitation rates and the value of the destination, and that the value of a site will increase with an increased quantity and quality of these environmental attributes. Towner and Wall (1991) demonstrate that this is not a new idea and that even the earliest literature regarding tourism emphasized the environmental quality of a site as being an important and contributing factor (as cited in Adamowicz et al., 2011).

It is evident throughout the literature that in some cases tourism is considered a threat to the environment, but also that the environment is considered an attribute in tourism, thereby providing incentive and a venue for conservation. Either way, there is certainly a complex relationship between the natural world and tourism. Clearly, when considering tourism through the lens of ecosystem services, there are both opportunities and threats present in all situations.

Box 3-2 - The Il'Ngwesi Ecolodge:

Kenya's Maasai culture is inherently tied to their land. In the early 90's the cattle rustling, poaching, and governmental pressure to subdivide and develop their land was threatening their land and culture. They decided to set aside 80% of their land as a wildlife conservation and established the Il'Ngwesi ecolodge to promote tourism in the area. Since the establishment of the lodge and the wildlife conservation area, the biodiversity once present in the area has returned, including the endangered Grevys zebra, and some wildlife populations have increased as much as 500%.

In this case, the Maasai people essentially leveraged the cultural, spiritual, and intrinsic services provided by this ecosystem to promote biodiversity and various other ecosystem services. Tourism does not always turn out this way, but in this case they found a balance where the various ecosystem services are self-perpetuating. (Tallis et al., 2008; Il Ngwesi, n.d)

3.7 Review of ecosystem service valuation

Westman (1977) initiated the discussion around valuing the natural world and the services it provides to humankind. Gómez-Baggerthum et al. (2010) provide an overview of the historical development and evolution of ongoing discussion regarding ecosystem service valuation. The literature on valuation is extensive and takes place in the environmental, philosophical, economic, and political realms. Though this paper will not be assessing the monetary valuation of ecosystem services, it is indeed important to present this idea as it is not only a next step and an important part of the ecosystem service discussion, but

ecosystem valuation underpins this entire subject area. Many authors have explored the valuation of the natural world (Daily, 1997; Daily et al., 2000; Costanza et al., 1997; Westman, 1977).

The valuation of ecosystems and therefore ecosystem services is a complex task for many reasons. As with much of the discussion surrounding ecosystem services, there is not a consensus on if, why or how ecosystems should be valued. In some regards it is a difficult task because the nature of valuation means that one must consider a complex, dynamic, not elusive system, namely an ecosystem, within a human created framework, namely value. Deconstructing the idea of value without considering complex ecosystems is a large task in itself. Goulder & Kennedy (2011) describe our approach in deriving value from the natural world as anthropocentric in that we value that which provides utility (or well-being) to humans.

3.7.1 Natural capital

Important to the valuation discussion is the idea of natural capital, as it is natural capital that is of value and ultimately provides ecosystem services. Hawken, Lovins and Lovins (1999) define natural capital as including “all the familiar resources used by humankind”(p. 2) such as “water, minerals, oil, trees, fish, soil, air, etcetera” (p.2). Hawken et al. (1999) go beyond the traditional perspective of capital and say that a properly functioning economy needs four types of capital, including human capital, financial capital, manufactured capital and natural capital. Costanza et al. (2011) maintain that these types of capital are interconnected and necessary in complex combinations in order to realize human benefits.

3.7.2 Valuation methods

Actual valuation methods are discussed in Goulder and Kennedy (2011), Salles (2011) and Costanza et al. (1997). Constanza et al. (2011) point at two general types of valuation categories, the first is revealed preference, which involves an analysis of individuals’ choices and preferences in real world settings and inferring value from this analysis. The second is stated preference, which are responses to hypothetical situations that involve ecosystem services.

Table 3-3 Valuation methods for ecosystem services

	Revealed Preferences	Stated Preferences
Direct Methods	Monetary valuation at market prices, avoided costs, cost of restoration/replacement	Contingent valuation
Indirect Methods	Prevention or protection expenditures, travel costs, hedonic pricing	Contingent ranking, comparison by pairs, joint analysis: choice experiment, choice modelling

Source: Adapted from Salles (2011)

3.7.3 Limitations of ecosystem service valuation

Putting value on something that is very conceivably priceless is not the only problematic part of the valuation of ecosystem services. This section will discuss other such limitations to the anthropocentric notion of value and attempts to place a monetary value on nature.

Spash (2008) and Turner (2007) indicate that economic valuation can be difficult to conduct when regarding ecosystem services for several reasons. First off, ecosystem services depend on complex and dynamic conditions that are difficult for people to grasp. Secondly, preferences for certain services, depending on the context and an individual's relationship to that service, be it a cultural or provisioning service, reflect altruistic or other ethical motivations (Wainger & Mazzotta, 2011). Costanza (2008) also speaks to these limitations by adding that the general population's understanding of the world, especially in regards to ecosystem services, is limited, and that the majority of ecosystem services will not be regarded by the greater part of the population.

Wainger & Mazzotta (2011) caution against relying too heavily on monetary valuation of non-market goods, such as ecosystem services, without understanding the inherent limitations of this process. They assert that there are two main limitations when valuing ecosystem services. The first is the inability to assign robust values for ecosystem services (especially non-use services) and the second is the lack of information to properly address valuation and benefits across spatial boundaries (Wainger & Mazzotta, 2011).

Dr. Ciara Raudsepp-Hearne suggests that although decision makers want a monetary valuation, the science behind ecosystem valuation is not particularly precise at this point in time, and a narrative explanation of value associated with ecosystem services is likely more important and valuable for decision makers within entities considering ecosystem services (personal communication, July 11th, 2012).

3.8 Conceptual foundations

The concepts underpinning the ecosystem services discussion were established early on by the early academics discussed above in the section regarding ecosystem service definitions, namely Daily (1997) and Costanza (1997). These works set the foundations for the ideas that are thoroughly explored and presented in the MA, which then became the foundation from which to explore ideas related to ecosystem services. Presented below is the conceptual framework established by the MA, which then provided a basis from which much of the ecosystem service discussion has been built upon, including the analytical framework used in this paper.

3.8.1 The Millennium Ecosystem Assessment conceptual framework

The MA has arguably contributed more knowledge regarding ecosystem services than any other undertaking. Having said this, one of its greatest accomplishments is the larger discussion and research that it provoked and enabled. Naidoo et al. (2008) and Rangathan et al. (2008) maintain that the MA built interest in an ecosystem services approach to address the relationship between economics, humans and ecosystems, and that since the publication of the MA, researchers and decision-makers have been furthering the development of these approaches (as cited in Layke et al., 2012). This is evident in how widely referenced and utilised the MA is throughout the literature. It is not only the findings of the MA that have been influential, but the conceptual framework that underpins that MA that has provided, and continues to provide, such fertile ground for new ideas and thinking.

The overarching questions and findings of the MA address human well-being and its relationship with ecosystems and ecosystem services. The focus of this paper is primarily concerned with the business realm. It is the Millennium Ecosystem Assessment Conceptual Framework (MA, 2003) that ultimately established the foundations from which to address ecosystem services through a business perspective as the framework underlying the entire

MA and all its research areas. It is this conceptual framework that in part established the foundation for the creation of the analytical framework used in this study.

Figure X outlines the conceptual framework developed by the MA. Although the findings and fundamental questions in this document address human well-being, the MA framework is entirely open to include a wide range of factors that ultimately contribute to the idea of human well-being, including economic, socio-political, security, health, and other factors. Furthermore, this conceptual framework established the base for a comprehensive understanding of the complex interconnections related to ecosystem services. Also, as demonstrated in section 3-2, the classification system outlined by the MA established the norm, which has since been expanded upon and critiqued. It is this framework that serves as a basis for much of the work, literature and other such reports that follow the MA, including the analytical framework that is used within the paper.

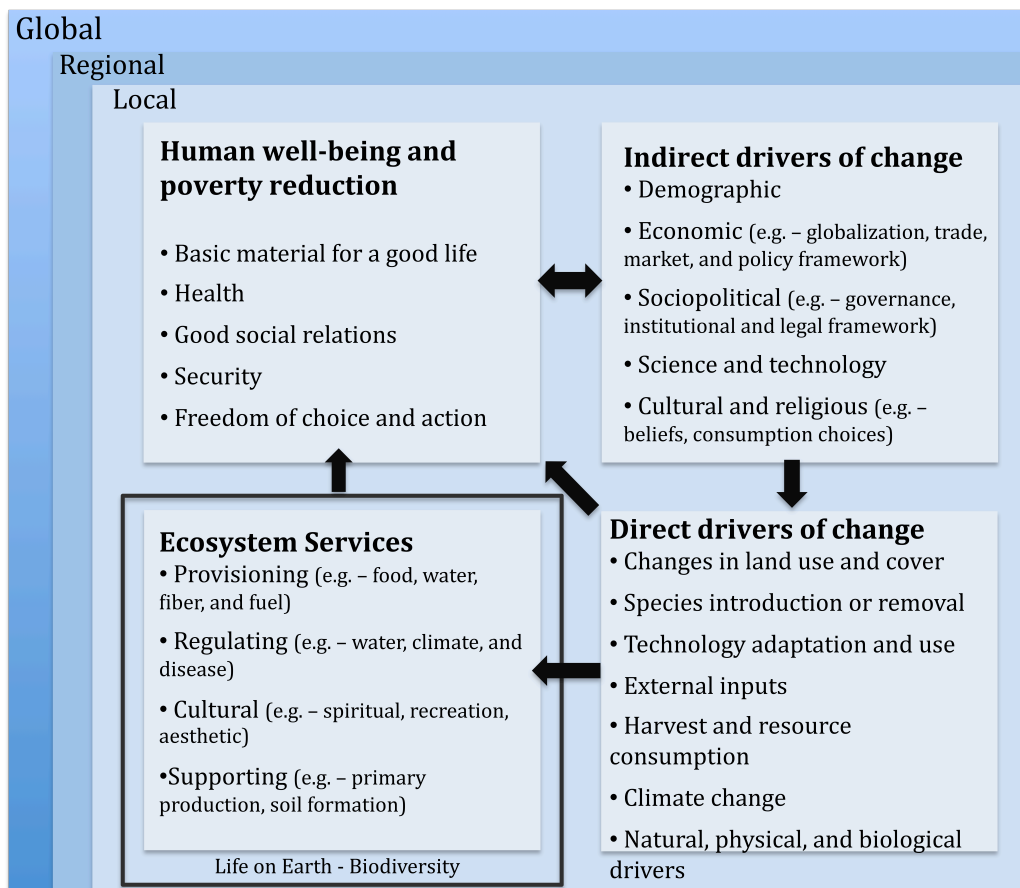


Figure 3-1 Millennium Ecosystem Assessment conceptual framework

Source: Adapted from Chopra et al., 2005; MA, 2005; MA, 2005a

The MA conceptual framework (Figure 3-1) considers interactions not just at one scale, or cross scales, but provides a platform to consider a multitude of interactions between indirect drivers, drivers and ecosystem services, and ultimately how they might affect human-well-being (MA, 2005). Moreover, it allows for an analysis of interactions between factors might improve human well-being, but be destructive to ecosystem services, and vice-versa. For example, a new farming technology might be able to increase farming yields for a specific crop, but at the same time be detrimental to soil-based bacterial communities that serve a

wide range of ecosystem functions, including the long-term health of that specific crop, soil fertility, etc.

Not only did the MA provide a foundation from which to build the discussion regarding ecosystem services and the design of the ESR as an analytical framework, but it also serves as a reference document through the entire ESR process. The MA Current State and Trends (MA, 2005c) document is likely the most thorough exploration of ecosystems status and trends. It details the current state and trend of all the identified ecosystem services presented in the MA. The concepts and ideas presented in this MA publication serve as a reference for further ecosystem services assessments and considerations. It is thorough and approaches the individual ecosystem services from a variety of perspectives.

3.8.2 The Millennium Ecosystem Assessment on business

The Millennium Ecosystem Assessment Opportunities and Challenges for Business and Industry (MA, 2005b) report (MAB) was published concurrently with the MA. MAB utilises the MA conceptual framework to present the MA findings through a business perspective. The MAB presents the MA through a business lens, stating that it “provides a benchmark for public policy, public awareness, and the private sector; it will influence investments, the regulatory climate, and public opinion at national and international levels” (MA, 2005b, p.2). The business perspective in the MAB provides three main insights into how the findings of the MA, particularly the assertion that two thirds of the world’s ecosystems are being degraded or used unsustainably, will have serious impacts on business and industry (MA, 2005b). These ramifications have been outlined in three principal ways:

1. If current trends continue, ecosystem services that are freely available today will cease to be available or become more costly in the near future. Once internalized by primary industries, additional costs that result will be passed downstream to secondary and tertiary industries and will transform the operating environment of all businesses (MA, 2005b, p.2)
2. Loss of ecosystem services will also affect the framework conditions within which businesses operate, influencing customer preferences, stockholder expectations, regulatory regimes, governmental policies, employee well-being, and the availability of finance and insurance (MA, 2005b, p.2)
3. New business opportunities will emerge as demand grows for more efficient or different ways to use ecosystem services for mitigating impacts or to track or trade services (MA, 2005b, p.2)

These three points are the foundations that the MA established for the relationship between business, industry and ecosystem services. This groundwork served as a basis for other such works, in particular the Economics of Ecosystems and Biodiversity (TEEB, 2010) and the Corporate Ecosystems Service Review (ESR), which are both used significantly within this paper. TEEB was utilised in this study as a reference and foundational document to specifically address business and ecosystem services, while the ESR was employed as an analytical framework from which to assess the business risks and opportunities within this specific case study.

3.8.3 The Economics of Ecosystems and Biodiversity (TEEB)

For the purposes of this paper, TEEB remains a reference document for both the paper as well as the ESR analytical framework being applied to the case study. Having said that, TEEB is central to the progression and foundation of the discussion surrounding the relationship between ecosystem services and business. TEEB is a major international study¹² that brings together experts from the scientific, economic and policy fields to draw attention to the global economic benefit of ecosystem services and biodiversity, as well as to highlight the cost of biodiversity loss and ecosystem degradation (Ring et al., 2010). TEEB is not proclaiming that an economic perspective will solve the on-going problem of ecosystem degradation and biodiversity loss, rather it can be used as a tool to reduce the invisibility of the relationship between economics and ecosystems, which will bring to light the benefits of efficient resource use and natural capital as a foundation of our economy (TEEB, 2010). Furthermore, the TEEB for business report (2010b) builds on the ecosystem-related opportunities and risks established in the ESR to provide further examples, strategies, and management tools to address these risks and opportunities.

3.8.4 Framework considerations

There are several frameworks that exist in order to assess, categorize, quantify, and study various areas related to ecosystem services. Many of them, as with the chosen analytical framework for this paper, are based on some of the ideas generated by the MA. That being said, due to the relative freshness of the MA and ideas surrounding ecosystem services, these frameworks span the spectrum from theoretical to well practiced, and feasible to inaccessible. The following provides a simple overview of some of these frameworks and studies:

- RUBICODE is a European Union funded project to study and further understand, define, and evaluate the components of biodiversity that are essential to the ecosystem services that we depend on as a society, and the consequences of their loss. The core of the framework is the Service Providing Unit (SPU) and Service Antagonising Units, which are used to make the connection between ecosystem character and services more explicit (de Groot et al., 2010; Harrison, 2009)
- Wainger & Mazzotta (2011) created a framework for producing ecological models and metrics that could be used as an economic benefits assessment for a potential change in policy or management. In this framework, Wainger & Mazzotta develop a comparable ecosystem services unit in order to support decision-making.
- Turner & Daily (2008) develop the Ecosystem Services Framework (ESF) that offers a decision-making support system in order to analyse and synthesize the relevant knowledge to capture the benefits of ecosystem services. The ESF focuses on the long-term role that health ecosystem play in human-well being, economic development and poverty alleviation.
- Tallis et al. (2008) outline a framework that assesses the economic development and conservation outcomes of ecosystem service management.

¹² TEEB is an undertaking hosted by the United Nations Environment Program and supported by several international and national government agencies, including the European Commission, the German Federal Ministry for the Environment, Nature and Nuclear Safety, the UK Department for the Environment, Food, and Rural Affairs, the UK Department for International Development, the Norwegian Ministry for Foreign Affairs, the Swedish Ministry for the Environment, The Netherlands Ministry of Housing, Spatial Planning and the Environment, and the Japanese Ministry of the Environment (TEEB, 2010).

4 Framework for analysis

The analytical framework used in this case is The Corporate Ecosystem Service Review (ESR). As mentioned above, the explorations, foundations and concepts established by the Millennium Ecosystem Assessment and The Economics of Ecosystems and Biodiversity were integral in the creation of the ESR. The ESR provides a framework, methodology, and materials to help identify the business risks and opportunities related to ecosystem services. The actual function and methodology established in the ESR that are utilised in this study are outlined in section 2.

4.1 The Corporate Ecosystem Service Review

The ESR is a joint venture amongst three contributing organizations, namely the World Resource Institute (WRI)¹³, the World Business Council for Sustainable Development (WBCSD)¹⁴, and the Meridian Institute (MI)¹⁵. The ESR addresses the issues and ideas established in the MA and TEEB through a corporate perspective. It provides corporations with a proactive approach to address their relationship to ecosystems and ecosystem services. The core of the ESR is the structured methodology that allows corporations to identify and assess their dependencies and impacts on ecosystem services, which can ultimately lead to the enhancement of corporate strategy and environmental management systems (Hanson et al., 2012).

Ecosystem services can be daunting for companies, governments and individuals alike. The ecosystem services discussion involves indirect and direct drivers of change, aspects of human well-being and societal well being, different segments of society, which ultimately results in a consideration of an assortment of interactions and complex relationship throughout the entire world. For these reasons, discussions of ecosystem services can be daunting. The WRI approach, on the other hand, works to simplify the complexities into a comprehensive and practical methodology (C. Raudsepp-Hearne, personal communication, July 11th, 2012).

4.1.1 Background

As established in the MA and TEEB, many companies are not aware of their relationship to ecosystems and their services. The invisibility of how ecosystem services affect the bottom line of corporations allows for complacency and inadvertent exposure and contribution to risks that may be escalating, and also leads to missed opportunities. Currently, traditional environmental management systems address things such as resource consumption, waste management and pollution, but do not consider dependencies or impacts on ecosystem services (Hanson et al., 2012). The ESR seeks to address these gaps and guides corporations by:

- Introducing the concept of “ecosystem services” as a framework for assessing a company’s dependence and impact on the environment;

¹³ The WRI (www.wri.org) developed the methodology and managed the road-testing phase (Hanson, 2012)

¹⁴ The WBCSD (www.wbcsd.org) had five member companies (Akso Nobel, BC Hydro, Mondi, Rio Tinto, & Syngenta) road test the methodology and provide feedback (Hanson, 2012)

¹⁵ The MI (www.merid.org), having been a core member of the secretariat the designed the MA, brought process design and facilitation skills to the team (Hanson, 2012)

- Describing a process for identifying which ecosystem services are “priority” services; that is, those most relevant to a company’s performance;
- Providing a structured approach for analyzing important trends in these priority ecosystem services;
- Offering a framework for identifying potential business risks and opportunities arising from these trends;
- Providing guidance on developing strategies to manage these risks and opportunities;
- Illustrating how other corporations have addressed ecosystem-related risks and opportunities (Hanson et al., 2012).

The defining of ecosystem services and ecosystem service categories, in this case, are based on those established by the MA. More specifically, the categories of ecosystem services used in the ESR are provisioning services, cultural services and regulatory services, as was outlined in greater detail in section 3.2 and Table 3-1.

4.1.2 Beyond traditional environmental considerations

Environmental management systems (EMS) and due diligence tools are prevalent throughout most major corporations and exist in many forms and processes. Included in these are environmental and social impact assessments, life cycle assessments, certification, and standardizations. The ESR complements many of these systems, but also goes beyond them in a way that is very relevant to corporate environmental efforts and strategies. The ESR allows corporations to address the emerging issue of ecosystem services, which is not generally covered in traditional EMSs that tend to focus more on resource consumption and emissions. In this way, the ESR helps corporations focus on impacts and dependencies in order to help inform corporate strategy regarding the business risks and opportunities associated with ecosystem services (Hanson et al., 2012).

4.1.3 Opportunities and risk

The ESR provides companies with a methodology to address opportunities and risks to their business based on their dependence and impacts on ecosystem services. The following sections highlight some of the ways in which the ESR has broken down potential opportunities and risks associated with ecosystem services. It must be noted, however, that every context is specific and opportunities and risks are not limited to these examples.

- **Operational:** related to the day-today activities, expenditures, and processes of the company (Hanson et al., 2012, p.24)
 - Risks: Increased scarcity and cost of natural resources such as water or timber, operational disruption or increased insurance cost due to natural disaster
 - Opportunities: Benefits from building an on-site wetland to treat water, benefits from an-site micro-hydro system (Hanson et al., 2012, p.7; TEEB, 2010b, p.26;)
- **Regulatory and Legal:** related to the laws, government policies, and court actions that can affect corporate performance (Hanson et al., 2012, p.25)
 - Risks: Fines, new fines, regulations, user fees, lawsuits from communities or other groups that take issue with business activities

- Opportunities: Engaging and informing governments to develop policies and incentives to preserve or restore beneficial ecosystem services, engage and inform communities (Hanson et al., 2012, p.7; TEEB, 2010b, p.27)
- **Reputational:** related to the company's brand, image, or relationship with customers, the general public, and other stakeholders (Hanson et al., 2012, p.25)
 - Risks: Damage to corporate reputation from media, NGOs, and community campaigns, shareholder resolutions, changing customer preferences, reputation of financiers or suppliers (Hanson et al., 2012, p.7; TEEB, 2010b, p.25)
 - Opportunities: Benefits from implementing and communicating sustainable purchasing, operating, investment practices, community involvement in order to differentiate (Hanson et al., 2012, p.7; TEEB, 2010b, p.27)
- **Market and Product:** related to product and service offerings, customer preferences, and other market factors that can affect corporate performance (Hanson et al., 2012, p.26)
 - Risk: Customers switching to other suppliers or operators due to a lower ecosystem impact or government implementing new sustainable procurement policy (Hanson et al., 2012, p.7; TEEB, 2010b, p.27)
 - Opportunities: launching new products and services that reduce customer impacts on ecosystems, participate in emerging ecosystem service markets such as carbon sequestration and watershed protection, capturing new sustainable revenue streams from natural capital assets (TEEB, 2010b, pp.27-28; Hanson et al., 2012, p.7)
- **Financing:** related to the cost and availability of capital from investors (Hanson et al., 2012, p.28)
 - Risks: Higher costs of capital or difficulties acquiring debt or equity as banks and investors adopt more rigorous lending and investment policies related to sustainability and ecosystems
 - Opportunities: More favourable financing terms or improved access to capital for companies supplying products and services that improve resource efficiency or restore degraded ecosystems (Hanson et al., 2012, p.7; TEEB, 2010b, p.28)

4.1.4 Methodology

As presented in Figure 4-1, the ESR methodology is a five-step process that begins with scoping and moves on to identification of priority ecosystem services, analysis of these services, identification of risks and opportunities, then calls for the development of strategy. Though the process is well defined, it is open to interpretation and adjustment along the way, as most contexts are quite different. The use of this approach as an analytical framework is more thoroughly presented in section 2.



Figure 4-1 ESR methodology

Source: Adapted from Corporate Ecosystem Services Review, Hanson et al. (2012)

5 Surroundings and snow: a case study

5.1 Canadian Mountain Holidays

Canadian Mountain Holidays (CMH) is a pioneering and well-established adventure travel company operating in western Canada. The core of CMH's operations is heli-skiing, though heli-hiking is also a part of the overall operation during the summer months. With offices in Banff, Alberta, but operating almost exclusively in various British Columbian mountain ranges, CMH is one of the largest and most experienced heli-hiking operators in the world (CMH, 2012a). The following section will outline CMH's history, current operations, geography, infrastructure, tenuring process, and sustainability stewardship in order to provide context for an ecosystem service related analysis.

5.1.1 History

CMH was founded in 1959 by Hans Gmoser, an Austrian immigrant to Canada and a well-practiced mountain guide, who began CMH as a ski-touring and ski-mountaineering company. In 1965, Hans Gmoser began transporting clients into the backcountry on helicopters in order to access untouched backcountry terrain. This would turn out to be the birth of heli-skiing worldwide and define CMH's pioneering trajectory for decades to come. Over the years since the birth of heli-skiing, CMH began building backcountry lodges to accommodate their guests. These comfortable backcountry lodges complemented the incredible wilderness access to create the core of CMH's business. Soon after, CMH began using its winter lodges and infrastructure in the summer for heli-hiking trips, where clients are flown into a lodge and use it as the base camp for remote hiking adventures (CMH, 2012a; CMH, 2012b).

5.1.2 Operations

CMH currently operates from eight backcountry lodges and three town based hotels in British Columbia. All are in use during the heli-skiing season (roughly December – April) and two are used for the summer heli-hiking programs. Each one of these lodges has a capacity of anywhere between ten to forty-eight guests. During the peak heli-skiing season, CMH employs about five-hundred people, 90% of whom work out of the eleven lodges and 10% work at the main office. Out of the seven thousand annual guests, 50% come from Europe, 40% come from the United States, and 10% from Canada and the rest of the world. Recently, CMH was purchased in part by Intrawest ULC, but is managed and operates independently of Intrawest (J. Guegt, personal communication, June 25th, 2012; CMH, 2012a; CMH, 2012b).

Administrative Structure

CMH operations are managed under three main administrative silos, though unlike the traditional notion of silos, there are obvious overlaps and open communication throughout the three management teams. The first is marketing and reservations, which includes managing all of the pre-trip logistics and details that impact guests. The second is hospitality services, which essentially includes anything that has to do with the guests while they stay at CMH, including transportation, services, retail, building maintenance, food and beverage, and construction. The third silo is the administration of guides and all mountain operations, including certification and training, mountain safety and risk management, weather and forecasting, and mountain decision-making (Personal communication, Jori Guegt, June 25th, 2012). Other aspects of CMH's operations include human resources, sustainability, and finance and accounting.

5.1.3 Geography

What makes CMH unique is the vast amount of prime skiing terrain that they have access to. Due to the fact that Hans Gmoser essentially invented heli-skiing, CMH touts that they offer, “the world’s greatest skiing” (CMH, 2012c) because “we (CMH) were first, we had first choice, and we chose the best terrain” (CMH, 2012c). CMH’s offices are in Banff, Alberta, though all their actual heli-skiing and heli-hiking takes place in the mountain ranges of British Columbia. CMH has 15,764 square kilometres¹⁶ of tenured skiing area from which they operate (see section 5.1.4 for the tenuring process). All of these tenured skiing areas are in the Purcell, Selkirk, Monashee and Cariboo mountains of the Columbia Mountain Range in eastern British Columbia (see Figure 5.1.4). The average size of CMH’s tenured area is approximately 1400km². Within each tenured area is a designated ski area, and within each ski area are some designated ski runs. Although CMH is not bound to use only these runs they are the safest, best, and most consistent and dependable skiing terrain (D. Butler, personal communication, June 26th, 2012). Although snowfall varies throughout the areas, this part of the world is famous for consistent and large amounts of

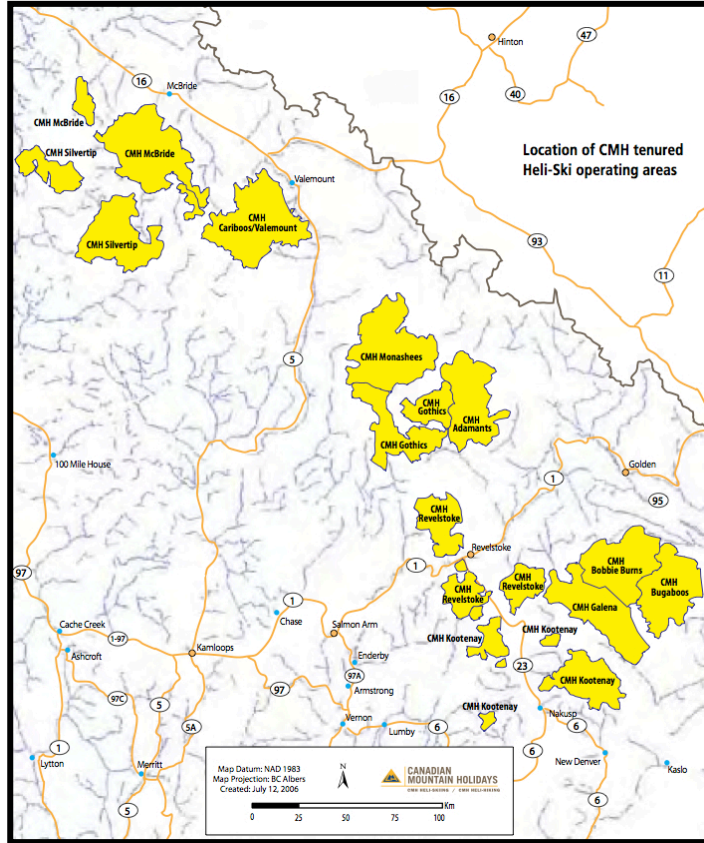


Figure 5-1 Map of CMH tenured heli-skiing areas

Source: Canadian Mountain Holidays (CMH, 2012c)



Figure 5-2 Location of the above map within Canada

Open source

¹⁶ To put this into perspective, Skiing Magazine did a comparison of CMH’s tenured area vs. combined skiable areas at the following resorts: Alyeska, Bretton Woods, Sugarloaf, Okemo, Crystal, Whistler, Squaw Valley, Solitude, Alta, Jackson Hole, Snowbird, Mammoth, Big Sky, Vail, Heavenly, Aspen Highlands, Sun Valley, Telluride, Crested Butte, & Taos Ski Valley. CMH’s tenured area (not all skiable, however) is 15,764 km² and the combined skiable area of the listed 20 resorts is 211 km². CMH’s tenured area is 75 times larger than the other 20 resorts combined (Skiing Magazine, 2011).

snow. The skiing terrain is for the most part between 1,800m and 2,800m above sea-level, though in certain circumstances it could be as high as 3,500m and as low as 600m. The specific terrain that guests ski on would be one or a combination of open snowfields, glaciers or in the trees (CMH, 2012a; CMH, 2012b; CMH, 2012c; CMH, 2012d).

5.1.4 Tenuring process

Although CMH's founder was the first to use helicopters to access untouched skiing terrain, essentially inventing heli-skiing, they are not the only operator offering this service and experience. There are many differentiating factors to CMH's operations, but at the core of their distinctiveness are the land tenures they have with the Government of British Columbia (BC), formally called a License of Occupation¹⁷ (LO). An LO essentially gives a party a license to perform a specific named activity on a given piece of land. The LO's that CMH has with the government of BC are primarily 30 years licenses to heli-ski on one of the swaths of tenured land presented in Figure 5-2. An LO does not exclude activities other than heli-skiing from taking place on this tenured piece of land. For example, if CMH has a 200km² LO to heli-ski in the Cariboo Mountains, this will preclude other operations from using this land for heli-skiing, but it does not mean that there are other government issued tenures on this land for other purposes. Within this 200km², there might be several government issued authorizations for mining, snow-mobiling, hiking, or forestry (D. Butler, personal communication, June 26th, 2012).

5.1.5 Infrastructure

Eleven lodges make up the bulk of CMH's infrastructure. Excluding the three town-based lodges, there are eight backcountry lodges in mountainous wilderness locations. All of the wilderness lodges and the land that they sit on are owned by CMH and are an average of ten acres in area. The capacity, access, locations, history, and infrastructure of the lodges all vary. Each lodge has a unique landscape and unique set of challenges to manage, such as wastewater treatment, energy, procurement of materials, transportation, food, and waste disposal among others. Unlike urban accommodations, there cannot be any scale economies or systematic efficiency built in the network of lodges, as they are all unique and remote (J. Guegt, personal communication, June 25th, 2012). This section will provide a general outline of the lodges as a whole, but will not offer specifics about each individual lodge.

In the winter, access to these lodges is generally via helicopter, although several lodges are also accessible by snow mobile. During the summer, there is both helicopter and in some cases road access via logging roads. Every lodge is fully equipped with a full kitchen and kitchen staff, which provide gourmet food services to guests. Most, if not all, include some variation of a spa service, including various forms of wellness facilities and services.

The energy, waste, and water infrastructures at the lodges vary, due to location, year built, capacity and funding. There are two different waste water treatment set ups at the various lodges; rotating bio cells (RBC) paired with a septic field and recirculation sand filters discharged into 'beaver ponds' and/or local stream systems. Drinking water comes from onsite wells, some from surface water sources (local streams or brooks), and water is filtered

¹⁷ Historically the government would give out land tenures (or a license of occupation) for specific blocks of land for activities such as mining, forestry, hunting. A tenure in this case could be a range of agreements, including licenses, leases, permits. In the 1970's the ski industry approached government to arrange a similar system for skiing in order to mitigate conflict over skiing areas and potential hazards caused by multiple users in the same area. Furthermore, working under a license allows ski industry operators to make financial investments based in these tenures (D. Butler, personal communication, June 26th, 2012).

using UV systems and in one case a chlorine drip. Energy provision to the various lodges comes either from the grid, diesel generators, or in the case of Galena lodge, micro-hydro system provides about 80% of the power needed for the year (J. Guegt, personal communication, June 25th, 2012; CMH, 2011).

5.1.6 Stewardship and sustainability profile

CMH has a well-established and robust sustainability profile. Their active stewardship spans economic, environmental and social sustainability, and is deeply rooted in their culture and the ethics of CMH's founder, Hans Gmoser. This section will outline CMH's sustainability profile and ongoing efforts to consider their relationship with the natural world throughout their operations. In no way does CMH neglect their impacts, in fact, as an organization they are quite aware of and own their impacts, though constantly working on ways to mitigate them. As Hans Gmoser articulated regarding CMH's undertakings, "we gently intrude, with respect and awe, into the sanctity of these marvellous places, partaking with deep appreciation of what they offer those who come to enjoy them in humble moderation and understanding" (CMH, 2007, p.21). The statements and behaviour of the employees indicate that they believe in this relationship of humility with the natural world, which allows CMH as an organization to emulate this vision.

Vision for sustainability

CMH formalized their commitment to sustainability in 2004 by declaring that they would like to be the leading sustainable tourism company in North America. It is important to note that CMH considers itself a sustainable tourism company, rather than an ecotourism company. As Dave Butler, CMH's Director of Sustainability, sees it, ecotourism implies a kind of niche tourism, whereas sustainable tourism is an overarching objective that can be achieved in any type of tourism operation (personal communication, June 26th, 2012; CMH, 2012e). Their commitment to fostering a sustainable relationship to the natural world is guided by their vision for sustainability, which states that CMH will:

- Be responsible stewards of the environments and communities in which we live, work and play;
- Strive to improve environmental performance in all of our operations;
- Be a leader in sustainability in our professional organizations and the broader tourism sector;
- Educate staff, guests and suppliers about our sustainability goals and initiatives and encourage personal action;
- Operate in a manner that is compliant with all government laws and regulations;
- Support research and education programs to improve our sustainability practices;
- Contribute to the economic and social well-being of our local communities;
- Deliver strong financial results to ensure a sustainable future for our company (CMH, 2012).

Performance

CMH's efforts are vast and cross into many areas. A more complete overview of their sustainability efforts, objectives and achievements is available in their most recent sustainability report entitled *Moving Towards Sustainability Volume III* (CMH, 2012). The above Vision for Sustainability may seem like something that any number of companies would include in their marketing material. However, CMH claims that their vision is not only

printed in their materials, but is actually being realized and lived in all aspects of the company's operations. Evidence from their operations lends some weight to such claims. Outlining their entire profile and efforts is not necessary for the purposes of this report, however the following are some of the areas that they are working on in order to realize their vision for sustainability:

- Second Nature Committee: CMH's employee-driven program that helps establish links between CMH's operations and the sustainability vision and objectives.
- Global Reporting Initiative (GRI): CMH recently began sustainability reporting within the GRI framework, and have become one of the first, if not only tourism company using the GRI. The following are some (not all) of the areas in which CMH has established objectives, strategies and indicators, based on the GRI in order to meet their vision for sustainability:
 - Wildlife Management: use of technology to understand wildlife patterns and engage in wildlife reporting and decision making based on avoiding wildlife disruptions
 - Water consumption: increase measurement and decrease water consumption
 - Waste management: measure volumes of waste created and implement strategies for waste reduction
 - Fuel management: monitor fuel use and handling
 - Energy management: measure and reduce carbon footprint, energy audit, monitor consumption by source, implement strategy for energy use reduction
 - Micro-hydro systems: monitor current micro-hydro system and explore feasibility of implementing further systems
 - Supply chain management: make efforts to reduce CMH impact by engaging their suppliers in their vision and using purchasing power to reduce suppliers' impacts
 - Staff Engagement: engage staff in all levels of CMH's efforts, including Second Nature Committee, education, communication, and support
 - Engaging with government: become involved in government initiatives, informing governments, communication
 - Education: engage in further research and education initiatives regarding sustainability (CMH, 2010)

Partners

The list above demonstrates the principal ways in which CMH currently engages in sustainability efforts. In many cases, they partner with various organizations, companies, or communities to advance the sustainability agenda both within and outside of CMH. An example of this is their role in the British Columbia Sustainable Tourism Collective (BCSTC)¹⁸. As a founding member of this collective, CMH is able influence the tourism sector, governments and communities in the identification and implementation of best practices in three key areas: climate change, human resources, and guest education (CMH, 2010). Other partners include the Adventure Collection¹⁹, ETHOS, Gros Morne Institute for Sustainable Tourism²⁰, and The Nature Conservancy of Canada²¹.

¹⁸ www.sustainablebc.ca

¹⁹ www.adventurecollection.com

²⁰ www.gmist.ca

²¹ www.thenatureconservancy.ca

Moving forward

It is clear by looking at the many areas that CMH is addressing that their sustainability profile is robust and beyond just a marketing tool. They have committed to Hans Gmoser's ethic to tread lightly and appreciate that natural world that affords them a business opportunity. What is also evident is that CMH is not only trying to address the typical internal issues, such as energy and water, but they are also addressing external issues like supply chain, community engagement, and staff education. This all comes together to create a story that surpasses mere number crunching. This is a story that CMH is proud of and the storytellers are the guests, staff, suppliers, communities, and regulators. In all of the personal communications that the author had with those directly or indirectly involved in CMH, it was apparent that they were all invested and engaged in the continuing efforts being made towards sustainability. Having said this, they were also very forward, honest, and knowledgeable about the ways in which they need to improve or are performing unfavourably. It is exactly these stories, the many storytellers, and their honesty and eagerness to set the standard that allows a project like this to occur. It seems natural that the next step for CMH is to address ecosystem services within their operations. In so doing, they will generate the ability to inform regulation and lead the tourism industry in considerations about the relationship between ecosystem services and business. Furthermore they will have the opportunity to take advantage of the opportunities presented and mitigate the risks.

6 Ecosystem services on the CMH landscape

This section summarises the findings of the various phases of this study. It presents the findings in terms of CMH's relationship to numerous ecosystem services and the identification of priority ecosystem services, as well as to the trends and drivers of each individual priority ecosystem service. Although this study found that a number of ecosystem services affect CMH's business in many ways, particular services present more significant risks and opportunities than others. For this reason, a select group of priority ecosystem services have been identified for further analysis.

This section is broken down by ecosystem service, and findings will be grouped under individual ecosystem service categories. The findings are drawn from the exploratory interviews conducted with a select group of CMH employees using the ESR's Ecosystem Services Dependence and Impacts Questionnaire (DIQ) (see appendix C for full version of the DIQ), the narrative explanations and comments from the DIQ, and conversations with various experts.

As explained in section 2.4.2, the DIQ is a tool to systematically assess a company's dependence and impact on almost thirty ecosystem services, as well as to aid in the identification of priority ecosystem services for later analysis. Generally, the DIQ would be conducted within a scope determined by the company – often a single business group or an aspect of the supply chain. In this case, the scope was the entire core operation and offering, so the author decided to conduct the DIQ with five separate individuals at CMH, each representing a certain aspect of the company's operations (see section 2 for further explanation of the methodology employed). The results of each individual DIQ were tabulated in an individual Ecosystem Services Dependence and Impact Matrix (DIM). The five individual DIM's were then amalgamated into one adapted collective DIM. Figure 6-1 represents the collective responses of the five DIQ interviewees, with each colour representing an individual, as outlined by the legend.

It must be noted that each individual is responding to questions as they pertain to their specific job description within CMH, therefore a sample questionnaire was garnered for each interviewee from various parts of the core business offering. The outcomes of these findings are the priority ecosystem services that were identified in the DIQ interviews, which then serve as the focal ecosystem services in the analysis. Reflecting the informant choice, the information on presented in this section are drawn from individual CMH employees with the accountabilities listed below. The author's discretion of the general perspective provided each individual is also provided.

- Mountain Safety Manager and Mountain Guide: This perspective pertains to risk management and safety throughout CMH's winter field operations, including heli-transportation
- Manager of Guiding Operations and Mountain Guide: This perspective related to that of the first informant but also reflects CMH's relationship to particular mountain environments and individual CMH lodges.
- Director of Hospitality Services and Infrastructure: This perspective focuses on the guest experience provided by CMH and encompasses accountability for a wide range of activities, including: transportation, services, retail, building maintenance, capital projects, food and beverage, and construction.

- **Food and Beverage Manager:** Because of the distinct nature of the food and beverage manager's responsibilities, this perspective is very much more focused, and encompasses the food chain for the business. The food and beverage manager is responsible for managing the large kitchen staff, sourcing food and beverage based on a variety of menu's and making sure that the foodstuffs arrive at the various lodges in good condition.
- **Director of Sustainability:** This perspective is based on this person's role in government relations (tenuring, policy, etc.), community relations, and the development and monitoring of CMH's environmental profile. Whereas other interviewees were focused on their specific job descriptions, this interviewee's job description covers the entire operation.

Each ecosystem service was constituted as a question category in the DIQ to assess CMH's dependence and impact on these services through the specific lens of accountability area. Figure 6-1 sums up the findings of the DIQ. Although impact on the ecosystem service is emphasized in the DIQ, it is not a focus of this study for reasons mentioned in the scope of this study (section 1.3). Ecosystem services that interviewees deemed non-relevant to CMH's operation are not included in these findings. This study therefore does not consider capture fisheries, wild foods, animals skins, sand, ornamental resource, genetic resources, biochemicals, natural medicines, pharmaceuticals, maintenance of soil quality, pest mitigation, and pollination.

ECOSYSTEM SERVICES DEPENDENCE AND IMPACT MATRIX																		
Ecosystem services		Company Operations																
		Dependence					Impact											
		T	E	J	R	D	T	E	J	R	D	T	E	J	R	D		
Provisioning																		
Food	Crops				●	●					●					+		
	Livestock				●	●					●	●					+	+
	Capture fisheries					?												
	Aquaculture				○	○					●	●					+	+
	Wild foods																	
Raw materials	Timber and other wood fibers	○	●	●		●	●	●	●							+/-	+/-	+/-
	Fibers and resins			●														
	Animal skins																	
	Sand																	
	Ornamental resources																	
	Biomass fuel			○		○												
	Freshwater			●	●	●			○	●	○					+/-	+	+/-
	Genetic resources																	
	Biochemicals, natural medicines, and pharmaceuticals																	
Regulating																		
	Maintenance of air quality	●		●		●	●	○			○	-	-					-
	Global climate regulation	●	○			●	●				○	-						+/-
	Regional/local climate regulation	●	?			●					●							+
	Regulation of water timing and flows	●		●		●	?											
	Erosion control	●	●	●		●	●	○			●	-	+					-
	Water purification and waste treatment			●		●												
	Disease mitigation					●												
	Maintenance of soil quality																	
	Pest mitigation																	
	Pollination																	
	Natural hazard mitigation	●	●	○		●	?	○								?		
Cultural																		
	Recreation and ecotourism	●	●			●	●	●								+	+	+/-
	Ethical and spiritual values	●	●			●	●	●								+	+	+/-
	Educational and inspirational values	●	●			●	●	●			●					+	+	+/-
Supporting																		
	Habitat	●	●			●	●	●			●					+	+	+/-
Key:																		
● High ○ Medium □ Low																		
+ Positive Impact - Negative Impact ? Don't know																		
		T	Todd Guyn - Mountain Guide, Mountain Safety Manager															
		E	Erich Unterberger - Mtn Guide, Mgr Guiding Operations															
		J	Jori Guetg - Director Hospitality Services & Infrastructure															
		R	Rick Carswell - Food & Beverage Manager															
		D	Dave Butler - Director of Sustainability															

Figure 6-1 Ecosystem services dependence and impact matrix, Canadian Mountain Holidays

Source: Adapted from Corporate Ecosystem Services Review, WRI (2012a)

6.1 Cultural services

For the purposes of this paper, the following three sub-categories of cultural services will be grouped into the larger cultural services category as they all play a somewhat similar and significant role in CMH’s operations.

Recreation and ecotourism

Recreational pleasure people derive from natural or cultivated ecosystems (WRI, 2012a).

Ethical and spiritual values

Spiritual, religious, aesthetic, intrinsic, “existence,” or other values people attach to ecosystems, landscapes, or species (WRI, 2012a).

Educational and inspirational values

Information derived from ecosystems used for intellectual development, culture, art, design, and innovation (WRI, 2012a).

Anecdotally, every interviewee responded to the importance of cultural services within CMH, though this service didn't relate explicitly to every job description. All interviewees essentially emphasized that recreation and tourism, ethical and spiritual values, and educational and inspirational values are at the core of CMH's business. If there were no cultural services, or cultural appreciation and valuing of these landscapes for their recreational, spiritual, educational and inspirational value, then there would be no business.

Although guests possess varying degrees of ethical and spiritual association with the mountains and the natural world, they almost always value the remote wilderness experience in a way that is unique to them. Being in far off places often offers guests a new perspective on life, creative and life-long inspiration, and a new appreciation and understanding of the natural world. Furthermore, as one interviewee noted, they often leave with a new environmental ethic and understanding, which they then bring home in the form of new perspectives on the world we live in and the power of vast and remote natural places. There is no substitute for cultural services. A guest's experience absolutely depends on this aspect of the natural world, and the capacity of CMH to afford guests the opportunity to access these areas.

The importance and cultural value of a CMH trip will differ for each individual guest. For some it will be the entire experience from the moment they left their home; the meals, days of skiing, views, and just the sense of being away that such a trip affords them. For others it will be sitting on the deck at the lodge surrounded by the mountains or the views from the helicopter ride, or it will be an indescribable sense of connection or solitude, while for others it will be standing on the top of a mountain about to make fresh turns on an untouched slope. Either way, every guest's experience in this sense is valid and belongs to the realm of cultural services.

6.1.1 Cultural services: drivers and trends

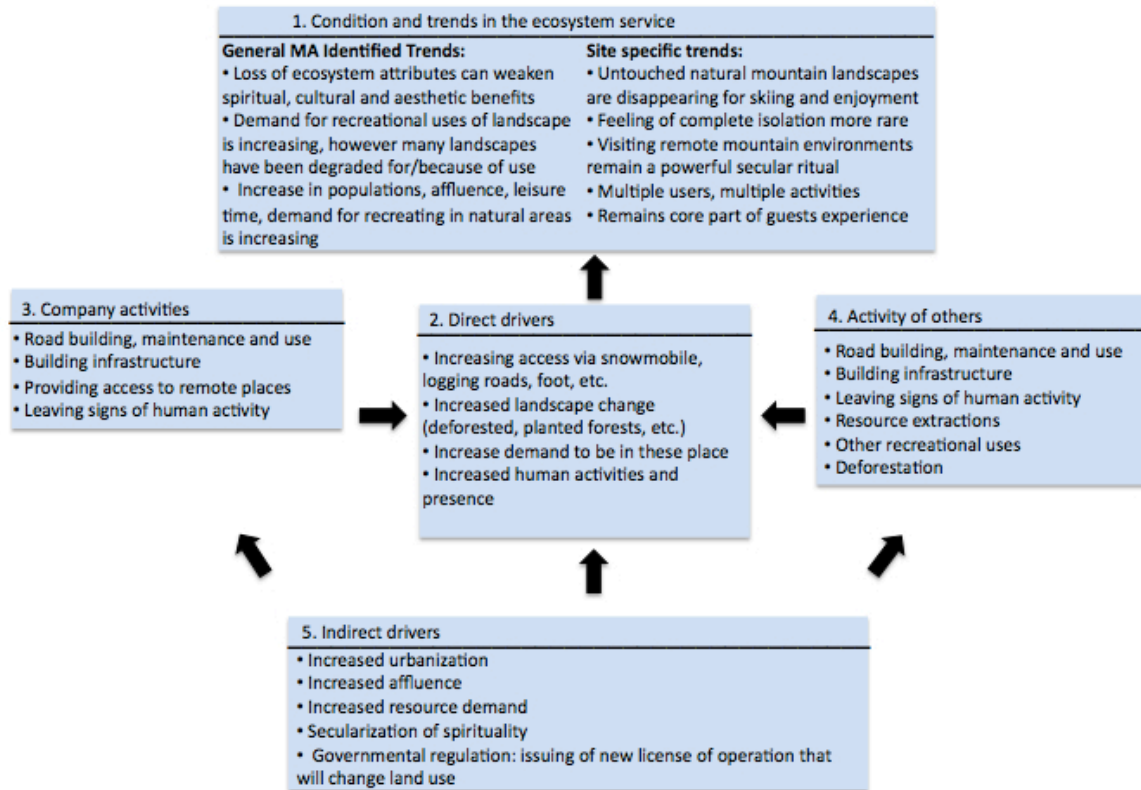


Figure 6-2 Drivers and trends of cultural services

Sources: MA, 2005; T. Guyn, D. Butler, E. Unterberger, personal communication, June/July 2012; Daniel et al., 2012

6.2 Water

Similar to the above cultural services section, the author has decided to group together findings and analysis of the three water-centric sub-categories under one larger water category. This has been done for a number of reasons, but primarily due to the interconnectedness of these three water-centric categories. This way, the reader can consider water as a whole, rather than the various water-centric services that often depend on each other.

Provisioning of freshwater

Inland bodies of water, groundwater, rainwater, and surface waters for household, industrial, and agricultural use (WRI, 2012a).

Water purification and wastewater treatment

Role ecosystems play in the filtration and decomposition of organic wastes and pollutants in water; assimilation and detoxification of compounds through soil and subsoil processes (WRI, 2012a).

Regulation of water timing and flows

Influence ecosystems have on the timing and magnitude of water runoff, flooding, and aquifer recharge, particularly in terms of the water storage potential of the ecosystem or landscape (WRI, 2012a).

It is said that the history of the world is not written in ink, but in water. This speaks to water's central role in all aspects of our lives, and CMH is no different. The provisioning of freshwater was chosen as a priority ecosystem service for its role in CMH's operations. All of the interviewees, outside those who are involved in mountain operations, identified the provisioning of freshwater as an integral part of CHM's operations. With eight remote lodges, CMH does not have the luxury of connecting to a municipal water supply. They depend heavily on the provisioning of freshwater from the proximate natural world. Each lodge depends on groundwater wells and terrestrial water sources in order to provide water for bathrooms, spas, drinking, and for cooking. Without high quantities of good quality freshwater provided by natural systems in lodge areas, CMH would have to transport water to the lodges; something that informants indicate would be logistically and financially unfeasible.

Water purification is the process that provides CMH with a quality of water that doesn't require huge treatment infrastructure. This service is enabled by the existence of the mountain lodges. For this reason it has been identified as a priority ecosystem service. According to the sustainability director and the director in charge of infrastructure, CMH is heavily dependent upon ecosystem based water purification and waste treatment. CMH does have treatment systems in place for both incoming water and wastewater, but they do depend on a certain level of freshwater cleanliness on the intake, with the cleaning being done by a properly functioning ecosystem. Furthermore, although they have wastewater treatment systems at every lodge, they depend on the downstream natural cleaning processes of the ecosystem to clean the water further in order to meet regulation. It is because of the functions provided by the streams, rivers, and septic fields at the various locations that CMH is even permitted to release their wastewater back onto the land. There are still times, however, when they must boil their water due to upstream contamination, likely from animal faeces. Without the ecosystem's provision of upstream natural treatment processes, this would be much more frequent.

The interviewees with a concern for CMH's infrastructure asserted that the regulation of water timing and flows were a particularly important ecosystem service in CMH's operations, and for this reason, they were identified as a priority ecosystem service. CMH depends on the regulation of water flows to mitigate potential flooding at the lodges, and prevent contamination or damage to a functional well. Furthermore, the consistency of freshwater provisioning for drinking and cooking at the lodges is equally as important. At the Galena lodge, water flows are also used to generate energy with a micro-hydro system. A consistent flow is required in this case in order to meet approximately 80% of lodge's total energy needs. Recently, the micro-hydro system was blown out due to an extreme rain event and large volumes of water. From the perspective of mountain operations and safety, one informant answered that CMH is dependent on water flow regulation because heavy runoff is a threat to safety by destroying roads and/or bridges. As with many of the other ecosystem services, there is an interconnection between dependencies. In this case water timing and flows have an affect on other services, such as erosion, natural hazards, provisioning of freshwater, and water purification.

6.2.1 Water: drivers and trends

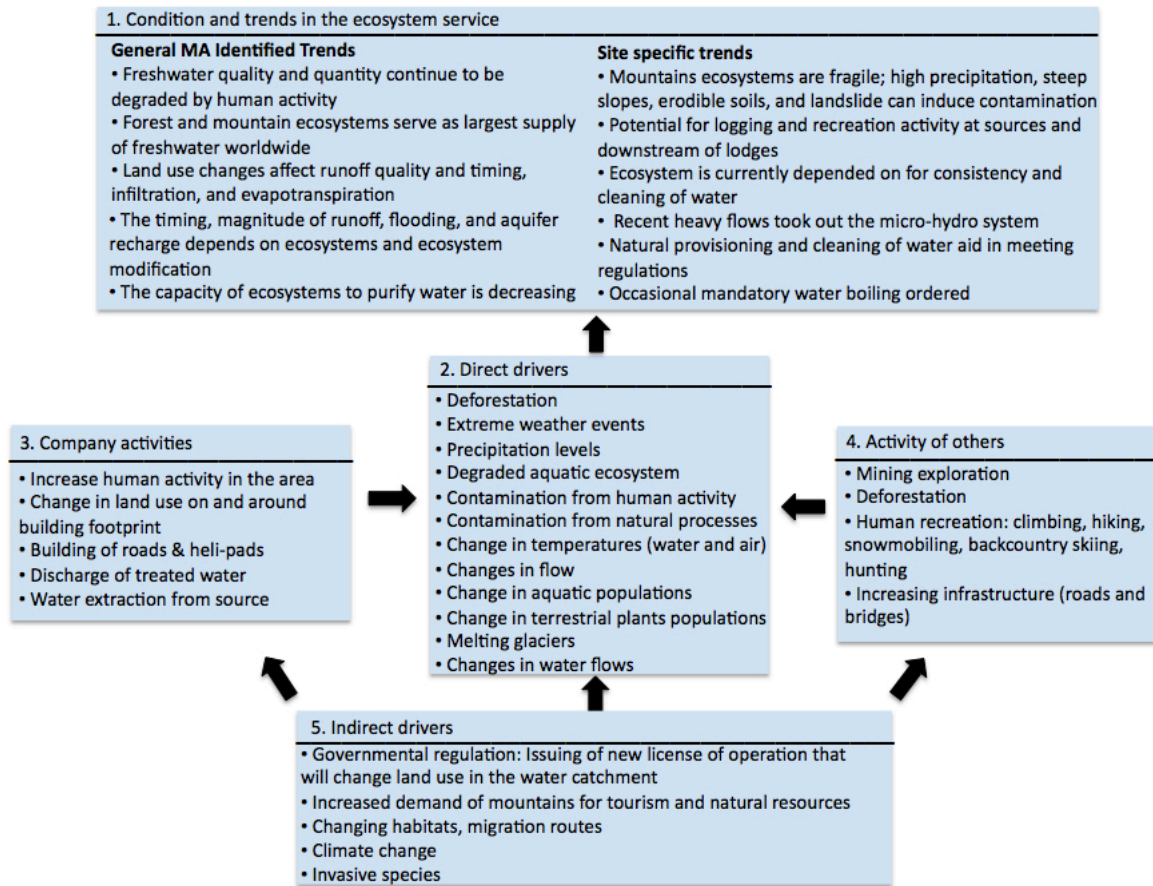


Figure 6-3 Drivers and trends for water-centric services

Sources: MA (2005); Liniger & Weingartner (1998); Hauer et al. (1997); J. Guegt, D. Butler, personal communication, June, 2012

6.3 Global climate regulation

Influence ecosystems have on the global climate by emitting greenhouse gases or aerosols to the atmosphere or by absorbing greenhouse gases or aerosols from the atmosphere (WRI, 2012a).

Hans Gmoser was first able to bring clients to ski in remote areas because of the cold winter season in mountainous terrain. Central to CMH's business operations is the existence of winter. Not just the idea of winter, but a winter with consistently cold temperatures and precipitation as high quality snow in abundant quantities delivered in regular renewal doses spread evenly throughout the season. Global climate change trends may put this balance that the business is built upon at risk, and for this reason global climate regulation has been identified as a priority ecosystem service. The interviewees involved in mountain operations and safety, as well as the sustainability director, all responded that CMH's operations depend upon global climate regulation continuing to deliver conditions conducive to business activities. It is not surprising that interviewees with perspectives related to sustainability and mountain operations consider this important. CMH's operations are heavily dependent upon a winter season that is consistent in precipitation and temperature. These informants know well enough that they do not have any scientific evidence to prove that the climate is changing, nor do they want to weigh in on such a debate. But they all have anecdotal

evidence that points to a changing climate: a shorter ski season, and more frequent periods of dangerous, difficult or undesirable conditions than experienced in previous years and decades. Furthermore, an interviewee responsible for mountain logistics pointed out that a potentially changing climate affects company operations by impacting group configurations, length of ski runs, company objectives, proximity and accessibility of safe skiing, risk management considerations and the quality of central business offering.

6.3.1 Global climate regulation: drivers and trends

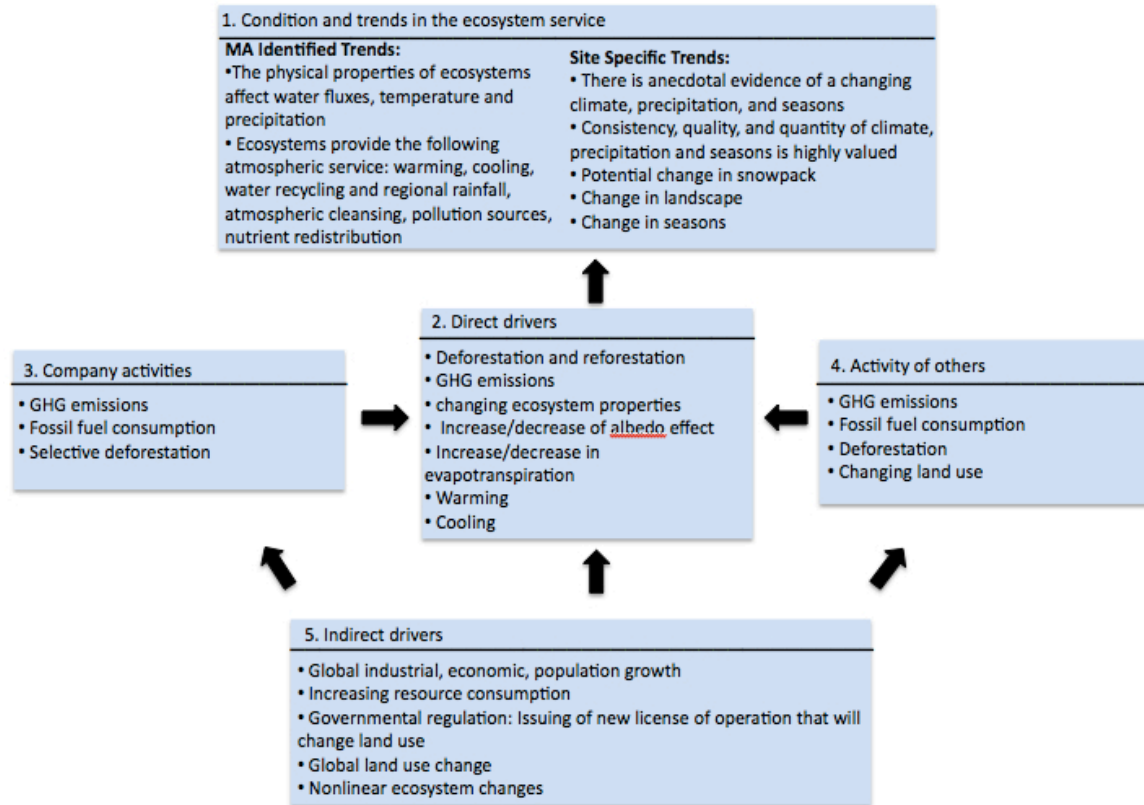


Figure 6-4 Drivers and trends for global climate regulation

Source: MA (2005); T. Guyn, D. Butler, E. Unterberger, personal communication, June/July 2012

6.4 Regional/local climate regulation

Influence ecosystems have on local or regional temperature, precipitation, and other climatic factors (WRI, 2012a).

Regional weather patterns can affect both the mountain-based operations of CMH, but also their logistical operations. Local weather patterns play into everyday decisions at CMH, and so regional/local climate regulation is considered a priority ecosystem service. Similar to the question regarding global climate regulation, the interviewees involved in mountain operations and safety, as well as the sustainability director, all responded that CMH was dependent upon local climate regulations. The reasoning behind categorising this as a dependency follows the reasoning described above, namely that CMH depends on a winter season that is fairly consistent in precipitation and temperature. In addition to this, both informants involved in mountain operations added that fog and precipitation hazards directly impact the safety of skiing and the operation of helicopters. For example, a recently dammed river has created a large lake in the mountains, which produces a significant amount of fog

that was not present in earlier years. Furthermore, because of the distances and change in altitude that a helicopter might experience on a given flight, there are risks associated with freezing rain, fog, and change in climate. Dangers of a changing snow pack also exist in areas where the microclimate is affected by a changing ecosystem, such as the impact that a deforested area might have on local climate, snow melt and snow pack. Also mentioned by these informants was the changing winter ranges for wildlife and human activities previously unavailable in certain areas due to winter conditions.

6.4.1 Regional / local climate regulation: drivers and trends

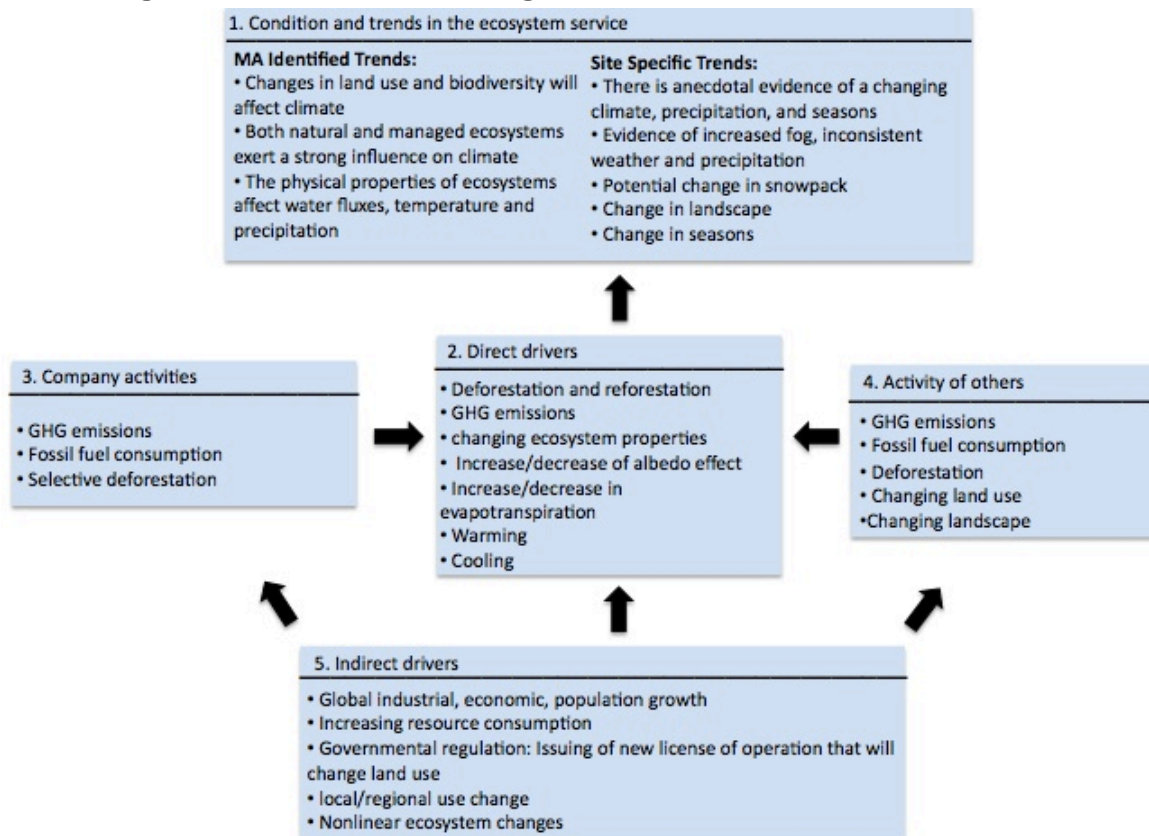


Figure 6-5 Drivers and trends for regional / local climate regulation

Source: Source: MA (2005); T. Guyn, D. Butler, E. Unterberger, personal communication, June/July 2012

6.5 Erosion control

Role ecosystems play in retaining and replenishing soil and sand deposits (WRI, 2012a).

The ability of a properly functioning forest, for example, to control erosion is valuable to CMH's skiing operations, infrastructure and logistical considerations, therefore it has been identified as a priority ecosystem service. With the exception of the food and beverage manager, all the interviewees mentioned that erosion control is an ecosystem service that their individual areas and CMH as a whole depends on. Those involved in the actual skiing aspects of CMH's business mentioned that erosion control is an important component of safe skiing terrain. The changing of a landscape in the summer months will certainly have an affect on slope stability and snow pack in the winter seasons. The interviewee involved with CMH's infrastructure noted that erosion threatens mountain lodges by decreasing slope

stability, as they are inherently vulnerable due to their remote and rugged locations. Like many ecosystem services, erosion control is tied in to a number of other ecosystem services. It is obviously directly related to the frequency and mitigation of natural hazards, which costs the company lots of money during the winter season in transportation diversions for guests, gear, food, or staff, during more frequent highway closure due to landslides and avalanches in areas where human activity is prominent and erosion results from building infrastructure.

6.5.1 Erosion control: drivers and trends

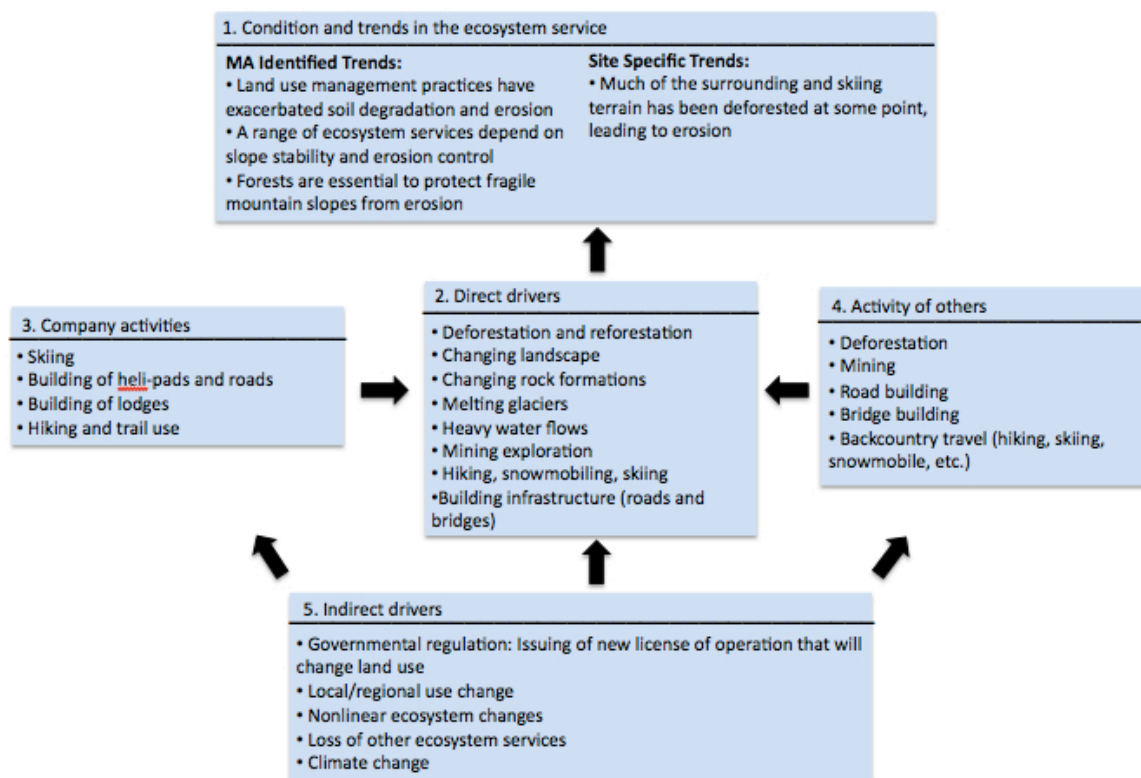


Figure 6-6 Drivers and trends for erosion control

Source: MA, 2005; Patel, 2012

6.6 Natural hazard mitigation

Capacity for ecosystems to reduce the damage caused by natural disasters such as hurricanes and to maintain natural fire frequency and intensity (WRI, 2012a).

Natural hazards can be frequent and devastating in a mountainous environment. Avalanches, landslides and fires present a risk to CMH on several fronts. The ability of the natural world to mitigate these hazards is invaluable and therefore has been identified as a priority ecosystem service. All interviewees, with the exception of the food and beverage manager, responded that CMH is dependent on the natural world’s role in mitigating natural hazards. Because the lodges are embedded in remote wilderness locations, the interviewee responsible for infrastructure noted that the natural world plays a significant role in fire prevention, which is a great threat to the very vulnerable lodges. The other interviewees all mentioned concerns with the ecosystems continued ability to mitigate fire, but also the mitigation of landslides and especially avalanches. Proper functioning ecosystems, especially forest ecosystems, play a large role in snow retention and the prevention of avalanches.

Furthermore, the managers focused on mountain operations mentioned that natural hazards play a role in changing landscapes, which may affect their guests' experiences. For example, if the forest were completely destroyed by fires surrounding one of the lodges, it would not be the wilderness experience that a guest would want to pay for. Similarly, skiing in a burn is not necessarily the experience they expected, nor is it necessarily very safe.

6.6.1 Natural hazard mitigation: drivers and trends

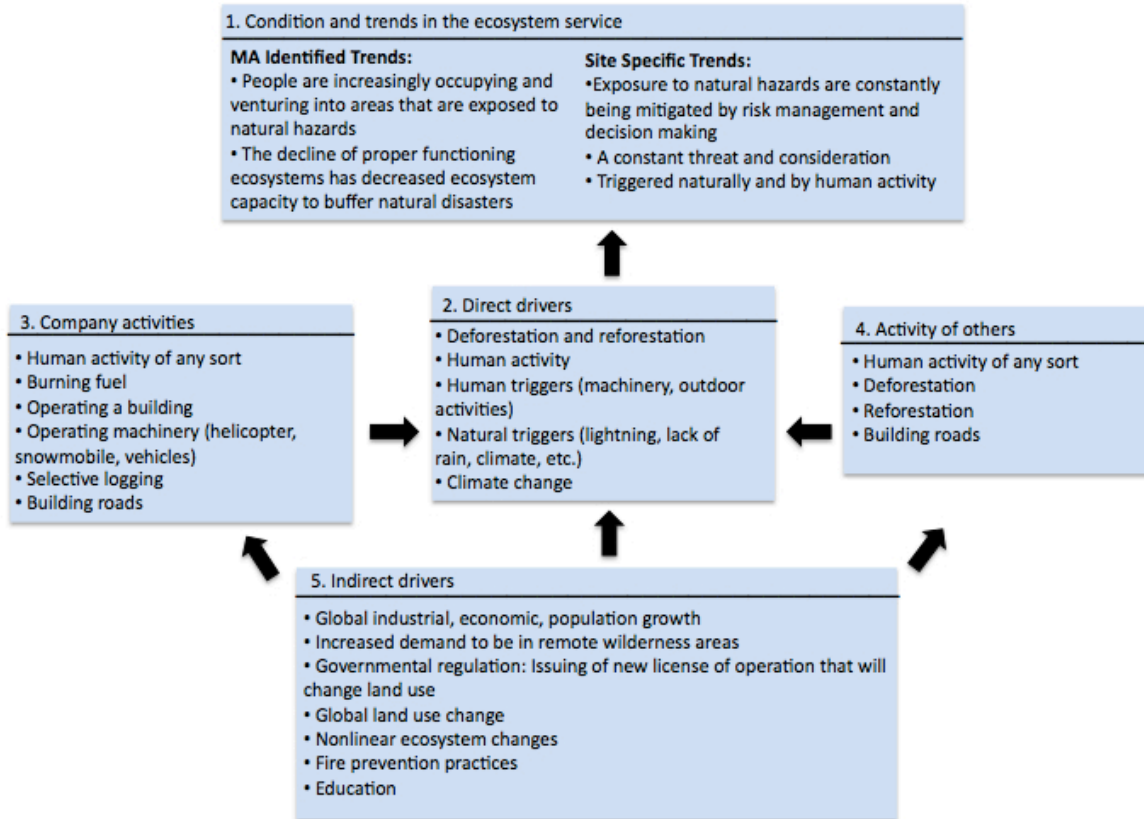


Figure 6-7 Drivers and trends for natural hazard mitigation

Source: MA, 2005; Dr. L. Dorren, personal communication, September 4th, 2012; T. Guyn, D. Butler, E. Unterberger, J. Guegt, personal communication, June/July 2012

6.7 Notable exclusions

Within the above list of priority ecosystem services selected for analysis, there are many exclusions from the original list of 29 ecosystem services as presented in the ESR (see Figure 6-1). As mentioned above, some of these were excluded because they had little or no relation to CMH's operations from the perspective of those interviewed. There are, however, some ecosystem services that were excluded from those identified by the interviewees as important to CMH's operations. Some were excluded because in the context of this work, it is judged that they provide a fringe service rather than being central or enabling their operations. The fringe ecosystem services include the provisioning of fibres and resins, the provisioning of biomass fuel, and disease mitigation. The exclusions that play a larger role in CMH's operation will be discussed below.

6.7.1 Crops, Livestock and Aquaculture

Cultivated plants or agricultural produce harvested by people for human or animal consumption as food (WRI, 2012a).

Animals raised for domestic or commercial consumption or use (WRI, 2012a).

Fish, shellfish, and/or plants that are bred and reared in ponds, enclosures, and other forms of fresh- or salt-water confinement for purposes of harvesting (WRI, 2012a).

It is evident that all of these forms of food provisioning ecosystem services are related to CMH's operation. Although they can be considered indirect ecosystem services, they are central to CMH, as food plays an important role in their clients' experience and the overall offering of the company. Furthermore, CMH has made an intentional and ethical commitment to certain suppliers and have used their purchasing power to enable the establishment of a more sustainable food source, namely through their purchasing of produce, salmon and beef. Having said that, these services were excluded because they are indirect, down the supply chain, and one step removed from CMH's operations. Furthermore, CMH and the food and beverage manager in particular, are already well aware of CMH's relationship to these suppliers, these services and the symbiotic role they play in each others' operations.

6.7.2 Timber and other wood fibres

Products made from trees harvested from natural forest ecosystems, plantations, or nonforested lands (WRI, 2012a).

The provisioning of timber and wood fibres is related to CMH in two ways. The first is what the interviewee overseeing infrastructure identified as the timber and wood fibre needed in capital projects and construction. The two interviewees focused on mountain operations answered that CMH is indirectly connected to the provisioning of timber in their realm. Their perspective is that CMH is somewhat dependent upon the companies that have logging LO's in their skiing terrain. Due of the provisioning of timber and demand for timber, these companies are building roads and bridges into these areas, which serve as safety access or helicopter landings for CMH in the winter and road access to the lodges in the summer. Furthermore, CMH has been able to create a relationship with these companies wherein they can request selective logging in order to thin out a given skiing area, collaborate on planting patterns for better future skiing, or compromise on deforestation in a certain area to prevent landslides and avalanches. Deforestation and logging directly affects all of the ecosystem services mentioned in this study, and so CMH is indeed linked to the industry, but less so to the product provided by the natural world. The ability to collaborate with timber companies is a benefit to CMH, however it is the logging companies that are actually more dependent on this ecosystem service, therefore it is categorised as indirectly related to CMH.

6.7.3 Maintenance of air quality

Influence ecosystems have on air quality by emitting chemicals into the atmosphere (i.e., serving as a "source") or extracting chemicals from the atmosphere (i.e., serving as a "sink") (WRI, 2012a).

The three interviewees involved with infrastructure, mountain operations, and sustainability all answered that the natural world is maintaining good air quality and helping to mitigate the pollution that CMH contributes through the burning of hydrocarbons with the use of generators, helicopters, and snowmobiles. Thus, they answered this question based on

CMH's impact and how the natural world is dealing with them. However it also makes sense that clean air constitutes part of the remote wilderness experience, and this too plays into this ecosystem service's relationship with CMH. It was excluded from the priority ecosystem services because the air quality in locations where CMH operates is obviously excellent, and this service is related primarily to CMH's impact, rather than how a changing natural world is impacting CMH.

6.7.4 Habitat

Natural or semi-natural spaces that maintain species populations and protect the capacity of ecological communities to recover from disturbances (WRI, 2012a).

The perspective of the sustainability director and the two informants involved in mountain operations was that although CMH is not a wildlife viewing company, the simple fact that guests are aware of the wildlife in the area is an important part of their experience, both in the summer and the winter. Furthermore, with CMH's work with local and migrating wildlife, there is an opportunity to educate guests and have conversations about. Habitat, therefore, can in some ways be considered a cultural service, as the existence of animal habitat is of value to the clients. Having said this, it is not an essential service that enables CMH's operations, rather it is a fringe service that CMH can relate to and engage with.

7 Analysis

The findings presented in the previous section demonstrate conclusively that CMH depends on a variety of ecosystem services in a number of ways. Although these findings were identified through the use of the ESR, a fairly simple framework relative to the complexity of ecosystem services, the implications of these findings in relation to business remain complex. This section will provide analysis of the findings in two areas. The first part of the analysis will focus primarily on CMH's theoretical relationship with ecosystem services in general. The second component will provide a more practical analysis using the fourth phase of the ESR (as detailed in section 2.4.4), which involves an identification of the business risks and opportunities associated with each individual ecosystem service. This analysis is separated into three sections. The first is a general analysis of CMH's relationship to ecosystem services. The second is an analysis of what can be considered the core priority ecosystem service related to CMH's offerings, and the third section covers the ecosystem services that enable CMH's core business offering.

7.1 Embedded in the natural world: theoretical considerations of CMH

This analysis indicates that CMH's relationship to ecosystem services occurs throughout their business offering. In fact, due to the nature of the business, where they are directly embedded in the natural world, these services are central to their operation. Referring back to Hawken et al. (1999), who suggest that any properly functioning economy needs four types of capital, including human, financial, manufactured and natural, it seems that natural capital is the greatest enabling asset to CMH's core business offering. As many of the interviewees mentioned, without the natural world, there is no business. This further cements natural capital and the ecosystem services provided by the natural world as the primary form of capital that allows the economy around CMH's business to function and even exist.

Hence, it is potentially advantageous and wise for a company such as CMH to consider the ideas proposed by Hawken (2010), Houdet et al. (2012), and Tallis et al. (2008), as presented in Section 3.4. Hawken (2010) suggests that we should rethink the nature of business to be more aligned with the complex self-sustaining, and efficient nature of the natural world. It could be argued that Hawken's call for rethinking business is philosophical ideology, but there are certainly practical applications to modelling business or aspects of a given business on the efficient and dynamic conditions of the natural world. This is no more relevant than in the case of a company that is embedded in the natural world and dependent upon natural capital, as CMH is. Houdet et al. (2012) support Hawken's notion that business is inherently tied to the natural world. They also go one step further by lending a sense of practicality to Hawken's ideas and suggesting that business interdependencies with ecosystem services can bring about new competitive strategies and practices. At this point, exactly what those strategies and practices are for CMH are unknown and would require further development and analysis, but needless to say, with the foundation provided by this study, there is a realistic opportunity for CMH to affect their business offering. Houdet et al. (2012) also suggest that going beyond a mitigation approach with ecosystem services can lead to innovation, sourcing new assets, skills and technology. This is also a theory supported by the findings of the MAB (2005). This approach fits well with CMH, as they are already focused on going beyond mitigation in other aspects of their industry-leading sustainability profile. Therefore considering ecosystem services with the same regard that they consider other sustainability related aspects is a realistic proposition. The potential that this approach holds is further supported by Tallis et al. (2008) who suggest that even a simple appreciation or

consideration of the value of ecosystem services in relation to business will increase stewardship and mitigate the need to spend on future payments for ecosystem services or their substitutes.

Consideration of the ideas proposed by Hawken (2010), Houdet et al. (2012) and Tallis et al. (2008) can indeed be advantageous for CMH for many reasons, not the least of which is their inherent connection to the natural world. Furthermore, in light of the findings and trends put forward by the MA (2005) and MAB (2005), ecosystem services are an important consideration for the future for any business and economy. The findings of the MA (2005) that hold particular relevance for CMH centre on the assertion that humans and businesses alike have gained, and continue to gain, from ecosystem services, but as ecosystems continue to degrade, irreversible effects will continue to be generated that pose a threat to our current business models and economies. CMH is no exception. It is a reality that a changing natural world will continue to affect their business over the coming years. Furthermore, as the MAB (2005) found and demonstrates, it is not only a company's core operations that will be affected by ecosystem service degradation, but also the operations of their suppliers, the expectations of their customers and stockholders, regulatory regimes, government policies, client and staff well-being and the availability of finance and insurance. In summary, the general conditions in which businesses operate will be and are being affected, and the associated costs will need to be internalized or externalized, impacting all those in the economic relationship (MAB, 2005).

7.2 Primary priority ecosystem services

Within all phases of this study, it was evident that the cultural services category, though potentially intangible at times, fundamentally underpins the entire ecosystem service discussion at CMH. For the most part, various other priority ecosystem services identified enable the existence, form and business offering of CMH, but it is the cultural services that are central to what CMH offers guests.

7.2.1 Cultural services

In this case, the author decided to analyse the entire ecosystem service category, as the three sub-categories²² within this category are all relevant in a very similar way within CMH's operations.

Cultural services, which encompass the guests' perspective and the experiential nature of a CMH trip beyond only skiing, provide a vast amount of benefit and are likely a strong contributory reason why CMH has such a large rate of repeat customers (CMH, 2012a; E. Unterberger, personal communication, July 10th, 2012). The literature supports the importance of cultural services by stating that recreation and tourism provide a vast amount of benefits, including physical health, exercise, inspiration, intellectual and spiritual stimulation, aesthetic experiences, and other contributions to physical and psychological well-being (Bowler et al., 2010; Chan et al., 2011; Dustin et al., 2010). In this way, it is obvious why these cultural services would be so important to CMH, as they are multi-faceted and address the needs, expectations and values of a wide range of clients, whether they are aware of the value or not.

²² The three sub-categories, as presented in the ESR and in are: (a) recreation and ecotourism, (b) ethical and spiritual values and, (c) educational and inspirational values.

CMH’s core business offering depends directly on the three sub-categories listed under cultural services, none more directly than the recreation and tourism based ecosystem service that is defined as “the recreational pleasure people derive from natural or cultivated ecosystems” (WRI, 2012a). Clearly people’s desire to recreate in these natural spaces is what drives CMH today and what drove it when it was founded in 1959. Referring back to Daniel et al. (2012), it is through recreation and tourism that people do most of their communing with the natural world and interact with ecosystem services. This is at the core of CMH’s unique offering. If it weren’t for this human desire to recreate in these places, CMH would not exist. This was made abundantly clear in all personal communications with CMH staff, where the understanding was that the natural world has provided them with an opportunity to conduct their business. The second sub-category of cultural services, ethical and spiritual values, is also of great importance to CMH’s business, as each one of their clients likely has a differing ethical perspective and objective for the trip. However, anecdotal evidence revealed through employee interviews indicates that many of these objectives and experiences are based on communing with the remote and majestic natural places that CMH offers access to. The third sub-category, educational and inspirational values, also plays a significant role in CMH’s offering, as clients are often inspired by the landscapes they visit with CMH in a wide range of areas that then have a lasting impact on their lives (T. Guyn, E. Unterberger, personal communication, June/July, 2012). Furthermore there is an ever-present opportunity, if solicited by the clients, to engage in discussion and educate clients about CMH’s relationship with the land. In some cases, their relationship or ethic is implicit in their offering. For example, within food services, the presentation of a beef or salmon meal will come with a descriptor of their ethical sourcing, which often turns into a healthy conversation regarding food sourcing (R. Carswell, personal communication, June 26th, 2012). Ultimately, as Adamowicz et al. (2011) support, the quality and quantity of environmental attributes at a tourism destination can augment the demand and the value of the destination. Clearly this is something that may present opportunities and / or risks for CMH and is something to constantly regard within their business offering. Todd Guyn typifies this relationship in saying that “it is very hard to find a valley that has not been touched by man, and when we do, the guides point out that it is untouched” (personal communication, June 27th, 2012).

Table 7-1 presents an analysis of CMH’s business risks and opportunities related to cultural services. Herein lie the risks and opportunities analysed through the lens of each of the five business aspects outlined in section 4.1.3.

Table 7-1 Risks and opportunities associated with cultural services

Cultural Services		
Type	Risk	Opportunity
Market & Product	Diminished product value due to diminished sense of cultural significance of the landscape Loss of ability to provide a unique offering	Engage and educate interested clients in the cultural, spiritual, and historical significance of the land Market not only the skiing terrain, but the landscape aesthetic and remoteness of a CMH experience Allow space for these landscapes to inspire and influence

Operational	<p>Loss of aspects that are of cultural or experiential value: remoteness, ruggedness, landscape aesthetics, sense of connectedness, inspiration, etc.</p> <p>Loss or erosion of cultural parameters valued by society/guests</p>	<p>Deepen guest experience by highlighting significant, rare, and special places</p>
Regulatory & Legal	<p>New regulations/law constraining CMH based on cultural significance of land for others</p> <p>Poor regulatory vigilance can open land to users that degrade cultural or experiential significance</p>	<p>Garner regulatory and legal support by contributing to conservation of terrain and land by promoting the cultural services provided</p> <p>Heighten regulatory (and political) awareness of tangible economic values attached to cultural aspects of land</p>
Reputational	<p>No longer perceived as providing a unique offering</p> <p>Association of CMH and CMH activities to damage and degradation</p> <p>Loss of the cultural services that guests/society value</p>	<p>Highlight unique, remote, comfortable, wilderness experience at CMH</p> <p>Garner broader support for preservation through CMH's role as ambassador</p>
Financing	<p>Access to finance could become difficult if they are linked to cultural service degradation (or any type of degradation)</p>	<p>Access to finance could be reinforced if seen as ambassadors</p> <p>Potential access to finance, grants or funding based on stewardship, understanding</p>

7.3 Enabling priority ecosystem services

The following identified priority ecosystem services are central to CMH's business offering and essentially enable their operations. Whereas cultural services underpin all of CMH's existence, these seven services are essential to one or more specific aspects of CMH's operations. In turn, they too present possible risks and opportunities in relation to CMH's operations.

7.3.1 Water

As with cultural services, the author decided to analyse the three sub-categories²³ related to water within one larger water category, as are all relevant in similar and overlapping ways to CMH's operations.

The provisioning of freshwater, the regulation of water and water purification and treatment are not central to CMH's operations in the way that cultural services are, meaning that there could be a heli-skiing operation without these ecosystem services. But these services do enable the core business offering to function properly and at a standard that their customers expect. Water provided by the natural world and natural systems is essential to the functioning of the lodges, as it is used for drinking, bathing, cleaning, and cooking. CMH's high standard and comfortable accommodations are certainly dependent upon a steady and fairly clean source of freshwater. If the provisioning of freshwater becomes scarce or

²³ The three water related sub-categories are: the provisioning of freshwater, the regulation of water timing and flows, and water purification and wastewater treatment.

inconsistent at any of the lodges, this could pose problems to both CMH's operations and their reputation.

When considering the regulation of water, there is no question that in a remote mountainous environment this is completely accomplished through natural processes. Changes in landscape through human activity, such as deforestation, or natural processes, such as landslides or wildfires, will compromise natural water regulation processes. This affects CMH in several ways that are necessary to acknowledge, including effects on water quality, threats to the functioning of infrastructure such as the micro-hydro system at Galena, jeopardizing road/bridge infrastructure, and so forth.

The degradation of natural processes that provide water purification and wastewater treatment is also of concern to CMH. Although they have on-site wastewater treatment systems, they still depend on a certain quality of water for a wide range of uses within their lodges, as the wastewater treatment systems cannot deal with all the natural contaminants potentially present in the water. Beyond clean water on the intake, CMH also depends on the natural world to contribute to the last steps of their wastewater treatment system in order to meet regulations. Without this ecosystem service, CMH's water quality and regulatory standards could be compromised both upstream and downstream.

Table 7-2 presents the analysis of CMH's business risks and opportunities related to the three water-centric ecosystem services. Herein lie the risks and opportunities analysed through the lens of each of the five business aspects outlined in section 4.1.3.

Table 7-2 Risks and opportunities associated with water-centric services

Water		
Type	Risk	Opportunity
Market & Product	Compromise the CMH product, i.e. – pristine image of lodge experience and food services	Promote the quality and locality of the water used
Operational	Water scarcity, inconsistency, and contamination increases the cost to clean water, or costs and resources related to transporting water to the lodges Severe water issues could halt lodge operations Heavy water flows and flooding can jeopardize infrastructure (Roads, bridges, lodges, micro-hydro) Loss of natural function of septic fields and septic ponds	Implementation of micro-hydro power generation at other lodges Provision of freshwater allows for potential new lodge sites Incorporate further use of natural wastewater treatment into operations
Regulatory & Legal	Quality and quantity of water needed to legally operate could be compromised A degraded quality of water due to the loss of natural cleaning processes (ponds, septic fields, streams) Mandatory boil water protocol	Inform and stay ahead of regulation by being stewards of the water source and maintaining a dialogue with regulators and land users Stay beyond compliance with further wastewater treatment efforts from natural processes
Reputational	Clients getting ill	Relationship with natural world

	Risk to CMH accommodation standard Boil water protocol does not reflect well on the company	Maintain strong ecological ties to water. Freshwater enters facility, is used and treated, then feeds back into natural processes Create internal and external awareness by contributing to local watershed efforts, based on understood dependence
Financing	Because large financing agencies/banks are beginning to assess investments based on water scarcity and availability, there could be a lack of financing for water-centric issues	Finance opportunities for new lodge locations Finance opportunities for new micro-hydro projects

7.3.2 Global climate regulation

At this point in time there is no lack of discussion related to global climate trends and the causes and effects of a changing climate. CMH’s operations are ultimately dependent upon a consistent winter season, as they have predominantly experienced in the past (E. Unterberger & T. Guyn, personal communication, June/July, 2012). As mountain safety manager, Todd Guyn, puts it, “we are directly tied the climate. We are just like farmers, snow farmers, and if it (climate) changes, we’re not going to have a product. It seems like the good years are getting few and far between” (personal communication, June 27th, 2012). In this way, global climate trends and the regulation of global climate are extremely important to CMH. The macro trends of global climate regulation, coupled with more immediate local and regional climate regulation, make up an important part of their business. CMH depends on a winter season and a potentially changing climate puts this at risk, whether it be in the form of a changing or shifting season, shorter runs, the disappearance of certain runs, heightened safety considerations or guests’ individual concerns about snow type and safety.

Table 7-3 presents the analysis of CMH’s business risks and opportunities related to global climate regulation. Herein lie the risks and opportunities analysed through the lens of each of the five business aspects outlined in section 4.1.3.

Table 7-3 Risks and opportunities associated with global climate regulation

Global Climate Regulation		
Type	Risk	Opportunity
Market & Product	Loss or diminishment of core service/product Loss of quality and timing core service/product	When others are affected by a changing climate, CMH can market extensive terrain Understanding of micro-climates and ecosystem services will help redefine skiable terrain
Operational	Lack of snow, increased terrain danger, loss of terrain, shortening of run lengths, shortening of season could cause a general disruption of main business offering	
Regulatory & Legal	With increased safety concerns, increased legal concerns and vulnerabilities Changing landscape may affect license of operation	

Reputational	Regional reputation for dangerous snow pack, short runs, lack of winter weather, lack of winter precipitation One bad season may taint returning clients' experiences and future business	CMH can promote their relationship with the natural world and mitigation efforts Support climate change efforts within community and industry Educate community, industry and government on how climate change affects the entire industry
Financing	Uncertain seasons may affect financing for growth Increased risk may increase insurance costs	Stewardship and acknowledgement may provide finance, grants or funding based for further research

7.3.3 Regional/local climate regulation

Similar to global climate regulation, CMH depends on a consistent climate, both on a macro and micro level, in order to ensure a consistent and quality product and service. Local climate regulation is particularly important, as it can have an immediate effect on transportation, whether it be via helicopter or car. Furthermore, local climate regulation is being compromised by changes in land use and the immediate effect can be realized very quickly in specific micro-climates, which can pose safety concerns for CMH's operations. Change in land-use and landscape is particularly relevant when it comes to local climate regulation as heavily forested areas influence local weather, snow pack, wind, humidity, etc., much differently than deforested areas. Similarly, areas that have been flooded, or where there has been a permanent loss or significant decrease in surface water, can have an effect on local climate.

Table 7-4 presents the analysis of CMH's business risks and opportunities related to local/regional climate regulation. Herein lie the risks and opportunities analysed through the lens of each of the five business aspects outlined in section 4.1.3.

Table 7-4 Risks and opportunities associated with local/regional climate regulation

Local/Regional Climate Regulation		
Type	Risk	Opportunity
Market & Product	Loss or diminishment core service/product Loss of quality and timing of core service/product Loss of individual runs, skiing areas, that are accessible	Use understanding of local climate variations to increase safety and good skiing
Operational	Lack of snow, increased terrain danger, loss of terrain, shortening of run lengths, shortening of season could cause a general disruption of main business offering Transportation disruptions may increase costs Precipitation hazards for skiing and transport	
Regulatory & Legal	With increased safety concerns, increased legal concerns and vulnerabilities Changing landscape may affect license of	

	operation	
Reputational	Certain areas/runs may get a reputation for having an undesirable climate for skiing	Promote local conservation efforts and land use planning efforts through the lens of local/regional climate regulation
Financing		

7.3.4 Erosion control

CMH’s main business offering occurs in steep and rugged terrain with relatively intense erosion drivers, unstable soil and geological conditions. The control of erosion provided by ecosystems is an ecosystem service that overlaps with many other ecosystem services, including water-centric services, natural hazard mitigation, and cultural services. Furthermore, it is an erosion control is a service that is also affected by the loss of a number of other ecosystem services. Erosion is a natural process that often occurs independent of human activity. Having said this, human activity drastically increases erosion in places that would otherwise not have an erosion problem. Furthermore, it is in these places where human activity is affecting erosion that erosion in turn affects human activities (L. Dorren, personal communication, September 3rd, 2012). In regards to CMH, as mentioned above, erosion affects and is caused by a number of other ecosystem services. For example, a forest has the ability to retain soil and water, but when deforested, the ability of that same land to retain water and soil is diminished significantly; this leads to water regulation and erosion problems. Erosion increases risk of land instability, water contamination, diminished ability of the land to regulate and store water, as well as a decrease in the land’s aesthetic value. Any high impact land use will decrease the ecosystem’s ability to properly and naturally control erosion.

Table 7-5 presents the analysis of CMH’s business risks and opportunities related to erosion control. Herein lie the risks and opportunities analysed through the lens of each of the five business aspects outlined in section 4.1.3.

Table 7-5 Risks and opportunities associated with erosion control

Erosion Control		
Type	Risk	Opportunity
Market & Product	Erosion can contribute to loss of skiing terrain Erosion can contribute to the loss of a natural wilderness aesthetic, which is so much a part of CMH’s offering	
Operational	Erosion can contribute to the loss of skiing terrain, increased safety concerns due to land instability, and damage to infrastructure (roads, bridges, water treatment systems, micro-hydro system) Increased transportation costs and logistics due to road damage	Mitigate the affects of erosion through collaborative land-use planning, planting plans, etc. with logging companies
Regulatory & Legal	With increased safety concerns, increased legal presence	Working with land-use planners, decision makers and regulators on the cumulative effects of erosion across all activities on

	Changing landscape may affect licence of operation	the land
Reputational		Working with logging companies, other land users, and communities to mitigate erosion through by promoting an ecosystem approach to mitigation methods
Financing		

7.3.5 Natural hazard mitigation

Whenever operating a business or providing a service/product embedded in the natural world, there is an inherent risk due to the large scale and unpredictable complexities of natural processes. Beyond just potential natural hazards, which exist even without human interaction, in this case the added human factor is a consideration. Activities such as snowmobiling, hiking, road building, mining prospecting, backcountry skiing, and CMH’s own operations of heli-skiing, all increase the risk of natural hazards through human triggered hazard, change of land use and change of landscape. Natural hazards, such as fires, avalanches and landslides, all affect CMH’s operation in multiple ways. Furthermore, they perpetuate or are perpetuated by the potential loss of other such ecosystem services. For example, natural hazards can compromise a guest’s experience by eliminating the aesthetic value at a given lodge, or global/local/regional climate trends can increase the risk of fire or avalanche.

Table 7-6 presents the analysis of CMH’s business risks and opportunities related to natural hazard mitigation. Herein lie the risks and opportunities analysed through the lens of each of the five business aspects outlined in section 4.1.3.

Table 7-6 Risks and opportunities associated with natural hazard mitigation

Natural Hazard Mitigation		
Type	Risk	Opportunity
Market & Product	Fires, avalanches, landslides, pine beetle infestations, can all contribute to the loss of wilderness aesthetics and sense of remoteness around the lodges Increase in natural hazards increases the risk of danger to clients and staff	Within natural hazard education, such as avalanche courses or briefings for clients, CMH could address a changing ecosystems role in increased natural hazard events
Operational	Increase in natural hazards increases the risk of danger to clients and staff On and off-season natural hazards can compromise reliable skiing terrain in which CMH operates Natural hazards pose a risk to the remote lodges	Engage in discussions with land-use planners and others operating on the same terrain about ecosystem conservation and low-impact use for safety purposes
Regulatory & Legal	With increased safety concerns, increased legal concerns and vulnerabilities Changing landscape due to natural hazards may affect license of operation	Encourage regulators to reduce high impact activities in skiing area for natural hazard mitigation

Reputational	Increase in natural hazards increases the risk of danger to clients and staff Geographical reputation compromised, i.e. - increased avalanches (and media coverage) during entirety of Canadian ski season increase clients' hesitation to heli-ski	
Financing		

7.4 Broader industry context

Hanson et al.'s (2012) notion that the ESR goes beyond traditional environmental management systems, which tend to focus on impacts and not necessarily on business risks and opportunities presented by a changing natural world, is in some way relevant to all businesses. This is especially pertinent for businesses that rely on aspects of the natural world in their operations, as many tourism companies do. Even if a company is not yet prepared or does not have the capacity to address all the ecosystem service related risks and opportunities identified by conducting the ESR, it is still a beneficial tool in order to gain an understanding of a company's place in the natural world and prepare for future changes in policy, ecosystems, and markets.

There are certain universal parallels between the analysis done specifically for CMH and the broader tourism industry in regards to ecosystem services. Having said that, much of the findings in this study would not be relevant to the majority of tourism operations throughout the world due to the particular geographical context and business offering. Some of the findings, however, would be relevant and applicable to companies operating in a similar geographic context, companies with a relatively similar product/service offering, and companies embedded in the natural world to the extent and in a similar manner that CMH is embedded. For example, obviously many of the findings and much of the analysis around cultural services would be relevant to a number of companies that are positioned with the aforementioned similarities. Referring back to Chan et al. (2011), Bowler et al. (2010), and Dustin et al. (2010), it is obvious that cultural services are a driving factor within the tourism industry and in the decision making of clients. The importance and demand of these cultural services will likely increase further as global urbanization increases.

Using the ESR as a methodology to address business opportunities and risks proved to be an ideal tool for the tourism sector. Not only is it applicable to individual companies, but one can imagine applying it within an entire tourism market or economy. For example, the findings within this study would be applicable to many of the companies associated with HeliCat Canada²⁴. In a similar way, the ESR could serve as a relevant and beneficial tool to be used within an entire tourism association, a specific tourism economy and geographical location, or within an individual company. The ESR helps identify an entity's relationship with ecosystem services in a practical and comprehensive manner, which could otherwise be overly complex and potentially overwhelming. It also presents results that are accessible and have a practical application that can be designed to suit any company or organisation's needs.

²⁴ HeliCat Canada is the industry association comprised of heli-skiing and cat-skiing operations within Canada. More information can be found at www.helicatcanada.com

8 Discussion and conclusions

Stepping back from the core of the study and analysis, in this section the author offers some general theoretical and analytical reflections regarding the process, outcomes and decisions made throughout this study. Also, the discussion seeks to present general and practical implications as they pertain to CMH, various stakeholders and the industry as a whole.

8.1 Implications for CMH

As mentioned above, the implications of this study are not solely academic contributions, rather they are much more related to the practical operations of CMH and segments of the tourism industry more broadly. In regards to CMH's operations, the implications of this study in providing an ecosystem service perspective, understanding and approach, are valuable on many levels. The most fundamental implication for CMH is that this study established a foundation from which to adopt or apply an ecosystem services perspective in one or more of the ecosystem service areas established within this study. This foundation also provides a platform from which to expand on and further explore some of the ecosystem services identified, whether that be in regards to a certain policy, decision, or initiative. Moreover, it further differentiates CMH as a leader in sustainability considerations within their industry and beyond, as CMH is now well positioned to lead the way into the next generation of sustainability initiatives, both internally and externally. The following are some of the implications of this study for CMH's overall operation:

- In participating in this study, CMH has engaged in the first real study of this nature, within this particular industry, which reinforces several of their main sustainability goals, including support of research and education that improves on their sustainability practices, and being responsible stewards (see section 5.1.6 for entire sustainability goals)
- The acknowledgment that certain problems, risks, or opportunities related to CMH's core offerings are directly, or indirectly, related to ecosystem services and a changing natural world provides CMH with a platform to begin internally addressing some of the risks and opportunities presented, across various aspects of CMH's operations.
- This study connects CMH's core business offerings with the services that will support the continued delivery of these offerings.
- This study provides CMH with a foundation from which to rethink their relationship with the natural world, thereby providing an opportunity for innovation on several levels.
- This study outlines a new ecological approach and perspective from which to view their operations and relationship with the natural world. For example, it is perfectly valid that the loss of a micro-hydro plant can be attributed to a severe storm event, swelling streams and large debris. With an ecosystem services perspective, a whole new set of questions may be considered and posed in ways that may provide for a more holistic view of risks. For example: How does deforestation play a role? What has occurred in the local climate? How will this affect erosion and our water sources? Why isn't the natural world regulating water flows?
- Sustainability discussions held across various aspects of CMH's operation, whether it be hospitality service or mountain guiding, can be held in a shared language.
- If CMH takes up as ecosystem services approach, an understanding by various groups within CMH that a single ecosystem service can affect very different parts of CMH's operation, in similar or different ways, can be very valuable. Given the shared language and foundational understanding, this can lead to more communication across these areas and a more efficient approach to being embedded in the natural world.

- An ecosystem services perspective can provide further understanding that sustainability considerations at CMH do not have to focus only on reducing CMH's impact, or being stewards of the land, but can allow for a consideration what being embedded in the natural world means to CMH's operations now and into the future.
- CMH can use an ecosystem service perspective and approach when engaging with stakeholders in the following ways:
 - Informing policy and regulation regarding land-use;
 - Aligning with all levels of government in their current or potentially emerging ecosystem approach to policy, permitting and decision-making;
 - Informing, furthering the agenda, providing new tools and new perspectives to the BCSTC, other industry associations or similar businesses;
 - Informing other stakeholders about the value of ecosystem services or an ecosystem service perspective in regards to the various land-uses, current or proposed.

8.2 Broader implications

The implications of this study extend further than the scope of CMH's operations. The broader tourism industry is indeed well aware of the natural world and the relationship that certain tourism operations or tourism economies have with ecosystem services, which is usually a relationship characterized by dependency. The Il'Ngwesi Ecolodge (as presented in Box 5-2) is an example of an operation that is well aware of their relationship with the natural world and has designed a program that promotes conservation, generates revenue, and does so in a sustainable manner. The ecosystem services discussion within the tourism industry is emerging and will continue to emerge as these services become degraded or lost and begin to impact tourism operations and economies more frequently. After all, in many cases, tourism operations such as CMH provide a fairly sustainable and long-term economy with marginal effects to the environment relative to other economically driven usages of land (i.e. – logging). The broader implications of this study are as follows:

- Ecosystem services, more specifically environmental quality and quantity, play a role in consumer demand and enjoyment.
- A degrading ecosystem poses a threat not only to companies directly embedded in that natural world, but to many tourism operations or economies.
- The ESR is a valid and beneficial tool to help identify opportunities and risks in regards to ecosystem services that can be used within singular tourism operations, larger tourism association or geographical defined tourism economies.

On a local scale, CMH as a company is part of a much larger ecosystem of stakeholders, decision-makers and communities. The stakeholders involved in CMH's operations, including local communities and First Nations, a variety of other companies that operate under government-issued License of Operation's on the same terrain, various levels of government, outdoor enthusiasts, business associations and many more were excluded from the core of this study due to the diversity of their stake and geographical context. Although they were mostly excluded, the implications of this study certainly extend into the diverse group of stakeholders that surround, are involved in and are affected by CMH's operations. The following are some of the implications of this study for CMH's stakeholders:

- With an increasing focus on ecosystem services within land-use planning and government policy, CMH can serve as an informant and a representative company.

- Ecosystem services can have overlapping or differing importance to various stakeholders. In both scenarios, this study helps CMH understand and engage other stakeholders in mutually beneficial considerations.
- Industry groups will benefit from a study of this nature as their relationship to ecosystem services are likely similar to those of CMH.
- Future land-use plans, by either local communities or First Nations groups, can benefit from an ecosystem approach and collaboration with CMH.

8.3 Theoretical considerations and reflections

The purpose of this study was not to engage in a comparative or theoretical discussion regarding the definition, classification or state of ecosystem services. Indeed there exists an academic debate regarding the theories that encompass the ecosystem services discussion. This debate is not far removed from the Millennium Ecosystem Assessment (2005), which established the definition, classification system, and implications of ecosystem services within a global scope. The MA, as an enormous undertaking, is far reaching in its implications and established the foundation and language that now underpin the debate around ecosystem services. As alluded to in section 3 the ecosystem services debate is ongoing, and given that it is a debate, it has a slightly adversarial tone to it. This is likely attributable to the fact that the ecosystem services discussion is relatively new and there remains much to clarify, both in the theoretical realm and in its practical applications. There is no doubt, though, that this feeling of jockeying is natural in an academic context and even necessary one in order to further establish the foundation from which to regard these theories and concepts in the future. Having said this, as Raudsepp-Hearne points out, the debate is not progressing much beyond defining ecosystem services, classifying ecosystem services and developing ways to determine the value of ecosystem services (personal communication, July 11th, 2012). The slow speed at which this discussion is emerging can perhaps be explained by its youthfulness and inherent need to firmly establish itself before getting beyond itself. It will, however, be a welcome progression when ecosystem service considerations begin to penetrate and establish themselves within larger policy, industry, and social discussions. In that way, the discussion will turn outwards into the practical realm and evolve with the application of ecosystem services theory in the real world.

This study is an attempt at considering ecosystem services from a theoretical perspective in support of a practical application. This study is not intended to impinge upon the core ecosystems service discussion. In some ways, this study considers the ongoing debate on this topic, but the author has chosen to use a framework supported by the concepts established in the MA, rather than the theories and concepts that have evolved since. As a result, this study is more focused towards the practical implications of the chosen framework. These implications exist on several scales, including the implications for CMH, the adventure tourism industry as a whole, and also on the implications associated with CMH's influence on the industry. In regards to theory, the author made the intentional choice to present theoretical debate without getting caught up in it. Keeping one foot firmly planted in the practical sphere facilitated this engagement with theory. The reasoning behind this decision is that the complexities of considering ecosystems services are seemingly never ending. Ecosystems are complex and dynamic, and we are always learning more about them. Moreover, with the addition of various anthropogenic systems that function alongside and influence ecosystems and ecosystem services, the complexities can converge into systems that are difficult to scope and comprehend. Raudsepp-Hearne articulates that when we talk about ecosystem services, we are essentially talking about the entire world (personal

communication, July 11th, 2012). Thus the author decided to choose the practical aspects of this large scope, rather than the purely theoretical.

Upon reflection, additional supporting theory considering business risks and opportunities could have been included within theoretical considerations. In certain regards, the author assumed that business risks and opportunities, not necessarily related to ecosystem service, but in general, are well understood. Even small theoretical considerations in this regard would have supported the selection of the particular risks and opportunities within the analysis.

8.4 Applying the framework

Throughout the course of this study, the author made several choices that directly affected the analysis undertaken and related outcomes. Most importantly were the decisions regarding how to approach this study from a conceptual and theoretical basis. This section will further reflect on these decisions.

8.4.1 Conceptual considerations: the Millennium Ecosystem Services Assessment

As mentioned above, the literature regarding ecosystem services is still in a fairly youthful stage. Although the MA was not a purely academic endeavour, it reset the stage and foundation for defining and classifying ecosystem services after early scholarship produced by Costanza et al. (1997) and Daily (1997) really established the ecosystem services trajectory. The decision to base this study on the concepts, definition and classification system of the MA had two important outcomes. The first is that it was able to present, but forego engaging with, the current academic jockeying. Secondly it supported the use of the corporate ecosystem service review as an analytical framework. Furthermore, it allowed the study to be positioned within a widely accepted, well-regarded and globally understood basis regarding ecosystem services.

8.4.2 Analytical considerations: The Corporate Ecosystem Service Review

By positioning this study within the conceptual grounding established by the MA, the Corporate Ecosystems Service review is an ideal framework to use to assess the business risks and opportunities of a company when considering ecosystem services. Despite being an ideal framework for analysis, and its implementation by over 300 companies, the ESR has never been used in an academic context (S. Ozment, personal communication, July 9th, 2012), as it was designed as a comprehensive tool for the corporate world. For this reason, this study has been a rich learning process given the lack of precedent or critique of a study such as this one. Fortunately, the ESR has been designed to be adapted along the way, which the author certainly had to do. One difficult factor in applying the ESR as an analytical framework in an academic context is that the information is gathered, processed and assessed through the subjective lens of one person. In its intended corporate application, the ESR is generally conducted in a longer time frame, as a more all-encompassing and participatory process. The application and approach of ESR in the corporate sector would generally consist of round tables and meetings comprised of business managers, experts, practitioners, NGOs, employees, industry associations, analysts, and others (see appendix E for the ESR summary of methodology), all voicing an opinion, and performing tasks such as collectively identifying priority ecosystem services or working through the business risks and opportunities related to those ecosystem services. In this case, the ESR tools and methodology have been a guiding factor for the author, but the process and results have

been affected by the fact that it was conducted by one external individual, who was learning about the general discussion around ecosystem services, the implications of individual ecosystem services related to CMH and its operations, all whilst conducting this study.

Despite the potential limitations inherent to conducting the ESR as one individual on the outside looking in, this process has convinced the author that there is validity in using the ESR as an analytical framework. In retrospect, given the learning that took place along the way regarding the application, of ESR in this context, the author would certainly consider slight modifications to the application or analytical approach in order to compensate for the individual perspective. One reason for this is that it has yet to be used in an academic context, which has implications for WRI, WCBSD, and the MI, who designed the ESR with more practical intentions. Moreover, employing a corporate focused methodology in an academic setting holds the potential to bridge the gap between the academic realm, which is still finding its way in the ecosystem service discussion, and the practical world, where there is space and interest to begin practical applications and considerations of ecosystem services. By considering the literature and theoretical foundations of ecosystem services, and applying a real-world framework in a practical sense, the author believes that this study has outlined valid practical implications.

Considering the above discussion regarding the use of the ESR in the academic realm, a study of this nature, where the findings and analysis include multiple ecosystems services, is naturally going to frame conclusions in general terms. This is due to the fact that ecosystems and ecosystem services are complex and dynamic systems, and when studied along side anthropogenic systems, as was the case in this study, these complexities cannot be fully explored. This is particularly relevant in this case, where the focus was on ecosystem services in general, which encompasses a number of complex, overlapping, and dynamic individual ecosystem services. It is conceivable that each individual ecosystem service, or even a single aspect of one ecosystem service, could be the focus of a study of this nature. Conversely, a singular aspect of CMH's operations, whether it be the food supply chain, one tenured ski area, one lodge, or marketing, could merit a full study regarding ecosystem services. This study established a fairly large scope and provided some generalized results and implications. Having said this, a study of this sort can be categorized as practical and comprehensive, as it provides a company and industry with an initial foundation in which to consider ecosystem services within their operations.

8.5 Overall reflections on this study

The main thrust of this study, as defined by the research question, was to consider the opportunities and risks to CMH's business offerings through the lens of ecosystem services. This study proved to be legitimate for several reasons. First, no study of this sort had been done previously in a similar sector or company, therefore this study was both timely and relevant. Second, the ESR had never been used in an academic context and it proved to provide a relevant and valid framework for analysis. Third, the findings and analysis revealed many practical implications for CMH, as well as broader theoretical implications for similar companies, stakeholders, and the tourism industry more generally. Lastly, this study, in collaboration with CMH, has established a foundation from which to further discuss our relationship to the natural world within this part of the world and within this industry. In this regard, the author is satisfied as both the practical implications and theoretical considerations were well balanced and fulfilled.

8.6 Conclusions

The conclusions drawn from this study will be presented in three main parts: (a) ecosystem service relationship to business, (b) the relationship between ecosystem services and the business offering of CMH, and (c) the risks and opportunities for CMH related to ecosystem services. These sections closely follow the three tasks established in the introduction to guide the author in answering the main research question: **How and where does consideration of ecosystem services as they relate to the business model and daily activities of CMH reveal risks and opportunities for the organisation?**

Regarding ecosystem service relationship to business

It is clear throughout the literature and in practice, that ecosystem services are inherently and directly related to human well-being and development. Businesses are no exception. As important institutions in our society, businesses are enabled, and often dependent upon ecosystems and their services to provide a given product or service. Although this is the case particularly for businesses that are embedded in the natural world (e.g.- a bottled water company or an agricultural offering), it is also the case at some point in the lifecycle of any product or service. Of particular interest to this study was the tourism industry, which is often directly embedded in the natural world, and therefore often dependent on ecosystem services for their primary business offering. This study employed the Corporate Ecosystem Service Review (ESR) and the concepts established by the Millennium Ecosystem Assessment (MA) as an analytical and conceptual framework, respectively. In this regard, these frameworks proved to be an ideal assessment tool when considering a company with an offering in the tourism industry.

Regarding the relationship between ecosystem services and the business offering of CMH

This study focused primarily on the core offerings of CMH and their relationship to ecosystem services. As a company whose main offering is embedded in the natural world, it is clear that CMH has an inherent dependence on ecosystem services. Guided by the ESR, the author discovered that CMH has a multitude of dependencies on the natural world, which all present risks and opportunities to their core offering. The following were the priority ecosystem services identified as holding particular importance within CMH's operations:

- Cultural Services: recreation and ecotourism, ethical and spiritual values, and educational and inspirational values
- Water: provisioning of freshwater, water regulation, and water purification and wastewater treatment
- Global climate regulation
- Local/regional climate regulation
- Erosion control
- Natural hazard mitigation

Of these priority ecosystem services, it is the cultural services that form the core of their business. Without these cultural services and the cultural value associated with the natural world and recreational activities, CMH would have no business. The other priority services identified enable CMH's core business offering. A heli-skiing operation could potentially exist without them, but certainly not a heli-skiing operation in the form of CMH's offering.

Regarding the risks and opportunities for CMH related to ecosystem services

An assessment of the business risks and opportunities related to ecosystem services was completed in section 7. Each of the aforementioned priority ecosystem services was assessed through the lens of five separate aspects of CMH's business, including market and product, operational, reputational, regulatory and legal, and financial. The assessment revealed a number of relevant risks and opportunities for CMH to consider as they move forward with their operations. The identified risks and opportunities associated with various ecosystem services are varied and affect CMH's offering in a range of different ways. It is obvious from this assessment, however, that ecosystem services play an important role in their operations and even in their very existence.

8.6.1 Future research

Due to the foundational nature of this study, there are several areas in which the author feels that future research would be beneficial for a continued understanding of the relationship to ecosystem services, both within CMH and in broader contexts.

Although valuation of ecosystem services depends on the development of accurate methods to deal with the complexities and dynamics of ecosystems, a future study on the monetary value of these ecosystem services would be extremely relevant to CMH, policy analysts, stakeholders and decision makers. The valuation of ecosystem services utilizes an economic lens to provide a tangible understanding of how degradation and the loss of ecosystem services can affect a business, industry or community.

Each one of the identified priority ecosystem services examined in this study are complex and dynamic natural processes. This study only scratches the surface of their current condition, relevance and relationship to CMH. Further exploration of each individual ecosystem service is no easy task, but is warranted given the complexities involved.

Research that considers and focuses on the various stakeholders involved in CMH's operation, this industry and geographical area is also warranted. It would be conceivable, and useful, to focus on one ecosystem service and its effect across an identified group of stakeholders. A study of this nature would provide further understanding into the broader implications of a given ecosystem service for business and other sectors across a group of different stakeholders. This would be extremely valuable for land-use planning and policy development.

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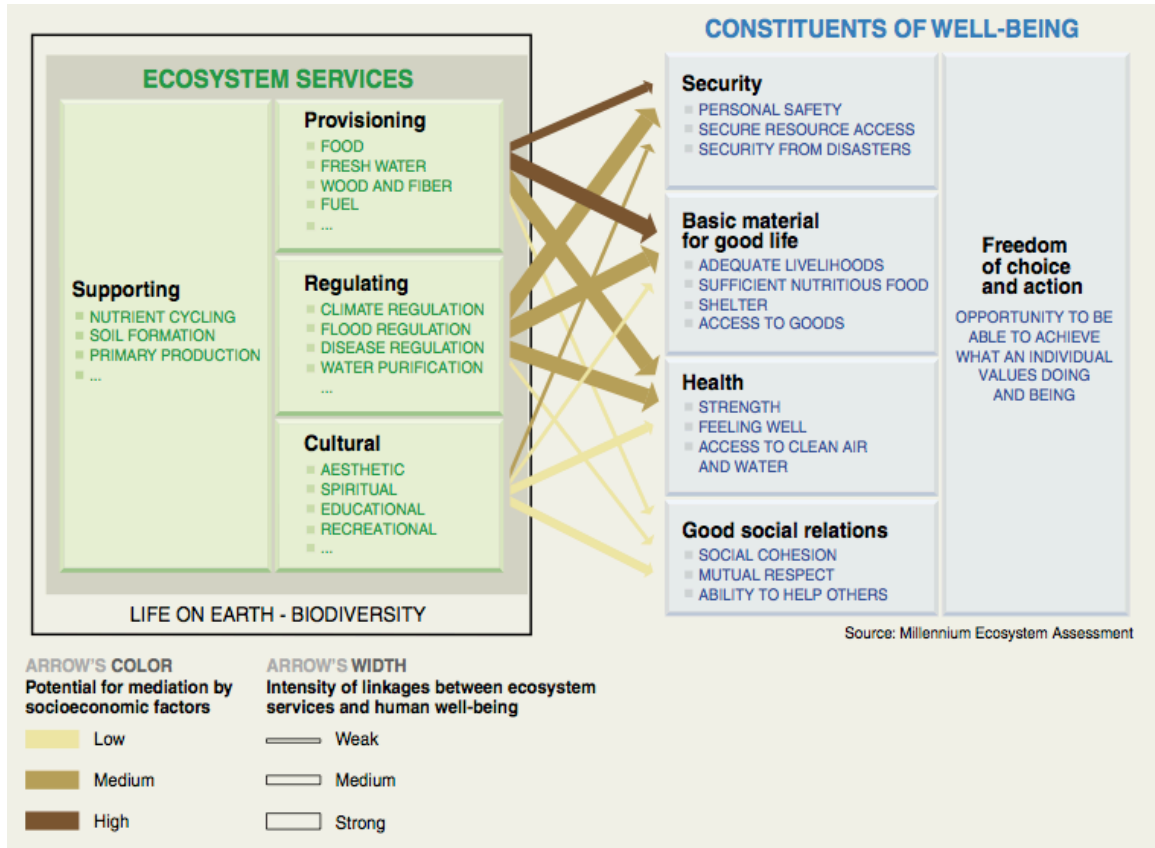
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Appendix A: MA constituents of human well-being

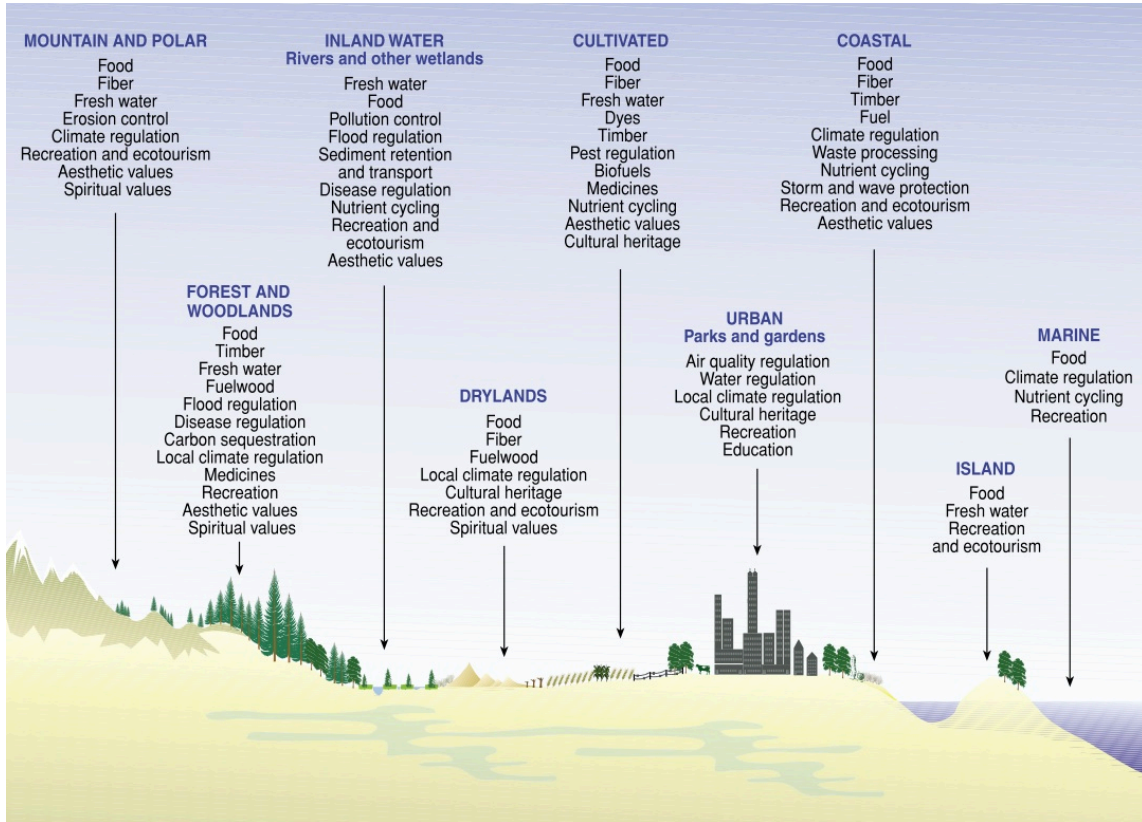
The constituents of human well-being, as per the Millennium Ecosystem Assessment



Source: Used with the permission of the World Resource Institute (MA, 2005)

Appendix B: Geographical representation of ecosystem services

This figure demonstrates the MA's representation of ecosystem services across a geographical spectrum. Though not specifically expressed, this figure also provides potential insight into how various industries, across the geographical landscape, may be affected or benefit from ecosystem services.



Source: Used with the permission of the World Resource Institute (MA, 2005)

Appendix C: ESR Dependencies and Impact Questionnaire

This following outlines the questions and categories in the ESR's Dependence and Impact Questionnaire. Due to the large size of the actual questionnaire, it is laid out much differently for the purposes of this appendix. Each one of the following five questions was asked, in order, for each of the subsequent ecosystem service categories.

A full Dependence and Impact Questionnaire can be found online at <http://www.wri.org/publication/corporate-ecosystem-services-review>.

Company DEPENDENCE on ecosystem Services

1. Does this ecosystem service serves as an input or does it enable/enhance conditions for successful company performance? If "no" skip to question 3
2. Does this ecosystem service have cost-effective substitutes?
(space left for comments o supporting information)

Company Impact on Ecosystem Services

3. Does the company affect the quantity or quality of this ecosystem service? If "no" skip to the next ecosystem service
4. Is the company's impact positive of negative?
 - a. Positive: The company increases the quantity or quality of this ecosystem service
 - b. Negative: The company decreases the quantity or quality of this ecosystem service
5. Does the company's impact limit or enhance the ability of others to benefit from this ecosystem service?
(space left for comments or supporting information)

Ecosystem Services

Provisioning Services:

Crops: Cultivated plants or agricultural produce harvested by people for human or animal consumption as food. Examples: grains, vegetables, fruit

Livestock: Animals raised for domestic or commercial consumption or use. Examples: chicken, pigs, cattle

Capture fisheries: Wild fish captured through trawling and other non-farming methods. Examples: cod, crabs, tuna.

Aquaculture: Fish, shellfish, and/or plants that are bred and reared in ponds, enclosures, and other forms of fresh- or salt-water confinement for purposes of harvesting. Examples: shrimp, oysters, salmon

Wild foods: Edible plant and animal species gathered or captured in the wild. Examples: fruit and nuts, fungi, bushmeat

Timber and other wood fiber: Products made from trees harvested from natural forest ecosystems, plantations, or nonforested lands. Examples: industrial roundwood, wood pulp, paper.

Fibers and resins: Nonwood and nonfuel fibers and resins extracted from the natural environment. Examples: cotton, hemp, and silk, twine and rope, natural rubber

Animal skins: Processed skins of cattle, deer, pig, snakes, sting rays, or other animals. Examples: leather, rawhide, and cordwain

Sand: Sand formed from coral and shells. Examples: White sand from coral

Ornamental resources: Ecosystem-derived products that serve aesthetic purposes. Examples: tagua nut, wild flowers, coral jewellery

Biomass fuel: Biological material derived from living or recently living organisms—both plant and animal—that serves as a source of energy. Examples: fuelwood, charcoal, grain for ethanol production, dung

Freshwater: Inland bodies of water, groundwater, rainwater, and surface waters for household, industrial, and agricultural uses. Examples: freshwater for drinking, cleaning, cooling, industrial processes, electricity generation, or mode of transportation

Genetic resources: Genes and genetic information used for animal breeding, plant improvement, and biotechnology. Example: genes used to increase crop resistance to disease

Biochemicals, natural medicines, and pharmaceuticals: Medicines, biocides, food additives, and other biological materials derived from ecosystems for commercial or domestic use. Examples: echinacea, ginseng, garlic; paclitaxel as basis for cancer drugs; tree extracts used for pest control

Regulating Services:

Maintenance of air quality: Influence ecosystems have on air quality by emitting chemicals to the atmosphere (i.e., serving as a “source”) or extracting chemicals from the atmosphere (i.e., serving as a “sink”). Examples: lakes serve as a sink for industrial emissions of sulfur compounds; tree and shrub leaves trap air pollutants from roadways

Global climate regulation: Influence ecosystems have on the global climate by emitting greenhouse gases or aerosols to the atmosphere or by absorbing greenhouse gases or aerosols from the atmosphere. Examples: forests capture and store carbon dioxide; cattle and rice paddies emit methane

Regional/local climate regulation: Influence ecosystems have on local or regional temperature, precipitation, and other climatic factors. Example: forests can impact regional rainfall levels

Regulation of water timing and flows: Influence ecosystems have on the timing and magnitude of water runoff, flooding, and aquifer recharge, particularly in terms of the water storage potential of the ecosystem or landscape. Examples: permeable soil facilitates aquifer

recharge; river floodplains and wetlands retain water—which can decrease flooding during runoff peaks—reducing the need for engineered flood control infrastructure

Erosion control: Role ecosystems play in retaining and replenishing soil and sand deposits. Examples: vegetation such as grass and trees prevents soil loss due to wind and rain; forests on slopes hold soil in place, thereby preventing landslides; coral reefs, oyster reefs, and sea grass beds reduce loss of land and beaches due to waves and storms

Water purification and waste treatment: Role ecosystems play in the filtration and decomposition of organic wastes and pollutants in water; assimilation and detoxification of compounds through soil and subsoil processes. Examples: wetlands remove harmful pollutants from water by trapping metals and organic materials; soil microbes degrade organic waste rendering it less harmful

Disease mitigation: Influence ecosystems have on the incidence and abundance of human pathogens. Example: intact forests reduce the occurrence of standing water—a breeding area for mosquitoes—and thereby can reduce the prevalence of malaria

Maintenance of soil quality: Role ecosystems play in sustaining soil's biological activity, diversity and productivity; in regulating and partitioning water and solute flow; and, in storing and recycling nutrients and gases. Example: some organisms aid in decomposition of organic matter, increasing soil nutrient levels; some organisms aerate soil, improve soil chemistry, and increase moisture retention; animal waste fertilizes soil.

Pest mitigation: Influence ecosystems have on the prevalence of crop and livestock pests and diseases. Example: predators from nearby forests—such as bats, toads, snakes—consume crop pests

Pollination: Role ecosystems play in transferring pollen from male to female flower parts. Example: bees from nearby forests pollinate crops

Natural hazard mitigation: Capacity for ecosystems to reduce the damage caused by natural disasters such as hurricanes and to maintain natural fire frequency and intensity. Examples: mangrove forests and coral reefs protect coastlines from storm surges; biological decomposition processes reduce potential fuel for wildfires

Cultural Services:

Recreation and ecotourism: Recreational pleasure people derive from natural or cultivated ecosystems. Examples: hiking, camping, bird watching, scuba diving, going on safari

Ethical and spiritual values: Spiritual, religious, aesthetic, intrinsic, “existence,” or other values people attach to ecosystems, landscapes, or species. Examples: spiritual fulfillment derived from sacred lands and rivers; people's desire to protect endangered species and rare habitats

Educational and inspiration values: Information derived from ecosystems used for intellectual development, culture, art, design, and innovation. Examples: the structure of tree leaves has inspired technological improvements in solar power cells; school field trips to nature preserves aid to teach scientific concepts and research skills

Supporting Services:

Habitat: Natural or semi-natural spaces that maintain species populations and protect the capacity of ecological communities to recover from disturbances. Examples: native plant communities often provide pollinators with food and structure for reproduction; rivers and estuaries provide nurseries for fish reproduction and juvenile development; land natural areas and biological corridors allow animals to survive forest fires and other disturbances.

Appendix D: List of interviews

Interviewee	Organisation	Position	Date	Method
Jori Guegt	CMH	Director of Hospitality Services	June 25 th , 2012	In person
Rick Carswell	CMH	Food and Beverage Manager	June 26 th , 2012	In person
Dave Butler	CMH	Director of Sustainability	June 26 th , 2012	In person
Todd Guyn	CMH	Mountain Safety Manager	June 27 th , 2012	via Skype
Bob Krysak	CMH	Retail Manager	July 2 nd , 2012	via Skype
Suzanne Ozment	World Resource Institute	Associate involved in the ESR	July 9 th , 2012	via Skype
Erich Unterberger	CMH	Manager of Guiding Operations	July 10 th , 2012	via Skype
Ciara Raudsepp-Hearne	N/A	Expert and consultant	July 11 th , 2012	via Skype
Todd Guyn	CMH	Mountain Safety Manager	July 16 th , 2012	via Skype
Erich Unterberger	CMH	Manager of Guiding Operations	July 19 th , 2012	via Skype
Rick Carswell	CMH	Food and Beverage Manager	July 25 th , 2012	via Skype
Jori Guegt	CMH	Director of Hospitality Services	July 30 th , 2012	via Skype
Dave Butler	CMH	Director of Sustainability	July 30 th , 2012	In person
Sean Herbert	BC Ministry of Forests, Lands and Natural Resource Operations	Director of Program Delivery	August 3 rd , 2012	via Telephone

Steven Wilson	EcoLogic Research	Biologist and Habitat expert	August 28 th , 2012	via Skype
Dr. Luuk Dorren	Swiss Federal office for the Environment	Natural hazards expert	September 3 rd , 2012	via Skype

Appendix E: Summary of ESR methodology

Table 1 Corporate Ecosystem Services Review: Summary of Methodology					
Step	1. Select the scope	2. Identify priority ecosystem services	3. Analyze trends in priority services	4. Identify business risks and opportunities	5. Develop strategies
Activity	Choose boundary within which to conduct the ESR (a specific business unit, product, market, landholdings, major customer, supplier, etc.)	Systematically evaluate degree of company's dependence and impact on more than 20 ecosystem services. Determine highest "priority" ecosystem services—those most relevant to business performance	Research and evaluate conditions and trends in the priority ecosystem services, as well as the drivers of these trends	Identify and evaluate business risks and opportunities that might arise due to the trends in priority ecosystem services	Outline and prioritize strategies for managing the risks and opportunities
Who is involved	<ul style="list-style-type: none"> Executive managers Manager(s) from selected scope Analysts Consultants (optional) 				
Sources of input and information	<ul style="list-style-type: none"> In-house business managers and analysts Existing and new in-house analyses Local stakeholders Experts from universities and research institutions Millennium Ecosystem Assessment publications and experts Nongovernmental organizations Industry associations Published research Other resources and tools* 				
End product	Boundary for ESR analysis	List of 5-7 "priority" ecosystem services	Short paper or set of data that summarizes trends for each priority ecosystem service	List and description of possible business risks and opportunities	Prioritized set of strategies
Estimated time**	1-2 weeks	1-2 weeks	2-5 weeks	1-2 weeks	1-2 weeks
For details see:	pages 13-14	14-20	20-23	24-30	30-32

Source: Used with the permission of the World Resource Institute, Hanson et al. (2012)