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National Park

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Strategic Environmental Assessment

for the Site Guidelines for
Development and Use, Sunshine
Village Ski Resort

Banff, Alberta
December, 2018



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1 BACKGROUND

1.1 OVERVIEW

Sunshine Village Ski Area (the Ski Area), situated south of the town of Banff, is one of four ski areas in Banff and Jasper national parks. Parks Canada is committed to working together with the Ski Area, the town of Banff, environmental non-government organizations, and the tourism industry to support a vibrant winter outdoor recreation experience while fulfilling its responsibilities of protecting heritage resources and ecological integrity, and facilitating opportunities for public education and memorable visitor experiences.

The *Ski Area Management Guidelines*, 2006 (the Management Guidelines) provide the overarching policy and planning foundation for the four mountain park ski areas. In accordance with direction in the Management Guidelines, Parks Canada has prepared draft *Sunshine Village Site Guidelines for Development and Use* (the Site Guidelines) that represent the site-specific application of the Management Guidelines to Sunshine Village Ski Area. The primary focus of the Site Guidelines is to establish permanent limits to growth and outline the types of development and use consistent with the Management Guidelines that can be brought forward in the future.

Following the establishment of Site Guidelines, the Ski Area will be responsible for preparing one or more Long-Range Plans that detail development or redevelopment plans, for a time period chosen by the operator (anticipated to be five to 15 years). Long-Range Plans brought forward by the Ski Area will be subject to impact assessment in accordance with the *Parks Canada Directive on the Implementation of the Canadian Environmental Assessment Act 2012* or successor legislation. Environmental impact analysis of Long-Range Plans will address the project-level environmental effects of specific development proposals consistent with the policy direction established in the Site Guidelines.

1.2 OBJECTIVES OF THIS REPORT

The *Sunshine Village Ski Area Site Guidelines for Development and Use* are subject to a strategic environmental assessment (SEA) consistent with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals* (the Cabinet Directive). The Cabinet Directive indicates that a strategic environmental assessment of a policy plan or program is expected when the following two conditions are met:

- The proposal is submitted to an individual minister of Cabinet for approval.
- Implementation of the proposal may result in important environmental effects, either positive or negative.

The Management Guidelines indicate that the Chief Executive Officer of Parks Canada will approve Site Guidelines, and as such, the decision to undertake a strategic environmental assessment is not strictly required by the Cabinet Directive. However, the Cabinet Directive also encourages departments and agencies to “conduct strategic environmental assessments for other policy, plan or program proposals when



circumstances warrant". Given the large size of ski area leaseholds within iconic mountain park landscapes, Parks Canada has decided to undertake a strategic environmental assessment of the Site Guidelines to address potential environmental implications and public concerns related to Ski Area development. The application of strategic environmental assessment to the Site Guidelines is consistent with the Cabinet Directive and with the approach to other Parks Canada strategic planning initiatives, including those for Marmot Basin Ski Area, Mount Norquay Ski Area, Lake Louise Ski Area, park communities and outlying commercial accommodations.

The development of Site Guidelines is nested within a larger policy and planning framework. The strategic environmental assessment of the Site Guidelines is neither the first nor the last step in the environmental analysis of ski areas in national parks. Rather, it addresses the transition between considering the ecological implications of ski area development at the broad strategic levels reflected in the *Canada National Parks Act*, the *Ski Area Management Guidelines* and the *Banff National Park Management Plan*, and project-level assessment of ski area development at Sunshine Village Ski Area as set out in future long-range development plans.

The objectives of this strategic environmental assessment report are:

- To examine the Site Guidelines and present information about how Ski Area development and activity carried out within those guidelines would affect the ecological, cultural and visitor experience environments of Banff National Park in a strategic planning context.
- To affirm that the Site Guidelines are consistent with direction provided in legislation and policy pertinent to the Parks Canada mandate.
- To identify and assess potential cumulative environmental effects at regional and local scales in order to inform future long-range planning and environmental assessment requirements.
- To document the strategic environmental assessment process in accordance with the guidance in the Cabinet Directive.

1.3 USE OF THIS REPORT

The strategic environmental assessment has been conducted so that decision-makers are informed of the potential environmental consequences associated with the Site Guidelines and may make decisions accordingly.

This document reports on the environmental implications of the draft *Sunshine Village Ski Area Site Guidelines for Development and Use* and was used to facilitate government, stakeholder and public review and understanding of the Site Guidelines. While certain key information from the Site Guidelines is summarized in this report, readers may wish to refer to the complete 2006 *Ski Area Management Guidelines* and the *Sunshine Village Ski Area Site Guidelines for Development and Use* for additional detail.



2 LEGAL AND POLICY FRAMEWORK

2.1 INTRODUCTION

The *Sunshine Village Ski Area Site Guidelines for Development and Use* provide direction for the consideration of potential, future development and operation initiatives that may be advanced by the Ski Area as part of a Long-Range Plan consistent with existing legislation and policy for the management of national parks. The following sections highlight the legislative and policy requirements most relevant to the development and assessment of the Site Guidelines. It should be noted that government legislation, regulation or formal Cabinet direction may change from time to time and that legal requirements will always take precedent over the policy established by the Site Guidelines or strategic environmental assessment.

2.2 CANADA NATIONAL PARKS ACT

The *Canada National Parks Act* (2000) is the enabling legislation under which Canada's national parks are established and managed. As a commercial operation within Banff National Park, the development and operation of Sunshine Village Ski Area is governed by that legislation. The general purpose of national parks is stated in Section 4 of the *Canada National Parks Act*:

The national parks of Canada are hereby dedicated to the people of Canada for their benefit, education and enjoyment, subject to this Act and the regulations, and the parks shall be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations.

Section 8 (2) provides clarity on what it means to leave national parks “unimpaired” by managing for ecological integrity:

8 (2) Maintenance or restoration of ecological integrity, through the protection of natural resources and natural processes, shall be the first priority of the Minister when considering all aspects of the management of parks.

2.3 GUIDING PRINCIPLES AND OPERATIONAL POLICIES

The *Parks Canada Guiding Principles and Operational Policies* (1994) provide broad principles that give direction to both present programs and future initiatives of Parks Canada. Specific direction on the management of ski areas is included in Section 5.2.2, Part II, National Parks Policy:

5.2.2 Due to the pressures placed on alpine and subalpine environments, the 1988 National Parks Act Amendments prohibited development of new commercial skiing areas inside the national parks. The five existing commercial alpine skiing areas will be managed within their legislated boundaries according to long-range development plans approved by the Minister and subject to public consultations.



Parks Canada is one of the principal cultural resource management organizations in Canada and is responsible for cultural resources in public settings at national parks, national historic sites and other properties. A *Cultural Resource Management Policy* was developed as part of the *Parks Canada Guiding Principles and Operational Policies* and provides the basis for cultural resource management and protection on lands administered by Parks Canada.

The objective of the *Cultural Resource Management Policy* is:

To manage cultural resources administered by Parks Canada in accordance with the principles of value, public benefit, understanding, respect and integrity.

The *Cultural Resource Management Policy* requires that the concept of historic value of cultural resources be fully integrated into the planning and delivery of conservation, presentation and operational programs specifying that:

2.3.2 In all actions that affect cultural resources, Parks Canada will consider the potential consequences of proposed actions and the cumulative impacts of those actions on the historic character of those resources, and will plan and implement measures that respect that historic character.

2.3.3 When a proposed action on lands or waters administered by Parks Canada requires an environmental assessment, that assessment will include consideration and mitigation of the impacts of the proposed action on cultural resources.

2.4 PARKS CANADA AGENCY REPORT ON PLANS AND PRIORITIES

Parks Canada annual plans and priorities provide direction on achieving the integrated delivery of Parks Canada's mandate of protection, education and visitor experience through an overarching strategic outcome.

Canadians have a strong sense of connection, through meaningful experiences, to their national parks, national historic sites and national marine conservation areas, and these protected places are enjoyed in ways that leave them unimpaired for future generations.

The focus of Parks Canada's plans to connect Canadians and visitors to heritage places is to continue to develop innovative programs and services and to promote Parks Canada places as key tourism destinations. Outreach engagement and promotional activities that contribute to increased visitation and associated revenues support *Canada's Federal Tourism Strategy* and will foster local economic and tourism development opportunities in and around Parks Canada places.

While plans for visitor experience involve diversifying travel and tourism opportunities, the long-term legislated priority of managing national parks to maintain or improve ecological integrity remains. Efforts to maintain and restore ecological integrity are a key contributor to the *Federal Sustainable Development Strategy* and the goal of maintaining "resilient ecosystems with healthy wildlife populations so Canadians can enjoy benefits from natural spaces, resources and ecological services for generations to



come.” In addition, Parks Canada’s Conservation and Restoration Program targeted at achieving conservation gains in national parks demonstrates Parks Canada’s leadership in conservation and environmental stewardship and contributes to the Government of Canada’s priorities of a clean environment and protection of species at risk.

2.5 BANFF NATIONAL PARK MANAGEMENT PLAN 2010

Banff National Park Management Plan 2010

The *Banff National Park Management Plan*, 2010 (the management plan) sets forth a vision for the future of the park, and strategic goals and key actions for achieving the vision. Section 5.5.1 of the management plan describes the Key Strategy:

To manage development and commercial activities to protect and celebrate national park heritage values.

Within this key strategy is specific direction for ski area development and operation:

With each ski operator, develop site guidelines that include negotiated permanent limits to growth in a manner that:

- *Builds on and enhances Banff’s international reputation for unique national park skiing experiences;*
- *Supports the maintenance or restoration of the park’s ecological integrity;*
- *Facilitates memorable national park visitor experiences and educational opportunities; and*
- *Provides ski area operators with clear parameters for long-range and business planning in support of an economically healthy operation.*

Due to the density of visitor use in the region and the sweeping, rugged vistas, the management plan notes the importance of ensuring development at the Ski Area remains sensitive to views from surrounding peaks and meadows. Positioning the Ski Area as an introduction to the backcountry on the edge of the mountain park wilderness is supported by the plan.

At the same time, the management plan identifies the importance of the area for ecological integrity. The region provides relatively gentle access across the Continental Divide for wildlife ranging between the west slopes of British Columbia and Alberta through regional corridors linking the Bow and Vermilion valleys; the management plan specifies these corridors are to be maintained or improved. The rugged mountainous terrain around the Ski Area is used by bighorn sheep and mountain goats, and the Healy Creek drainage and meadows along the divide are identified as important high-quality grizzly bear habitat. Maintaining or improving grizzly bear habitat security is a priority of the management plan. The intended future for the area envisions visitor enjoyment of the popular trails while maintaining grizzly bear occupancy with minimal human-bear conflict.



In addition to issues that are specific to the Ski Area and surrounding environments, the management plan highlights issues that are considered the most serious threats to the ecological integrity of the park. These issues provide a focus for the strategic environmental assessment of the Site Guidelines and include:

- Landscape fragmentation due to human activity and facilities
- Loss of habitat connectivity between major areas of protected habitat as a result of human development and use
- Loss of aquatic and riparian habitat associated with dams, stream channelization and water regulation
- Blockage of fish movements associated with dams and water regulation
- Human-caused mortality of fish and wildlife
- Altered vegetation successional patterns due to fire control and human modification of the landscape
- Loss of montane habitats due to human development and fire control
- Blockage of wildlife movement along and across the Bow Valley
- Altered predator-prey relationships
- Wildlife-human conflicts
- Effects of human activities on water quality
- Introduction of non-native plants and fish

Without being prescriptive on the types of use and development that could take place at the Ski Area, the management plan is clear that the overall goal is finding a balance between Ski Area viability, needs of various user groups both on and off the Ski Area, and maintaining ecosystem integrity. In order to achieve consistency with management plan direction, the nature and intensity of use and development on the Ski Area will ideally create a transition between development and high visitor use along the major transportation corridors linking the townsite of Banff and the Village of Lake Louise, and outdoor adventure experiences that take place on the edge of the mountain park wilderness.

2.6 SKI AREA MANAGEMENT GUIDELINES

The *Ski Area Management Guidelines* and the *Banff National Park Management Plan* together provide the Ski Area-specific policy and planning foundation for the preparation of the Site Guidelines and the subsequent long-range planning process. The Management Guidelines stipulate that Parks Canada's primary goal for the management of ski areas is to achieve long-term land use certainty that:

- *Ensures ecological integrity will be maintained or restored;*
- *Contributes to facilitating memorable national park visitor experiences and educational opportunities; and*
- *Provides ski area operators with clear parameters for business planning in support of an economically healthy operation.*

The Management Guidelines distinguish between the existing "Developed Area" within the Ski Area leasehold and the area of the lease itself. The Management Guidelines



stipulate that “inside the existing Developed Area, new development can be considered where potential ecological impacts can be mitigated. Outside the existing Developed Area, new development can be considered if there is a Substantial Environmental Gain”. Exceptions to the Management Guidelines “may be considered if a Substantial Environmental Gain can be shown by demonstrating a positive change in key ecological conditions”. A leasehold reduction or reconfiguration that results in better protection of sensitive areas in exchange for development in less sensitive areas is an example provided in the Management Guidelines of an exception that can be considered.

The definition of Substantial Environmental Gain in the Management Guidelines includes criteria for determining if an ecological gain is substantial, including:

- *Magnitude – major as opposed to minor improvement;*
- *Geographic context – broad scale as opposed to local impact; and*
- *Ecological context – improved protection or positive impacts to high value, rare or sensitive species or multiple species.*

The identification of ecological parameters is required by the Management Guidelines as part of developing the *Sunshine Village Ski Area Site Guidelines for Development and Use*. With respect to new Ski Area development, the Management Guidelines indicate that:

Within the Developed Area, improvements to services and facilities can be considered. Additional infill ski runs, glading, run widening and parking can be considered. However, to ensure ecological integrity and address aesthetic issues, modification of physical terrain and forest cover will be carefully managed. Site Guidelines will identify ecological management parameters to ensure ecosystem functioning is maintained and that sensitive areas are protected. At a minimum, this will include maximum run width, minimum distance between runs, maximum number of new runs and the prohibition of development in sensitive areas. Other parameters will be determined on a ski area by ski area basis.

The Management Guidelines also provide direction on Memorable Visitor Experiences and Education summarized later in Section 4.6.

2.7 SPECIES AT RISK AND SPECIES OF SPECIAL CONCERN

The terrestrial environment in the Banff area serves as habitat for a number of Schedule 1 species listed under the *Species at Risk Act* (SARA). Whitebark pine, listed as Endangered, are found throughout forested subalpine regions of the Ski Area. Little brown myotis, listed as Endangered, common nighthawk and olive-sided flycatcher, listed as Threatened, and western toad, listed as Special Concern, are found throughout Banff National Park. While woodland caribou have been extirpated from Banff National Park, much of the park, including the area around Sunshine Village, is designated as Type 2 Critical Habitat under SARA. Type 2 Critical Habitat areas are managed to maintain regional predator densities that would allow for the potential reintroduction of caribou into traditional habitats.



In addition to Schedule 1 wildlife species, wolverine is listed under Schedule 2 of SARA. The Ski Area environment is also habitat for grizzly bears. Grizzly bears are considered Threatened in Alberta and have been the subject of considerable management effort in the Banff area for many years to ensure habitat security during summer season visitor use and operational activities.

Healy Creek, which runs through the leasehold, supports populations of westslope cutthroat trout, listed under Schedule 1 of SARA, and drains into Brewster Creek, which contains bull trout, a Threatened species listed provincially and by COSEWIC (Committee on the Status of Endangered Wildlife in Canada). Healy Creek and its tributary Sunshine Creek are the receiving waters for all sewage effluent and stormwater runoff from the Upper Village and Bourgeau base area parking lot. Healy Creek is one of the only monitored waterbodies in Banff National Park with impaired aquatic ecological integrity below reference conditions. Changes to aquatic and riparian habitat, surface drainage, and wastewater and surface runoff quality have the potential to directly or indirectly affect habitat for these fish species.

Under SARA, prohibitions exist to protect individuals, residences and critical habitat of species listed as Extirpated, Endangered or Threatened. Authorization to engage in activities that may affect a listed species, its residence or critical habitat may be issued for specific purposes under SARA (such as research), and under specified conditions – primarily that the activity would not jeopardize the survival or recovery of the species.

It is important to note that legal SARA requirements will always supersede policy and planning decisions, including those of the Site Guidelines. It is equally important to note that the status of species and decisions made for species recovery purposes are likely to change over time. The species presented in the above discussion are not a comprehensive list of federally or provincially listed species that may be present on the Ski Area at the current time or in the future. Given the fluid nature of species listings, the evolving legal status of species under SARA must be tracked, and Ski Area plans updated as specific proposals are brought forward over the course of a Long-Range Plan.

2.8 CABINET DIRECTIVE ON THE ASSESSMENT OF POLICIES, PLANS AND PROGRAM PROPOSALS

The conduct of strategic environmental assessment for federal authorities is guided by the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The Guidelines for implementing the Cabinet Directive indicate that federal departments and agencies have “discretion in determining how they conduct strategic environmental assessments” and are “encouraged to apply appropriate frameworks and techniques and to develop approaches tailored to their particular needs and circumstances”. The general guidance provided on the Cabinet Directive recommends that a strategic environmental assessment should address the following considerations:

- The scope and nature of potential positive and adverse effects including cumulative effects
- The need for mitigation or opportunities for enhancement
- The scope and nature of residual effects
- The need for follow-up measures



- Public and stakeholder concerns

Early integration of the strategic environmental assessment process into existing planning, public consultation and reporting processes is a key feature of the Cabinet Directive.

3 PUBLIC CONSULTATION

Public engagement on the *Sunshine Village Ski Area Site Guidelines for Development and Use* and the strategic environmental assessment is currently underway.

4 APPROACH

4.1 STRATEGIC APPROACH

The primary objective of the strategic environmental assessment is to examine the Site Guidelines and present information about how potential Ski Area development and activity carried out within the scope of those guidelines would affect the ecological, cultural and visitor experience environments of Banff National Park. Legislation and policy direction as described above is used to focus the strategic environmental assessment on the most important issues to Banff National Park and to provide a benchmark against which the potential environmental impacts of the Site Guidelines can be assessed.

The Cabinet Directive indicates that the focus of strategic environmental assessment “should be on identifying strategic considerations at a relatively general or conceptual level, rather than evaluating quantitative, detailed environmental impacts, as in a project-level assessment”. Accordingly, the strategic environmental assessment does not attempt to identify or assess all potential environmental impacts arising from Ski Area development and use. Instead, a suite of valued components has been selected for assessment that reflects the key issues arising from legislation and policy direction. The strategic environmental assessment relies on existing information and research to inform the assessment process. Information gaps are identified and future information requirements are noted, as appropriate.

Mitigating measures in the strategic environmental assessment take the form of ecological management parameters aimed at achieving expected outcomes pertaining to Parks Canada’s integrated mandate. Mitigations also take the form of planning, operational and knowledge requirements to be addressed in future Long-Range Plans and project design proposals. The strategic environmental assessment does not address mitigations related to potential Ski Area project construction or day-to-day operational or visitor use. These are addressed separately through a combination of best management practices, the implementation of an environmental management system consistent with an approved Long-Range Plan, and the environmental assessment of Long-Range Plans and other projects pursuant to the requirements of the *Parks Canada Directive on the Implementation of the Canadian Environmental Assessment Act 2012*.



4.2 GEOGRAPHIC AND TEMPORAL SCOPE

The geographic scope of the assessment encompasses both landscape and local ecosystem scales.

At the landscape scale, the Ski Area will be assessed in terms of its context within the mountain parks – and where “landscape” is defined as a mosaic where a mix of local ecosystems and land uses is repeated in similar form over a kilometres-wide area. The landscape assessment will include the consideration of broad patterns of habitat use and movement for wide-ranging wildlife species, and of important or sensitive ecosystem functions likely to interact with Ski Area development and use.

The Ski Area will also be assessed in terms of its context to local ecosystems – where a “local ecosystem” is defined as a spatial element within a landscape relatively homogeneous and distinct in boundary. The local ecosystem scale includes the area contained within the Ski Area leasehold as well as ecosystem features that span leasehold boundaries that are likely to be affected by Ski Area development and activity. Local ecosystems will include the Sunshine Meadows natural region, including those areas within Mount Assiniboine Provincial Park, surrounding mountain ranges encompassed within the Sunshine-Egypt and Massive land management units, and the Healy and Sunshine watersheds as well as important wildlife habitat and movement corridors.

The existing environmental conditions at the Ski Area represent the cumulative impact of past projects and activities and provide the temporal baseline from which the strategic environmental assessment will proceed. The scope of assessment extends to future projects and activities that may be presented in Long-Range Plans consistent with the Site Guidelines. The scope of assessment also includes consideration of other key centres of development and activity that are important from a cumulative effects perspective (see Section 4.8).

Although individual project proposals may have limited life spans, overall Ski Area development is regarded as a permanent change to the environment, and the scope of assessment considers potential environmental impacts into the foreseeable future.

4.3 ALTERNATIVES

The Cabinet Directive identifies the consideration of alternatives as one of the most important aspects of strategic environmental assessment. Alternative approaches to ski area development in the mountain parks were first considered in the development of the *Ski Area Management Guidelines*. The Management Guidelines provide both direction and limitations on potential development and use alternatives that may be proposed by any of the mountain park ski areas addressing a wide range of issues such as on-hill accommodation, development footprint, growth limits, transportation, terrain modification, water and infrastructure development, and summer visitor use. While the purpose of the Management Guidelines is to limit potential alternatives to those that would not impair park heritage resources, they do allow for the consideration of exceptions to the established direction and limitations if a Substantial Environmental Gain can be shown by demonstrating a positive change in key ecological conditions:

Exceptions to these Guidelines for facilities, parking, terrain modification limitations and adjustments to the perimeter of the



Developed Area can be considered if there are Substantial Environmental Gains. Exceptions will not be considered for on-hill accommodation, Growth Limits, water permits and infrastructure requirements.

Substantial Environmental Gain is defined by the Management Guidelines as:

An environmental gain is a positive change in key ecological conditions (wildlife movement and habitat, wildlife mortality, sensitive species/areas and aquatic ecosystems) that leads to the restoration or the long-term certainty of maintaining ecological integrity.

The exceptions outlined in the *Sunshine Village Ski Area Site Guidelines for Development and Use* are considered as key strategic alternatives to the limitations imposed by the Management Guidelines. The potential exceptions are identified and assessed individually throughout this strategic environmental assessment document and are also evaluated as a package with a focus on cumulative environmental effects.

The consideration of alternative means of carrying out a proposed project is not addressed in the scope of the strategic environmental assessment. The need to consider alternative means such as locations, technologies, methods or approaches to development is identified in proposed mitigation measures throughout the strategic environmental assessment. Where recommended in the strategic environmental assessment, alternative means will be more fully considered in the development of Long-Range Plans and the associated environmental assessment.

4.4 ECOLOGICAL INTEGRITY

The *Canada National Parks Act* clarifies the meaning of ecological integrity through the following definition:

“ecological integrity” means, with respect to a park, a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes.

The key threats to the ecological integrity of Banff National Park (see Section 2.5) reflect the definition and include modification of natural processes, landscape fragmentation and loss of habitat connectivity, modification of vegetation patterns and composition, wildlife displacement, habituation and mortality, degradation of aquatic ecosystems and habitat, altered predator-prey relationships, and introduction of exotic organisms. To address these threats, the strategic environmental assessment focuses on expected outcomes for ecological integrity that reflect the wildlife, vegetation, terrain and aquatic concerns of highest importance to Banff National Park. With respect to the potential impacts of the Site Guidelines, ecological integrity will be maintained when the following expected outcomes are realized:

- Development and use parameters support achievement of local region ecological integrity goals, including those for fire and vegetation management, wildlife



- movement, grizzly bear habitat security, and species at risk protection and recovery.
- Terrestrial and aquatic habitat conditions for sensitive species, including whitebark pine, grizzly bear, wolverine, mountain goat, bighorn sheep, westslope cutthroat trout and bull trout, are maintained or restored.
 - Water quality, including chemical, physical and biological parameters, associated with Ski Area operations is maintained and restored as necessary to local reference levels, and implications of interbasin water transfer are reviewed and considered to be of low risk.
 - Habitat and movement security is ensured for all species by maintaining or reducing the potential for human-wildlife conflict and for wildlife displacement and habituation.
 - The effectiveness of the Upper Healy (Bourgeau) Wildlife Corridor is maintained or improved.
 - Vegetation is managed to reflect natural composition, diversity and structure and to maintain the function of landform/soil/vegetation complexes that support rare plants and alpine plant communities.
 - The composition and diversity of native vegetation species and communities throughout the Sunshine Meadows area are maintained and restored where necessary.

Building on these expected outcomes, the suite of valued components selected for assessment in Section 7 represents ecological integrity issues consistent with the requirements of the *Canada National Parks Act* and the *Banff National Park Management Plan*.

4.5 CULTURAL RESOURCES

The Cultural Resource Management Policy defines a cultural resource as a human work or a place that gives evidence of human activity or that has spiritual or cultural meaning, and that has been determined to be of historic value.

Four known cultural resource sites have the potential to be impacted by Ski Area development and operations:

- A historic cabin near the confluence of Healy and Sunshine creeks
- A horse campsite reportedly used for the storage of teepee poles from the 1920s
- An old dump site at the base of the Tin Can Alley ski run
- Sunshine Camp, located near the base of the Teepee Town chairlift and a stopover for the Wheeler Walking Tours during the 1920s

Potential impacts to the above and to other currently unknown or unassessed cultural or historic resources, such as buried archaeological resources, will be addressed as part of Ski Area best management practices, the long-range planning process and associated environmental impact analyses.

Given the application of the cultural resource outcomes into Long-Range Plans, best management practices, and individual project assessment and review processes, cultural



resource values are not considered further as part of this strategic environmental assessment.

4.6 VISITOR EXPERIENCE

The operation of existing downhill ski areas, including Sunshine Village, is appropriate in accordance with overarching direction in Parks Canada legislation, policy and plans as outlined in Section 2. Accordingly, the issue of Ski Area development as an appropriate park use is not considered further as part of the strategic environmental assessment.

As reviewed in Section 2.4, Parks Canada plans and priorities promote meaningful experiences and quality visitor services that improve personal connections to the heritage places administered by Parks Canada.

The *Ski Area Management Guidelines* provide specific direction on memorable visitor experience and education indicating that “the nature of ski area operations and visitor experiences will reflect and reinforce its location in a national park and world heritage site”. Ski areas are encouraged to “provide winter educational opportunities that focus on the heritage values of the park and world heritage site as a component of the skiing/snowboarding experience”.

In order to meet the intent of the *Ski Area Management Guidelines*, the Site Guidelines and the strategic environmental assessment focus on expected outcomes and priorities that may be affected by changes to the environment as a result of Ski Area development and use. Impacts to both on-hill and off-hill park visitors are considered. Expected outcomes and priorities for visitor experience in support of the *Ski Area Management Guidelines* include:

- Develop and maintain authentic mountain national park experiences for all visitors in all seasons at the Ski Area.
- Ensure a balance of Ski Area components in order to minimize congestion and crowding and maximize memorable visitor experience and connection.
- Strengthen the connection of Ski Area winter and summer visitors to Banff National Park and the World Heritage Site through enhanced heritage interpretation, learning opportunities and experiential opportunities.
- Maintain and, where feasible, restore visual and natural viewscales and minimize other sensory disturbance, such as noise and traffic, for on-hill and off-hill visitors.

4.7 REGIONAL INFRASTRUCTURE AND RESOURCE CAPACITY

The *Ski Area Management Guidelines* indicate that increases in Ski Area infrastructure capacity may be considered but that there must be sufficient infrastructure capacity in place, and environmental standards must be met, before related development projects are implemented. With this expected outcome from the Management Guidelines in mind, the strategic environmental assessment will consider how the proposed increases in visitor use in the Site Guidelines will result in a greater demand for or increased pressure on:

- Road and parking infrastructure



- Water and wastewater systems
- Utility consumption

The Site Guidelines establish growth limits that define the limits of potential build-out and require balancing of Ski Area components. These limits can be used to identify and evaluate the potential change in natural resource and infrastructure demand pertaining to transportation, water and power. The focus of the strategic environmental assessment is on avoiding potential impacts first, and second, on identifying mitigations that address planning, operational and knowledge requirements for inclusion in the Long-Range Plan and environmental assessment process.

4.8 APPROACH TO CUMULATIVE EFFECTS ASSESSMENT

“Cumulative effects are the residual adverse effects of the project being assessed, in combination with the adverse effects from other activities which have affected, are currently affecting, or are likely in the future to affect the same ecosystem components or cultural resources” (Parks Canada 2007). Consideration of cumulative effects is an important aspect of strategic environmental assessment and is the main focus of the strategic environmental assessment of the Site Guidelines.

Cumulative effects issues in the Banff area are well known and are reflected in the important ecological issues previously identified for Banff National Park in Section 2.5. Many actions have been cumulatively taken over the years in the greater Banff area to address key issues including highway traffic mortality, grizzly bear habituation and aggressive bear-human encounters, wildlife movement corridors, and restoration of natural wildfire and vegetation succession processes. Visitor management in busy locations including the townsite of Banff, the Bow Valley Parkway and at bear jams along highways, and for the existing summer-use program at the Ski Area have all been successful at reducing human-bear encounters and in providing habitat security for bears and other wildlife.

Development in the Banff area has been capped through the park management planning process, the Banff community planning process, and the outlying commercial accommodation guidelines to help manage cumulative impacts of visitation. Although management planning has capped accommodation and commercial facility capacity, increasing use of the park and the Ski Area for day trips, and during previously under-capacity shoulder seasons, contributes to added visitation year-round. With climate impacts potentially shortening the length of the quality ski season in surrounding areas, winter visitation may be expected to further increase at mountain park ski areas, which are located at relatively higher elevations than surrounding resorts. Added visitation during winter and summer seasons may act cumulatively with other regional stressors to compound potential effects on various valued components. Significant projects or increases in regional scale development that would further compound cumulative effects issues over the foreseeable future are not anticipated.

The strategic environmental assessment in its entirety is focused on cumulative effects assessment, evaluating potential development and use under the Site Guidelines against valued components that are representative of locally relevant cumulative effects issues. Potential impacts to valued components are evaluated, in turn, against expected



outcomes and parameters designed to ensure that cumulative effects issues are effectively addressed in both the Site Guidelines and in future Long-Range Plan proposals. A three-pronged approach to cumulative effects assessment has been integrated into the strategic environmental assessment.

First, the potential cumulative effects of past and current activities are incorporated into the selection and description of the current status for each of the valued components of ecological integrity included in the scope of the strategic environmental assessment. Although cumulative effects are the main consideration for all factors throughout the strategic environmental assessment, the strategic environmental assessment focuses greatest effort on cumulative effects with respect to valued components that are relevant in a regional context, including:

- Wildlife movement and habitat connectivity
- Aquatic habitat
- Wildlife habitat security
- Sunshine Meadows vegetation community
- Species at Risk recovery

Second, the assessment of regional infrastructure capacity as outlined in Section 4.7 directly addresses cumulative effects and interactions between potential Ski Area development activity and regional resource capacity and infrastructure. The strategic environmental assessment recognizes that other developments and use in the Bow Valley may combine with the potential effects of development and use at the Ski Area to exert additional stress on regional resource capacity issues.

Third, the evaluation of potential exceptions to the *Ski Area Management Guidelines* is focused on cumulative effects. As outlined in Section 4.3, proposed exceptions are identified and assessed as a package with a focus on cumulative environmental effects and interactions with valued components at the local and regional ecosystem scales.

The cumulative effects of potential Ski Area development are reflected in the ability of the Site Guidelines to satisfy the expected outcomes for ecological integrity, cultural resource protection, visitor experience and infrastructure capacity as outlined in previous subsections. The expected outcomes as a group reflect Parks Canada's integrated mandate and serve as the benchmark for assessing the potential implications of cumulative effects.

5 SUNSHINE VILLAGE SKI AREA SITE GUIDELINES SUMMARY

The Sunshine Village Ski Area is a large and complex winter and summer outdoor recreation operation situated in one of Canada's most popular and iconic park settings. The Ski Area is located centrally at the conjunction of several significant mountain valleys that serve as habitat and movement corridors for a wide range of aquatic and terrestrial wildlife species. The location of the Ski Area provides opportunities for visitors to experience spectacular scenery, wildlife and outdoor recreation activities on the edge of mountain park wilderness. The Site Guidelines are developed around a Core Concept



for the Ski Area that links the commercial development and recreational use of the Ski Area to its position on the edge of mountain park wilderness, and that recognizes the local, regional and even international importance the Ski Area plays in tourism, visitor experience and ecological integrity.

This section summarizes the key components of the Site Guidelines to be considered in the strategic environmental assessment. The reader should refer to the Site Guidelines themselves for more detailed information.

5.1 CORE CONCEPT

The Core Concept in the Site Guidelines establishes the long-term vision for Ski Area development and use and the connection with the Parks Canada mandate. The Core Concept provides a conceptual approach for the development of the rest of the Site Guidelines and for evaluating specific Ski Area initiatives as they are brought forward as part of Long-Range Plans. Key elements of the Core Concept include the purposeful connection of Ski Area services to the wild, natural environment of Banff National Park, to authentic mountain experience and education opportunities, and to infrastructure and resource sustainability.

Sunshine Village is a ski area, first. Winter use and development as envisioned by the Core Concept focuses on enhancing existing snow riding opportunities for a range of abilities in all weather and snow conditions. The Core Concept encourages recreational challenges from convenient, comfortable, full-service experiences to opportunities to progressively step into sidecountry areas of Banff National Park through access managed for visitors with greater independence and experience. In its approach to summer use, the Core Concept focuses on experiences and active learning about the natural systems and local mountain culture within the Sunshine Meadows area. Architectural and design themes that reflect local mountain tradition and connect visitors to the natural environment are important elements of the Core Concept that help to engage visitors with the spaciousness and wildness of the mountain park environment in all seasons and activities. The engagement of visitors and staff in the Core Concept is realized through a culture of environmental stewardship and protection, application of best practices, incorporation of green design technologies, and resource efficiency in all aspects of Ski Area design and operations.

The Core Concept is applied to Ski Area development and use in the Site Guidelines through minor leasehold reconfiguration, a licence of occupation, the development of Area Concepts, and supporting development guidelines and ecological management parameters. Consistency between the direction of the Core Concept and the rest of the Site Guidelines is a key factor in the strategic environmental assessment of the Site Guidelines.

5.2 LEASEHOLD RECONFIGURATION

The Site Guidelines include a leasehold reduction of approximately 15% and the return of key areas to designated park wilderness, thus contributing to ecological integrity in the area. The key elements of the leasehold reduction include:



- *Healy Corridor* – Removing the lands on either side of the existing Bourgeau base area parking lot and Gondola Corridor from the leasehold. These undeveloped areas function as core wildlife movement corridors past the Ski Area along the Healy Creek and Sunshine Creek valleys.
- *Meadow Park* – Removal of an area on the west slopes of Sunshine Creek valley, north of the Wawa area and down to the lower ski-out through Sunshine Creek. This undeveloped area provides continuous cover for wary wildlife moving to and from the Simpson Pass area and will help to protect water quality and seasonal flow regimes in Sunshine Creek.
- *Sunshine Meadows* – Removal of lands at the southern extent of Sunshine Meadows adjacent to the British Columbia provincial boundary. This relatively unimpacted area could serve as a valuable ecological baseline for the rest of the Sunshine Meadows environment.
- *Bye Bye Bowl Extension* – Removal of a portion of Bye Bye Bowl from the leasehold. Removal of this area eliminates the potential for expanded lifts, roads, utilities or terrain development in the Sunshine Meadows.

Another adjustment to the lease outlined in the Site Guidelines is the removal of the Eagle Crest area from the lease, and inclusion of this area within the Alpine Bowls licence of occupation for avalanche control purposes. The adjustment to a licence of occupation is primarily to manage this location in a manner consistent with the rest of the Alpine Bowls area. These are summarized as follows:

- The current Ski Area lease of approximately 917 ha will be reduced to approximately 782 ha.
- The Developed Area of the reconfigured lease will be approximately 609 ha.
- Undeveloped ski terrain outside of the lease requiring avalanche control will be formalized under a licence of occupation covering approximately 223 ha.
- Total leased and licensed area will be established at approximately 1,005 ha.

In consideration for the substantial environmental gains associated with the reductions described above, certain exceptions, as per the *Ski Area Management Guidelines*, have been considered in the Site Guidelines. These include:

- Parking lot terracing to provide an additional two-row parking terrace immediately adjacent to the existing parking area. This will result in major terrain modification and limited expansion of the Developed Area.
- Ski run, terrain and lift development outside of the current Developed Area to balance skiing opportunities and capacity issues on poor weather/visibility days within overall resort design capacity growth limits. This exception includes the potential for new lifts, runs and glade expansion in the Goat's Eye II, Hayes Hill and Meadow Park areas.
- A winter-only licence of occupation for avalanche control and undeveloped sidecountry skiing in the Alpine Bowls above Goat's Eye II, including Delirium Dive, Howard Douglas Bowls, Eagle Crest and Wild West. Most of this area (except Eagle Crest) is currently managed by the Ski Area under contract. Avalanche control is a necessary public safety requirement in this area to protect



areas within the leasehold below. Although this area comprises a total of approximately 247 ha, only approximately 69 ha is skiable sidecountry terrain.

Together the suite of environmental gains and exceptions is intended to achieve several purposes that align with visitor experience and long-term ecological integrity:

- Facilitates Ski Area improvements within existing leasehold, including imbalances in skiing opportunities and capacity during bad weather/visibility days, and skier safety on ski-ways and ski-out.
- Facilitates increases in visitor use and demand that are reasonably associated with regional population growth and climate change trends.
- Facilitates long-term environmental security of key areas and ecological resources long important to Parks Canada.
- Addresses key aspects of the Core Concept including “soft adventure” and changing industry dynamics such as sidecountry experiences.

Parks Canada considers that the removal of lands from Healy Corridor, Meadow Park, Sunshine Meadows and Bye Bye Bowl represents a significant environmental gain consistent with the *Ski Area Management Guidelines* by providing long-term certainty that these areas will not be developed in the future. Areas removed from Bye Bye Bowl and Sunshine Meadows will provide long-term certainty that the pristine Sunshine Meadows will not be further developed and will enable an area of the Sunshine Meadows to be secured as an Environmentally Sensitive Site for use as an important ecological reference. The lower areas of the leasehold, along the parking lot and Gondola Corridor, that are being returned to Parks Canada provide long-term security to the function of the Upper Healy Wildlife Corridor, and the Meadow Park leasehold removal will help to protect the movement of wary wildlife to Simpson Pass and to protect Sunshine Creek.

Potential lift, run and glade expansions into the Goat’s Eye II, Hayes Hill and lower Meadow Park areas, and the operation of sidecountry skiing in Delirium Dive, Howard Douglas and Wild West under licence of occupation represent exceptions to the *Ski Area Management Guidelines* that can be permitted following the reconfiguration of the leasehold.

Several other exceptions are also considered in the Site Guidelines, including:

- Limited construction of surface runoff water reservoirs in disturbed areas to remove direct withdrawal from Healy Creek and provide snowmaking and potable water to the Goat’s Eye base area and lower ski-out. This type of development will result in major terrain modification.
- Terrain modification to address public safety issues at specific locations below unbroken treeline.
- Significant ski-out and ski-way modifications, including widening, reconfiguration, egress run connection, and structural support on Angel Traverse.

While these exceptions are all associated with inherent environmental gains as outlined, they may only be considered in association with leasehold reconfiguration.



5.3 DEVELOPMENT AND USE CAPACITY

In addition to the leasehold restrictions outlined above, the capacity will be permanently capped through the following:

- A maximum capacity of 8,500 skiers per day (a 24% increase) to be applied when designing and developing other resort elements, including parking and transit capability, terrain, infrastructure, commercial space and lift capacity.
- A maximum of 3,650 m² of commercial space to stay within industry standards for a maximum of 8,500 skiers per day.
- No increases to any of the existing 2,923 m² of hotel indoor commercial space, or the existing 215 m² of deck space, or the overnight commercial accommodation capacity of the existing 84 rooms.

5.4 AREA CONCEPTS

A vast range of elevation and terrain is available within the proposed reconfigured leasehold and licence of occupation areas, resulting in a variety of different environmental conditions and potential types of visitor experience opportunities across the Ski Area. Within the Site Guidelines, Area Concepts provide a vision for future development and use, and they include guidelines and parameters regarding the types of development, visitor use and management that may be considered for a given area, based on its environmental characteristics and visitor experience opportunities.

5.4.1 Bourgeau Base and Gondola Corridor Areas

The base area serves as the operational hub for the Ski Area as well as the welcome centre and staging area for all visitors in all seasons. The purpose of the base area and Gondola Corridor is to facilitate movement of visitors to the upper mountain. The Gondola Corridor also provides alternate egress from the Ski Area via the ski-out and connecting egress runs. Lands on either side of the base area and Gondola Corridor provide core wildlife movement routes along the Healy Wildlife Corridor. Development at the base area and along the Gondola Corridor is for the purpose of facilitating access, visitor circulation and efficient business transactions. Permanent recreation facilities or attractions are not available. In the summer, the base area is the staging area for the summer-use sightseeing and learning programs offered by the Ski Area. Visitor activities, including hiking, interpretive programs and educational opportunities, are focused in the Sunshine Meadows and are accessible from the Ski Area gondola or on foot. During all seasons, the base area also provides public access to the Healy Creek trailhead. While the base area must be capable of facilitating high-intensity use, mountain architecture and a sense of space are important elements of facility design and visitor experience, connecting visitors to the location in the mountain parks.

Key elements of the base area concept that are important to the strategic environmental assessment include:

- Replacement, relocation and reconfiguration of existing buildings, facilities and parking lots to increase parking capacity within the existing parking lot footprint.
- Additional gondola or canyon lift that would increase out-of-base capacity.
- Widening the ski-out and linking egress runs to facilitate increased skier egress capacity.



- Additional snowmaking infrastructure, including water reservoirs within the Gondola Corridor to serve the ski-out egress areas.
- A potential parking terrace to increase the parking lot capacity.
- Potential development of one or more multi-level parking structures.
- People mover lifts or shuttles within the base area to transport people to the gondola base.

5.4.2 Goat's Eye Area

The Goat's Eye area ski terrain is accessed by the Wolverine, Jackrabbit and main Goat's Eye chairlifts. A wide variety of ski terrain is available predominantly near or below treeline, providing opportunities for beginner and intermediate skiers and for alternate challenging terrain during inclement weather and poor visibility days in the Sunshine Meadows. Recreation in the area is focused on moderate- to high-density snow riding experiences, with summer use considered for indoor use only at the Goat's Eye Day Lodge.

Key elements of the Goat's Eye area concept that are important to the strategic environmental assessment include:

- **Buildings**
 - Development of a permanent day lodge in the Goat's Eye base area in advance of a Long-Range Plan, within Ski Area commercial space capacity.
 - Development of a small winter-use warming hut at one of the bottom lift terminals through a Long-Range Plan, within Ski Area commercial space capacity.
- **Development of new terrain**
 - Development of additional terrain outside of the Developed Area below treeline in the Goat's Eye II and Hayes Hill areas.
 - Infill runs or glading within the existing Developed Area.
- **Major terrain modification – below treeline**
 - Snow capture structures and reversible, site-specific terrain modification to assist in early-season snow capture along the Sunshine Coast (Goat's Eye) traverse may be considered in a Long-Range Plan.
- **Snowmaking**
 - Extension of snowmaking infrastructure from the Gondola Corridor to Goat's Eye terrain.
 - A small reservoir located in the valley bottom above the Goat's Eye Day Lodge for snowmaking and potable water.
 - Existing permanent snow fencing and other snow capture structures.
- **Lifts**
 - New lifts to service additional terrain in the Goat's Eye II, Hayes Hill and Wolverine-Lookout areas, with access below the Alpine Bowls area. Additional lifts will not exceed that needed to balance the Ski Area capacity of 8,500 skiers per day.

5.4.3 Sunshine Meadows Area Concept

The spectacular scenery and alpine meadows terrain of the Sunshine Meadows area serves as the core of the Ski Area experience for both winter and summer visitors. The



Sunshine Meadows area includes the Upper Village day-use and overnight facilities. Winter snow riding experiences include open alpine terrain and scenery, accessed by the lifts and runs on Lookout Mountain and Mount Standish. Summer hiking and summer educational and interpretive opportunities occur within the meadows along a trail system shared with British Columbia. The Sunshine Meadows is the largest expanse of alpine meadows with extensive ecological diversity in the Canadian Rockies; the meadow environment is very sensitive to development and use in all seasons. Facilitating the experience and education of visitors while preventing incremental, cumulative damage to this environment is a key challenge and priority for Parks Canada.

Key elements of the Sunshine Meadows concept that are important to the strategic environmental assessment include:

- Summer trails and lifts
 - Redevelopment, modification and enhancement of trails, rest stops, viewpoints and washroom facilities, and measures to protect vegetation, to prevent soil trampling, and to prevent erosion may be considered through a new Summer-Use Plan.
 - Summer recreation and education programs and special events.
- Summer accommodation and facility use
 - Summer use of the Upper Village Hotel accommodations may be considered in a Long-Range Plan and updated Summer-Use Plan.
 - Restaurant operation in the Upper Village and gondola base area for day users and hotel guests may be considered in an updated Summer-Use Plan.
 - Facility improvement, modification or redevelopment in the Upper Village area, within commercial space limits of winter use, may be considered through a Long-Range Plan.
- Winter visitor activities
 - Limited development of terrain parks below the unbroken treeline may be considered subject to terrain modification guidelines.
 - Traditional outdoor recreation activities for non-skiing guests may be considered during normal daytime operating hours within the existing base area footprint, consistent with the plan's *Federal Heritage Tourism Strategy*.
- Facilities
 - Improvement, modification or redevelopment of facilities in the Upper Village within commercial space limits.
 - Improvement, modification or redevelopment of staff housing and operational support buildings may be considered outside of a Long-Range Plan.
 - Development of a winter-use warming hut on the disturbed footprint of the existing Lower Divide building may be considered through a Long-Range Plan, within commercial space capacity limits.
- Development of new terrain
 - Development of additional terrain outside of the Developed Area, including runs and glades at or below treeline in the Meadow Park Area, consistent with new lease exceptions, may be considered through a Long-Range Plan.
 - Infill runs or glading within the Developed Area.



- Non-permanent features such as terrain parks may be developed where terrain and soil disturbance is not required and where snow compaction and melt will not alter native vegetation community structure.
- Terrain modification
 - Structural support with selective terrain modification to improve the ski-way and enhance safety on Angel Traverse, consistent with Terrain Modification Guidelines (Core Guidelines Section 5.6).
- Snowmaking
 - Snowmaking infrastructure from the Upper Village down the ski-out using reservoirs as part of the Gondola Corridor concept may be considered through a Long-Range Plan.
 - Permanent snow fencing and snow capture structures where snowmaking is not available may be considered.
- Lifts
 - New lifts to service additional terrain in the Meadow Park, Wawa and Lookout areas may be considered, consistent with the leasehold reconfiguration and the Site Guidelines. Additional lifts will not exceed that needed to balance the Ski Area capacity of 8,500 skiers per day.

5.4.4 Alpine Bowls Area Concept

The Alpine Bowls refers to the area within the height of land above the Goat's Eye area, known locally as Delirium Dive, Howard Douglas Bowls, Eagle Crest and Wild West. Avalanche control in the Alpine Bowls is required to protect skier safety and assets within the Ski Area leasehold below. The Alpine Bowls provides an opportunity for advanced skiers and snowboarders to experience an introduction to the backcountry of Banff National Park with access to challenging undeveloped sidecountry terrain when snow and avalanche conditions are favourable. Skier facilities, terrain modification or run development will not be considered. Recreational activities in the Alpine Bowls will be limited to winter use only within the licence of occupation required for avalanche management.

Key elements of the Alpine Bowls concept that are important to the strategic environmental assessment include:

- Winter activities
 - Avalanche control and maintenance of existing skier use of the area.
 - Winter recreation education opportunities and special events may be considered in the Alpine Bowls.
- Facilities
 - Small removable structures such as steps or railings, and minor terrain manipulation to facilitate safe snow rider foot access from controlled entry points.
 - No facilities will be considered unless required for avalanche control or environmental protection.
 - Designated and maintained skier trails may be developed to provide safe egress from the Alpine Bowls to the Ski Area.



- Trail construction and terrain modification to address skier hazard or environmental concerns will be considered if brought forward in a Long-Range Plan.
- Vegetation management
 - Routine removal of small trees or branches may occur within natural ski lines or glades in upper subalpine areas.
 - Selective glading may be considered in the Wild West areas adjacent to natural egress chutes to facilitate safe and clear access to egress trails.
- Snowmaking
 - Seasonal snow fencing to ensure rider safety and environmental protection may be considered only along access and egress routes.

5.5 SKI AREA OPERATIONS, INFRASTRUCTURE AND ENVIRONMENTAL STEWARDSHIP

The Site Guidelines allow for the potential improvement and modification of the existing snowmaking and snow farming system at the Ski Area. Specific potential improvements and modifications considered within the scope of the Site Guidelines include:

- Expansion of the area serviced by snowmaking
- The use of snowmaking nucleating additives
- Use and modification of permanent snow fencing

Potential exceptions considered under the Site Guidelines include:

- Development of limited small reservoirs for snowmaking and potable water within disturbed areas along the Gondola Corridor to service the ski-out and Goat's Eye base area.

The provincial power grid is the power source for the Ski Area. Confirmation that sufficient capacity of infrastructure and utilities exists will be required prior to or concurrent with plans to expand on-hill capacity and facilities at the Ski Area.

Drinking water requirements are met by water withdrawal from Ski Area reservoirs, Healy Creek and Rock Isle Lake. Wastewater is captured and treated on-site; treated effluent flows into Sunshine Creek, which flows into Healy Creek. The combination of increased snowmaking and increased visitor use is likely to increase water demand and pressure on water and wastewater systems.

The Ski Area currently has accommodation on-site in the Upper Village for 190 employees in the Larix, Mountain Holme and Arnica buildings. Increased Ski Area capacity will likely require more staff. Pressure on staff accommodation and on the Ski Area infrastructure must be considered as part of future planning, and it is pertinent to the strategic environmental assessment.



6 DESCRIPTION OF ENVIRONMENT

6.1 LOCAL LANDSCAPE

The Sunshine Village Ski Area is located along the border of Banff National Park, Alberta, and Mount Assiniboine Provincial Park, B.C. The Ski Area is approximately 17 km southwest of the townsite of Banff. The Ski Area local landscape consists of relatively remote mountainous terrain encompassing portions of Banff National Park and Mount Assiniboine Provincial Park, both bordering on Kootenay National Park. Development is predominantly concentrated along valley bottoms and, in particular, within the Bow Valley, which contains major transportation and utilities infrastructure. Running through the Bow Valley, which is located north of the Ski Area, are major power lines, the Trans-Canada Highway, the Bow Valley Parkway and the Canadian Pacific Railway. To the west, Highway 93 South provides access to Kootenay National Park.

Developments and infrastructure within the local landscape fall within several significant mountain watersheds. Areas east of the Continental Divide, including Redearth Creek, Healy Creek, Brewster Creek, Spray River and their tributaries, drain into the Bow River. Drainages to the west provide access to the Kootenay River valley from the North Simpson and Simpson River drainages (Eccles and Strom 1994). Although not present within the Ski Area, various high-elevation lakes are also present in the landscape both east and west of the Continental Divide. Of particular relevance, Rock Isle Lake is located in British Columbia west of the divide and drains into the Simpson River and eventually the Kootenay River system (Eccles and Strom 1994). Water withdrawal from Rock Isle Lake into the Ski Area, located east of the Continental Divide represents mixing of water from the Hudson's Bay and Pacific Ocean continental watersheds.

The Ski Area landscape features an ecological complex of high-elevation subalpine and alpine habitats, limited old-growth-forested montane habitat, and creeks and streams. These features are central to the habitat requirements of a number of vegetation and wildlife species. The Sunshine Meadows, which encompass a portion of the Ski Area and extend from Fatigue Pass, north to Bourgeau and west to Healy Pass and the Monarch Ramparts (Achuff et al. 1986), represent the largest alpine plateau in the local landscape and within the southern Rocky Mountains (Eccles and Strom 1994). The Sunshine Meadows area provides a moderate gradient approach to the Continental Divide, and is renowned for its spectacular scenery and diversity of native vegetation.

The diversity of the local landscape serves to function as core habitat for a variety of wildlife species, including grizzly bears. Areas along the Bourgeau massif, forested riparian habitat along Healy Creek (Eccles and Strom 1994), and cirque basins and meadows near the divide provide key grizzly bear habitat. High human use in the area, particularly around Egypt Lake and the Sunshine area, reduces habitat security for grizzly bears in the Egypt land management unit. The Ski Area landscape also functions as a key wildlife movement corridor linking habitat within Banff National Park across the provincial border into British Columbia. The Upper Healy Wildlife Corridor in particular provides one of the most direct and least rugged passes between British Columbia and Alberta (Eccles and Strom 1994). The Healy Corridor runs through Healy Creek, including lands on either side of the existing Bourgeau base area parking lot and the



Gondola Corridor, and facilitates wildlife movement connecting the Bow and Vermilion valleys. While many wildlife species make use of these natural movement corridors, the Upper Healy Corridor is considered important for facilitating movement of cougars, wolves, grizzly bears, black bears, ungulates and other wary wildlife.

The ecological values of the local landscape contrast significantly with the intensity of human use. Although motorized use is largely restricted to highway corridors, the overall landscape experiences some of the heaviest visitation and backcountry use in Banff National Park. Banff and Lake Louise attract approximately 4 million visitors annually, with visitation focused in easily accessible areas along highway corridors between the townsite of Banff and the Village of Lake Louise. The local landscape also sees the highest backcountry use levels in Banff National Park in the Redearth-Egypt (including Healy Pass) area northwest of the Ski Area, and in the Bryant-Spray-Brewster area south and east of the Ski Area. Mount Assiniboine Provincial Park also offers an extensive trail system and the Assiniboine Lodge, accessible by hiking, skiing or helicopter. Despite this level of use and development, the local landscape is renowned for spectacular mountain scenery, hiking and mountaineering opportunities, wildlife viewing, and a wide variety of tourism accommodation and services, including those of the Sunshine Ski Area.

6.2 LOCAL ECOSYSTEMS

The local ecosystems associated with Sunshine Village Ski Area encompass the existing Ski Area leasehold as well as the mountain ridges and valleys immediately adjacent to it. The existing Ski Area leasehold spans a wide variety of terrain, elevations and aspects on Eagle Mountain, Lookout Mountain and Standish Ridge, including an expansive area of the Sunshine Meadows plateau. The Sunshine Meadows comprise the core of the Ski Area experience in winter and summer, offering spectacular scenery and wide open alpine terrain. The Ski Area is located along the boundary of the Great Divide, at the headwaters of Healy Creek and Sunshine Meadows watersheds. Water originating in these watersheds drains east of the divide. Healy Creek and Sunshine Creek, which respectively run adjacent to and through the Ski Area, serve as the partial water supply to the Ski Area and receive effluent from sewage treatment. Healy Creek is the largest watercourse in the drainage area and is fed by Sunshine Creek and various seeps and streams from Mount Bourgeau and Goat's Eye Mountain (Eccles and Strom 1994). Sunshine Creek receives water from its main tributaries, Wawa and Delirium creeks, and eventually drains into Healy Creek. Sunshine Creek is ephemeral with typical seasonal flows during late spring and early summer near the Sunshine Village; flows as late as October are seen near the confluence with Healy Creek (Mudry and Green 1977). Recent invertebrate and water chemistry monitoring indicates that the ecological integrity of Healy Creek is significantly impaired. Sewage effluent, stormwater flows and large spring freshets of contaminated snow are thought to be contributing to degraded water quality in the Healy Creek watershed (see Section 8.6).

Healy Creek and the upstream Healy Ponds also support native fish populations. Healy Creek was heavily stocked with trout between 1915 and 1964 (Mudry and Green 1977, Fernet et al. 1987). The Healy Ponds, upstream of the Ski Area, provide important habitat for westslope cutthroat trout, a SARA-listed Threatened species. Cutthroat trout can also be found downstream in Healy Creek, which drains into Brewster Creek, where SARA-listed bull trout are also found. As a result of the ephemeral nature and rugged



terrain of Sunshine Creek and its tributaries, it does not provide suitable habitat for fish (Eccles and Strom 1994).

Vegetation on the Ski Area is very diverse, reflecting differences in elevation, slope and aspect, in surface and subsurface water sources, and in the soil complexes that have developed as a result of these conditions. Lower subalpine ecosystems are characterized by old growth closed Engelmann spruce and subalpine fir forests (Eccles and Strom 1994). Subalpine larch becomes predominant in upper subalpine regions, giving way to scattered stunted trees and herb-shrub communities in the upper subalpine zone (Holland and Coen 1983). Whitebark pine, a SARA-listed Endangered species, occurs primarily within an elevation band in the upper subalpine. The Sunshine Meadows ecosystem is a pristine example of alpine and upper subalpine meadows, unique in the area because of its large and contiguous extent. The Sunshine Meadows have a high diversity of native species, and various plants considered to be found only in highly localized alpine areas in Canada and the United States are found in these meadows (Eccles and Strom 1994). In addition, several of the species found in the Sunshine Meadows are sensitive, and they exhibit slow growth and slow rehabilitation following disturbance.

The size and variation of local ecosystems across the Ski Area means that habitat conditions exist to support virtually the entire range of wildlife species in the mountain parks. Mountain goats inhabit the alpine and upper subalpine areas, particularly on the north and west aspects of Mount Bourgeau and Goat's Eye Mountain (Eccles and Strom 1994). The mountain goats also range down to Healy Creek in the vicinity of the Bourgeau base area parking lot to access water and minerals (Eccles and Strom 1994). Bighorn sheep are also common on Mount Bourgeau. The Mount Bourgeau-Healy Creek region supports one of the largest winter sheep herds in the park, and it also serves as traditional rutting grounds (Eccles and Strom 1994). Other ungulates, including deer, elk and moose, are also found in the montane areas of the ski hill. The Ski Area provides a mosaic of contiguous habitat favoured by carnivores, and the full range of carnivores, including cougar, wolf, lynx, wolverine, black bear and grizzly bear, are found in the local area. Grizzly bears are listed as a species of Special Concern under COSEWIC, and they can range from very tolerant to very wary and highly sensitive to human disturbance. The Bourgeau massif slide paths and the Healy Creek wildlife corridor are thought to be particularly important grizzly bear habitat in the area (Eccles and Strom 1994).

Current and proposed use and development for the Sunshine Village Ski Area has been discussed in detail in Section 5. Although there is significant backcountry use in the regional landscape area, backcountry use in the local landscape is highly concentrated around access from the Ski Area. Summer trails in Mount Assiniboine Provincial Park in the Sunshine-Rock Isle Lake area experience heavy use when accessed by gondola via the Sunshine Meadows (Eccles and Strom 1994).

6.3 CLIMATE CHANGE

Regional climate scenarios modelling potential impacts on winter recreation, national parks, and the ski industry in western Canada predict reduced snowfall and higher melt rates as a result of warmer temperatures through the 2020s (Scott and Suffling 2000, Scott and Jones 2005, Scott and Jones 2006). Fine-scale modelling at the sub-regional



level supports the findings of general models and predicts increases in mean annual temperature and in mean annual precipitation, with most of the precipitation increase coming in spring and fall seasons. As a result, the duration of winter snow cover will likely be shortened, and reduced natural snowpack, particularly at lower elevations (~1,600 m – the approximate base elevation of the Sunshine Village Ski Area), can be expected. Reduced natural snowpack could result in marginal conditions necessary to support ski operations at lower elevations during some winters, thereby increasing reliance on efficient snowmaking systems to ensure adequate snow conditions near the base of ski runs, especially in the early season.

By the 2050s, average natural snow depth at low elevations (1,600 m) is predicted to be reduced by over 50% throughout most of the winter tourism season under most climate change scenarios, and this snow depth becomes largely unsuitable for ski operations unless augmented with snowmaking (Scott and Jones 2006). Recent research supporting predictions of lower natural snowfall, warmer temperatures and shorter ski seasons suggests that there may be insufficient reliable natural snow cover in the future, at both high and low elevations, to maintain quality ski conditions unless snowmaking is able to maintain snow cover and the length of the ski season. With snowmaking factored in, average ski seasons at low elevations are projected to be 7% to 15% shorter in the 2020s (Scott and Jones 2006). Predictions for the 2050s are far more variable, ranging between minor reductions of 9% in average ski season length, to a 43% reduction under the warmest scenarios (Scott and Jones 2006). Average temperatures will predictably remain below freezing, allowing snowmaking operations to be feasible from a technical standpoint (Scott and Jones 2005, Scott and Jones 2006); however, snowmaking relies on a sufficient water supply. While climate predictions include increases in overall precipitation levels for Banff, in combination with other factors such as temperature change and snowmelt, it is not clear that changes in precipitation will affect water availability for snowmaking or potable use at the Ski Area one way or another.

Warming climate is expected to affect length of the winter ski season, timing onset of elevations appropriate for snowmaking, timing and state of precipitation, peak and low flows in streams, stream temperatures, forest wildfire and disease risk, avalanche patterns, timing of onset and emergence from hibernation for bears, and a potential range of shifts in vegetation affecting a variety of wildlife species. These shifts present operation and environmental management implications that will have to be considered in reaching viable Ski Area planning and development decisions.

7 VALUED COMPONENTS FOR ENVIRONMENTAL ASSESSMENT

The valued components (VCs) selected for assessment represent the expected outcomes associated with maintaining ecological integrity, visitor experience and infrastructure capacity outlined in Section 4. Consistent with the approach to the assessment outlined in Section 4.1, the VCs selected for evaluating ecological integrity function as indicators of known threats and are associated with maintaining ecological integrity. Expected outcomes for visitor experience and infrastructure capacity can be evaluated directly and



do not require an indicator approach for the purposes of this strategic environmental assessment.

7.1 VALUED COMPONENTS OF ECOLOGICAL INTEGRITY

Valued components for evaluating ecological integrity were chosen based on known ecological issues related to past Ski Area development and in consultation with Banff National Park science staff. The following criteria were applied to identify the VCs used to evaluate potential impacts to ecological integrity. As a group, the VCs:

- Reflect known threats and cumulative effects to ecological integrity.
- Serve an “umbrella” role where protecting the valued component will inherently protect other ecological values.
- Are likely sensitive to Ski Area development and activity.
- Reflect both local and regional ecosystem scales.
- Represent a broad range of biodiversity and cumulative effects concerns, including vegetation, soils and terrain, aquatic systems, and wildlife.

The VCs selected to evaluate the potential implications to ecological integrity are:

- Healy Wildlife Corridor with a focus on year-round wildlife movement and on winter habitat for bighorn sheep and mountain goat.
- Wildlife species and habitat focusing on grizzly bear, mountain goat, and small mammal and carnivore habitat.
- Native vegetation focusing on forest structure, whitebark pine and alpine meadows communities.
- Aquatic ecosystems with a focus on surface and subsurface flow regimes, water quality, riparian habitat, westslope cutthroat trout and bull trout.

7.2 VALUED COMPONENTS OF VISITOR EXPERIENCE

Valued components for the evaluation of potential impacts to visitor experience directly reflect the visitor experience quality objectives outlined earlier in Section 4.6. The potential impacts to visitor experience will be evaluated with respect to the following VCs:

- Safe, comfortable and enjoyable visitor experience
- Visitor education
- Viewscales and aesthetics
- Visitor perception and wilderness character

7.3 VALUED COMPONENTS – REGIONAL INFRASTRUCTURE CAPACITY

Valued components for the evaluation of potential impacts to regional infrastructure capacity directly reflect the expected outcomes of the Management Guidelines outlined earlier in Section 4.7. The potential impacts to regional infrastructure capacity will be evaluated with respect to the following VCs:

- Road, parking and transportation system capacity



- Water supply
- Downstream water quality
- Electrical supply and demand
- Visitor and staff accommodation capacity

8 IMPACT ASSESSMENT – ECOLOGICAL INTEGRITY

Each valued component of ecological integrity is discussed below with respect to:

- The current status and ecology of the VC in relation to the local and regional ecosystems.
- Existing and potential interactions between Ski Area development activity and the VC, and the resulting potential impacts.
- Knowledge requirements that are important to current and future management decisions.

Mitigations are presented as ecological management parameters, long-range planning and/or operational parameters, or environmental assessment and information requirements that contribute to the realization of expected ecological outcomes. Ecological management parameters developed through the strategic environmental assessment were incorporated directly into the Site Guidelines.

Residual environmental effects – those remaining after the successful implementation of mitigation – are identified and evaluated in terms of the potential cumulative effects on the VC as a result of all Ski Area development activities. The impact assessment for each VC concludes with a discussion on the cumulative potential to realize expected ecological outcomes associated with the VC as a result of implementing the Site Guidelines.

8.1 UPPER HEALY WILDLIFE CORRIDOR

8.1.1 Current Status

Wildlife corridors are landscape features widely considered to serve important roles in wildlife conservation by connecting habitat patches and facilitating daily, seasonal and life cycle movements (Soule and Gilpin 1991, Chester et al. 2013, Lidicker and Koenig 1996). Wildlife corridors facilitate movement among patches of habitat, providing accesses to food and cover to meet daily needs, as well as facilitate connections between seasonal breeding, denning or migration areas (Panzacchi et al. 2016). In landscapes that are increasingly developed and fragmented, wildlife corridors enhance habitat connectivity (O'Donnel 1991, Saunders and deRebeir 1991, Dunning et al. 1995, Odette and Thomas 1996) and reduce the adverse effects of habitat fragmentation (Newmark 1993, Walker and Craighead 1997).

Animal use of wildlife corridors can be categorized into several types along a continuum from short, localized movements to long distance movements over tens or hundreds of kilometres. Short-term movements occur as animals strive to meet their daily foraging and other life requirements. Medium- and longer-distance movements occur as part of seasonal migrations to access food resources and mating/reproductive opportunities, for dispersal required to maintain gene flow or to colonize unoccupied habitat patches, and



for movement between source-sink habitats (Chester et al. 2013, Benz et al. 2016, Marrotte et al. 2017).

Corridors are not only strips of habitat that animals travel through quickly to get from one patch of habitat to another. Animals may need to forage, avoid mortality, find resting places, and avoid human disturbance while moving across landscapes at any scale (Chetkiewicz et al. 2006). Wildlife corridors serve as habitat “linkages” providing required resources while small species pass across the landscape over the course of days or weeks (Beier et al. 2008, Chetkiewicz et al. 2006, Turchin 1998). Corridors also serve simply as life-long habitat and provide multi-generational habitat connectivity for corridor-dwelling species that slowly disperse across the landscape over generations (Beier et al. 2008). Like wildlife crossing structures, wildlife corridors should allow for the maintenance or restoration of five key ecological functions:

- Reduced wildlife mortality and increased movement within populations.
- Meeting biological requirements such as finding food, cover and mates.
- Dispersal from maternal or natal ranges and recolonization after long absences.
- Redistribution of populations in response to environmental changes and natural disturbances; movement or migration during times of stress.
- Long-term maintenance of metapopulations, community stability and ecosystem processes (Beckman et al. 2010, Foreman et al. 2003).

Landscape connectivity may be considered as the degree to which the landscape facilitates wildlife movement and other ecological flows (Taylor et al. 1993). No two landscapes are likely to function the same way for wildlife movement. Terrain, habitat type, levels of human activity and climate are a few factors that influence wildlife movement and ecological flows (Beckman et al. 2010). Identifying effective wildlife corridor and road crossing structure characteristics depends largely on the species of focus (Beckman et al. 2010, Foreman et al. 2003). Corridor characteristics are ideally focused on the identification of habitat suitability for a range of focal species that collectively serve as an umbrella for all native species and biological processes (Beier et al. 2008, Maika et al. 2007). With the broad purposes of wildlife corridors and habitat connectivity in mind, and for the purposes of this strategic environmental assessment, wildlife corridors are considered to be “...spaces in which connectivity between species, ecosystems, and ecological processes is maintained or restored at various levels” (Anderson and Jenkins 2006).

In Banff National Park, much of the productive habitat optimal for wildlife use is concentrated in valley bottoms, overlapping with fragmentation and degradation from human development. In the Bow Valley, the loss and fragmentation of montane habitat from development has resulted in reduced connectivity and impaired ability of some sensitive wildlife, including bears, cougars and wolves, to move through the area (Heuer 1995, Paquet et al. 1996, Heuer et al. 1998, Duke 1999a, Duke 1999b, Duke 2000). The Banff Bow Valley Study recognized that impaired corridor function for these species could negatively affect interactions between carnivores, ungulates and plant communities as well as increase the potential for human-wildlife conflicts. Accordingly, the maintenance and restoration of wildlife corridors in Banff has been an ongoing priority of the *Banff National Park Management Plan* (Parks Canada 2010).



Multi-species wildlife corridors adjacent to developed areas may be more successful if they are sufficiently wide to buffer wary animals from disturbance, have relatively flat topography, provide high-quality habitat, and retain sufficient vegetation cover to provide security for animal movement between habitat patches (The Bow Corridor Ecosystem Advisory Group 2012). For instance, wolves are considered to be a wary carnivore species that tends to avoid encounters with people (Whittington et al. 2005). Wolf use of corridors increases with increases in habitat quality and corridor width, and wolf use decreases with increases in corridor length, slope, snow depth, and the presence of people (Shepherd and Whittington 2006, Duke et al. 2001, Ford 2017).

At the same time, it is well understood that even sensitive and wary wildlife species can move through and inhabit both natural and modified landscapes that do not even closely match idealized corridor conditions. Most large carnivores are habitat generalists that can move through marginal and degraded habitats, and a corridor designed for them does not necessarily serve habitat specialists with limited mobility, or the specialized habitat needs of corridor-dwelling species (Beier et al. 2008, Maika et al. 2007). Many mountain stream valleys are naturally narrow, steep and constricted, and they afford less than ideal conditions for the movement of large carnivore species. The same characteristics restricting valley bottom carnivores may afford more idealized cover and conditions for the habitat and movement of other species such as small mammals, bighorn sheep or mountain goats. The restrictions to carnivore movement associated with narrow, restricted, steep terrain and deep snow cover describe the natural condition of the Healy Creek valley both upstream and downstream of the Sunshine base area, even if no development were to exist.

Clevenger et al. (2002) have highlighted the importance of minimizing human disturbance at crossing structures intended to facilitate animal movement across highways. Successful crossing structures themselves do not often meet the width or cover characteristics of idealized wildlife corridors. Wildlife overpasses are immediately proximate to areas of high sensory disturbance, and may range from only 40 m to 70 m wide, but they are navigated successfully by a wide range of species (Beckman et al. 2010). Overpasses are successful, not merely due to width or distance from disturbance, but due to short crossing distances, high-quality habitat on both sides and the absence of human use or disturbance within the crossing structure. Likewise, short corridor “bottlenecks” can likely be navigated by most species (Beier et al. 2008, Maika et al. 2007) given the presence of high-quality habitat and the absence of human use or disturbance within the corridor itself.

The Healy Creek valley connects the montane habitat of the Bow Valley to quality alpine habitat along the Continental Divide and on to the Vermilion Valley to the west (Eccles and Strom 1994). The Upper Healy Wildlife Corridor consists of the Upper Bourgeau Slopes corridor located on the north side of the Ski Area parking lot and the Eagle Slopes corridor located on the south side of the parking lot and Healy Creek (Figure 1).

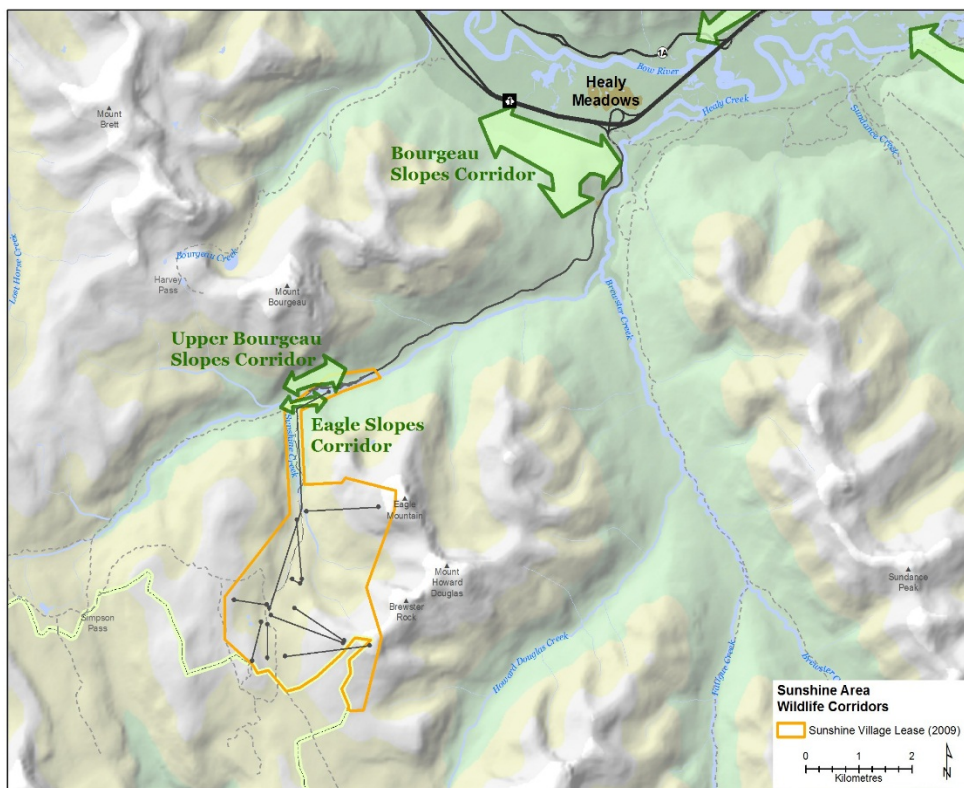


Figure 1. Map of the Upper Bourgeau Slopes and Eagle Slopes corridors, part of the Upper Healy Corridor in Banff National Park.

Together, the Upper Bourgeau Slopes and Eagle Slopes corridors are used by a wide diversity of wildlife species (Figure 2).

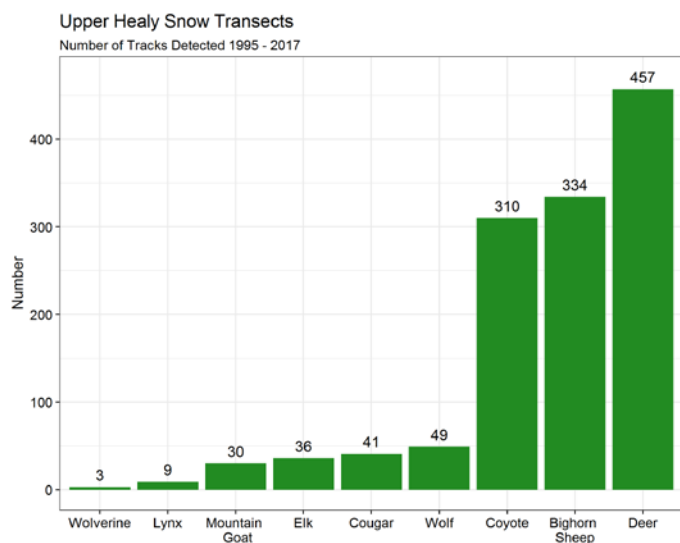


Figure 2. Winter wildlife detections on snow transects in the Upper Healy Wildlife Corridor between 1995 and 2017.



A full range of species uses the Upper Healy Wildlife Corridor, including bighorn sheep, deer, mountain goat, elk, coyote, cougar, wolf, Canada lynx, wolverine and black bears, and grizzly bears in the summer. Winter transects and snow tracking, summer wildlife trail monitoring, and GPS radio-collar data together show that the Upper Bourgeau Slopes area is more highly used by wildlife than the Eagle Slopes. The Eagle Slopes corridor on the south side of Healy Creek provides a less-used, alternate movement route for wary species, including wolverine and lynx, connecting the Upper Healy Wildlife Corridor with the Sunshine Creek valley. Undeveloped lands at the east end of the lease adjacent to Healy Creek serve as a junction for wildlife moving between the Bourgeau and Eagle slopes and the Healy Creek valley to the east (Figure 3).

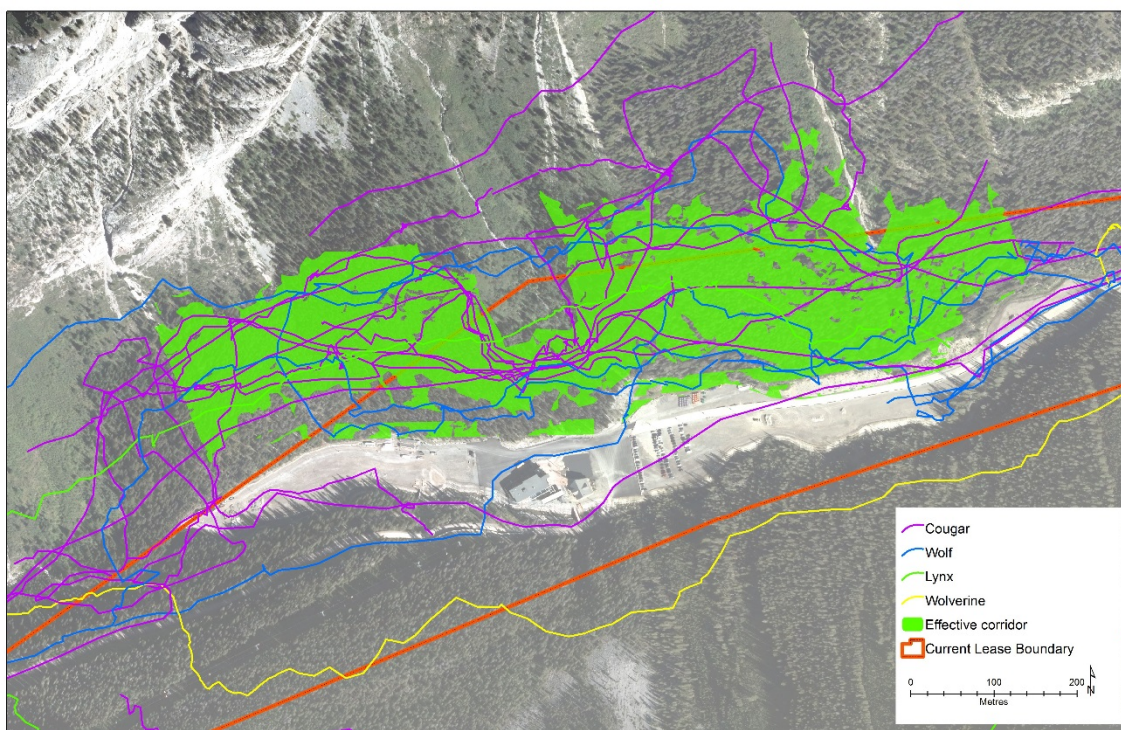


Figure 3. Wildlife Movement-Bourgeau/Eagle Slopes

Habitat in the Upper Healy Wildlife Corridor area also provides uncommon winter range for bighorn sheep and is an important traditional rutting ground (Eccles and Strom 1994). Year-round habitat for bighorn sheep in the area is classified as very high quality to moderate quality (Holroyd and Van Tighem 1983), and the Mount Bourgeau-Healy Creek area supports one of the largest winter sheep herds in the park (Eccles and Strom 1994). During winter, sheep almost exclusively use the southwest slopes of Mount Bourgeau adjacent to the Bourgeau base area parking lot. The area also provides moderate- to good-quality habitat for mountain goats (Holroyd and Van Tighem 1983), which are also concentrated within habitat on the Upper Bourgeau Slopes and are discussed further in Section 8.3. Mountain goats frequently use steep trails to access minerals and water near the Healy Creek valley from surrounding high-elevation habitat (Eccles and Strom 1994).



8.1.2 Existing and Potential Interactions and Impact Analysis

Potential activities associated with the Sunshine Village Ski Area Site Guidelines that have implications for wildlife use of the Upper Healy Corridor include:

- Lease reconfiguration
- New or expanded parking facilities
- Potential growth in summer use

Lease Reconfiguration

The Site Guidelines include the removal of lands surrounding the parking lot on both sides of Healy Creek. Removing the lands from the lease is intended to provide long-term certainty for wildlife corridor effectiveness by removing the potential for parking lot, lift or ski terrain development in these areas. The function of the corridor area in terms of wildlife habitat, vegetation buffer and cover, corridor width, slope and slope shape, and corridor entry/egress were all considered with respect to the potential benefits of removing these areas from the lease.

Corridor as Habitat Node

The Bourgeau Slopes side of the Healy Corridor is somewhat unique as a wildlife corridor in that the slopes provide significant year-round habitat for local deer, bighorn sheep and mountain goat populations. Carnivores, including wolf, cougar and coyote, move up and down the Healy Creek valley, through the Bourgeau Slopes, preying on resident ungulate populations. From spring through fall, grizzly bears use the Bourgeau corridor slopes for both movement and foraging.

While there is little question that wildlife move through the corridor on their way to other locations, the role of the Bourgeau Slopes in particular as a local wildlife habitat node may be considered as an element of the desired environmental gain that may be at least as important as the function of the area as a wildlife corridor.

Vegetation Buffer and Cover

One of the critical elements of wildlife corridor function is the role of vegetation. Vegetation provides security and thermal cover, offers food sources and reduces sensory disturbance from noise. In the case of the Bourgeau Slopes, vegetation likely also plays a role in overall habitat function for resident species by providing habitat diversity, food, hiding cover for predators and for prey, and more. While vegetation provides habitat and cover for wildlife, fallen trees or dense understory may also be an obstacle to wildlife movement – particularly for larger species. Vegetation immediately adjacent to the parking lot may be less functional as habitat and more functional as a visual and sensory buffer to the visitor and operational activities that take place in the parking lot. The role of forest cover as a sensory disturbance buffer maintains the function of areas beyond for effective wildlife habitat and movement. Removal of forest cover for additional development adjacent to the parking lot would push the area of sensory disturbance further into what may now be considered effective corridor habitat.



Effective Corridor Width

The area that wildlife can use for foraging and travel within the Bourgeau Slopes corridor is inherently steep and constrained. Accounting for a vegetated corridor buffer of 30–40 m from the parking lot, and for steep slopes and open avalanche paths that do not provide ideal movement cover for wary species, the narrowest forested width of the Bourgeau Slopes corridor becomes a potential bottleneck in the range of 60–70 m wide over a distance of roughly 80 m (Figure 3). The break in forest cover creating this narrow width is at the toe of an avalanche path that diverts some wildlife movement around the bottom of the slide path – likely due in part to both limited vegetation cover and avalanche debris. Features such as this are not uncommon in the mountain landscape, and at roughly 80 m wide and featuring significant vegetation and partial forest cover, this location is unlikely to present a barrier that most wildlife cannot move across, as illustrated in Figure 3. However, at this narrowest point the forested corridor width below the avalanche path is similar to that of a typical highway wildlife crossing, and it is appropriately considered as a minimum effective corridor width for wary species such as cougar.

Most of the forested corridor is considerably wider than 70 m and is constrained on the uphill side by steep topography, as opposed to any sort of development or human use that would contribute to disturbance from that side. Figure 3 illustrates that wary carnivores, including wolf and cougar, also move through buffer areas adjacent to the parking lot, through steep terrain that does not fall within ideal corridor parameters, and through the parking lot itself. However, at a rough overall effective width of 140–150 m, the remaining corridor may be considered important to maintaining movement effectiveness for wary species, and to total effective habitat footprint on the Bourgeau Slopes. Securing the corridor at current widths may be considered an important element of the desired environmental gain.

Slope and Slope Shape

The overall angle of the Bourgeau Slopes immediately above the parking lot is relatively steep (30%–40%), and the slopes cannot be considered ideal movement terrain for some wildlife species, including wolves, which typically select shallower slopes (under 27°) within the corridor and throughout Banff National Park (Hebblewhite and Merrill 2008). As noted previously, the narrow, steep and constricted terrain is characteristic of the Healy and Sunshine Creek valleys, both above and below the current base area, and presents natural terrain not particularly well suited to the movement of large carnivores. The rugged terrain and steep slopes do provide movement, forage and escape habitat well suited to mountain goats and bighorn sheep, and this attracts some use by wolves and other predators despite less than ideal terrain conditions.

Slope shape may play a partial role in corridor effectiveness for the Bourgeau Slopes corridor. The slopes immediately above the east end of the parking lot are slightly convex in shape. As a convex slope, visual sightlines to the near edge of the parking lot from above are blocked by the slope itself. The convex slope shape above the parking lot may result in a more effective buffer to the corridor as visual, noise and other potential sensory disturbances along the north edge of the parking lot are likely to be less easily sensed from above.



The convex slopes immediately above the parking lot give way to slightly reduced slopes that are about 50 m or 60 m back from the parking lot edge. This slope reduction represents the so-called Bourgeau Bench that has been the subject of a number of development proposals in the past. The “bench” is merely a slight reduction in slope over a limited distance above the east end of the parking lot. The transition in slope, however, does create the primary movement path for wolves and other wary wildlife.

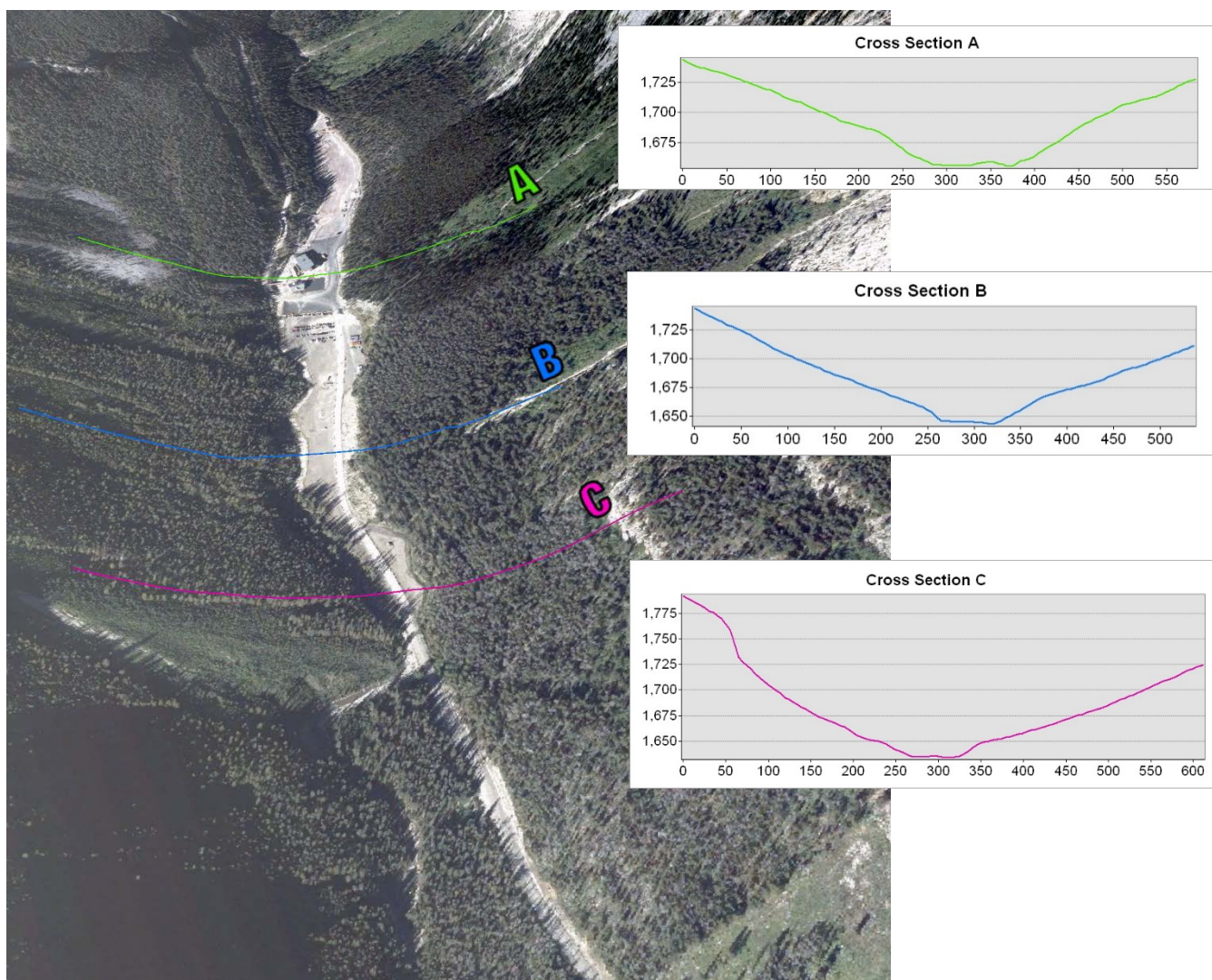


Figure 4. Slope cross-sections at three points along the east end of the Sunshine parking lot.

Parking development proposals for the Bourgeau Slopes have been presented and evaluated several times in the past. Because of the steepness of terrain, these proposals have all involved the need for extensive cut and fill construction techniques for the development of access roads and lots. Such methods would require extensive backsloping or the development of high retaining walls – some likely in the range of 10 m



high. In addition to consuming significant corridor footprint, assessments of past proposals have identified issues related to slope stability, mass wasting and natural drainage patterns. Terrain impacts of construction or of potential slope failure would likely be irreversible.

The overall steep terrain of the Bourgeau Slopes corridor is favoured by bighorn sheep and mountain goats that use steep terrain to reduce predation risk. These species make vertical movement down to Healy Creek from slopes above. Tracking data and well-used summer wildlife trails as well as anecdotal observations are evidence of this type of movement.

Together, slope and slope shape create corridor characteristics that may not be ideal for lateral wildlife movement, but which nevertheless may be considered important elements of corridor and wildlife habitat function at this location. Removing the Bourgeau Slopes from potential development can be seen as part of a substantial environmental gain, preserving existing habitat and corridor function, maintaining existing slope shape and steepness that may reduce the effects of sensory disturbance, and eliminating the potential for slope failure resulting from development.

Entry and Egress

The far-east end of the parking lot may represent a functional entry and egress point for wildlife entering and exiting from the Bourgeau Slopes corridor. Here, the slopes above the parking lot are broken and somewhat less steep, and the reduced slopes of the “bench” are accessed close to the road providing a somewhat less arduous path. Tracking data suggests that the far end of the parking lot may be a typical wildlife crossing point for animals entering or exiting the corridor, or travelling vertically to access Healy Creek. This juncture is the only place along the length of the parking lot where wildlife can descend and cross to a habitat patch on the same side of Healy Creek.

Removing the Bourgeau and Eagle slopes corridor lands from the lease also includes the undeveloped lands adjacent to Healy Creek at the far-east end of the current lease. Eliminating potential development from this area can be seen as part of the substantial environmental gain by maintaining conditions that allow for wildlife movement to and from the Bourgeau Slopes and by maintaining connection to Healy Creek.

New or Expanded Parking Facilities

(Note to the reader: As part of the development of these draft Site Guidelines, the Sunshine Village Corporation has proposed a number of additional parking lots for development. These proposals are largely located outside the lease boundaries along the Sunshine access road. They were not assessed in this document, but the proposals and supporting documentation offered by Sunshine will be considered in finalizing these Site Guidelines. Information on these proposals can be obtained at (www.talkwithparks.ca). Public comment on them will be carefully considered by Parks Canada in making any final decisions on parking.)

The Site Guidelines allow for the consideration of new or expanded parking facilities within or immediately adjacent to the existing disturbed footprint of the base area parking lot. Parking facilities for consideration include the development of a multi-level



parking structure within the current lot and the potential development of a narrow parking terrace along the north boundary of the east end lot.

The lack of suitable space to expand public parking at the base area has been recognized as a natural limitation to development since the early 1970s. The potential development of multi-level parking structures has been an alternative open to the Ski Area since the approval of the 1978 Long-Range Plan in the recognition that flat terrain for parking expansion in or around the base area was virtually non-existent. Parking structures have been incorporated into developments within the communities of Banff and Lake Louise and are known to be effective solutions in other congested ski town communities such as Whistler, B.C., and Vail, Colorado. The Site Guidelines support this alternative with a number of conditions that apply to environmental performance and aesthetics, including that any parkade proposal must:

- Meet all applicable building codes and performance standards as legally required and/or otherwise determined by Parks Canada.
- Integrate structures into the landscape, visitor use patterns and architecture of the overall base area.
- Include runoff, drainage and filter systems to minimize the transport of polluting materials into Healy Creek.
- Be located so as not to impede vertical movement of wildlife or access to the Upper Healy Corridor.
- Include improvements to the parking lot berm and runoff management for Healy Creek.

From a strategic environmental perspective, the development of multi-level parking structures coupled with effective mass transit or other demand management strategies is the best alternative to address parking demand over the available space. Well-designed parking structures have the following advantages:

- If they are similar in size to those in the Banff and Lake Louise areas, they would remove most or all of the need for road or off-site parking necessary to address the parking shortfall for the resort's current capacity of 6,500 skiers.
- They would require no new land for development, either on-site or off-site.
- Their ongoing environmental impacts (e.g., surface runoff, garbage and waste management) can be effectively contained and managed.
- They can be cost-recovered, in whole or in part, through user fees.
- They enhance convenience for visitors.

The Site Guidelines identify conditions for building and safety codes, visual and aesthetic impact, protection of aquatic systems, and wildlife movement. Combined with effective mass transit services, the development of parking structures may be considered to have an overall positive effect on environmental and winter visitor experience factors.

The Site Guidelines also include the potential to expand surface parking within the previously disturbed east side of the north boundary of the existing parking lot. This area could be modified to create a limited parking terrace immediately adjacent to the existing parking area. It should be noted that the alternative presented in the Site Guidelines is not of the scale of past parking terrace proposals. Past proposals have



involved the development of one or more multiple-row terraces uphill from the existing parking lot, sized at roughly half that of the existing parking lot to accommodate about 1,000 vehicles. Formal proposals for terraces of this magnitude were rejected as part of proposed Long-Range Plan expansions in 1987 and 1992.

The Site Guidelines East End Terrace proposal is considerably smaller in scale and aims to limit potential expansion to the current disturbed area immediately adjacent to the existing lot. A terrace constructed along the north edge of the parking lot might provide capacity for up to 200 additional vehicles. Since development of a terrace would reduce the width of the Bourgeau Slopes wildlife corridor and may present other environmental issues, the Site Guidelines include a number of engineering and environmental design conditions intended to ensure wildlife access and movement, proper management of surface runoff, and terrain stability. These include:

- Limiting the terrace footprint to the area immediately adjacent to the existing parking area.
- Facilitating continued wildlife access and vertical movement through the parking area to the Bourgeau Slopes during non-busy times.
- Ensuring terrain stability and avoiding known surface runoff channels and materials-flow routes.
- Including improvements to the parking lot berm and runoff management for Healy Creek.

A terrace concept that included a one-way access road with angled parking on either side would require roughly 20 m of additional horizontal space along the parking lot edge, not accounting for backsloping or retaining walls above or below the terrace itself (Figure 5). With reference to past proposals, retaining walls below the terrace are likely to be in the range of 1–2 m while retaining walls in some locations above a terrace are likely to be in the range of 5 m or more. The concept involves development of the terrace along the full length of the east end of the parking lot. Some slopes would be cut away while other areas would likely be filled in to create as linear and efficient a parking layout as possible. In the process, some existing parking areas might be filled in and replaced by the terrace resulting in no net gain for those locations.



Figure 5. Extent of a 20 m setback from current parking lot edge. Note that this does not represent the footprint of a designed terrace, but merely illustrates an approximate location and extent for the terrace concept.

Despite its considerably reduced scope, the East End Terrace concept is further considered below with respect to the function of the Bourgeau Slopes corridor area in terms of wildlife habitat, vegetation buffer and cover, corridor width, slope and slope shape, and corridor entry/egress.

Vegetation Buffer and Cover

A terrace width of 20 m could be contained mostly, but not completely, within the existing disturbed slopes adjacent to the parking lot (Figure 5). Narrow bands of tree removal will be required to form a continuous terrace, and along the tops of retaining walls. Some vegetation removal and management will be required above retaining walls to manage for windthrow and hazard trees, as occurs currently. This may require the ongoing monitoring and removal of selected trees up to a mature tree height back from the top of potential retaining walls or parking lot edges.

With respect to vegetation buffer and cover for wildlife above, the use of retaining walls is far preferable to backsloping. Backslopes would require terrain disturbance and vegetation clearing over an undetermined but likely substantial footprint above the terraced parking area. The removal of vegetation and change in sightlines associated



with backslopes would likely result in a discernable increase in visual and other sensory disturbance within and above a newly disturbed terrace area.

Slope and Slope Shape

The slope angles adjacent to the parking lot are some of the steepest along the Bourgeau Slopes, which is likely why the current parking lot ends where it does. Construction beyond this point, even for a small terrace as proposed, would require the excavation and movement of large volumes of material along the north edge of the parking lot. As discussed previously, excavation and construction on these steep and slightly convex colluvial slopes has the potential to trigger slope instability and failure, perhaps the most significant risk associated with development in this area. Several ephemeral drainage channels also intersect the slopes in the area under consideration. During spring runoff, these streams often carry rock and gravel materials from upslope and deposit them on the edge of the parking lot. Slope excavation has the potential to interrupt hidden subterranean springs and flows, which can also lead to surface seeps, slumping and long-term slope instability.

The potential for slope failure or the extent of potential slope failure as a result of construction is unknown. It is similarly difficult to predict what the potential impacts to the Bourgeau Slopes and habitat would be in the event of such failure.

Terrace construction using backslope designs has potential to change slope shape from the current convex shape, which in part blocks sightlines from the effective corridor area above. Changing slope shape, or the event of slope failure, may open up visual sightlines and expose the effective corridor to other sensory disturbance coming from the parking lot.

Corridor as Wildlife Habitat

Although the slopes immediately adjacent to the current parking lot are already modified and open to sensory disturbance, concentrated human use and development would be extended the 20 m width of the terrace into these highly disturbed but as yet undeveloped slopes. Unlike past proposals, however, the footprint of the terrace concept is not expected to fall directly within the most effective wildlife habitat above the existing disturbed footprint.

Extending the parking footprint and concentrated human use into the Bourgeau Slopes is likely to extend sensory disturbance further into the corridor lands, as well. How far sensory disturbance may extend from the edge of the terrace into effective wildlife habitat is likely to depend on terrace design and modifications to slope shape. Terrace design using wildlife-permeable retaining walls could minimize the extent of sensory disturbance, as parking lot activities would occur below the terrace walls where visual and auditory disturbance may be effectively screened from wildlife habitat above.

In terms of functional habitat for mountain goats, bighorn sheep and mule deer, the terrace itself and the extension of sensory disturbance is likely to result in little discernable change. Terrace design is more likely to impact the use of the Bourgeau Slopes for wary predators. Terrace construction using backslope designs is likely to modify both slope and vegetation cover and to extend physical and sensory disturbance substantially further into corridor habitat than would retaining wall designs that retain



greater vegetation cover and more characteristics of the current slope shape and configuration.

Corridor Width

The issues and considerations associated with corridor width are much the same as for corridor habitat. As proposed, the terrace concept will extend the area of development and concentrated visitor use into the highly modified and disturbed slopes adjacent to the current parking lot. These slopes are currently cleared, open and exposed to direct sensory disturbance from the existing parking lot, and they provide little in terms of effective buffer or corridor function. The footprint of intensified human activity will reduce the physical corridor width across the 20 m width of the terrace, but how far sensory disturbance may extend from the edge of the terrace into effective wildlife habitat is likely to depend on terrace design and on modifications to slope shape. As discussed for corridor habitat, terrace design using retaining walls could minimize sensory disturbance, as parking lot activities would occur below the terrace walls where visual and auditory disturbance may be effectively screened from wildlife habitat above.

As with corridor habitat, decreased corridor width is more likely to impact the movement of wary predators than it is to impact the suite of ungulate species that inhabits and moves through the area. The developed footprint of the terrace concept itself changes little with respect to conditions for potential predator movement. The open terrain, high levels of activity, and sensory disturbance adjacent to the existing parking lot identified for the terrace concept already effectively exclude wary species from these areas during high-use periods. However, the potential increase in sensory disturbance beyond the developed footprint is likely to decrease effective corridor width for wary species during high-use periods. The degree to which sensory disturbance is likely to decrease effective corridor width is at least somewhat dependent on design, and it represents a key uncertainty associated with the terrace concept.

Corridor Access and Egress

The terrace concept as proposed runs the length of the east end of the parking lot. At the far-east end, terrace development would intersect with the access/egress routes and road crossing area often used by wildlife to enter and exit the corridor. The middle to far-east end of the terrace also intersects with identified summer wildlife trails that descend from corridor habitat above and are known to be used by bighorn sheep and mountain goats.

The Site Guidelines fully recognize the likely importance of maintaining vertical movement for wildlife down to and through the parking area. Conditions of the Guidelines clearly include the requirement to accommodate the movement of sheep and goats through the terrace area using design measures that provide navigable breaks through retaining walls at known wildlife trails.

Potential to block corridor access routes and interfere with wildlife crossing at the far-east end of the terrace is not clearly identified as a potential issue in the Site Guidelines. Design measures to accommodate wildlife movement in this location might include maintaining ramp-style access through the terrace, and improving the ease of wildlife movement through vegetation management on either side of the road/parking area. Vegetation management in this area could improve and direct movement of wildlife as



well as contribute to fire fuel breaks and broader fire management objectives for the Bow Valley.

Summary of Potential Impacts – Terrace Development

While terrace development clearly alters the slopes immediately adjacent to the parking lot, these slopes have been altered physically and ecologically for many years, and they are subject to direct visual and sensory disturbance from the existing parking lot. Maintaining slope shape and using retaining walls as part of terrace design has some potential to minimize the extent of visual or sensory disturbance further into undeveloped corridor terrain above. Barring potential catastrophic slope failure, the anticipated extent of increased sensory disturbance associated with terrace development may range from a few metres up to 20 m from the disturbed footprint adjacent to the existing parking lot, depending on slope and retaining wall design.

While perhaps not as extensive in scale as past proposals, the increased disturbance footprint and alterations associated with terrace development would be considered incremental, adverse impacts to the physical characteristics that maintain the current functionality of corridor habitat. The potential increase in sensory disturbance beyond the developed footprint is likely to decrease effective corridor width for wary species to some degree during periods of high parking lot use. The degree to which sensory disturbance is likely to decrease effective corridor width is dependent to some degree on design, and it represents a key uncertainty associated with the terrace concept.

There are three important assumptions to the summary above. The first is that the overall terrace development falls within the anticipated footprint of being within a few metres of the existing development and operational footprint. The second is that slope stability is not affected by terrace development. The third is that mitigations for wildlife movement and access through the corridor, including vertical habitat movement for bighorn sheep and mountain goat, are successful. At this stage of consideration, these assumptions must be considered as significant areas of uncertainty associated with the terrace concept.

Potential Growth in Summer Use

As briefly discussed above, the timing and predictability of periods of low-intensity visitor and operational use are likely to be important factors in how wildlife access and use Bourgeau Slopes corridor habitat. Managing for daily and seasonal periods of low-intensity use has been considered to be an important aspect of wildlife management for the approved Mount Norquay and Lake Louise Site Guidelines and for roadways such as the Bow Valley Parkway. The background and rationale for these approaches is not reviewed further here.

As with the other ski areas, it is assumed that a significant aspect of current wildlife corridor effectiveness is related to the predictability of low-use disturbance periods in the parking lot. In the winter season, evening and night use of the parking lot is considerably lessened following the shutdown of lifts in the late afternoon. While vehicle use of the road and parking lot does continue through the night, most vehicles have left, the parking lot is mostly empty and disturbance is focused around the gondola base. Although it is difficult to track wildlife movement through the parking area, the relatively



low after-hours use in the winter is likely to provide wildlife with the best opportunity to gain access to the corridor and to facilitate vertical access to and from corridor habitat through the parking lot.

Current effectiveness of the corridor is likely to be higher for wildlife in summer compared to winter. Current levels of human use are lower in summer compared to winter, and deep snows do not inhibit wildlife movement. With the parking lot mostly empty of vehicles, and both visitor and operational use concentrated around the gondola base, conditions for wildlife movement throughout the summer are much like evening and nighttime conditions in the winter season. While it is also difficult to track summer season wildlife movement through the parking lots, anecdotal observations indicate that wildlife, including grizzly bears, wolves, sheep and goats, move through and across the parking lot in daylight hours during the summer season. Well-used summer wildlife trails provide evidence that animals access the parking area from corridor habitat in the Bourgeau Slopes above (Figure 6).

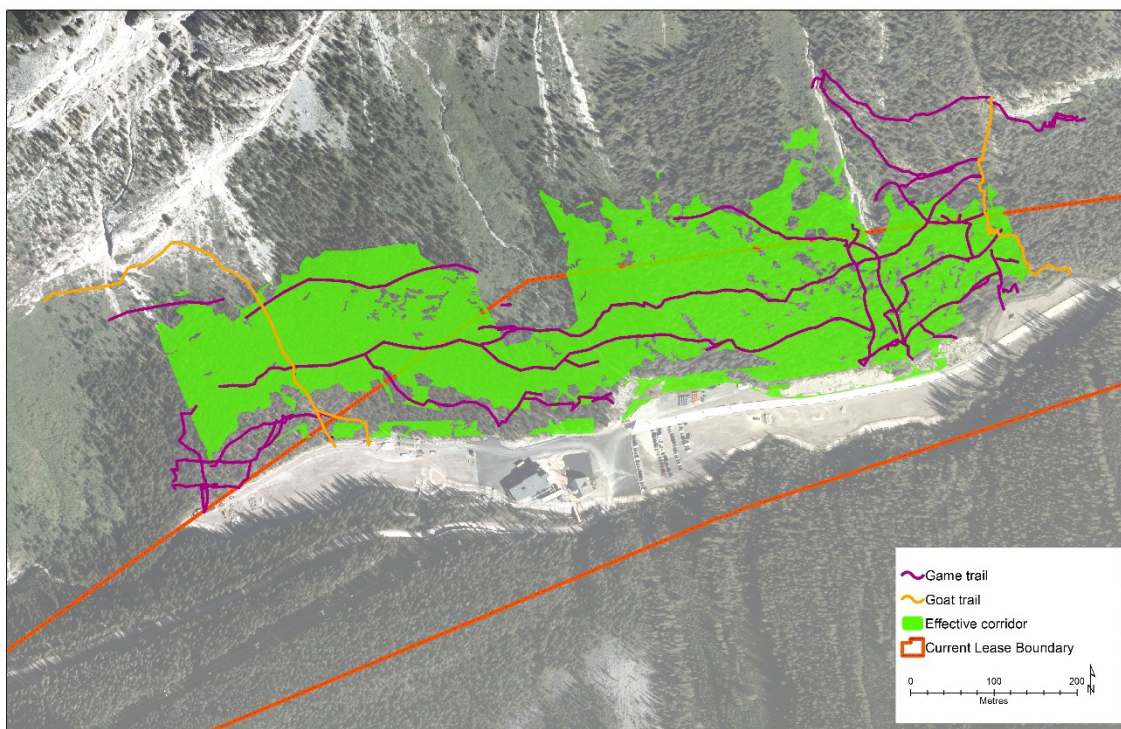


Figure 6. Bourgeau Slopes summer season wildlife trails.

The Site Guidelines provide restrictions to summer use in advance of a Long-Range Plan that limit summer use to existing seasons, hours and locations. Absent from the Site Guidelines are any restrictions to the potential incremental growth in total summer visitation in advance of a Long-Range Plan. As for native vegetation and grizzly bears, the overall potential unrestricted growth in the summer-use program in advance of a Long-Range Plan also represents a significant potential interaction with wildlife corridor and habitat effectiveness.



As visitor numbers potentially increase, vehicle numbers and activity in the parking area increase in footprint. Additional parking area activity will likely result in increased disturbance to wildlife and in displacement of wildlife that is attempting to pass through the parking area in the summer season. Although the potential demand for increased summer visitation cannot be quantified at this stage, it is at least conceptually feasible that levels of summer use could reach levels of winter use. The numbers of cars using the parking lot in the summer could increase from a couple of hundred to over a thousand. Visitor numbers could increase from a few hundred to several thousand. Significant increases in summer visitation are not only likely to affect the seasonal ability of wildlife to pass through the parking area and access the wildlife corridor. It is also likely that wildlife would be excluded completely from the parking area during operational hours.

8.1.3 Mitigating Measures

The mitigations for the Healy Wildlife Corridor identify ecological management parameters, future planning and/or operational requirements, or future knowledge requirements that are needed to realize expected ecological outcomes.

Ecological Management Parameters

Ecological management parameters serve as the on-the-ground benchmarks against which the environmental impacts of future development and use proposals will be assessed. In order to realize expected ecological outcomes important to maintaining the function of the Healy Wildlife Corridor, the following ecological management parameters have been incorporated into the Site Guidelines:

- Wildlife have low-disturbance access to and through the wildlife corridor, during sensitive seasons, or times of restricted habitat use:
 - The timing of visitor use facilitates predictable, seasonally based periods and patterns for wildlife to establish and maintain secure patterns of movement and habitat use.
 - Daily and seasonal spatial patterns of wildlife use and movement are maintained by avoiding development or visitor activities likely to result in potential displacement of wildlife from established movement routes.
- Wildlife have low-disturbance access to and through the wildlife corridor, through a range of natural daylight conditions, including morning and evening daylight periods (where feasible according to season), crepuscular periods and nocturnal periods.
- Permanent, seasonal and temporary structures, and base area operations are designed to maintain corridor access and connectivity for all wary species.
- Parking and development in the base area will be designed to facilitate vertical wildlife movement and habitat for mountain goat and bighorn sheep between the Bourgeau Bench and Healy Creek areas through the parking lot during low-use times.

Long-Range Planning and Operational Parameters

Specific planning and operational parameters are identified to provide greater clarity for project design and planning, and for Ski Area operations. These parameters should be



considered as part of future planning proposals or management initiatives, as appropriate.

New or Expanded Parking Facilities

- Long-Range Plans are to include consideration for visual impact, including height of parking structures, building architecture, and the design and aesthetics of proposed terrace development.
- Terrace proposals are to be developed using known expertise in geotechnology, hydrogeology, wildlife, engineering and landscape design to address potential impacts and to present designs that clearly meet the ecological management parameters of the Site Guidelines and strategic environmental assessment.

Summer Visitor Use

- In advance of Long-Range Plans, summer use of the base area parking lot should be limited to the scope of use developed with respect to identifying a carrying capacity for Sunshine Meadows and grizzly bear.
- Adhering to the mitigations and carrying capacity for Sunshine Meadows and grizzly bear is anticipated to limit the numbers of summer visitors and the potential impacts associated with increased summer use of the parking lot on corridor and habitat effectiveness.
- As part of long-term summer-use management, Long-Range Plan parking and transportation strategies will limit summer-use visitor parking to areas close to the gondola base and away from summer wildlife trails that provide access and egress from the corridor through the parking lot.

Environmental Assessment and Information Requirements

The development, design and assessment of future Long-Range Plan proposals should be informed by comprehensive, year-round data on wildlife activity in the corridor, including assessment of:

- Wildlife response to existing Ski Area activity, including human use and sensory disturbances, including noise thresholds.
- Opportunities for habitat restoration or enhancements to corridor effectiveness.
- Requirements for low-disturbance conditions that include daylight, crepuscular periods and nocturnal periods necessary to maintain natural patterns of movement and habitat use for the expected range of wildlife species.
- Patterns of habitat use and vertical movement by bighorn sheep and mountain goats, and predator-prey relationships.

8.1.4 Residual and Cumulative Effects

Desired outcomes and priorities from the Site Guidelines that apply to mitigating potential impacts to the Healy Wildlife Corridor and habitat include:

- Land use decisions contribute to local region ecological integrity goals, including fire and vegetation management, wildlife movement, grizzly bear habitat security, and species at risk protection and recovery.



- Terrestrial and aquatic habitat conditions for sensitive species, including whitebark pine, grizzly bear, wolverine, mountain goat, bighorn sheep, westslope cutthroat trout and bull trout, are conserved or restored.
- Habitat and movement security for all species is ensured by maintaining or reducing potential for human-wildlife displacement and habituation.

Two elements of the Site Guidelines can be considered to contribute positively towards ecological and visitor experience outcomes. The removal from the lease of large areas of the Healy Wildlife Corridor on both sides of the valley is a clear environmental gain eliminating the potential for significant development proposals within the limited footprint of wildlife corridor habitat. The development of a parking structure has clear benefits for visitor experience and convenience.

The Site Guidelines identify conditions for building and safety codes, visual and aesthetic impact, protection of aquatic systems, and wildlife movement. A parking structure would require no new lands for development, and ongoing impacts resulting from operational use, such as surface runoff, garbage and waste management, may be effectively contained and managed from an environmental perspective. Wildlife movement or habitat effectiveness are unlikely to be impacted by a well-located parking structure that avoids known movement routes.

The potential terraced parking concept and the potential for increases in summer visitor use have potential adverse residual and cumulative effects for wildlife movement and habitat use, particularly for the Bourgeau Slopes corridor, as summarized in the following table:



Valued Component: Healy Wildlife Corridor and Habitat			
Project/Environment Interaction: Terraced parking; Summer visitor use			
1. Nature of Impact			
Disturbance	Disruption	Alteration	Destruction
The development of a new parking terrace involves substantial physical alteration of the existing north slopes of the parking area; with effective design mitigations, the parking terrace is expected to slightly reduce the winter season effectiveness of the wildlife corridor. Growth in summer visitor and parking lot use within carrying capacity limitations is likely to result in increased disturbance levels to wildlife, and this growth may also slightly reduce the effectiveness of the corridor and corridor habitat – especially vertical movement through the parking lot and across the Healy Creek valley.			
2. Frequency of Interaction			
Single occurrence	Occasional	Regular	Continuous
Beyond the one-time impact associated with terrace development, parking lot visitor and operational use, including the terrace, has regular impacts on wildlife that is attempting to navigate into or out of the corridor habitat on the Bourgeau Slopes. Growth in summer visitor use may change the frequency of disturbance from occasional to regular, depending on the scope of growth.			
3. Duration of Impacts			
Days or less	Weeks	Seasons	Permanent
Changes to the north edge of the parking lot that result from terrace development or development of a parking structure can essentially be considered permanent in nature. Potential growth of summer use will increase disturbance levels and will shift disturbance from primarily the winter season to the summer season on what may be considered a permanent basis.			
4. Reversibility			
At end of project	With mitigation	Long-term restoration	Irreversible
Changes associated with the development of a parking terrace may be addressed largely through mitigation. In the event of unpredictable slope failure associated with development of a parking terrace, or of project abandonment, impacts to terrain may be considered irreversible, although ecological function may be restored through long-term restoration effort. Maintaining low sensory impact periods through crepuscular and evening hours in the winter and through summer			



operating hours will be an important mitigation technique to provide predictable periods for wildlife use and movement.			
5. Ecological Scale			
Site specific	Local feature	Local ecosystem	Landscape
Potential impacts to corridor function and corridor habitat associated with the terrace concept and increased summer use of the parking lot may be considered to primarily impact the local ecosystem. Impacts to bighorn sheep and mountain goat habitat use and associated predator-prey relationships on the Bourgeau Slopes are the factors that are most likely to be affected by terrace proposals and an increase in parking activity triggered by summer visitor use expansion.			
6. Ecosystem Context			
Modified	Resilient	Vulnerable	At risk
Current corridor and habitat function may be considered to be resilient to existing development and use patterns that have remained largely unchanged for many years. However, changes to important functional characteristics of the Bourgeau Slopes, including corridor width, slope stability, wildlife access and egress, and periods of low disturbance, are associated with terrace development and increased summer visitor use of the parking area. Uncertainties related to slope stability and potential growth in summer use, in particular, leave current levels of corridor and habitat function more vulnerable to slope failure and human use disturbance.			
Significance			
Negligible	Predictable and manageable	Considerable impact, risk or uncertainty	
The lease reduction on both sides of the valley is a clear environmental gain, eliminating the potential for significant development proposals within the limited footprint of wildlife corridor habitat. Despite this gain, there is a risk of measurable additional impacts beyond the current situation, and there are key uncertainties in terms of the scope and potential cumulative impacts to corridor and habitat function resulting from new parking development and growth in summer use.			

With the successful implementation of design parameters and mitigations associated with conceptual parking expansion proposals, the potential impacts to wildlife corridors and habitat may be best characterized as the permanent alteration of terrain structure important to local wildlife movement. However, key uncertainties remain that have potential for impact beyond terrain structure, and that may adversely impact ecosystem process and function.



Slope and terrain stability, including the potential for small- to large-scale slope failure and impacts to subsurface water flows, remains an issue even with the scale of the current terrace concept, which is much reduced in scale from past proposals. These types of impacts are difficult to predict, difficult or expensive to mitigate, and potentially irreversible.

Accidental impacts such as slope failure may be coupled with uncertainty associated with the ability to design terraced structures that actually do stay within the conceptual footprint envisioned by the Site Guidelines. Design and mitigation within the parameters of the Site Guidelines to allow for terrain stability, wildlife access and vertical movement, and minimal tree removal within the current disturbance footprint may be expensive or impractical. The reconfiguration of existing slopes may not result in the anticipated gains in parking capacity. None of these uncertainties can be fully assessed without further site investigation and professional design work.

Finally, potential growth in summer-use visitation is also a key uncertainty. The scope of the long-range planning process in the Site Guidelines includes the identification of maximum visitation numbers but provides no interim guidance or limitations on incremental visitor growth prior to Long-Range Plan completion. Many years could elapse between the approval of Site Guidelines and the development and approval of a Long-Range Plan during which summer visitation and use of the parking area are not subject to growth limits. Significant growth in summer use is likely to increase the disturbance and displacement of wildlife moving to and from Bourgeau Slopes corridor habitat during what is currently a relatively low-use period for wildlife.

The potential impacts associated with increased summer use also have impacts on grizzly bear and Sunshine Meadows, discussed further in Sections 8.2 and 8.5, respectively.

In conclusion, the removal of lands from the lease within the Upper Healy Wildlife Corridor can be considered as a clear environmental gain. It may be possible to design and mitigate limited additional terraced parking along the east end of the parking lot that maintains the intended gain. However, uncertainties associated with design failure, or significant increase in summer use within the parking area, or both, have the potential to offset the gains made through lease reduction. Accordingly, it is not clear that the expected ecological outcomes of the Site Guidelines will be achieved.



8.2 GRIZZLY BEAR

8.2.1 Current Status

The Western population of grizzly bears in Canada has declined by over 50% since the 1800s and is designated as a species of Special Concern by COSEWIC (COSEWIC 2012). At the time of writing, grizzly bear is under consideration for listing under Schedule 1 of the *Species at Risk Act* as a species of Special Concern. Western Canada represents a large proportion of the current North American range. Grizzly bears are highly sensitive to human disturbance and face high risk for mortality where human activity is present. While the overall population has remained stable over the past 20 years and records indicate some range expansion north, a number of populations in southern Alberta and British Columbia have declined, thereby raising concern of unsustainable mortality. The poor condition of the species in some parts of the range, combined with its naturally low reproductive rate and increasing pressures of resource extraction and cumulative human impacts in currently intact parts of the range, heightens concern for this species if such pressures are not successfully reversed.

The local population in Alberta is listed under provincial legislation as Threatened due to increasing anthropogenic strains on grizzly bear populations, including harvest pressures, human attractants, highway and railway mortalities, habitat loss and fragmentation, and fire suppression (Festa-Bianchet 2010). Within Banff National Park, grizzly bears are considered an important element of ecological integrity, and the management plan has established a goal of maintaining a non-declining grizzly bear population (Parks Canada 2010). The density of grizzly bears has been stable throughout Banff, Kootenay and Yoho national parks at roughly 13 grizzly bears per 1,000 km² (Whittington et al. 2018). Similarly, the number of females detected with young of year and the number of females with offspring has been stable at around 5 and 20 individuals, respectively, within Banff, Kootenay and Yoho. Female grizzly bears with offspring frequent regions south of the Sunshine lease and along the slopes of Bourgeau.

A large proportion of the mountain national parks consists of rock and ice and does not contain large areas of high-quality habitat for grizzly bears (Gibeau 1998). Regional studies indicate that grizzly bears prefer open, unforested, vegetated areas from the lower montane to the alpine. Canada buffaloberries (*Shepherdia canadensis*) are one of the most important grizzly bear foods in Banff National Park, and they are most abundant in areas with high solar radiation along forest edges (Pollock et al. 2017). Avalanche slide paths, riparian areas, and 30-year-old to 60-year-old burns are favoured habitats (Jalkotzy et al. 1999). Near the Ski Area, the alpine meadows and cirque basins along the Continental Divide, the Bourgeau massif slide paths, and the Healy Creek wildlife corridor and riparian areas provide local high-quality grizzly bear habitat (Parks Canada 2010, Eccles and Strom 1994).

Due to limited high-quality habitat across the regional landscape, grizzly bears in the Bow Valley have some of the lowest densities in North America. Grizzly bears require large areas of interconnected habitat to maintain population dynamics (Festa-Bianchet 2010). In the Central Rockies Ecosystem (part of the Northwestern population), grizzly bears survive in low-density populations (e.g., Alberta Grizzly Bear Inventory Team 2007) and are characterized as having among the lowest reproductive rates for the species (Garshelis et al. 2005). Survival of female bears is a key parameter for population



persistence as grizzly bear populations are small and have little capacity to recover from decline.

Due to their naturally low rates of reproduction and requirements for large home ranges, grizzly bears are considered to be sensitive to human disturbance and mortality risks associated with transportation corridors (Garshelis et al. 2005, COSEWIC 2012). Despite management measures, a recent study of Banff and Yoho national parks found that 80% of grizzly bear mortalities were human-caused, and all of those occurred within 500 m of roads or 200 m of trails (Benn and Herrero 2002). In general, grizzly bear risk of mortality is considerably higher near developed areas such as the Bow Valley than it is in more remote locations (Nielsen 2004).

In addition to direct effects on mortality, human disturbance can also have a variety of effects on grizzly bear populations and demographics. Grizzly bears tend to select den sites further from roads (Pigeon et al. 2014). Linnell et al. (2000) found that grizzly bears often den 1–2 km from human use areas without apparent disturbance, but activity within 1 km produces a significant risk that bears will abandon their dens. In the Canadian Rockies, the majority of dens are located at elevations between 2,000 m and 2,450 m, with slope angles of 26°–39° and with aspects predominantly northeast to southeast (Russell et al. 1979, Vroom et al. 1980, Hamer and Herrero 1983, Stevens and Gibeau 2005). Grizzly bears have a high site fidelity for denning locations, and clusters of dens have been observed in various studies (Vroom et al. 1980, Servheen and Klaver 1983, Van Daele et al. 1990, Ciarniello et al. 2005). This is likely related to the limited availability of sites with suitable den characteristics and to learned behaviours supporting a return to sites with appropriate den features (Servheen and Klaver 1983).

Grizzly bears have also been found to alter their temporal use of human-disturbed areas to reduce potential interactions. In the Bow Valley, wary bears use high-quality habitat more efficiently in the absence of humans while habituated bears travel further in sub-optimal habitats during times of high human use (Gibeau and Stevens 2005). Male grizzlies are often found closer to the Trans-Canada Highway during the human-inactive period, and all age classes tend to move away from human development during high-activity periods (Gibeau et al. 2002, Mueller et al. 2004, Donelon et al. 2006). Similarly, recent remote camera data illustrates that grizzly bear use of human and wildlife trails decreases with increasing levels of human activity (Whittington et al. 2018 *in prep*).

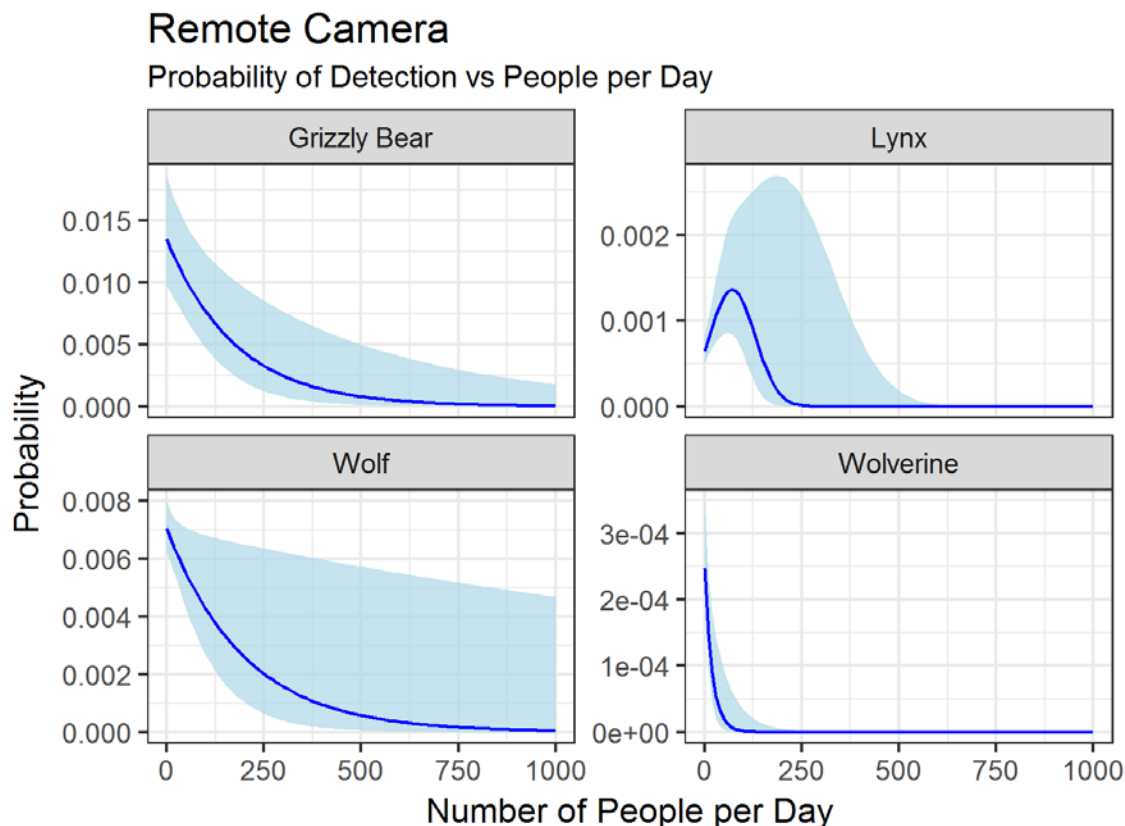


Figure 7. Probability of wildlife detection by remote camera vs. number of people per day.

When grizzly bears emerge from their dens, they seek out high-nutrient foods in an efficient foraging area and often select disturbed areas (Berland et al. 2008, Milakovic et al. 2012, Bourbonnais 2013). These areas often include low-traffic roadsides and other altered landscapes that offer resources to maximize body condition quickly (Chruszcz et al. 2003). Construction and maintenance of ski runs and forest glading increases open, meadow-like habitat. When coupled with excess moisture from winter snowmaking, areas with appropriate soil and plant communities can produce high-quality early-seral vegetation, which can be attractive to grizzly bears. Summer visitor use in areas of high-quality grizzly bear habitat and occupancy has the potential to adversely affect grizzly bear habitat security, and to increase habituation and associated human-bear conflicts.

The *Banff National Park Management Plan* (Parks Canada 2010) emphasizes the prevention of further declines in grizzly bear habitat security by managing human use, and the plan requires maintenance or improvement of grizzly bear habitat security, especially in identified female core reproductive areas. Grizzly bear habitat is considered secure when bears have a low probability of encountering humans and can forage with little human-caused disturbance, thereby maintaining their wary behaviour, a trait considered desirable given the mortality risk associated with habituated individuals. Blocks of habitat known as landscape management units (LMUs) are monitored and managed for habitat security, a measure of the proportion of an LMU where female bears can meet their daily foraging needs undisturbed except for minimal levels of road or trail



use (Gibeau et al. 2002). Gibeau et al. (2002) determined that a target of 69% secure habitat in each LMU was appropriate for Banff National Park.

The Ski Area is located in the Egypt LMU, which includes areas of high visitor use in winter and summer seasons, and which experiences among the highest levels of summer backcountry use in Banff National Park. As a result of summer use, 2018 estimates of habitat security indicate that 54% of the Egypt LMU with elevations less than 2,500 m was considered secure for grizzly bears. This estimate is slightly higher than the 51% estimate from 2008, likely because of improved estimates of human use and refined mapping (Figure 8). The 2008 and 2018 estimates were among the lowest scores from Banff National Park, and they were higher than only the Banff and Lake Louise LMUs. Grizzly bear-human conflicts have been relatively rare within the Ski Area in part because grizzly bears spend relatively little time in the area. However, managing human use in high-quality grizzly bear habitat will be a key component of maintaining grizzly bear habitat security in the future.

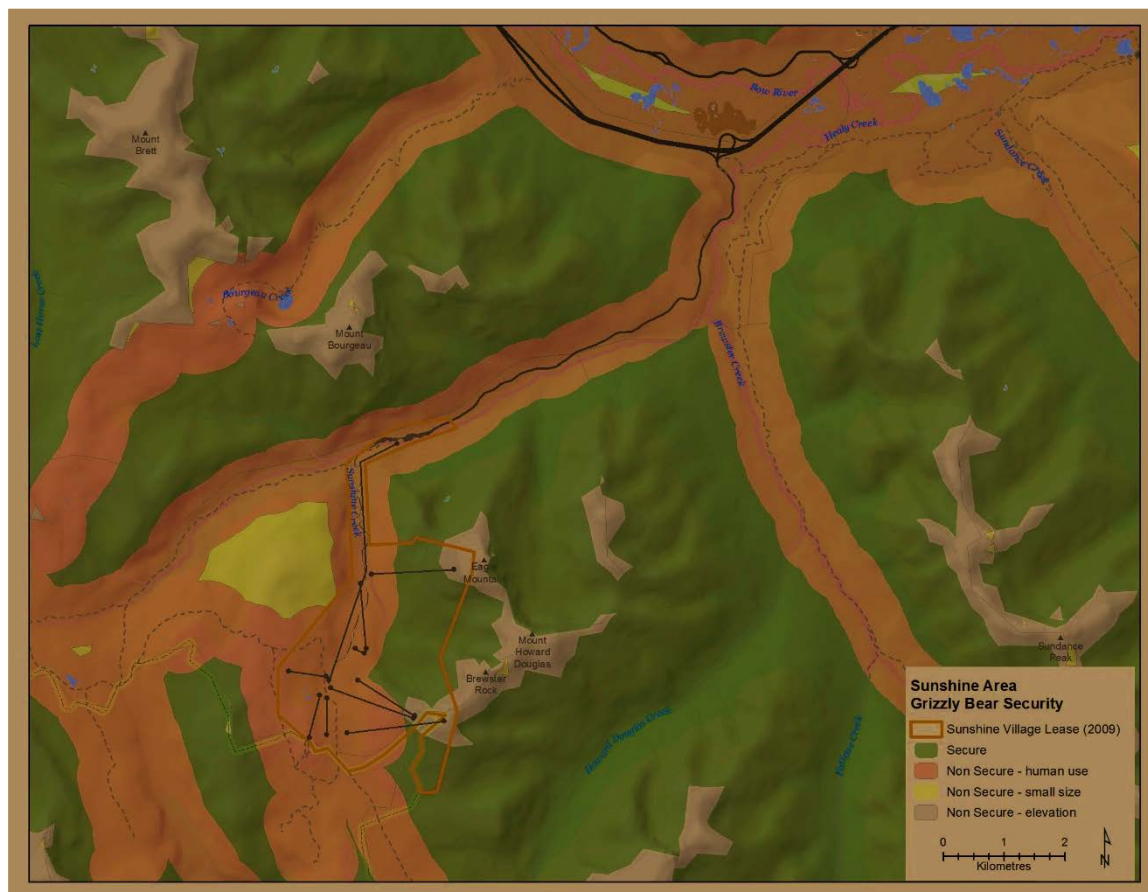


Figure 8. Grizzly bear habitat security in the Sunshine Village Ski Area.

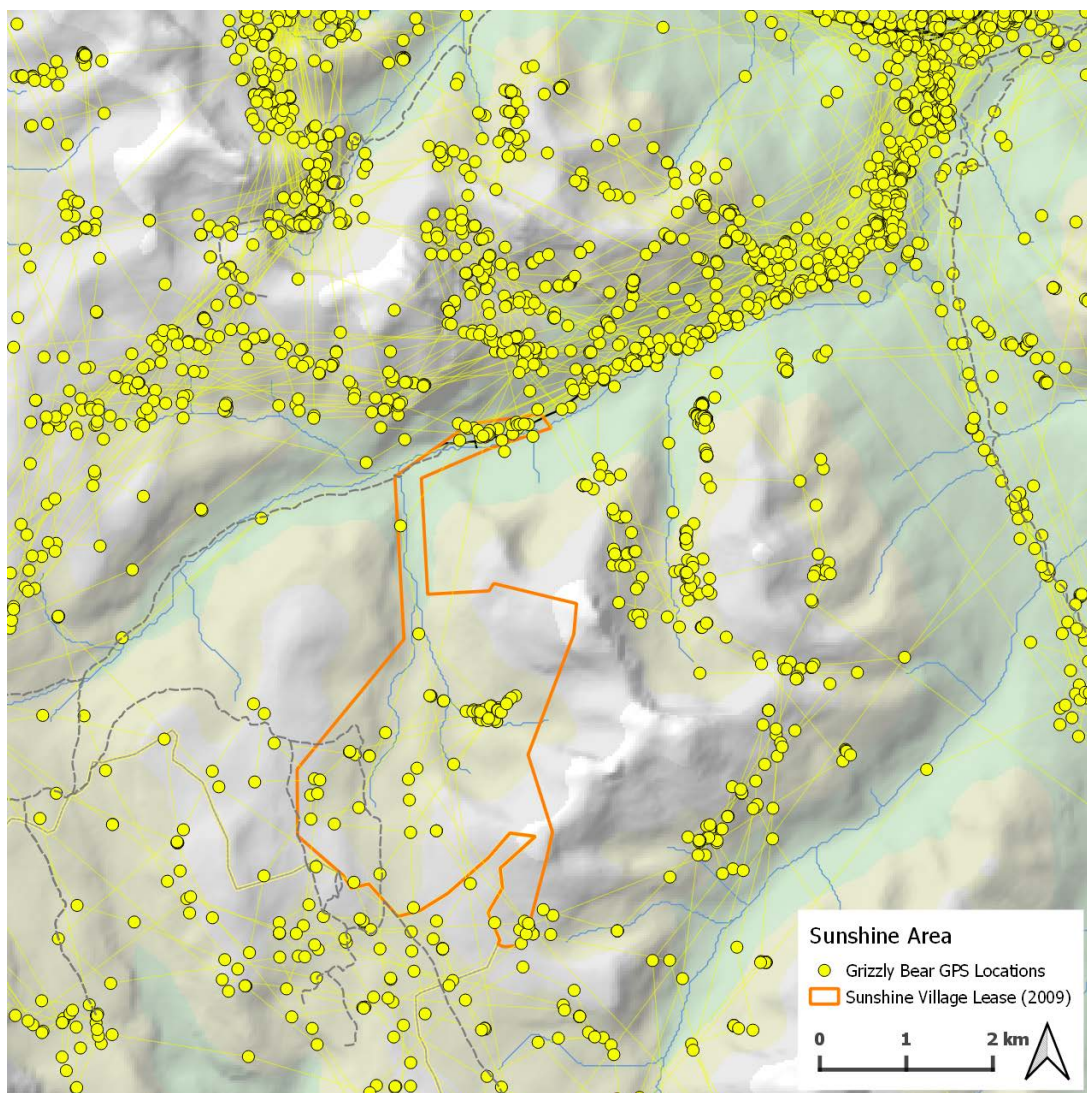


Figure 9. Grizzly bear GPS locations from seven grizzly bears that used the Healy valley, collected from 2009 to 2017, Banff National Park.

8.2.2 Existing and Potential Interactions and Impacts

Potential activities associated with the Sunshine Village Ski Area Site Guidelines that have strategic implications for grizzly bear and grizzly bear habitat include:

- Lease reconfiguration
- Development of new ski terrain
- Summer-use program

Potential Interactions and Impacts – Lease Reconfiguration

The Site Guidelines include the removal of lands from the lease as substantial environmental gains that have potential benefit to grizzly bears and grizzly bear habitat security. Of these areas, Eagle Crest is the only region that will have minimal effects on



grizzly bear habitat security. The influence of lease reconfiguration on habitat security will depend on how lease configuration influences the spatial extent and intensity of human activity.

Lands removed from the Healy Wildlife Corridor above the base area parking lot can be expected to maintain current levels of habitat security and movement for grizzly bears. Removing the potential for development in this area is not likely to change the current habitat status of non-secure. However, it will preserve the current function of the area for grizzly bear, which provides not only a movement corridor but also seasonal bear habitat along the slopes of Mount Bourgeau.

Similarly, lands removed from the Sunshine Meadows and Meadow Park area may provide some long-term security benefits to grizzly bear by restricting the potential scope of development. As with the Healy Corridor, both these areas are currently considered to be unsecure due to levels of human use. Park trails and the Rock Isle Lake water pipeline pass through the Sunshine Meadows environmental gain area. Visitor use and occasional pipeline maintenance work will both continue. While some areas of Meadow Park will be secured from future development, other areas adjacent to the environmental gain area may be developed or modified for limited runs, lifts and ski-out improvements. While use in both these areas will be limited by the Site Guidelines, both will still be considered unsecured habitat.

The return of lands in Bye Bye Bowl offers a clear benefit to future grizzly bear habitat security. The area of consideration plus adjacent lands in B.C are considered to be secure grizzly bear habitat. Removing the potential for development in Bye Bye Bowl provides long-term certainty that development in this area will not be considered and that grizzly bear habitat security will be maintained.

Potential Interactions and Impacts – Development of New Ski Terrain

The Site Guidelines include the potential development of new ski runs and glading in the Goat's Eye II, Hayes Hill and Meadow Park areas. The clearing of forest cover and modification of vegetation may be expected to create habitat and foraging conditions that are more suited to grizzly bear than are current closed forest conditions in these areas. The attractiveness of ski runs to foraging bears will depend on the soil characteristics, soil compaction and endemic plant communities. However, the Lake Louise, Marmot and Mount Norquay ski areas have enhanced grizzly bear forage quality in some areas, and they are frequently used seasonally by grizzly bears.

Although run clearing may create attractive grizzly bear habitat, it may also lead to bear habituation and bear-human conflict. Unlike the other ski areas, however, the potential nodes for new ski terrain development are located away from areas of summer visitor use. Best management practices and bear management protocols are already employed by ski areas to manage for potential conflict between bear use and ski area operations.



Potential Interactions and Impacts – Summer-Use Program

The Site Guidelines confine the potential scope of summer visitor use to the Upper Village and existing trail systems. Most of the trail systems used by visitors lie outside of the Ski Area boundary within the Sunshine-Egypt landscape management unit (LMU) of Banff National Park or Mount Assiniboine Provincial Park in B.C. However, many visitors access these trails from the Upper Village. Most of the potential management issues associated with Ski Area summer visitor use, including potential bear-human interactions, result from Ski Area programs but fall outside of Ski Area management responsibility.

The overall potential growth in the summer-use program represents the most significant potential interaction with grizzly bears and habitat security. Even though the summer-use program operates within a restricted footprint, an increasing number of visitors increases the potential for human-bear encounters, or for more complete bear displacement. Overall growth of visitor numbers is also assured to lead to increased use of trails outside of the Ski Area itself. Hikers in relatively small numbers have long used the Ski Area bus system to access trails off the Ski Area, and to a large degree this is nothing new and is a feature of the summer program for many users. What has changed is the recent use of the gondola to transport more visitors in greater numbers. Increased numbers of visitors has potential to increase grizzly bear-human conflicts and to increase displacement from high-quality habitat.

Trails accessed from the Ski Area throughout the Sunshine-Egypt LMU and Mount Assiniboine Provincial Park have greater than 100 user groups per month and thus are considered unsecured habitat. Additional visitor use is unlikely to change habitat security ratings, but it may increase the potential for bear-human encounters, increase bear habituation, or increase bear displacement, especially with potential off-trail travel. Other potential elements of summer visitor use may have potential to extend impacts to grizzly bear. After-hours use of the Standish chair and overnight use in the Upper Village may further constrain the availability of low-use times for bears. Use of the Upper Village for overnight visitors in summer has potential to increase attractants, habituation and bear-human conflicts.

8.2.3 Mitigating Measures

The suite of mitigations for grizzly bears identifies ecological management parameters, Long-Range Plan and operational parameters, and environmental assessment and information requirements that are needed to realize the desired ecological integrity outcomes of the Site Guidelines.

Ecological Management Parameters

Ecological management parameters serve as the on-the-ground benchmarks against which the environmental impacts of future development and use proposals will be assessed. The following ecological management parameters have been incorporated into the Site Guidelines in order to realize desired outcomes and priorities for grizzly bears:

- Changes in development, operations and visitor use result in an overall improvement for grizzly bears, including reduced potential for displacement, habituation or bear-human conflicts.



- Summer visitor numbers and use do not reduce habitat security within the Sunshine-Egypt Lake LMU or the adjacent North Core of Mount Assiniboine Provincial Park.
- Development preserves natural food sources for grizzly bears and does not create non-native food sources that would attract bears or increase bear-human conflict.
- Ski Area operations and visitor use provide effective low-disturbance periods for wary wildlife that respond to winter and summer seasonal habitat use patterns and sensitivities.

Long-Range Planning and Operational Parameters

The Site Guidelines provide direction for the management of summer visitor use in advance of a Long-Range Plan, including limits to the current length of the season and hours of operation, and the use of ski lifts and commercial facilities. Continued monitoring as prescribed by Parks Canada will provide information to inform Long-Range Plan proposals and decisions. Off-trail and early-season travel will continue to be discouraged through public communications, operational protocols, closures and restrictions.

Noticeably absent from the Site Guidelines are any restrictions to the potential incremental growth in total summer visitation in advance of a Long-Range Plan. As visitor use numbers are likely the biggest issue with respect to grizzly bear habitat security, interim measures are likely required to limit total visitor numbers or to place restrictions on group size for trails that lead outside of the Ski Area lease. The following measures are identified for inclusion in the Site Guidelines in order to limit the potential impact of summer visitor growth on grizzly bear habitat security:

- Apply a minimum group size known to discourage bear-human interactions (i.e., group-of-four strategy) to the use of trails outside of the Ski Area during times of known bear use if bear encounters or conflicts increase.
- Apply a summer-use carrying capacity based on analysis of the current trail system, analysis of target criteria such as number of desired group encounters, group size, people at one time, rest stop and viewpoint congestion, trail congestion, and environmental impacts, and analysis of the number of visitor disturbance events affecting bears or other sensitive wildlife.
- Continue to limit off-trail use in areas with high-quality grizzly bear habitat.

With respect to Long-Range Plans, visitor use numbers will continue to be the biggest issue with respect to maintaining grizzly bear habitat security, even at current levels.

The Site Guidelines provide direction for achieving overall improvement for grizzly bears, including reduced displacement, habituation and bear-human conflict, in relation to the development of summer-use plans. Key conditions that are relevant to summer use in Long-Range Plans that interact with grizzly bear include:

- Definition of visitor experience and ecological objectives (including desired maximum visitation numbers) consistent with applicable policy.
- Limiting summer use to the gondola base, the Upper Village and Sunshine Meadows trail system.



- Defining day-to-day operations, including trail opening and closing procedures, lift operations, guest programs (number, type and scope, activities, education, and safety; management of garbage and waste), and infrastructure requirements, including:
 - Seasonal and visitor day-use operating hours that ensure periods of minimal wildlife disturbance during crepuscular and overnight periods.
 - The operation of the gondola and day-use facilities at the Sunshine Village to expedite visitor access and egress while reducing on-the-ground impacts.
 - Guided, outdoor-based activities that focus on experiencing the natural environment, managed consistently with established commercial guiding group training, group sizes and ratios.
 - Management of off-hours visitor use of the trail systems, village facilities, or supporting outdoor activities for overnight guests.
- Adaptive monitoring and management of visitor use numbers for early identification of wear and tear on trails and facilities and to ensure protection of vegetation, terrain and shorelines.

In addition to the parameters of the Site Guidelines summarized above, Long-Range Plans should include consideration for:

- Minimum group size for visitors during sensitive seasons if bear encounters or conflict increase over time.
- Visitor carrying capacity and target maximum potential disturbance events.
- Regular monitoring and identification of local bear activity.
- Public education efforts.

Other activities associated with the construction of trail systems and other features are not expected to have long-term strategic-level impacts on grizzly bears. Considerations such as construction techniques, construction timing and operational management will be addressed at the Long-Range Plan stage and through the application of established best management practices.

Environmental Assessment and Information Requirements

The development, design and assessment of future Long-Range Plan proposals should be informed by updated, on-site information on grizzly bear habitat use and disturbance thresholds, including information and assessment of:

- Grizzly bear movement patterns and habitat use adjacent to and on the Ski Area.
- Analyses examining the cumulative effects of human activities on grizzly bear movement and habitat selection.
- Potential disturbance thresholds and human-bear conflict/habituation.
- Methodical research and consideration of summer-use carrying capacity, including desired visitor experience and grizzly bear displacement.

8.2.4 Residual and Cumulative Effects

Desired outcomes and priorities from the Site Guidelines that apply to mitigating potential impacts to grizzly bears include:



- Land use decisions contribute to local region ecological integrity goals, including fire and vegetation management, wildlife movement, grizzly bear habitat security, and species at risk protection and recovery.
- Terrestrial and aquatic habitat conditions for sensitive species, including whitebark pine, grizzly bear, wolverine, mountain goat, bighorn sheep, westslope cutthroat trout and bull trout, are conserved or restored.
- Habitat and movement security for all species is ensured by maintaining or reducing potential for human-wildlife displacement and habituation.

Valued Component: Grizzly Bear			
Project/Environment Interaction: New ski terrain; Summer visitor use			
1. Nature of Impact			
Disturbance	Disruption	Alteration	Destruction
The development of new ski terrain may be seen as a neutral or positive alteration of current habitat conditions for grizzly bear. The key potential adverse impacts are associated with increased summer use and may be considered a disruption to grizzly bear use of habitat.			
2. Frequency of Interaction			
Single occurrence	Occasional	Regular	Continuous
The impacts of summer use would be regular on an hourly and daily basis throughout the open summer season with potential frequent disturbance if grizzly bears are occupying the summer-use area. Evening and nighttime restrictions on visitor use would provide predictable and regular periods of undisturbed time for bears.			
3. Duration of Impacts			
Days or less	Weeks	Seasons	Permanent
Potential impacts to grizzly bear resulting from summer use would continue throughout the visitor season. There may be times of less frequent use by bears, with less potential for bear-human encounters.			
4. Reversibility			
At end of project	With mitigation	Long-term restoration	Irreversible



Impacts in terms of bear-human encounters have been successfully mitigated with restrictions on minimum group sizes in other areas of the park such as Larch Valley; frequent disturbance and potential displacement of bears is not, however, mitigated by minimum group size. Potential impacts associated with unrestricted visitor use growth may be partially mitigated through implementation of a summer-use carrying capacity and ongoing monitoring of disturbance patterns. Maintaining low sensory impact periods through crepuscular and evening hours will be an important management technique providing predictable periods for bear use and movement.			
5. Ecological Scale			
Site specific	Local feature	Local ecosystem	Landscape
As a species of Special Concern, visitor use impacts that result in bear displacement, habituation or aggressive encounters can be seen as a cumulative impact that affects grizzly bears at the scale of the Sunshine-Egypt LMU or beyond.			
6. Ecosystem Context			
Modified	Resilient	Vulnerable	At risk
Individual bears may be quite resilient to human use and encounter within predictable circumstances around visitor timing and location. However as a species of Special Concern, grizzly bear populations must be considered as vulnerable to the impacts of increasing summer visitor use at the Ski Area, which may be reasonably considered to contribute towards cumulative effects.			
Significance			
Negligible	Predictable and manageable	Considerable impact, risk or uncertainty	
Overall, the potential cumulative impact to grizzly bears resulting from Ski Area development and use may be characterized as uncertain. The key uncertainty for grizzly bears relates to the potential growth in summer-use visitation and the ability within the Site Guidelines to effectively limit or manage that growth.			

The residual and cumulative impacts of Ski Area development and use on grizzly bear habitat effectiveness may be described as the potential, regular, seasonal disruption of a vulnerable species with implications at a local ecosystem scale and cumulative effects at a landscape scale.

The key uncertainty with respect to grizzly bear habitat effectiveness is the potential for undetermined levels of growth in summer visitor use. Individual bears may be quite resilient to human use and encounter within predictable circumstances. Creating



predictable circumstances for grizzly bears is the key challenge with respect to current and future summer use. The Site Guidelines do contain numerous measures intended to limit and mitigate the impacts of summer visitor use, including the protection of low-use times and restrictions to the current trail systems. The Site Guidelines do not currently consider measures to limit potential growth in summer visitor use in advance of Long-Range Plans. It may take many years before a Long-Range Plan is completed following the approval of Site Guidelines, and the potential for unrestricted growth in summer visitation may be considered a significant oversight with potentially significant implications for grizzly bear habitat security.

Mitigations of the strategic environmental assessment (SEA) add measures that are intended to further address the need for limiting maximum visitation numbers prior to, and as part of, the long-range planning process, including the implementation of:

- Carrying capacity based on desired visitor experience criteria and potential grizzly bear disturbance event thresholds.
- Minimum size for groups during sensitive seasons or times of bear activity if bear use and encounters increase.
- Regular monitoring and identification of local bear activity.
- Public education efforts.

The Site Guidelines include parameters and conditions that address the seasons and timing of visitor use, limitations to the areas used, and a suite of long-range planning requirements. The Site Guidelines also require the identification of desired maximum visitation numbers through the long-range planning process, but these numbers are not linked to grizzly bear habitat requirements or other ecological criteria.

The Ski Area summer-use program presents a situation where most visitors attain access to the Sunshine Meadows environment through the Ski Area, but where most of the trail system and features of the environment that attract visitors, such as the numerous lakes scattered across the local landscape, are actually outside of the Ski Area lease. As a result, many of the potential management issues associated with summer visitor use, including potential bear-human interactions, result from Ski Area programs, but fall outside of Ski Area management responsibility.

Consideration of Ski Area summer use is therefore more than just consideration for what is appropriate within, and desired by, the Ski Area operation itself. Key decisions on Ski Area summer use, combined with other visitor use of the greater Sunshine Meadows area in Banff National Park and Mount Assiniboine Provincial Park, have direct potential cumulative effects implications for grizzly bear habitat security and ecological integrity at local and regional landscape scales. As a result, summer use of the Sunshine Meadows area is most appropriately considered as a park management planning issue whose scope extends beyond the Site Guidelines and long-range planning process envisioned by the *Ski Area Management Guidelines*.

Considering the full suite of guidelines and mitigations of the Site Guidelines and SEA, it remains somewhat uncertain that expected ecological outcomes for grizzly bear will be attained. The Site Guidelines facilitate increased grizzly bear habitat security in the long term through lease reduction and limitations to future development and use in undeveloped areas – particularly the Bye Bye Bowl area. The potential to improve grizzly



bear foraging habitat away from areas of summer visitor use may be facilitated through new run development that alters vegetation structure in alignment with conditions expected of the historical fire cycle and provides more open meadow habitat. Habitat improvement may draw bears away from human use areas, but it may also result in attracting more bears into and through the Sunshine area. Despite the potential gains, the possibility of increasing summer visitor use numbers outside of the long-range planning process creates significant uncertainty with respect to grizzly bear habitat security, levels of disturbance and potential for bear-human encounters. Although summer visitor use of Sunshine Meadows is a desirable experience supported by Parks Canada, the geographic and ecological scale of summer use extends considerably beyond the Ski Area boundaries. The scale of summer visitor use, combined with the ecological importance of the Sunshine Meadows and grizzly bear habitat security, presents issues that may be considered beyond the sole scope of Ski Area Site Guidelines or long-range planning processes.

8.3 MOUNTAIN GOAT

Mountain goats primarily occupy the slopes of Mount Bourgeau in the immediate vicinity of the Sunshine base area parking lot throughout summer and winter seasons. The proximity of goat habitat to the base area increases the potential for new development or use in the base area to interact with mountain goat use of the Mount Bourgeau habitat.

8.3.1 Current Status

Mountain goats occupy alpine and subalpine areas throughout northwestern North America. In Alberta, provincial goat numbers are estimated at 2,000 to 3,000 animals, including national parks (Smith and Hobson 2008, Myatt and Larkins 2010). Mountain goat populations in Alberta are believed to have drastically declined in the 1960s, and they have been slow to recover despite more stringent management programs adopted in the 1980s.

The Sunshine leasehold and adjacent slopes provide moderate- to good-quality year-round habitat for mountain goats (Holroyd and VanTighem 1983). Goats primarily use high-elevation colluvial slopes with low shrub and grass meadow areas, in close proximity to steep cliff escape terrain (Eccles and Strom 1994). Lower-elevation forested areas are also used to access mineral licks and water (Holroyd and Van Tighem 1983). During winter, mountain goats use high-elevation windswept, grassy slopes in rocky terrain (Holroyd and Van Tighem 1983).

Near the Ski Area, steep trails connecting Mount Bourgeau with the Healy Wildlife Corridor and valley bottom are frequented by mountain goats accessing water and minerals near Healy Creek (Eccles and Strom 1994). Groups of 15–40 mountain goats have repeatedly been observed on the steep rocky terrain of Mount Bourgeau, directly upslope of the existing Bourgeau parking lot. Mountain goat use is concentrated along the southwest slopes of Mount Bourgeau, although other high-elevation historical observations have been made on the north and west aspects of Goat's Eye Mountain (Figure 10). It is perhaps significant to note that observations of mountain goats on Goat's Eye Mountain identified in Figure 10 were made in 1982 and 1985 with none since, suggesting that goats may have abandoned this area.



Some research suggests that mountain goats are particularly sensitive to human disturbance and are more easily displaced and disrupted than other more tolerant ungulate species (Côté 2010). Like other prey species, mountain goats have associated certain stimuli to predators, such as loud noises and directional movement, which causes disturbance and affects important decision-making processes (Lima and Dill 1990, Frid and Dill 2002). Numerous activities can result in disturbance of mountain goats. Activities associated with tourism and recreation can displace mountain goats, which is particularly important to consider during the critical winter season when movement is restricted by deep snowpack (BCMOE 2010). Research in Jasper National Park suggested mountain goats avoided ski areas but not the surrounding area (Richard and Côté 2016).

Mountain goats are also particularly sensitive to aerial and overhead disturbance from helicopters (BCMOE 2010, Côté et al. 2013). Mountain goats are moderately to strongly disturbed by helicopters, although some mountain goats showed a slight reduction in disturbance response after 10–15 years of repeated exposure (Côté et al. 2013). Disturbed animals can experience decreased foraging rates, nutritional deficits, habitat abandonment, increased energy expenditure due to displacement, altered daily feeding patterns, occupancy of marginal habitats, energetic costs and potential for injury associated with a chase (Christianson and Creel 2010, Buchanan et al. 2014, Hutchins and Geist 1987, White et al. 2014, Ydenberg and Dill 1986, Cooper and Frederick 2007).

Despite the research, there are numerous examples where mountain goats have become habituated to park and visitor activities along heavily used roads and trails at various locations in the mountain parks and western North America. Given the close proximity of the Sunshine parking lot, the access road and avalanche control activity, the mountain goats of Mount Bourgeau likely have developed some level of tolerance to human disturbance, while not reaching levels of habituation seen in other locations of high visitor use.

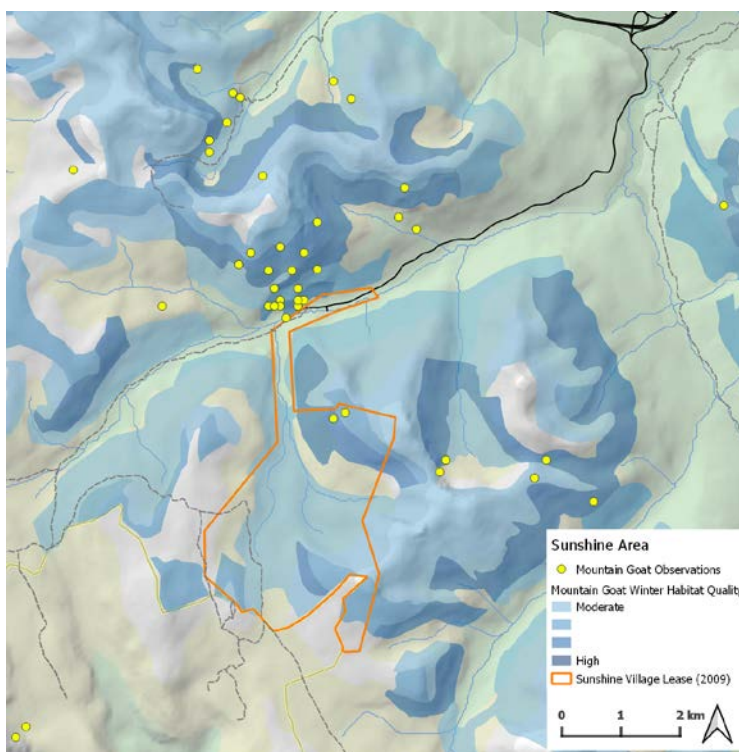
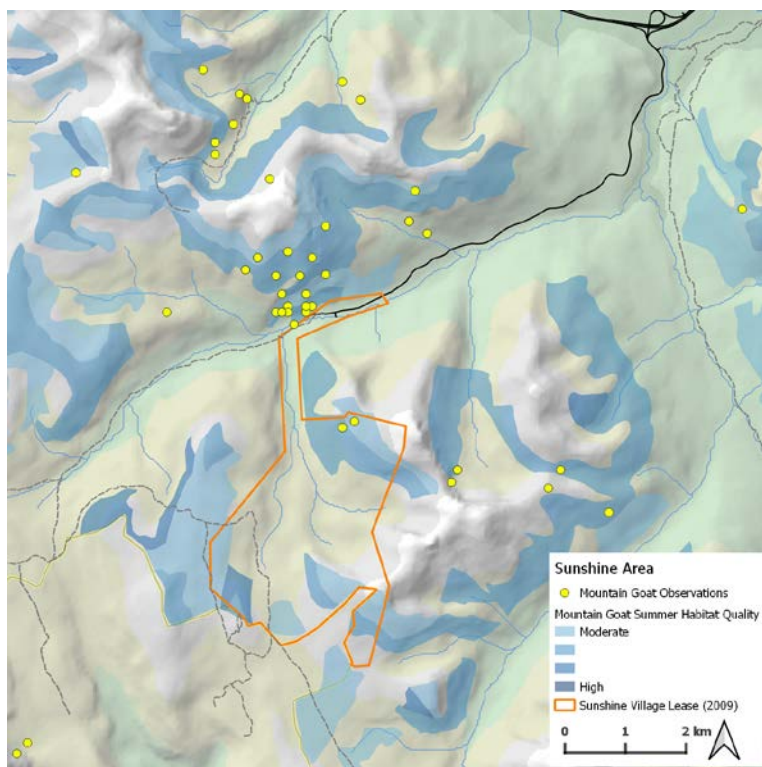


Figure 10. Summer and winter mountain goat habitat and sightings near the Sunshine Village Ski Area.



8.3.2 Existing and Potential Interactions and Impacts

Consideration of direct displacement and sensory impacts on mountain goats from Ski Area development and operation will be key to maintaining mountain goat populations in the local area. Potential Ski Area development activities contemplated in the Site Guidelines that have strategic implications for mountain goats include:

- Lease reconfiguration
- Parking lot development and use
- Backcountry skier access and avalanche control

Potential Interactions and Impacts – Lease Reconfiguration

The removal of lands on the north side of the parking lot in the Upper Healy Wildlife Corridor are expected to secure high-quality and frequently used mountain goat habitat on Mount Bourgeau from the impacts of potential development and use. Multiple parking lot expansion proposals have been brought forward for this area over many years. Removing the area from the lease will eliminate the potential for significant expansion proposals that would bring the potential for disturbance or displacement into close proximity to existing mountain goat habitat.

While mountain goats in the Mount Bourgeau area clearly have some level of tolerance for human activity, mountain goats may have abandoned other areas that have been, or are being, subjected to more intensive ski area development and use, including areas on Marmot Mountain at Marmot Basin, Whitehorn Mountain at Lake Louise, and Goat's Eye Mountain at Sunshine, as discussed earlier. Removing Healy Corridor lands from the lease limits potential future development and use to levels that resident goats currently tolerate, and it can be seen as part of the substantial environmental gain associated with the overall lease reconfiguration in this area.

Potential Interactions and Impacts – Parking Lot Development

Parking lot development as envisioned by the Site Guidelines is limited to the disturbed slopes immediately adjacent to the north parking lot. The extent of the potential development footprint is unlikely to result in further visual, auditory or other sensory disturbance, or to displace goats higher on the slopes of Mount Bourgeau.

As with bighorn sheep, mountain goats do on occasion travel vertically from their core habitat above through the parking lot to Healy Creek. Habitat and sightings shown in Figure 10 suggest that there could be some mountain goat movement across the Healy Creek valley. Forest cover and relatively steep slopes above the parking lot likely provide movement security and escape terrain for goats making this journey.

The north terrace parking proposal from the Site Guidelines would involve a negligible change to forest cover. The timing and disturbance from Ski Area traffic, parking and visitor use would not change, and the increase in open crossing distance across the parking lot is negligible. Periods of low visitor use and traffic will continue to provide opportunities for mountain goats to move through the parking area at current frequencies. High retaining walls are necessary for terraced parking lot development, and while mountain goats are famous for navigating steep terrain, the most vertical of



retaining walls are likely to act as a barrier to potential goat movement. Non-vertical retaining walls or walls with breaks are likely to continue to facilitate mountain goat movement. The vertical movement of wildlife through the Healy Corridor is discussed further in Section 8.1 on wildlife corridors.

The potential impact of increased summer visitor use on mountain goat movement through the parking area is unknown. At best, mountain goat use through the base areas would mimic that of winter use and movement. However, it is clear from well-established wildlife trails descending vertically to the base area that there is considerable wildlife movement that may be facilitated by the fact that the far ends of the parking lot are empty of vehicles and visitors throughout the summer season.

Potential Interactions and Impacts – Backcountry Access and Avalanche Control

Avalanche control activities may be reasonably linked to potential disturbance or displacement of mountain goats. The slopes of Mount Bourgeau and Goat's Eye Mountain above the parking lot and along the access road are both frequently subject to helicopter use, and to the use of explosives and GAZX systems to trigger small avalanches throughout the ski season. Similarly but less frequently, explosives are used in the same manner in the Delirium Dive and Alpine Bowls area as part of public safety operations.

The Site Guidelines do not contain any proposals that would change the current situation. Despite the history of avalanche control in immediate proximity to mountain goat habitat, goats continue to use the area. Converting the Alpine Bowls to a licence of occupation will not change the current situation in terms of area covered by avalanche control, frequency of control, or type of control measures. No additional interactions with avalanche control operations are identified.

Similarly, the conversion of the Alpine Bowls to a licence of occupation will not change the current circumstances related to backcountry access from this area. No new lifts, development or access is contained within the scope of the Site Guidelines that would promote additional backcountry access into potential mountain goat habitat off the lease. No additional interactions with avalanche control operations are identified.

8.3.3 Mitigating Measures

The suite of mitigations for mountain goats identifies ecological management parameters, Long-Range Plan and operational parameters, and environmental assessment and information requirements that are needed to realize the desired ecological integrity outcomes of the Site Guidelines.

Ecological Management Parameters

Ecological management parameters serve as the on-the-ground benchmarks against which the environmental impacts of future development and use proposals will be assessed. The following ecological management parameters have been incorporated into the Site Guidelines and address the ecological outcomes and priorities pertinent to mountain goats:



- Ski Area development and use do not displace mountain goats or bighorn sheep from seasonally important habitat areas or from established local travel routes.
- Ski Area operations and visitor use provide effective low-disturbance periods for wary wildlife that respond to winter and summer seasonal habitat use patterns and sensitivities.
- Ski Area development and use does not create habitat conditions or result in human use patterns that alter characteristic predator-prey relationships.
- Wildlife have low-disturbance access to and through the wildlife corridor during sensitive seasons or during times of restricted habitat use. Specifically:
 - Development and operations are timed so as to allow for predictable, seasonally based periods and patterns, in order that wildlife can establish and maintain secure patterns of movement and habitat use.
 - Normal daily and seasonal spatial patterns of wildlife use and movement are maintained by avoiding development or operations likely to result in potential displacement of wildlife from established movement routes.
- Wildlife have low-disturbance access to and through the wildlife corridor, through a range of natural daylight conditions, including morning and evening daylight periods (where feasible according to season), crepuscular periods and nocturnal periods.
- Development and use in the base area will be designed to facilitate vertical wildlife movement and habitat use during low-use times for mountain goat and bighorn sheep between the Bourgeau Bench area and Healy Creek through the parking lot.

Long-Range Planning and Operational Parameters

Specific planning and operational parameters are identified to provide greater clarity for project design and planning, and for Ski Area operations. These parameters should be included as part of future planning proposals or management initiatives, as appropriate.

- Proposals for the north terrace parking expansion will include design measures to ensure that mountain goats and bighorn sheep can navigate past or through parking lot retaining walls or other structures from established wildlife trails.
- New lifts for the Goat's Eye II area, if proposed, will not be located so as to increase potential backcountry access to the far side of Goat's Eye Mountain or the Alpine Bowls area.

Environmental Assessment and Information Requirements

- Long-Range Plan proposals that include expanded backcountry skiing activity or an increase in avalanche control measures in the Alpine Bowls will be informed by an assessment of mountain goat habitat, use and sensitivities on surrounding peaks outside of the licence of occupation.
- Long-Range Plan proposals for the development of the north terrace parking lot will be informed by monitoring of mountain goat habitat use, including access to mineral licks, water, seasonal travel routes and escape terrain that may be impacted by parking development.



- Long-Range Plan proposals for increases in summer visitor use and the development of a summer-use carrying capacity will be informed by monitoring of mountain goat habitat use of the Bourgeau base area, including access to mineral licks, water, seasonal travel routes and escape terrain that may be impacted by increased visitor traffic, vehicle parking and visitor use.

8.3.4 Residual and Cumulative Effects

Expected ecological outcomes from the Site Guidelines that apply to mitigating potential impacts to mountain goats include:

- Land use decisions contribute to local region ecological integrity goals, including vegetation management, wildlife movement, grizzly bear habitat security, and species at risk protection and recovery.
- Habitat and movement security is ensured by maintaining or reducing potential human-wildlife displacement and habituation.
- The Upper Healy (Bourgeau) Wildlife Corridor effectiveness is maintained or improved.

Valued Component: Mountain Goat Habitat			
Project/Environment Interaction: Terraced parking development; Alpine Bowls operations			
1. Nature of Impact			
Disturbance	Disruption	Alteration	Destruction
The development of terraced parking as envisioned by the Site Guidelines may disrupt mountain goat movement patterns through changes in terrain, but it is not anticipated to further alter the ability for goats to move across the Healy Creek valley or through the parking lot. Avalanche and backcountry ski activities in the Alpine Bowls is unlikely to disrupt the Bourgeau goat population.			
2. Frequency of Interaction			
Single occurrence	Occasional	Regular	Continuous
Goat use through the parking area appears to be infrequent. The development of terraced parking within the parameters of the Site Guidelines is unlikely to result in change, and the frequency of avalanche control or backcountry access from the Alpine Bowls is unlikely to change.			
3. Duration of Impacts			
Days or less	Weeks	Seasons	Permanent



Disturbances related to avalanche control, backcountry access or passage by goats through the parking lot are likely to last from minutes to hours.			
4. Reversibility			
At end of project	With mitigation	Long-term restoration	Irreversible
Goat passage through a terraced parking lot is likely to be facilitated by the design of retaining walls that allow for breaks or are of appropriate slope to allow for goat movement. Past and current management of avalanche control and backcountry or sidecountry ski operations has been effective in limiting potential interaction with mountain goats.			
5. Ecological Scale			
Site specific	Local feature	Local ecosystem	Landscape
Potential ecological impacts to mountain goats are likely to be limited to the slopes of Mount Bourgeau. Impacts of Ski Area activities to other areas of mountain goat habitat are unlikely.			
6. Ecosystem Context			
Modified	Resilient	Vulnerable	At risk
The mountain goat population on Mount Bourgeau may be considered resilient to the potential impacts on ongoing Ski Area use and operations as it has been for many years. Bourgeau mountain goats are anticipated to adjust to movement through retaining walls along existing movement paths.			
Significance			
Negligible	Predictable and manageable	Considerable impact, risk or uncertainty	
Overall, the potential cumulative impact to mountain goats across the Ski Area may be considered to be negligible. The Site Guidelines contain little potential to impact mountain goat populations beyond current levels. Securing habitat on the Bourgeau Slopes above the parking lot through lease reconfiguration provides positive long-term habitat security for mountain goats in this area.			

The residual and cumulative impacts of Ski Area development and use on mountain goat habitat may be summarized as the occasional, limited disruption of movement patterns or habitat use. The environmental gain associated with the removal of lands from the lease within the Healy Corridor enhances long-term habitat security. Avalanche control and backcountry skiing activities likely have little current impact on goats and are



unlikely to change in terms of the nature, frequency or location of potential disturbance. The potential development of a parking terrace along the north edge of the parking lot has some potential to restrict or alter goat movement from habitats above to Healy Creek and beyond due to the vertical nature of retaining walls. These potential restrictions are expected to be overcome through design that allows for goat passage through or over walls in association with established movement paths.

Although the physical movement of mountain goats through the base area can likely be facilitated through design, it is not clear how goats currently use the area in the summer, nor how significantly increased summer visitation, traffic and parking might impact summer season goat use. Research and information on summer season mountain goat use will be a key consideration in the development of summer-use carrying capacities in future Long-Range Plans.

Considering the full suite of guidelines and mitigations, it is anticipated that the expected ecological outcomes related to mountain goats may be achieved under the Site Guidelines. Specific ecological outcomes related to mountain goats that are likely to be achieved under the Site Guidelines include:

- Areas within the Upper Healy Wildlife Corridor will be removed from future development considerations, providing long-term security for mountain goat habitat within the Upper Healy Corridor.
- Development of a north terrace in the parking lot will facilitate continued goat movement through the parking lot area to Healy Creek.
- Ski Area hours of visitor use will continue to provide significant periods of low visitor use intensity through all seasons and to provide predictable times for mountain goats to move through the Ski Area parking lot and landscape.
- Backcountry skier access and avalanche control will continue at levels that minimize disturbance to mountain goats.

8.4 SMALL MAMMAL HABITAT

The diversity of terrain elevation and vegetation across the Ski Area lease provides a wide variety of potential habitat for small mammal species ranging from small predators such as wolverine and lynx to mice and voles. The management of vegetation and snow cover has the potential to influence habitat composition and structure and the movement of small mammals across the Ski Area landscape.

8.4.1 Current Status

Small mammals are key components in the diet of many mammalian and avian predators, and these small mammals influence the ecological processes that maintain vegetation communities and nutrient cycling between soils and plants (Euroala et al. 1984). Many small mammal species are found throughout the park. Figure 11 summarizes a list of 23 species likely to occur within the Sunshine Village Ski Area, identified by Eccles and Strom (1994). Of these, the pygmy shrew and water shrew occur rarely in Banff and Jasper national parks, and the Richardson's water vole is considered an uncommon species in the park (Eccles and Strom 1994). The least chipmunk is also listed on British Columbia's Blue List of vulnerable species and is limited to the



Continental Divide Range with the northern extent at the Bow River valley, including the Ski Area and surrounding region (Eccles and Strom 1994).

Figure 11. List of small mammals that may occur within the Sunshine Lease Area (Eccles and Strom 1994).

Deer mouse	<i>Peromyscus maniculatus</i>
Western jumping mouse	<i>Zapus princeps</i>
Gapper's red-backed vole	<i>Myodes gapperi</i>
Long-tailed vole	<i>Microtus longicaudus</i>
Meadow vole	<i>Microtus pennsylvanicus</i>
Western Heather vole	<i>Phenacomys intermedius</i>
Richardson's water vole	<i>Microtus richardsoni</i>
Masked shrew	<i>Sorex cinereus</i>
Vagrant shrew	<i>Sorex vagrans</i>
Northern water shrew	<i>Sorex palustris</i>
American pygmy shrew	<i>Sorex hoyi</i>
Least chipmunk	<i>Tamias minimus</i>
Yellow pine chipmunk	<i>Tamias amoenus</i>
Hoary marmot	<i>Marmota caligata</i>
American Red squirrel	<i>Tamiasciurus hudsonicus</i>
American pika	<i>Ochotona princeps</i>
Columbian ground squirrel	<i>Spermophilus columbianus</i>
Golden-mantled ground squirrel	<i>Spermophilus lateralis</i>
Bushy-tailed woodrat	<i>Neotoma cinerea</i>
Northern flying squirrel	<i>Glaucomys sabrinus</i>
Varying (snowshoe) hare	<i>Lepus americanus</i>
North American Porcupine	<i>Erethizon dorsatum</i>
Weasel/Wolverine/Marten/Mink	<i>Mustela</i> sp.

Other small mammals are also likely to occur in and around the Ski Area, such as pine marten, fisher, red fox, bobcat and striped skunk. Of the small mammals likely to occur within the Ski Area, some are niche specialists selecting habitats with particular



characteristics while others are generalists and use a wide variety of habitat types. Particular sites, such as locations of pika and ground squirrel colonies or moist riparian areas for the rare water and pygmy shrews, can be important for certain specialist species.

The Ski Area provides a wide range of local habitat characteristics for a variety of small mammal species. The local absence of fire in the Ski Area region has resulted in a predominance of old growth forests, resulting in habitat characteristics favourable for species that select for contiguous closed canopy forest areas. The Sunshine Meadows and surrounding transitional areas provide more open and alpine meadow-like regions, with rocky outcrops, favourable for a variety of subalpine and alpine species. The Healy and Sunshine creeks provide potential riparian habitats.

At the local scale, vegetation cover and habitat within the Ski Area leasehold has been fragmented by the development of ski runs and altered through glading and ongoing vegetation control on developed ski runs. The pattern of vegetation and resulting habitat structure within altered areas of the Ski Area is perhaps most similar to subalpine areas that are naturally fragmented and frequently disturbed by avalanche activity. However, Ski Area activities can affect soil structure (soils become more dense in areas with grooming), which can in turn affect vegetation, small mammals and bird communities (Rolando et al. 2007, Roux-Fouillet et al. 2011).

Small predators can also be affected by Ski Area development and activity. For example, ski areas and distances between forest patches can affect marten density and movements in winter (Slauson et al. 2017). Wolverine and Canada lynx are species of interest with respect to levels of human disturbance and forest fragmentation associated with Ski Area development and operations.

Wolverine

Wolverines are solitary animals with large, overlapping home ranges that tend to occur in the upper elevations of subalpine and alpine habitats (May et al. 2006, Copeland et al. 2007). Wolverines in Banff National Park belong to the Western population, which has been designated as a species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2003).

Low reproductive rates, small litter sizes and a relatively early age of reproductive senescence contribute to the species being highly sensitive to human disturbance of its habitat and populations (Hornocker and Hash 1981, Weaver et al. 1996, Krebs and Lewis 2000, Carrol et al. 2001).

Wolverines maintain relatively large home ranges, likely due to the dispersion of food resources, the distribution of habitat features such as den sites, and the need to maintain security from interspecific competitors (Krebs et al. 2007). Male home ranges have been typically found to be three times the size of female home ranges. Krebs and Lewis (2000) estimated home range sizes of males and females in the Columbia Mountains to be 1,005 km² and 311 km², respectively.

Natal and maternal dens are believed to be the only small-scale structures for which wolverines exhibit selection. The persistence of snow cover into the spring and the association with avalanche terrain have been found to be the most important factors in



accounting for the location and distribution of wolverine den sites across North America (Aubry et al. 2007, Krebs et al. 2007, Ruggerio et al. 2007, Fisher et al. 2014).

Canada Lynx

In the southern Canadian Rockies, including Banff National Park, landscapes capable of supporting lynx occur in patches in a complex mountainous environment. Resident lynx in the southern Rockies occur at low densities, move extensively and occupy large home ranges (Apps 2007). This situation, combined with various threats and a growing human population in the region, has led to heightened conservation concern for lynx in the southern Canadian Rockies (Apps et al. 2000).

Maintaining a suitable mosaic of habitat necessary for foraging, denning and travel is essential for conserving lynx. Specific targets are not available for degree of fragmentation, but lynx are traditionally considered to avoid open areas (Koehler 1990, Ruggieri et al. 1994). There is little literature on the width of ski runs that lynx will cross, but it is documented that lynx typically do not cross open areas wider than 100 m (Koehler 1990).

The USDA Forest Service (2012) reported that lynx may be able to adapt to concentrated human use during winter if security habitat is available that “allows lynx the ability to retreat from adjacent human disturbances during daytime hours, and emerge at dusk to hunt and travel when most human activity ceases”. Lynx have been frequently observed at Lake Louise, Nakiska and other ski areas during daytime visitor hours.

Lynx are linked to their primary prey, snowshoe hare, and require a mosaic of habitat types to be successful, including young or mid-successional conifer forests for foraging, and older forests for denning and travel (Ruggiero et al. 1994, Apps 2007). Mature coniferous forests are also important for red squirrel, a secondary prey species for lynx. The association of lynx with forest mosaics, and their response to habitat conditions at multiple spatial scales, makes the lynx a potentially useful focal species for biodiversity management strategies (Apps et al. 2000, Apps 2007).

8.4.2 Existing and Potential Interactions and Impact Analysis

Potential Ski Area development activities within the Site Guidelines that have the potential to impact small mammal habitat include:

- Lease reconfiguration
- New ski terrain
- Snowmaking and grooming

Impacts and Interactions – Lease Reconfiguration

Each of the areas identified to be removed from the lease as substantial environmental gains has different potential benefits for small mammal habitat.

The removal of the Bye Bye Bowl, Sunshine Meadows and Eagle Crest areas from the lease will preclude potential future development and use in sensitive alpine and alpine meadows habitat. In addition to the elimination of direct impacts of development, the secondary impacts of snow packing and snow management on vegetation and subnivean



habitat will be avoided. Removing these areas from the lease represents a clear gain in long-term certainty for these small mammal habitats.

The removal from the lease of areas along Healy Wildlife Corridor on either side of the parking lot will have clear benefits to the potential movement of small wary carnivores, such as Canada lynx and wolverine. Potential gains associated with corridor protection are discussed in greater detail in Section 8.1.

The removal of the Meadow Park area from the lease has fewer discernable gains than the removal in the Healy Corridor in terms of wildlife movement effectiveness, and the Meadow Park removal has minimal benefit for the protection of riparian small mammal habitat. Although some forested area upslope of Sunshine Creek could be removed, the developments that are permitted in the Site Guidelines, such as ski-way improvements and lifts, will still have potential impacts to riparian habitat along the creek. Protection of riparian habitat will have to be managed on a project basis, and it is likely to make little difference whether the Meadow Park area is removed from the lease or not. Avoiding the development of packed and groomed ski runs is of clear benefit to subnivean wildlife, but the extent of potential impact or of associated gain may not be substantial.

The assignment of the Alpine Bowls area to a licence of occupation is unlikely to result in any changes that would affect small mammal habitat in these alpine areas. Avalanche control and skiing activity under a licence of occupation will continue with little to no development or operations such as grooming or snowmaking that could impact subnivean habitat.

Impacts and Interactions – New Ski Terrain

The development of ski terrain generally involves the removal and modification of vegetation, and it may involve physical terrain modification with implications for soil, underlying parent material and water. Along with direct impacts to small mammal habitat, Ski Area development may contribute to habitat fragmentation. Habitat fragmentation may result in a reduction in habitat effectiveness, the destruction of daily movement and long distance dispersal routes, a disturbance of predator-prey relationships, the direct mortality of small mammals, and a shift in habitat use patterns (Percy 2006). The width of ski runs, the patch size in between runs, and the overall footprint and pattern of development are key considerations with respect to wildlife habitat and movement across the Ski Area.

Forest patches of a size that is suitable for small mammal predators are expected to provide effective habitat for prey species and other small mammals. Canada lynx and pine marten are small mammal predators, both of which may be sensitive to fragmentation in forest cover. Openings in forest cover greater than 90–100 m are generally avoided by lynx and pine marten (Koehler 1990, Brittell et al. 1989, Hargis et al. 1999) and would be reasonably expected to reduce habitat effectiveness for smaller species, as well. Ski Area development that results in openings greater than 100 m could result in disruption of predator-prey relationships, daily movement patterns and long distance dispersal of small mammals and prey species.



Lynx management in the Pacific Northwest recommends maintaining contiguous forest patches of 8–16 ha (Koehler and Brittell 1990, Brittell et al. 1989), and pine marten habitat use has been found to decrease in landscapes with more than 25% non-forest cover, which are close to open areas, and where high-contrast edges have increasing extent (Hargis et al. 1999). Existing or future ski run configuration in excess of these parameters would begin to favour edge species over interior forest species. Maximum ski run widths of 50 m, with contiguous forest at least as wide as the run and of irregular shape and size, are specified in the Site Guidelines and the *Best Management Practices for Development at Ski Areas in Banff and Jasper National Parks of Canada* to help maintain small mammal habitat structure and function.

In addition to run configuration, ski terrain development and vegetation management practices may also result in ongoing impacts to small mammal habitat structure. Coarse woody debris, snags and legacy trees that provide habitat may be removed as part of ski terrain development and management. Disposal practices for cleared forest debris could enhance or reduce habitat suitability for small mammals and insects. Mowing or brushing of vegetation on ungroomed ski terrain impacts the vertical structure of native vegetation with the potential of reducing movement and hiding cover for some species. Glading practices can result in the creation of an artificial forest structure with little vegetation understory or habitat structure.

Wolverine

The primary potential impact to wolverine that is related to Ski Area development activities under the Site Guidelines is the expansion of terrain for ski and snowboarding activity and the potential disturbance within wildlife corridors. Wolverine are known to maintain a large distance from human developments, especially during winter (Weaver et al. 1996, May et al. 2012). Although wolverine are not known to frequently move through or to inhabit the Ski Area, the expansion of ski terrain may further disrupt and fragment wolverine movement through the Ski Area.

The Goat's Eye II and Hayes Hill areas are effectively contained by the height of land in the surrounding Alpine Bowls. Expansion of ski terrain in these areas is unlikely to result in further displacement of wolverine or in diminishing habitat effectiveness beyond the areas of proposed expansion. The Ski Area is not known to overlap with wolverine denning locations, although the abundance and distribution of maternal dens around the Ski Area is unknown. Similarly, potential ski run development in the Meadow Park area is effectively surrounded by the disturbed and developed lands of the Upper Village and Wawa ski pods. Expansion of ski terrain in these areas is unlikely to result in further displacement of wolverine or in diminishing habitat effectiveness beyond the areas of proposed expansion.

Canada Lynx

Snowshoe hare populations achieve high densities in young, dense coniferous forests or in mature forests with well-developed understory. Red squirrels also require mature conifer forests. Lynx require areas with large amounts of coarse woody debris, such as blowdowns and upturned root systems, for natal dens. Forest management practices that



remove or alter such habitats may impact lynx. In addition, lynx avoid large openings (Anderson and Lovallo 2000) and may be reluctant to cross clearcuts or wide ski runs.

Ski hill forest management activities that could impact lynx and their prey include clearing forest stands for ski run development, glading, removing shrubby cover from ski runs, and creating fire guards around the ski hill or around particular facilities. In lynx habitat, wildfire is an important disturbance agent that helps to create early- to mid-seral conditions with high hare densities and abundant coarse woody debris while maintaining all forest age classes and a diverse landscape structure. Fire suppression activities, including those intended to protect major infrastructure such as ski hills and townsites, may ultimately reduce the ability of these landscapes to support lynx.

Overall, disturbance levels associated with recreational activities at ski hills may preclude use by lynx (Ruediger et al. 2000). However, the nocturnal activity patterns of lynx may provide an opportunity for lynx to co-exist with diurnal recreational activities in the same area (USDA 2012).

The potential development of new ski terrain below treeline in the Goat's Eye II, Hayes Hill and Meadow Park areas all extend the patchwork of forest and open ski runs that currently exists on the Ski Area. Although lynx are not common in the Sunshine Ski Area, lynx successfully inhabit ski area patchwork habitats at other ski areas. With considered design and management in accordance with vegetation management parameters, and by minimizing after-hours sensory disturbance to the extent feasible, lynx may be expected to use newly developed areas in a similar manner to existing areas. Maintaining run widths of less than 50 m, maintaining forest patches of significant size in between runs, and maintaining understory that supports snowshoe hare habitat and provides hiding and travel cover for lynx are key aspects of successful lynx habitat design for new and modified ski runs.

Impacts and Interactions – Snowmaking and Grooming

Snowmaking and grooming impact native vegetation and soils, which in turn can influence small mammal habitat. Snow compaction may result in direct damage to vegetation and soils, increased soil compaction, decreased soil temperature, increased frost and ice formation, gradual changes in plant composition, and delayed spring melt and runoff (Fahey and Wardle 1998, Rixen et al. 2003). Changes to vegetation and soils can result in a shortened growing season during which foraging is available for wildlife, and in changes to herbaceous cover for selected species. Snow compaction can result in restriction of subnivean movement by small mammals as a result of increased ice formation and snow density, and of changing abiotic conditions, including temperature, oxygen levels, water content and frost penetration.

8.4.3 Mitigating Measures

Ecological Management Parameters

Ecological management parameters serve as on-the-ground benchmarks against which the environmental impacts of future development and use proposals will be assessed. The following ecological management parameters for vegetation have been incorporated



into the Site Guidelines and are anticipated to achieve expected ecological outcomes important to small mammal habitat:

- Native species and communities dominate vegetation throughout the Ski Area, reflecting regional and local vegetation structure and diversity.
 - Glading and thinning simulate natural vegetation patterns and structure.
 - Below treeline, the maximum width for new runs and for widening of existing runs is 50 m.
 - A strip of contiguous forest at least as wide as the run remains in between runs for all new runs or modifications to runs.
 - Forested areas between runs are irregular in shape and are of sufficient size to provide effective wildlife habitat and movement cover.
- Habitat conditions for rare and sensitive species are maintained, including critical habitat for listed species under the *Species at Risk Act*:
 - The composition and structure of vegetation provide habitat for the expected range of native species.
- Native vegetation serves as an anchor against soil and terrain erosion.
- Construction, terrain modification and vegetation removal activities avoid the disturbance of saturated soils or surficial deposits.
- Rare and sensitive vegetation communities, and the terrain features and habitat conditions that support them, are maintained or restored.

Long-Range Planning and Operational Parameters

The ecological management parameters of the Site Guidelines are expected to address potential overall change in vegetation structure and function and to ensure that small mammal movement and habitat effectiveness are maintained in such a way that expected small mammal species continue to persist on and around the Ski Area environment. Specific planning and operational parameters are identified to provide greater clarity for project design and planning, and for Ski Area operations. These parameters should be included as part of future planning proposals or management initiatives, as appropriate.

New Terrain Development and Vegetation Management

- Long-Range Plans are to include a Ski Run and Vegetation Improvement Strategy as part of every Long-Range Plan. The strategies contain directions that are expected to maintain habitat diversity for small mammals across the Ski Area, including:
 - Glading project designs that reflect conditions of natural forest structure and succession in accordance with the different ecological zones and habitat types across the Ski Area.
 - Protection of ground cover vegetation diversity, wet soils and sensitive environments.
 - Protection and restoration of habitat features and conditions that support vegetation communities and species diversity throughout the Sunshine Meadows environment and other upper subalpine and alpine locations.



Snowmaking and Grooming

- The scope of potential snowmaking expansion at the Ski Area is limited to the ski-out and other high-traffic areas. Expansion of snowmaking into areas above the unbroken treeline will not be considered in order to protect important upper subalpine and alpine vegetation and habitat.
- Long-Range Plans should include best management practices for grooming management where shallow snow conditions may leave underlying vegetation exposed to scalping or other damage.

Wolverine

No additional, specific planning and operational requirements are identified to ensure that expected ecological outcomes are realized for wolverine. Parameters for grizzly bear, the Whitehorn wildlife corridor, vegetation management and mountain goat are anticipated to address the potential issues related to wolverine travel and use of the Ski Area landscape.

Canada Lynx

No additional, specific planning and operational requirements are identified to ensure that expected ecological outcomes are realized for Canada lynx. Parameters for grizzly bear, the Whitehorn wildlife corridor, vegetation management and mountain goat are anticipated to address the potential issues related to the use of the Ski Area by Canada lynx.

Environmental Assessment and Information Requirements

- It is anticipated that environmental assessment information requirements for vegetation management will be sufficient to identify potential issues related to small mammal habitat on the Ski Area. No additional environmental assessment or information requirements are identified.
- It is anticipated that environmental assessment information requirements for wildlife corridors will be sufficient to address the needs of wolverine and lynx movement through the Ski Area. No additional environmental assessment or information requirements are identified.

8.4.4 Residual and Cumulative Effects – Small Mammals

The expected ecological outcomes that apply to mitigating potential impacts on small mammal habitat include:

- Land use decisions contribute to local region ecological integrity goals, including vegetation management, wildlife movement, grizzly bear habitat security, and species at risk protection and recovery.
- Habitat and movement security is ensured by maintaining or reducing potential human-wildlife displacement and habituation.
- The Upper Healy (Bourgeau) Wildlife Corridor effectiveness is maintained or improved.
- Demonstrated leadership is applied to environmental management, stewardship, monitoring and best practices.



The Site Guidelines have been developed in recognition of the key factors that contribute to maintenance of the structure and function of small mammal habitat. Vegetation management strategies are addressed through the parameters and conditions of the Site Guidelines and through the *Best Management Practices for Development at Ski Areas in Banff and Jasper National Parks of Canada*. Managing vegetation and run development in accordance with the Site Guidelines and best management practices is anticipated to maintain a range of conditions that supports the expected range of wildlife species and wildlife movement, including small mammals, across the Ski Area.

Residual and cumulative impacts following mitigations are evaluated with respect to new run and terrain development and to ongoing effects of snowmaking and grooming operations. Changes to vegetation composition and structure resulting from Ski Area activities provide the basis for considering impacts to small mammal habitat in general and to habitat connectivity across the Ski Area with respect to Canada lynx and wolverine.

Valued Component: Small Mammal Habitat: Lynx and wolverine movement			
Project/Environment Interaction: New run and terrain development; Snowmaking and grooming			
1. Nature of Impact			
Disturbance	Disruption	Alteration	Destruction
New ski run and glade development within the parameters and conditions of the Site Guidelines will result in the alteration of forest composition and structure in newly developed areas. In cleared areas and on slopes subject to grooming, long-term alteration of underlying vegetation may occur. Snowmaking activities as considered within the scope of the Site Guidelines are limited to highly disturbed areas with previously modified ground cover. Further alteration of these areas is unlikely.			
2. Frequency of Interaction			
Single occurrence	Occasional	Regular	Continuous
New ski run development is expected to occur as individual projects subject to the long-range planning process. Vegetation management activities such as brush clearing occur occasionally for any particular location. Grooming may be considered a regular activity on high-traffic terrain but only occasional elsewhere.			
3. Duration of Impacts			
Days or less	Weeks	Seasons	Permanent



The alteration of vegetation through terrain development and ongoing management may be considered essentially permanent, lasting as long as the area is used and managed for skiing.			
4. Reversibility			
At end of project	With mitigation	Long-term restoration	Irreversible
Following the removal of infrastructure, most cleared ski runs would be expected to return to a natural vegetated state consistent with surrounding forest and disturbance regimes. Recovery of natural vegetation at ground level in cleared areas and persistence of native ground cover vegetation that supports small mammal habitat will be enhanced with development and mitigation techniques that retain native vegetation to the degree feasible during project development.			
5. Ecological Scale			
Site specific	Local feature	Local ecosystem	Landscape
Potential ecological impacts to small mammal habitat are likely to be limited to local features. Neither the location nor the extent of potential disturbance to wolverine or lynx movement is likely to extend beyond the Ski Area itself. Existing development and use conditions that may affect wolverine movement are not anticipated to change in a substantial way or to affect wolverine movement at a local ecosystem scale.			
6. Ecosystem Context			
Modified	Resilient	Vulnerable	At risk
Clearing and modification of vegetation cover may be considered in part as a shift in small mammal habitat from those species that rely on closed mature forest to those that rely on forest edge and open meadow habitat. Some small mammals are likely to benefit while others will not. Overall, the expected range of small mammals is likely to persist in various habitats distributed across the Ski Area.			
Significance			
Negligible	Predictable and manageable	Considerable impact, risk or uncertainty	
Overall, the potential cumulative impact to small mammal habitat across the Ski Area is considered to be predictable and manageable. Potential changes to habitat structure and composition resulting from new terrain development is restricted in scale and potential extent through the parameters of the Site Guidelines. Lynx and wolverine are expected to be able to continue to move through the Ski Area environment and, in the case of lynx, even occupy habitat on the Ski Area.			



The residual and cumulative impacts of Ski Area development and use on small mammal habitat may be summarized as the permanent alteration of one type of habitat to another. Closed and mature forest habitats will be replaced to a limited degree by open meadow and edge habitats associated with cleared ski runs. The application of development and mitigation techniques on developed ski runs that preserves native ground cover may be expected to maintain overall habitat effectiveness for small mammals in the summer seasons.

Subnivean small mammals are likely to be the most affected by Ski Area operations that are associated with hardened snowpack, such as snowmaking and grooming. The application of best management practices for snow management and grooming, and the limited extent of new snowmaking can be expected to limit the potential spatial scope of impacts associated with these activities. However, high-traffic areas and frequently groomed areas with shallow snowpack are not expected to serve as effective habitat for subnivean wildlife.

Considering the full suite of guidelines and mitigations, it is anticipated that the expected ecological outcomes related to small mammal habitat will be achieved under the Site Guidelines. Although high-use areas are not likely to support wildlife in the winter season, small mammals may be expected to continue to occupy and move successfully through the Ski Area overall, making use of a diverse patchwork of forest types, shrublands and meadows to provide both living habitat and movement cover. The location and extent of potential new ski run development is unlikely to prevent the movement of wolverine, or the movement or even habitation of the Ski Area by Canada lynx.

8.5 VEGETATION

The core of the Sunshine Village Ski Area experience is the open alpine environment of Sunshine Meadows. In the winter, open alpine slopes, ample snowfall along the Continental Divide and spectacular scenery provide an exceptional skiing and snowboarding experience. In the summer season, the spectacular alpine scenery is enhanced with exceptional wildflower and rare plant displays within one of the largest contiguous alpine meadows in the Rockies. Alpine communities are fragile, however, and frequent inclement weather conditions along the divide have both led to the development of alternative snow riding opportunities below treeline. The development and use of ski terrain above and below treeline, and the summer visitor use of Sunshine Meadows have the potential to affect the function of native vegetation communities through interactions with:

- Forest composition and structure
- Whitebark pine and other rare and sensitive species
- Alpine vegetation communities

8.5.1 Current Status

Current Status – Forest Composition and Structure



Native vegetation plays a number of important roles in local ecosystem function and is a key element of native biodiversity. Vegetation anchors soils and terrain against wind and water erosion and mass wasting, and it functions to capture and release water as part of the hydrologic system. Native plant communities contribute to structural habitat diversity in support of wildlife habitat and species diversity.

A wide range of vegetation types are present in and around the Ski Area, resulting from variable elevation and topography (Figure 12). Eccles and Strom (1994) characterized forest ecosites within the Sunshine Village Ski Area based on Holland and Coen (1983). Within the lower subalpine ecoregion on the Ski Area, native vegetation is dominated by closed Engelmann spruce and subalpine fir forests. Lodgepole pine is less common within the Sunshine Village Ski Area, proportionate to the remainder of Banff National Park, and deciduous trees and grasslands are of limited distribution. The majority of the Sunshine Village Ski Area is located within the upper subalpine zone, characterized by a mix of Engelmann spruce, subalpine fir, whitebark pine and alpine larch stands. At higher elevations in the upper subalpine, alpine larch becomes an important component of many stands, and whitebark pine is more common. At the highest elevations of the subalpine, forest cover is reduced to scattered islands of stunted trees and a complex mosaic of herb and shrub communities dominates (Holland and Coen 1983).

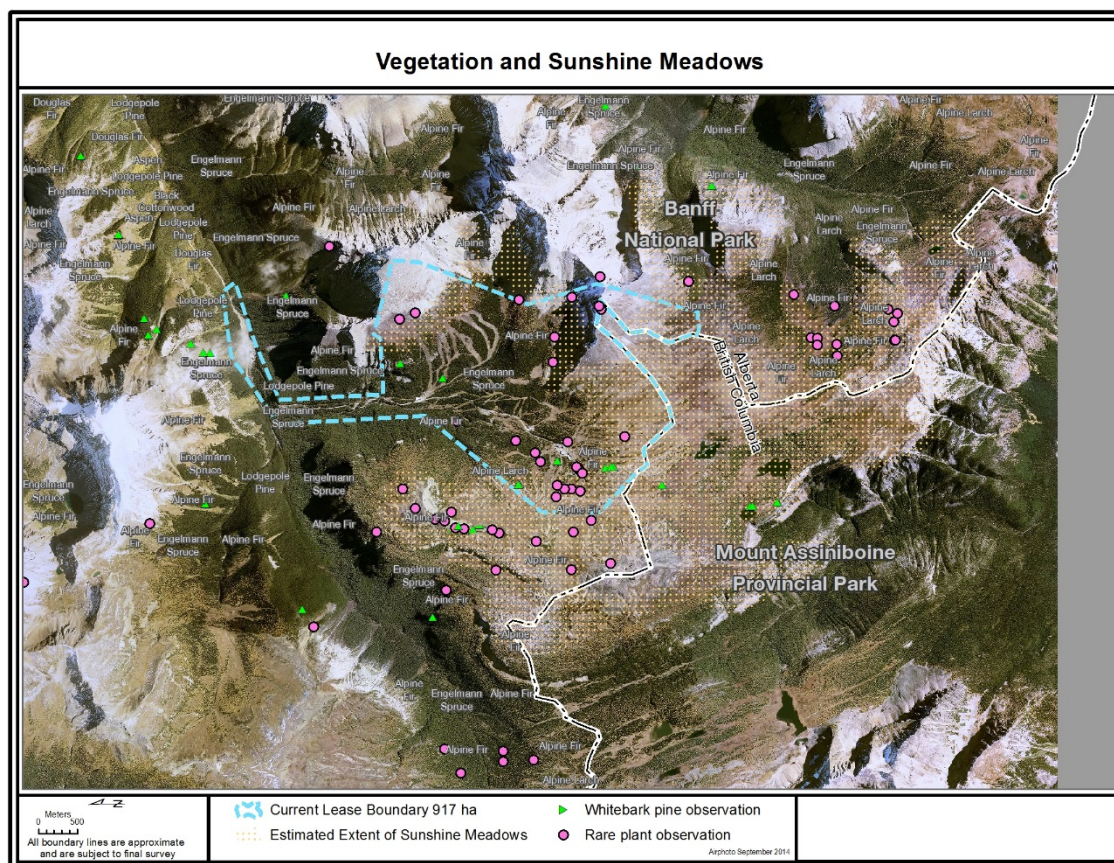


Figure 12. Sunshine Village Ski Area vegetation communities.



Alpine tundra communities occur at and above the transition from the Upper Subalpine to the Alpine ecoregions. Alpine tundra contains a complex of fine-scale, low-lying vegetation that reflects microclimatic variations due to aspect, exposure, snow depth and time of snowmelt, and soil moisture (Eccles and Strom 1994). The Alpine ecoregion within and adjacent to the Ski Area defines the approximate boundaries of the “Sunshine Meadows”, discussed further in sections below.

Old growth forest stands exist in the Sunshine and Healy drainages. These forest patches were identified by Eccles and Strom (1994) as an important ecological component occurring within the Ski Area lease. Old growth forest and aged trees found within the Sunshine Creek and Healy Creek drainages have developed due to an extended history without fire, and they may be considered in part the result of long-term fire suppression efforts.

In the vicinity of the Bourgeau base area parking lot, mature forest dates back to 1630–1765 (Eccles and Strom 1994). These forest stands are composed of mature lodgepole pine interspersed with Douglas fir and include a mature Englemann spruce and subalpine fir stand. Within the Sunshine Creek valley, large Englemann spruce and larch date back to the 1620s, and they occur sporadically mid-slope on Goat’s Eye, as well (Eccles and Strom 1994).

It should be noted that the presence of old growth stands in the Sunshine area represents a departure from the historical fire cycle. Banff National Park’s historical fire regime changed significantly in the 1900s, with reductions to human-caused burning as a result of fire prevention programs and with the suppression of lightning-caused fires. A reduction in the area burned through natural wildfire has most impacted ecosystems with the shortest fire cycle, such as those in the bottom of the Bow Valley.

Historically, fire regimes of the Banff Bow Valley were dominated by mixed severity fires (White et al. 2005, Rogeau et al. 2004). Within the Sunshine Village Ski Area, lower-elevation subalpine lodgepole pine forests of the Bow Valley were historically characterized by fire cycles of approximately 100–150 years. Higher-elevation Englemann spruce and subalpine forests in the Ski Area region are characterized by a historical fire cycle of 150–200 years. Old growth stands in the area, and in the mountain parks overall, are now considered to be overrepresented with regard to the distribution of stand age groups.

While unique within the Ski Area boundary, the uniqueness of old growth stands on the Ski Area in relation to other stands in the local landscape may be considered somewhat less so. Old growth stands on the Ski Area are of considerable size, but there are many others in the surrounding valleys that are larger. Stand mapping for the area indicates that old growth stands in the surrounding Healy Creek and Brewster Creek valleys are relatively common, and there are other more significant old growth stands where the natural historical fire cycle is much longer.

Current Status – Whitebark Pine

Whitebark pine is an essential element of ecosystem composition and function in many subalpine and treeline forests at high elevations throughout the mountain national parks, including all four mountain park ski areas. At the Sunshine Village Ski Area,



whitebark pine occurs scattered throughout an elevation band beginning roughly at 2,000 m and extends to treeline in areas across the Ski Area (Figure 13). Despite its wide range, whitebark pine is susceptible to several key threats and has been listed as Endangered on Schedule 1 of the *Species at Risk Act* (SARA).

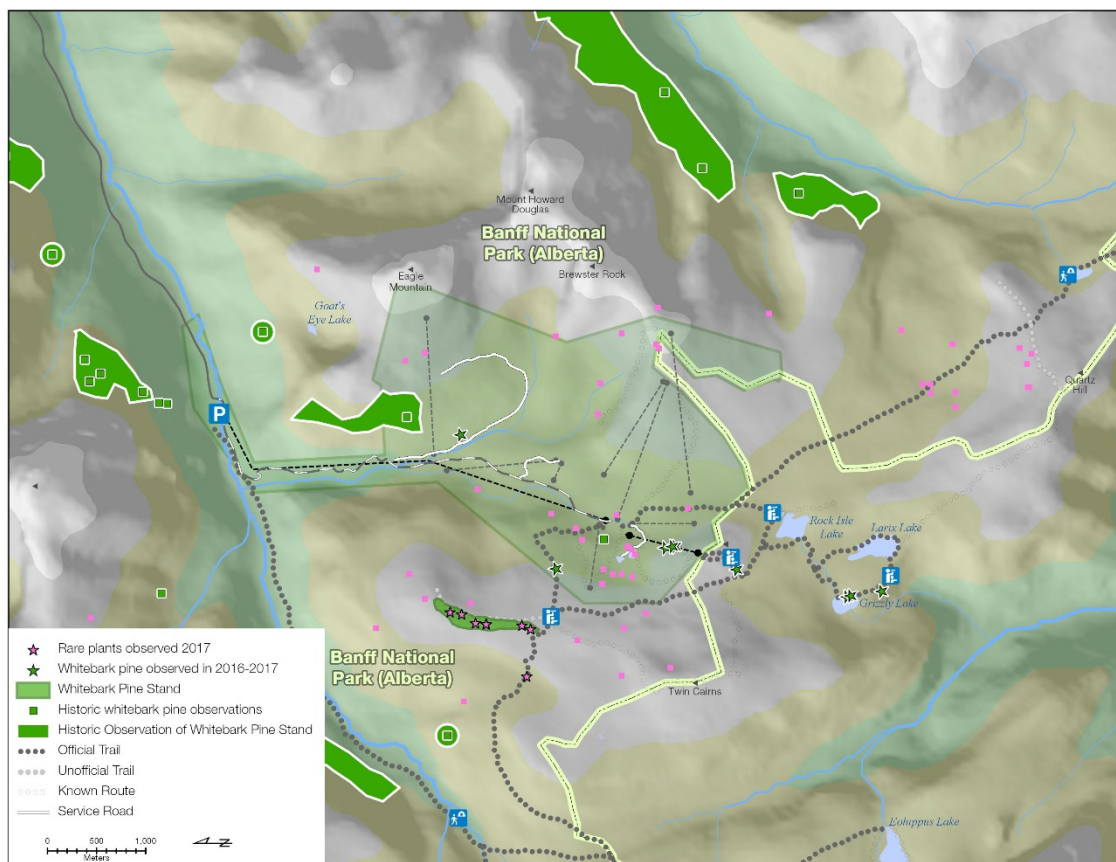


Figure 13. Whitebark pine and rare plant species.

Whitebark pine is a slow-growing, five-needled stone pine that is rapidly declining throughout its range in North America due to the combined effects of historical and current mountain pine beetle outbreaks, fire exclusion, climate change, and the introduced pathogen *Cronartium ribicola*, which causes the disease white pine blister rust (Keane and Arno 1993, Smith et al. 2012, Keane et al. 2012). The loss of this tree species has implications for the integrity of subalpine ecosystems, both in the loss of biodiversity and in the loss of ecosystem processes and services that provide habitat requirements for other species such as Clark's nutcracker (Tomback and Achuff 2010). From a ski hill perspective, whitebark pine and associated treeline communities are known to stabilize and shade snowpack (thus regulating snowmelt and downstream flow), to stabilize loose, rocky soils, and to reduce erosion (Farnes 1990, Arno and Raymond 1990).

Historical run clearing and lift development at the Ski Area may have resulted in the removal of whitebark pine long before it was designated as a species at risk. Similarly, ongoing vegetation maintenance at the Ski Area, such as brushing, maintaining glades



and removing hazardous branches, may have affected individual trees. Despite these impacts, whitebark pine continues to persist on the Sunshine Village Ski Area. To some degree, the persistence of whitebark pine on the Ski Area may be attributed to ski run clearing, glading and vegetation management that clears and leaves open spaces within maturing forest cover, where whitebark pine may successfully germinate and mature.

Under SARA Sections 32 and 58(1), whitebark pine individuals and their identified critical habitat are legally protected. Accordingly, special consideration of the species and protection measures for whitebark pine must be included as part of Ski Area operations and development planning in association with the application of other best management practices.

Current Status – Alpine Meadows Communities

The Sunshine Meadows are widely recognized as an exceptional example of an alpine vegetation community. The contiguous extent of the meadows is unparalleled within the mountain parks (Eccles and Strom 1994). The Sunshine Meadows are located on a large plateau and extend from Fatigue Pass, north to Mount Bourgeau and west to Healy Pass and the Monarch Ramparts (Achuff et al. 1986). Further, the meadows comprise a diversity of alpine vegetation, the botanical characteristics of which are a key aspect of the ecological value (Eccles and Strom 1994). In addition to the federally listed whitebark pine (*Pinus albicaulis*), 69 known rare plant species have been documented within Sunshine Meadows (Hirose and Fassina 2016). A rare plant survey conducted by Tannas (2017) identified five species of sufficient conservation concern that their status is ranked and tracked by the Alberta Conservation Information Management System, with rankings ranging from S1 (highest level of concern) to S3, including:

- *Taraxacum scopulorum*, alpine dandelion (S1)
- *Arenaria longipedunculata*, sandwort (S2)
- *Botrychium simplex*, dwarf grape fern (S2)
- *Agoseris lackschewitzii*, pink false dandelion (S3)
- *Boechera lemmonii*, Lemmon's rockcress (S3)

The majority of the rare plants identified by Tannas were located along the Wawa Ridge. The exception was the pink false dandelion, which was found along the Simpson Pass East Trail (Figure 13 above).

The Sunshine Meadows provide visitors to Sunshine Village Ski Area with both winter and summer experiences. Access to the Sunshine Meadows is from the Upper Village. In the winter, skiers and snowboarders enjoy expansive, open alpine terrain. More significantly from a vegetation standpoint, there is also a long history of summer use in the Sunshine Meadows, for both day hikes and as a departure point for backcountry trips. Summer visitors can travel a trail network of hiking paths that draws them into the heart of the mountains along the Continental Divide, over to Mount Assiniboine Provincial Park, and that provides access to Simpson Pass (Eccles and Strom 1994).

Although providing an exceptional visitor opportunity, summer use of the Sunshine Meadows area exposes fragile vegetation communities to potential impacts associated with hiking and visitor day use. For many years, day-use levels could be considered relatively low with visitors transferred from the base area to the Upper Village via bus or



van. In recent years, the Ski Area has increased access by transferring visitors via the gondola system and by opening the Upper Village hotel for the summer season. The increase in use, even over just a few years, can be seen to have increasing impact on trails, vegetation and wildlife habitat in the Sunshine Meadows area, both on and off the Ski Area lease.

8.5.2 Existing and Potential Interactions and Impacts

A number of elements of the Site Guidelines summarized in Section 5 of this report have the potential to interact with native vegetation:

- Lease reconfiguration interacting primarily with alpine meadows communities and forest composition and structure.
- New ski run and terrain development, including terrain modification, interacting primarily with forest structure and whitebark pine.
- Summer visitor use interacting primarily with alpine meadows communities.
- Snowmaking and avalanche control operations interacting primarily with alpine meadows communities.

Impacts and Interactions – Lease Reconfiguration

The Site Guidelines propose to remove Meadow Park and Healy Corridor areas, on either side of the Gondola Corridor and Bourgeau base parking lot respectively, as substantial environmental gains in accordance with the *Ski Area Management Guidelines*. With respect to native vegetation, these areas contain stands and trees of old growth forest as discussed earlier, and they serve as cover for wildlife movement as part of the Healy Wildlife Corridor.

Removing the Meadow Park and Healy Corridor areas from the lease would limit the potential for future vegetation clearing or modification related to ski terrain or parking development. Removing the potential for development would provide long-term security for the composition and structure of existing old growth stands and trees. As discussed earlier, while these old growth stands may be significant within the Ski Area, their persistence is not consistent with the historical fire cycle. The values associated with old growth forest stands in the Meadow Park and Sunshine Creek corridor are primarily aesthetic, experiential and educational as opposed to being ecologically significant on the local landscape scale.

The forest cover over much of the Ski Area is not as open as would be expected under natural historical fire conditions, and the potential development of ski runs and glades in the Meadow Park area would not necessarily be inconsistent with historical, more open forest conditions. Removing the Meadow Park and the Eagle Crest areas would also provide some long-term security for limited numbers of whitebark pine trees and alpine larch stands at higher elevations in the subalpine to alpine transition zones. Individual old growth larch and whitebark pine can be avoided when glading or developing runs. While either of these areas may contain scattered whitebark pine, there are no significant whitebark pine stands that make the Meadow Park or Eagle Crest areas any more significant than other parts of the Ski Area lease.

The primary substantial environmental gain to forest composition and structure is contained in lands removed from the Healy Wildlife Corridor that are associated with



wildlife movement. Removal of lands in the Meadow Park and Eagle Crest areas may have some benefit for individual whitebark pine trees, but neither area features significant numbers or stands.

In addition to Eagle Crest, the Site Guidelines also propose to remove an undeveloped portion of Sunshine Meadows and Bye Bye Bowl from the Ski Area lease, providing future security for the alpine vegetation communities in these areas. The Sunshine and Bye Bye Bowl gains are both in the heart of the greater Sunshine Meadows environment. The potential development and use of these areas has been under consideration for decades. Development or intensive use would clearly impact these areas as well as exert further impact on parts of the meadows already developed. To reach the location for any development of lifts and terrain in Bye Bye Bowl would require that utilities and new maintenance and construction roads or trails cross and impact areas of the Sunshine Meadows environment and parts of Mount Assiniboine Provincial Park in B.C. The subject areas within the current lease are relatively pristine. Their removal from the lease eliminates the potential for future Ski Area-related development. Maintaining these areas in their current condition will provide Banff Park staff with opportunities for the collection of baseline data relevant to future monitoring.

Removal of Eagle Crest from the lease eliminates the opportunity for new higher-elevation lifts in the Goat's Eye area that would directly impact alpine and upper subalpine vegetation communities. The removal of the Eagle Crest area also limits the potential for high-elevation lift terminals that would essentially open up terrain in the Alpine Bowls to lift-serviced skiing.

In short, the removal of Meadow Park and Eagle Crest from the Ski Area lease has limited benefits to forest composition and structure. Old growth stands and individual trees, including whitebark pine, can be protected and managed effectively without lease reduction. The protection of overall forest cover and structure in Healy Corridor has clear benefit to wildlife movement and habitat. Removing Eagle Crest, Bye Bye Bowl and the undeveloped part of Sunshine Meadows from the lease provides long-term security for these and adjacent alpine and alpine meadows communities and provides a substantial environmental gain for sensitive vegetation consistent with the *Ski Area Management Guidelines*.

Impacts and Interactions – New Run and Terrain Development

The Site Guidelines for the Sunshine Village Ski Area allow for lift, run and glade expansion into previously undeveloped areas of subalpine forest. Widening of the existing ski-out and egress runs, and terrain modification in select locations may also be considered. The Site Guidelines provides the Sunshine Village Ski Area with specific direction regarding the development of new ski terrain and the modification of existing ski terrain. The Sunshine Village Ski Area may consider new ski terrain development in the form of lift, run and glade expansion in the following three areas:

- The Goat's Eye II area below treeline
- The Hayes Hill area to treeline
- The lower Meadow Park area below the existing Meadow Park run



Terrain modification may be considered along the ski-out and connecting egress runs, and on the Angel Ski-Way. Proposed modification to the ski-out and egress runs may involve run widening and reconfiguration, to help ensure that the ski-out is safe, comfortable and within established industry standards. Site-specific modifications to the Angel Ski-Way are intended to improve track width and create a consistent skiable slope for greater skier safety.

Ski run development below treeline involves the removal or modification of forest cover and the variable modification of understory vegetation and ground cover to facilitate skier safety and to maintain adequate snow cover. Grooming, snowmaking and avalanche control activities may all be part of the long-term operation of any ski terrain.

Vegetation Clearing

Machine grading or mechanical ski run clearing has been found to directly impact existing vegetation and to decrease plant cover, plant productivity and species diversity (Roux-Fouillet et al. 2011). The disturbance intensity associated with grading results in considerably greater impacts to plant community composition and diversity, soil nutrient characteristics, and measures of erosion potential. Cleared but ungraded ski runs retain many ecological similarities to reference forests, and they may be found to contribute more positively to plant species and functional diversity than either natural forests or graded runs. Vegetation clearing associated with ski terrain development and maintenance can be consistent with the disturbance dynamics associated historically with wildfire or avalanche events.

A key consideration in the development of new ski terrain at Sunshine is the presence of old growth trees and whitebark pine. Typical ski run development involves the clearing of all trees and understory vegetation across a planned ski run. However, Ski Area run development and modification activities may be expected to result in positive impacts for these sensitive or desired species if whitebark pine and old growth trees are given preferential protection during run design and implementation.

Ski run development and vegetation maintenance activities may create or maintain habitat conditions that are favourable to whitebark pine by removing competing tree species and creating openings for the establishment of seedlings. Whitebark pine do not occur in dense stands on the Ski Area, but rather occur primarily as scattered individuals throughout the upper subalpine treeline band. The scattered nature of whitebark pine across the Ski Area provides opportunity for run development that selectively avoids existing trees. Approaches to run design and development in whitebark pine zones that leave existing trees and that create openings for the establishment of seedlings and immature trees may be reasonably expected to enhance habitat conditions for whitebark pine. It should be noted that the identification and operational protection of seedlings and immature trees from skiing and grooming damage is an essential element of successful whitebark pine regeneration. To a certain degree, run and vegetation management activities may be seen to replicate the stand-replacing function of natural wildfire on the Ski Area landscape.

Similarly, the development and management of ski terrain may be planned so as to avoid, or take advantage of old growth stands from a visitor experience perspective. The development of ski glades through or around old growth stands in particular has the



potential to provide an exceptional and unique experience for winter visitors. Modern glade development involves more than simply clearing and thinning trees and understory. Glade development can be planned to maintain large, old trees or replicate vegetation patterns characteristic of the natural environment such as creating patchy stands that create edge habitat and diverse understory more representative of the expected fire-maintained conditions. The creative development and management of old growth glades has potential to replicate long-term succession processes while maintaining the aesthetic, experiential and educational value that old trees and stands can provide.

Terrain Modification

Soil and vegetation disturbance associated with terrain modification can result in increased potential for erosion and slumping where inadequate erosion control, drainage structures and vegetation reclamation occur. Removal of vegetation and disturbance of soils takes away the physical anchor provided by the root systems of native vegetation, but it also adversely affects the water holding capacity of soils leading to soil saturation and potential slumping in areas that may otherwise have been stable. Diligent planning and reclamation is necessary to both predict and prevent erosion of any new sites that are subject to terrain modification.

The Site Guidelines allow for limited terrain modification on the Angel Traverse, to improve track width and to create a consistent skiable slope. Improvements to the traverse may involve installation of structural supports to increase track width, grading or filling specific locations along the length of the traverse to create a consistent downgrade, or minor removal of rocks or outcroppings that present obstacles to safe grooming and skiing activities. The potential improvement of the Angel Ski-Way is a needed and worthwhile project under consideration. The ski-way joins intermediate terrain both above and below a set of steep slopes and rocky outcrops in between the Teepee Town and Angel chairlifts. The ski-way traverses diagonally across this difficult ground following natural ledges and breaks, and must reasonably present terrain that intermediate skiers can safely and comfortably navigate within their skill level. The purpose of ski-way improvements is not to create an all-season road or access route, but to enhance the ability to capture snow over a surface wide enough to facilitate effective grooming and safe descent.

The Angel Traverse is located on what may be considered the edge of the Sunshine Meadows vegetation community. The steep and rocky terrain of the traverse is on the transition between the upper subalpine fir and whitebark pine forests of the Teepee Town area below and the broad expanses of alpine vegetation more typical of the Sunshine Meadows environment above. Terrain modification involving a series of focused, site-specific modifications may be anticipated to have site-specific impacts to vegetation along the traverse. Vegetation restoration in this area will be difficult if not impossible. The Site Guidelines do not envision a scope of work that would result in major terrain modification or in the destruction of vegetation extending the length of the traverse, thereby limiting potential impacts to terrain, vegetation and visibility. Following existing breaks and ledges in the natural terrain may also be expected to limit the extent of terrain modification and potential visibility of the traverse from other parts of the Ski Area.



Invasion by non-native species is considered the second-most-significant threat to native biodiversity (Groom 2006, Wonham 2006). Ground disturbance associated with potential terrain development, construction and operational activities creates potential for the establishment of non-native vegetation that displaces native species and reduces native vegetation diversity. Parks Canada undertook invasive plant monitoring in 2016 and 2017 and found 13 alien plant species within the Sunshine Village Ski Area and surrounding trails.

Snowmaking and Grooming

In Sunshine Village Ski Area, snowmaking currently occurs within the Gondola Corridor along a section of the ski-out and in the base area of the Upper Village. Additional snowmaking may be considered along the ski-out and in the Goat's Eye-Hayes Hill base areas to provide adequate snow coverage to ski-ways, high-traffic areas, collector runs and snow retention trouble spots. Snowmaking increases snow depth, a key factor in the mechanical protection of vegetation (Fahey and Wardle 1998, Rixen et al. 2003).

While providing protection from grooming and skiing activity, snowmaking can negatively impact understory vegetation and ground cover as it shortens the growing season (Rixen et al. 2003), it increases the amount of water on-site due to the increased water content of artificial snow, and it changes the mineral content and pH of snowmelt. The delay in spring snowmelt effectively shortens the growing season, and it may result in a species shift from "wind edge" species that favour shallow snow cover and low temperature environments towards "snowbed" species that favour long-lasting snow cover and a short snow-free period (Rixen et al. 2003). Snowmaking is found to cause deviations in natural plant species composition and a decrease in numbers of plant species, but snowmaking can also help limit damage caused by mechanical disturbance such as snow grooming or ski and snowboard edges. It should be noted that the areas identified for potential snowmaking in the Site Guidelines are primarily areas of modified terrain around lodges and on the ski-out where native vegetation has already been removed or heavily modified.

The grooming of existing ski runs occurs throughout the Sunshine Village Ski Area. Vegetation and soils scalping by grooming equipment is a common issue on irregular terrain, in areas of low snow cover, and on convex terrain rolls. Snow depth is a key consideration in managing the potential effects of vegetation and soils scalping resulting from grooming activities. The most vulnerable age classes of whitebark pine are immature trees that are exposed to damage from activities such as grooming, skiing or snowmobiling. Trees that are taller than the snow base and have live branches that are exposed to impact from ski edges or equipment may be prevented from growing taller or reaching seed-bearing maturity. Protection of exposed trees from mechanical damage is an obvious requirement that must be addressed in vegetation management strategies and by the application of best management practices. A compacted snow depth of 20 cm greater than vegetation height is likely to provide protection for whitebark pine seedlings or other vegetation. There is very little potential for regular grooming and skiing activities to damage mature trees where the height from snowpack to live branches is greater than 2 m.

Avalanche Control Activities



Avalanche control activities take place at various locations within the boundaries of the Sunshine Village Ski Area lease and over a significant area outside and above the lease, including Delirium Dive, the Howard Douglas Bowls, Wild West and Eagle Crest (i.e., the Alpine Bowls Area Concept). The primary objective of avalanche control at the Sunshine Village Ski Area is to prevent large accumulations of snow and to mitigate the probability of large avalanches that can pose a threat to skier safety and/or Ski Area infrastructure. Avalanche control leads to more frequent but smaller avalanches that travel shorter distances down slope. Shorter runout zones result in less removal of forest and tall shrub vegetation towards the bottom of avalanche-managed mountain slopes. The area of avalanche-maintained vegetation, such as low shrub and grassland communities at the bottom of controlled slide paths, may decrease while forest and tall shrubs increase with reduced avalanche disturbance.

Avalanche control activities also result in less snow accumulation in slide path runout zones over the winter season. The decreased snowpack in these lower zones melts earlier in the spring, creating conditions potentially less favourable for mesic snowbed vegetation species that thrive in these zones. Avalanche control that results in less snow near the bottom of slide paths will also result in an increase in snow at middle and higher elevations leading to increased moisture conditions in these areas during the spring and early summer. Changes to drier moisture regimes and vegetation types may, in turn, increase the potential wildfire risk in these areas.

Impacts and Interactions – Summer Visitor Use

The Site Guidelines allow for the continued summer use of the Upper Village and Sunshine Meadows trails system, including access to trails leading into Mount Assiniboine Provincial Park in B.C. and into the Simpson and Healy Pass areas of Banff National Park off the Ski Area lease. The overall footprint of summer use considered in the Site Guidelines is limited to the gondola base area, the Upper Village and Sunshine Meadows. The gondola base area serves as the access and staging area for summer use on the upper mountain. Summer use of the Upper Village will include use of the hotel, day-use facilities and the Standish chairlift. Summer use of the alpine trail system is restricted by access, location and timing. Access to the Sunshine Meadows is gained only via the Standish chair or designated trails from the Upper Village. The Site Guidelines discourage off-trail and early-season travel, mirroring a restricted activity order put in place in 2016 to limit visitor use only to designated trails. The Site Guidelines do not contemplate increases to the current length of the season or the hours of day-use operation.

The scope and extent of hiking considered in the Site Guidelines is the same as what has been taking place since summer use began in 1984. In 2016, the Ski Area resumed summer operation of the gondola as a means to transfer visitors from the base area parking lot to the Upper Village. And in 2017, hotel operations were added to the summer visitor offer at the Upper Village. These two changes have resulted in an increase in summer visitation of approximately 60% over the peak visitation levels documented between 2000 and 2015.

Monitoring by Parks Canada over the 2016 and 2017 seasons examined potential impacts of summer visitor use on trail conditions, trailside conditions and vegetation conditions,



including consideration of whitebark pine, rare plants and the presence of invasive species. Visitor trail use is concentrated from the Upper Village to the Standish Lookout and to the Rock Isle-Grizzly-Larix lake loops into Mount Assiniboine Provincial Park. The Meadow Park trail also leads away from the Upper Village to the Simpson Pass and Twin Cairns trail, the latter of which can be followed in a round trip circuit that connects back to the Rock Isle trail.

Overall, trail conditions in the area were found to range from fair (61%) through moderate (33%) to poor (6%). The most common problems associated with trail conditions were overall trail braiding, widening and deepening. No trails received a score of good condition. In looking at trailside conditions, the extent of trampled vegetation and bare soil were significantly higher along most trail segments than at control sites. A host of rare plants are known to exist in the Sunshine Meadows area. The key area identified for rare plants in the summer trails area was on trails to Simpson Pass and along the unofficial Wawa Ridge trail. Most invasive plant species were found to occur in the area of the Upper Village itself. As the Village is the starting point for all hikers, the presence of invasive plants presents a significant concern related to the potential spread of these species throughout the rest of the trail system.

Impacts of visitor use on whitebark pine in the summer-use area have not been observed. Whitebark pine are known to have extended root systems, a characteristic that may account in part for the success of individual trees at high elevations and in dry rocky terrain. Off-trail foot traffic has potential to impact whitebark pine individuals or to alter whitebark pine habitat conditions as a result of soil disturbance and compaction, root damage or altered surface and subsurface water drainage patterns (Jones et al. 2014).

The 60% increase in summer visitor use is reflected in daily averages in the range of 600 visitors per day and peak visitation in the range of 1,000 visitors per day, on days that the gondola is operating. Although not all trail impacts can be associated with this increase in use, it is reasonable to assume that as visitor use continues to increase with the use of the gondola and hotel, so will the impacts on trail and trailside condition. In turn, potential damage to vegetation in general and to rare plants in particular increases, as does the potential for the introduction of invasive species to new areas. The Site Guidelines do not specify a daily limit for summer visitor use in advance of Long-Range Plans. However, using the gondola capacity as the theoretical limiting factor, it is conceivable that summer-use levels could match winter-use levels and provide access for over 6,000 visitors per day.

Increased visitation also creates increased opportunities for positive visitor experiences that align with Parks Canada's mandate. Increased visitor access to interpretation, experiential programs and related activities may result in an increased understanding and appreciation of the Sunshine Meadows natural environment. The Site Guidelines require the development of educational and interpretive programming to educate people on the importance of alpine area flora and fauna. Sunshine Meadows offers a unique opportunity for targeted educational experiences relating to alpine ecosystems, rare and sensitive vegetation, and whitebark pine, and these experiences may foster greater appreciation and understanding of these sensitive species and fragile environments.

At the same time, increased visitation is associated with increased impact to the fragile environment that visitors come to experience. Controls on visitor use and mitigations to



protect ecosystems, such as boardwalks or barriers, can adversely affect visitor experience. Protective measures, such as trail widening or construction of boardwalks or barriers, are associated with their own impacts that cumulatively increase with the need to manage increased visitor capacity.

Increased visitor presence may also interfere with wildlife habitat effectiveness and wildlife movement. Of specific consideration is the potential for summer visitor use to interfere with grizzly bear habitat use. These potential impacts are discussed further in Section 8.2 on grizzly bear.

8.5.3 Mitigating Measures

Ecological Management Parameters

Ecological management parameters serve as the on-the-ground benchmarks against which the environmental impacts of future development and use proposals will be assessed. In order to realize expected ecological outcomes important to native vegetation diversity, the following ecological management parameters have been incorporated into the Site Guidelines:

- Native species and communities dominate vegetation throughout the Ski Area, reflecting regional and local vegetation structure and diversity.
 - Glading and thinning simulate natural vegetation patterns and structure.
 - Below treeline, the maximum width for new runs and for widening of existing runs is 50 m.
 - A strip of contiguous forest at least as wide as the run remains in between runs for all new runs or modifications to runs.
 - Forested areas between runs are irregular in shape and are of sufficient size to provide effective wildlife habitat and movement cover.
- Native vegetation serves as an anchor against soil and terrain erosion.
 - Construction, terrain modification and vegetation removal activities avoid the disturbance of saturated soils or surficial deposits.
 - Construction and terrain modification do not alter rock flow features.
- Habitat conditions for rare and sensitive species are maintained, including critical habitat for listed species under the *Species at Risk Act*.
 - Favourable habitat conditions, stand distribution and age distribution of whitebark pine that sustain the ecological function of the species are enhanced and maintained over time across its expected range at the Ski Area.
 - The aesthetic, experiential and educational values of old growth trees and forest stands are maintained in run design and development.
 - The composition and structure of vegetation provide habitat for the expected range of native species.
 - Rare and sensitive vegetation communities, and the terrain features and habitat conditions that support them, are maintained or restored.



Long-Range Plan – Run and Vegetation Management Strategies

Vegetation management related to ski terrain development and modification will be addressed through a Ski Run and Vegetation Improvement Strategy, to be developed as part of Sunshine Village Ski Area's Long-Range Plan. As per the Site Guidelines, the strategy will address or include:

- Glading parameters that mimic natural forest structure and succession in accordance with different ecological zones and habitat types across the Ski Area.
- Protection of ground cover vegetation diversity, wet soils and wet environments.
- Protection and restoration of habitat features and conditions that support vegetation communities and species diversity throughout the Sunshine Meadows environment and other upper subalpine and alpine locations.
- Maintaining natural vegetation patterns to preserve natural appearances and views for off-site visitors.
- Existing and new clearing for gondola and lift lines may be combined with ski-out widening and the development of linking egress runs to facilitate increased skier egress capacity:
 - Clearing for new or modified lift lines, utilities, ski-out improvements and egress run development in the Gondola Corridor will be planned and designed to maintain natural drainage and runoff patterns in Sunshine and Healy creeks.
 - Vegetation clearing for Gondola Corridor infrastructure will be planned and managed so as to maintain wildlife habitat and movement cover along Sunshine Creek during off-hours and off-seasons – especially late spring, summer and autumn seasons.

Both routine vegetation management activities and ski run and vegetation management proposals are to be consistent with any applicable SARA requirements, and are to include measures to protect whitebark pine individuals as well as measures to identify and protect other rare or sensitive vegetation.

SARA legislation, legal requirements, recovery strategies and subsequent action plans may be developed or change over time. Where applicable, the legal requirements of SARA will always take precedence over the direction provided by the Site Guidelines or this strategic environmental assessment.

Long-Range Planning and Operational Parameters

Long-range planning vegetation management requirements are identified for new ski terrain development and modification; for management of whitebark pine; for snowmaking, grooming and avalanche control activities; and for summer visitor use, including consideration of rare plants, alpine vegetation communities and non-native species.

Ski Terrain Development and Modification

In order to effectively address the ecological management parameters of the Site Guidelines, Long-Range Plans should prioritize methods for run clearing, terrain



modification and vegetation management that minimize disturbance of native vegetation to the degree possible.

In areas where grading and other soil disturbance has occurred, active vegetation reclamation and restoration is important. Research acknowledges that replication of exact pre-disturbance conditions is likely impossible and that the long-term objective of restoration for alpine areas and ski runs is to establish self-sustaining ecosystems and to maintain ecosystem function.

Overall, the research on ski area development and alpine restoration suggests a hierarchy of preferred ski run development and restoration practices. The following practices for ski run development should be implemented as part of future run and terrain development proposals, as appropriate to the situation:

- Forest and tall vegetation removal without the disturbance of soils, root systems or seed banks is the preferred method of run development as it maintains important ecosystem function and diversity. Undertaking clearing or construction while the ground is still frozen should be applied wherever possible.
- In circumstances where grading or soil disturbance must take place, such as for the removal of physical hazards, minimizing the disturbance footprint of soils and seed layers to the extent possible will minimize impacts to ecosystem function.
- In circumstances where grading or disturbance must take place over larger areas, the separation, conservation and replacement of organic soils and seed layers will help to restore native species and functional vegetation diversity.
- In areas where grading or other soils disturbance has taken place, active restoration with native and non-native species, and long-term success monitoring, will be implemented.

In addition to mitigations that ensure the restoration of vegetation function, the Site Guidelines include substantial direction on the circumstances where terrain modification may be considered, including:

- New ski runs and reconfiguration of existing runs must be designed to avoid the need for major terrain modification.
- Terrain modification is proposed only where (re)configuration of existing runs, lifts or vegetation cannot address safety, environmental or operational issues.
- Terrain modification is proposed where it is essential to skier safety, including management of constricted, icy, congested situations, sudden drops and visibility issues.
- Terrain modification is proposed only for stable slopes within the leasehold area where reclamation is assured.
- No major terrain modification above the unbroken treeline will be considered.

The Site Guidelines also require that terrain modification be undertaken using low-impact equipment, machines and techniques to ensure minimal disturbance, quicker rehabilitation and minimal visual impact. Grading of new runs will be minimized to only what is necessary to remove hazards (such as rocks and exposed stumps) and to otherwise provide a safe skiing experience. Native ground cover and soils will be



preserved to the extent possible, and where not feasible, they will be salvaged and used for reclamation. Site-specific development and mitigation measures will be identified for specific Long-Range Plan proposals, subject to project-level environmental impact assessment.

Although modifications to the Angel Traverse are considered to be an exception to the *Ski Area Management Guidelines*, the Site Guidelines include specific direction to inform the design and development of modifications in order to limit environmental and visual impacts to the traverse, including:

- Design proposals that rely on linear cut and fill techniques will not be considered.
- The jagged lines and broken nature of local rock outcrops and bands are to be maintained through design.
- Structural support, including fences or walls, will be designed or seasonally managed so as to not increase visibility of the ski-way in the summer season.

The potential aesthetic, experiential and educational values of old growth trees and stands should also be taken into consideration with respect to ski run and terrain development brought forward in Long-Range Plans. Where old growth stands or trees may intersect or be in proximity to proposed run development, Long-Range Plans should consider:

- The environmental and visitor experience benefits of preserving large trees and stand integrity for the area under consideration.
- Ways in which winter or summer development or visitor experience may be managed while preserving stand integrity.
- Where warranted, the potential experiential and educational values of old growth forest should be integrated into the Ski Area Interpretation and Education Strategy as part of the Long-Range Plan.

The Site Guidelines allow for regular Ski Area vegetation management activities, including the maintenance of existing runs and glades, to occur outside of a Long-Range Plan. Such activities will be subject to the application of the *Best Management Practices for Development at Ski Areas in Banff and Jasper National Parks of Canada*.

Management of Whitebark Pine

The protection and recovery of whitebark pine as a species at risk is a key legal responsibility and ecosystem management priority of Parks Canada. Ecological outcomes and mitigations that apply to overall vegetation management are anticipated to contribute to the ongoing protection and recovery of whitebark pine both on and off the Sunshine Village Ski Area. For instance, the Site Guidelines require that the design of cleared runs and glades will avoid the removal of whitebark pine or the exposure of whitebark pine individuals to damage or destruction as a result of operational or snow rider use. Whitebark pine will not be removed or modified to facilitate snow riding in the Alpine Bowls. The unique sensitivities and ecological characteristics of whitebark pine require specific additional consideration as part of Ski Area long-range planning and operations.



The ecological characteristics of whitebark pine and the need for ongoing vegetation management on the Ski Area can be combined to provide management approaches and opportunities beneficial to whitebark pine conservation. The integration of routine vegetation management with enhancement of whitebark pine habitat may be realistically accomplished through a variety of means, including physical avoidance, project and operational planning, and the application of best management practices.

The following considerations for whitebark pine should be incorporated into the planning of individual infrastructure or terrain development proposals brought forward in Long-Range Plans:

- The siting or location of infrastructure, including buildings, lifts, trails or other structures, will avoid the need to remove or damage existing whitebark pine individuals, including damage to extended root zones, soils and supporting drainage patterns.
- Where whitebark pine must be unavoidably removed, or be damaged to an extent that maturation or cone production is compromised, restoration plans for transplanting or replanting and the long-term survival of at least an equal number of trees will be implemented in advance of, or in conjunction with, project implementation.
- If available, proven rust-resistant seedlings will be used for planting.
- Proposals for new ski run, glading or other ski terrain development will be planned to effectively protect existing whitebark pine trees and stands with a focus on the preferential removal of shade-tolerant competing species such as Engelmann spruce and subalpine fir.
- Where the location or siting of infrastructure or the clearing of ski terrain eliminates quality habitat that could potentially support whitebark pine, an equal or greater amount of quality habitat will be enhanced or restored to a state favourable to the colonization and maturation of whitebark pine. Measures to enhance or restore whitebark pine habitat may include measures, or combinations of measures, such as:
 - Planting of seedlings resistant to blister rust in suitable areas.
 - Thinning areas around existing trees to remove shade-tolerant competition.
 - Protection of existing trees or stands that allows for maturation or stand expansion.
 - Using prescribed fire to promote natural regeneration.
- Long-Range Plans will include measures to create awareness and to educate skiers and staff on whitebark pine ecology and the protection of trees as part of the visitor experience.

Snowmaking, Grooming and Avalanche Control Activities

The Site Guidelines limit the expansion of snowmaking to providing adequate snow coverage to ski-ways, high-traffic areas, collector runs and snow retention trouble spots. Expansion of snowmaking into areas above the unbroken treeline will not be considered in order to protect important upper subalpine and alpine vegetation and habitat, and snowmaking will not be permitted in the Alpine Bowls area or along egress trails.



The potential impacts of grooming activities or avalanche control on new developed terrain is limited in the scope of the Site Guidelines. No new terrain development will take place in sensitive alpine or alpine meadows environments. No areas requiring new avalanche control activities are within the scope of the Site Guidelines. The potential impacts of regular grooming activities are expected to be effectively addressed within the scope of Long-Range Plan run and vegetation management strategies.

The Site Guidelines provide specific conditions that protect vegetation communities within the Alpine Bowls area. Snowmaking, grooming, ski run clearing and lift redevelopment will not be considered. Egress trail design must take advantage of natural terrain features and must limit trail width to that necessary to provide safe skier egress focusing primarily on vegetation clearing or hazard removal. Rider safety and soils and vegetation protection associated with adequate snow cover is expected to be achieved through seasonal snow fencing in exposed locations along access and egress routes only.

No additional long-range planning or operational parameters are identified for snowmaking, grooming or avalanche control activities.

Summer Visitor Use

The Site Guidelines include a suite of mitigations aimed at managing the potential impacts of summer visitor use on rare plants and on alpine meadows ecological communities. Long-range planning requirements of the Site Guidelines include:

- Limiting summer use to the gondola base, Upper Village and Sunshine Meadows trail system.
- Restrictions on off-trail and early-season travel and use.
- Managing for a desired maximum visitation number.
- Proposals for trail modifications or facility development to ameliorate the environmental pressures of visitor use, including potential measures such as the development of hardened rest stops or viewpoints and primitive washroom facilities, or other measures to protect vegetation and to prevent soils trampling and erosion.
- Adaptive monitoring and management of visitor use numbers for early identification of wear and tear on trails and facilities and to ensure protection of vegetation, terrain and shorelines.

To provide additional scope and clarity to the Site Guidelines measures above, Long-Range Plan development and use proposals will include limits and measures that are specifically designed to protect rare plants, to protect the integrity of alpine vegetation communities, and to prevent the spread of invasive non-native species. These issues should be integrated into Long-Range Plan considerations for visitor use capacity, into the need for protective infrastructure, and into visitor use management.

The Long-Range Plan will include an Interpretive and Education Strategy that will be informed by Parks Canada's Interpretive Plans. The strategy will educate people on the importance of alpine areas, climate change, and historical use and cultural values associated with the area. Increased visitor exposure to the Sunshine Meadows alpine community, within a context of interpretive and educational experiences, will result in



increased understanding and appreciation of the Sunshine Meadows natural environment.

The summer-use program presents an exceptional opportunity to engage and educate people on the values associated with sensitive vegetation species, including whitebark pine, rare plants and other alpine species. Visitors may be more inclined to adhere to existing trail systems if they understand the potential impacts. Educational efforts may have positive effects on off-trail impacts to whitebark pine that benefit the Sunshine Meadows ecological area and other alpine areas of the park that visitors may travel to.

In addition to the conditions of the Site Guidelines, the Interpretive and Education Strategy, developed as part of the Long-Range Plan, should include communication activities aimed at increasing awareness of, and reducing human-caused impacts on, whitebark pine and alpine meadows vegetation communities.

Environmental Assessment and Information Requirements

Long-Range Plans that include proposals for run and lift development, for other infrastructure development, or for summer use will be informed by rare alpine plant surveys, by monitoring of non-native and invasive plant species, and by mitigations.

Consideration for whitebark pine in Long-Range Plans should be informed by monitoring and site assessment that includes:

- Identification and health assessment of cone-bearing trees and seed dispersal stands.
- Identification and physical protection of any existing trees susceptible to damage.
- Approaches to the dynamic adaptation of ski terrain to the growth and maturation of young trees involving measures such as:
 - Ongoing reconfiguration of runs or glades to allow regeneration, growth and maturation of whitebark pine.
 - Transplanting of trees from areas of likely impact.
- The development and application of best management practices for tree removal, brushing, limbing or transplanting, as necessary, that prevent functional long-term damage.
- Identification of effective planting or transplanting guidelines and techniques for whitebark pine, such as those from McCaughey, Scott and Izlar (2009), or as based on other professional advice.
- Ongoing monitoring and mapping of whitebark pine distribution, abundance and tree health on the Ski Area and surrounding licences of occupation.

As vegetation cover and health are dynamic over time, there is a need for ongoing monitoring of whitebark pine on the Ski Area. Vegetation management strategies in Long-Range Plans and other individual project proposals should be informed by an annual whitebark pine monitoring program that:

- Tracks all known locations and age classes of all whitebark pine
- Tracks incidental damage, trees at risk, and success of protection measures
- Records actions to replace and restore individual trees and habitat conditions



8.5.4 Residual and Cumulative Effects

The expected ecological outcomes that apply to mitigating potential impacts to native vegetation include:

- Land use decisions concerning the Ski Area contribute positively to Parks Canada ecological integrity goals in respect of vegetation management, wildlife connectivity and habitat protection, and species at risk protection and recovery.
- Terrestrial and aquatic habitat conditions for sensitive species, such as whitebark pine, grizzly bear, mountain goat, bighorn sheep, westslope cutthroat trout and bull trout, are maintained or improved to support healthy ecosystem function.
- Vegetation is managed to reflect natural composition, diversity and pattern, and to maintain function of sensitive soil-vegetation complexes, including those supporting rare plants, wet soils and alpine plant communities.
- Leadership is demonstrated in environmental management, stewardship, monitoring and best practices.

The Site Guidelines also contain expected outcomes related to visitor access and design capacity that are relevant to summer use of Sunshine Meadows, including:

- The intensity of summer visitor use is managed so the natural values of Sunshine Meadows that visitors come to experience are not impaired by those activities.
- Potential consideration of expanded terrain or lift capacity is limited to areas that would not increase pressure on Sunshine Meadows or other sensitive alpine meadows environments.

The mitigations for native vegetation are intended to maintain conditions that support representative diversity in forest composition and structure, including old growth stands and trees, conditions that enhance the long-term distribution of whitebark pine across the Ski Area, and conditions that prevent long-term cumulative damage to alpine vegetation communities.

Residual and cumulative impacts following mitigations are evaluated with respect to substantial environmental gains associated with lease reconfiguration, the impacts of new run and terrain development on forest composition and structure and on whitebark pine, and the impacts of summer visitor use on whitebark pine and alpine vegetation communities in Sunshine Meadows.

Residual and Cumulative Impacts – Lease Reconfiguration

Site Guidelines propose to remove a number of areas within the current leasehold in order to achieve substantial environmental gains in accordance with the *Ski Area Management Guidelines*. With respect to native vegetation values, the Meadow Park and Healy Corridor gains are intended to protect native forest composition and structure, including old growth forest stands and whitebark pine. The Sunshine Meadows, Bye Bye Bowl and Eagle Crest gains are intended to protect alpine meadows communities and whitebark pine within transition zones from the upper subalpine to alpine communities.

Removing the Meadow Park area from the lease would limit the potential for future vegetation clearing or modification related to new ski terrain development at higher elevations adjacent to the current Wawa area. Removing the potential for ski terrain



development would provide long-term security for the composition and structure of old growth stands and aged trees in this area. While old growth stands in Meadow Park may be significant within the Ski Area, their persistence is not consistent with the historical fire cycle, and the potential development of runs and glades would not necessarily be inconsistent with historical, more open forest conditions. The values associated with old growth forest stands in the Meadow Park and Sunshine Creek corridor are primarily aesthetic, experiential and educational as opposed to being ecologically significant at the local landscape scale.

Whitebark pine and old growth stands of alpine larch also exist in the Meadow Park area at higher elevations in the subalpine to alpine transition zones. Mitigation measures for working around old growth stands and trees, including mature alpine larch, are expected to preserve the aesthetic, experiential and educational values of these stands while also creating forest and habitat conditions more representative of natural fire-maintained conditions. Mitigation measures for whitebark pine include the selective opening of forest cover to enhance conditions for the re-establishment and growth of whitebark pine. The continued spread and persistence of subalpine forest types is not in the favour of whitebark pine, and ecological gains of removing the Meadow Park area from the lease are likely to be minimal.

Removing the Healy Corridor areas adjacent to the parking lot from the lease would protect forest cover and structure important to the function of the Healy Wildlife Corridor as well as include some of the old growth stands in this area. Removing important wildlife corridor movement areas from potential development is considered to be a gain in long-term habitat security and is discussed in further detail in Section 8.1 on the Upper Healy Wildlife Corridor. However, as with the Meadow Park area, old growth stands and trees in the Healy Corridor are considered to be inconsistent with the historical fire cycle. The primary substantial environmental gain with respect to forest composition and structure in the Healy Corridor is in the wildlife habitat and movement cover afforded by the mature forest cover on either side of the parking lot. The long-term protection of forest cover from potential development enhances the future security of the wildlife corridor and can be considered a substantial environmental gain consistent with the *Ski Area Management Guidelines*.

The Sunshine and Bye Bye Bowl gains are relatively pristine locations both in the heart of the greater Sunshine Meadows environment. Development and use of these areas would clearly impact alpine vegetation communities as well as exert further impact on parts of the meadows within the current lease and across parts of Mount Assiniboine Provincial Park in B.C. Their removal from the lease eliminates the potential for future Ski Area-related development.

Removal of Eagle Crest from the lease eliminates the opportunity for new higher-elevation lifts in the Goat's Eye area that would directly impact alpine and upper subalpine vegetation communities. The removal of the Eagle Crest area also limits the potential for high-elevation lift terminals that would essentially open up terrain in the Alpine Bowls to lift-serviced skiing.

In summary, the protection of overall forest cover and structure in Healy Corridor has clear benefit to wildlife movement and habitat. Removing Eagle Crest, Bye Bye Bowl and the Sunshine Meadows gain area from the lease provides long-term security for the



greater Sunshine Meadows environment and other alpine communities, and it is likely to provide a substantial environmental gain for sensitive vegetation consistent with the *Ski Area Management Guidelines*.

Residual and Cumulative Effects – Forest Composition and Structure

The consideration of residual and cumulative impacts to forest composition and structure takes into account the combined potential effects of new run and terrain development alternatives in the Site Guidelines, including potential development of one or more of Goat's Eye II, Hayes Hill and Meadow Park lifts and runs.

The assessments of cumulative residual impacts are considered with respect to the nature, frequency and duration of potential impacts, the ability to manage or mitigate potential impacts, and the ecological scale and context of potential impacts. Cumulative residual impacts are categorized as negligible, as those that are predictable and manageable, or as those associated with considerable impact, risk or uncertainty.

Valued Component: Forest Composition and Structure			
Project/Environment Interaction: New run and terrain development			
1. Nature of Impact			
Disturbance	Disruption	Alteration	Destruction
The clearing of vegetation in accordance with mitigating measures constitutes an alteration of forest composition and structure that reflects a state consistent with the natural historical fire regime. Run development can be planned and managed to maintain the aesthetic, experiential and educational values associated with old growth trees and stands.			
2. Frequency of Interaction			
Single occurrence	Occasional	Regular	Continuous
Initial development of runs, including vegetation clearing, terrain modification and associated structures such as lifts, may be considered a one-time interaction. Snowmaking, grooming and avalanche control activities take place regularly through the winter season. Vegetation management, such as tree branch limbing and brush clearing, takes place seasonally or on a rotating basis.			
3. Duration of Impacts			
Days or less	Weeks	Seasons	Permanent



Changes to vegetation structure and composition as a result of ski terrain development are essentially permanent, lasting as long as the terrain is used and maintained for skiing.			
4. Reversibility			
At end of project	With mitigation	Long-term restoration	Irreversible
With good initial planning and mitigation, the initial impacts of run development, such as clearing and soil disturbance, are reclaimed within a few growing seasons. If runs are abandoned in the future for any reason, good initial mitigation and reclamation facilitates the infill of ski runs with successional forest cover.			
5. Ecological Scale			
Site specific	Local feature	Local ecosystem	Landscape
Impacts take place at, or close to, the scale of the forest stand affected. To some degree, run and glade development may replicate the effects of fire and other natural disturbance consistent with natural, historical fire cycles.			
6. Ecosystem Context			
Modified	Resilient	Vulnerable	At risk
Forest composition and structure across the Ski Area may be considered resilient to run clearing and glading activities that mimic natural forest landscape patterns. The site-specific values of old growth trees and stands may be successfully maintained with deliberate planning and development.			
Significance			
Negligible	Predictable and manageable	Considerable impact, risk or uncertainty	
The potential impacts of new run and ski terrain development on forest compositions and structure are considered to be predictable and manageable. It is anticipated that forest compositional and structural integrity across the Ski Area landscape will be maintained consistent with conditions representative of the natural historical disturbance regime. Changes to forest cover will occur on a site-specific scale while forest diversity, connectivity and the aesthetic, experiential and educational values of old growth trees and stands are expected to be maintained within the Ski Area lease.			



The long-term cumulative effects of new run and terrain development may be summarized as the essentially permanent alteration of forest composition and structure at the scale of the Ski Area, to a state that is more reflective of the natural historical fire cycle than are current conditions.

Although development of ski terrain may have some benefits for vegetation composition and structure in the absence of the natural fire cycle, it does not replicate the full range of ecological effects associated with fire. Nor does it allow for normal vegetation succession. It primarily shifts forest structure from a mature state towards an earlier successional state. It is expected that run development and subsequent seasonal maintenance of vegetation can be directed towards purposely enhancing growing conditions for whitebark pine, and towards maintaining the experiential values associated with old growth forest trees and stands.

The potential for positive effects does not create a case for unlimited run or terrain development. The ecological management parameters and mitigations of the strategic environmental assessment (SEA) are designed to ensure diversity in forest composition and structure, and to maintain wildlife habitat values and connectivity across the Ski Area while allowing for limited new development.

The location and scale of potential terrain development is significantly limited in the Site Guidelines. Only three new areas are identified for potential development. It is unlikely that development at all three locations will be required in order to attain lift and terrain capacity in balance with future design capacity of 8,500 skiers per day. Ski Area planners and development experts as well as Parks Canada have gained considerable experience over many years with respect to vegetation clearing, minimizing impacts from ground cover and soils disturbance, construction mitigation, reclamation and restoration. Potential development techniques and mitigations may be considered to be overall effective, familiar and well understood.

Residual and Cumulative Effects – Whitebark Pine

The consideration of residual and cumulative impacts to whitebark pine takes into account the potential for impacts associated with new terrain and run development in the Goat's Eye II, Hayes Hill or Meadow Park areas, and for incidental impacts to whitebark pine individuals resulting from summer visitor use, trailside damage and off-trail travel.

The assessments of cumulative residual impacts are considered with respect to the nature, frequency and duration of potential impacts, the ability to manage or mitigate potential impacts, and the ecological scale and context of potential impacts. Cumulative residual impacts are categorized as negligible, as those that are predictable and manageable, or as those associated with considerable impact, risk or uncertainty.

Valued Component: Whitebark Pine
Project/Environment Interaction: New run and terrain development; Summer visitor use



1. Nature of Impact			
Disturbance	Disruption	Alteration	Destruction
New run and glade development within the parameters and conditions of the Site Guidelines is intended to avoid direct impact and to create openings in suitable habitat that will facilitate the persistence, and increase the distribution, of whitebark pine across the Ski Area in the long term. Restricting summer visitor use to the existing trail system is expected to limit impacts on whitebark pine to that of occasional disturbance.			
2. Frequency of Interaction			
Single occurrence	Occasional	Regular	Continuous
With identification of potentially affected trees and mitigation to avoid disturbance, adverse impacts to whitebark pine are likely to be infrequent. Occasional adverse impacts to individual trees are expected to be offset with habitat improvement and with expansion and planting.			
3. Duration of Impacts			
Days or less	Weeks	Seasons	Permanent
It is anticipated that the gradual enhancement of whitebark pine distribution across the Ski Area will occur over many seasons. Potential adverse impacts, such as inadvertent damage to individual trees, may affect trees over their lifetime.			
4. Reversibility			
At end of project	With mitigation	Long-term restoration	Irreversible
It is expected that most direct impacts to existing whitebark pine trees can be avoided through planning and avoidance. Residual impacts to individual trees may be reasonably offset with an overall increase in the distribution of whitebark pine across the Ski Area resulting from overall run and vegetation management parameters outlined in the Site Guidelines.			
5. Ecological Scale			
Site specific	Local feature	Local ecosystem	Landscape
Potential adverse impacts to whitebark pine are expected to be limited to specific trees or sites. Positive impacts of the overall strategy for whitebark pine across the Ski Area may be seen at the local ecosystem scale of the Sunshine Creek watershed.			



6. Ecosystem Context			
Modified	Resilient	Vulnerable	At risk
Whitebark pine is a listed species at risk. Ski Area management may be directed so as to contribute positively to the health of individual trees and to overall distribution objectives for whitebark pine recovery.			
Significance			
Negligible	Predictable and manageable	Considerable impact, risk or uncertainty	
Potential development and use is likely to occur at a scale where impacts to individual trees can likely be identified in advance and avoided. Overall success at increasing distribution is less certain, but conditions and parameters for enhancing and restoring effective whitebark pine habitat conditions are understood and improving. Aligning Ski Area vegetation management strategies with the Banff National Park Multi-Species Action Plan is likely to enhance the potential for successful improvement of whitebark pine on the Ski Area.			

The long-term cumulative effects of new run and terrain development on whitebark pine may be summarized as the intentional alteration of habitat conditions at a site scale, to enhance overall whitebark pine growth and distribution across the Ski Area. Given the scattered distribution across the Ski Area, it is expected that potential impacts to whitebark pine individuals can be avoided when planning for new terrain development. Vegetation management strategies of the Site Guidelines and mitigations of the strategic environmental assessment provide direction that may be expected to facilitate enhanced conditions for whitebark pine as a part of regular vegetation management.

The long-term cumulative effects of summer use on whitebark pine may be summarized as the potential for occasional site-specific damage or disruption caused by potential off-trail visitor travel. Limitations to the existing trail system, trail improvements and restrictions on off-trail travel may be reasonably expected to limit any repetitive and cumulative potential impacts to whitebark pine individuals.

A potential uncertainty remains with respect to the future growth of summer visitor use. Compared with current daily visitor use in the hundreds, daily visitor use in the thousands may result in significantly different impacts. The Site Guidelines and the mitigations of the strategic environmental assessment include the need for ongoing monitoring and adaptive management to ensure that increasing visitor use does not result in increasing adverse impacts to whitebark pine or other alpine meadows vegetation.



Residual and Cumulative Effects – Alpine Meadows

The consideration of residual and cumulative impacts to alpine meadows communities takes into account the potential for impacts associated with new terrain and run development in Sunshine Meadows area and for impacts to alpine meadows vegetation resulting from increasing summer-use visitor numbers and intensity of use, and attendant damage associated with trailside and off-trail travel visitor use.

The assessments of cumulative residual impacts are considered with respect to the nature, frequency and duration of potential impacts, the ability to manage or mitigate potential impacts, and the ecological scale and context of potential impacts. Cumulative residual impacts are categorized as negligible, as those that are predictable and manageable, or as those associated with considerable impact, risk or uncertainty.

Valued Component: Alpine Meadows Communities			
Project/Environment Interaction: Summer use; Run and terrain development			
1. Nature of Impact			
Disturbance	Damage/Disruption	Alteration	Destruction
Continued increases in summer visitation have potential to result in increased trailside damage to vegetation and some potential for spread and colonization of invasive species. There is limited potential for new terrain development in Sunshine Meadows or other alpine areas of the lease. Modifications to the Angel Traverse may result in damage to vegetation at the project scale.			
2. Frequency of Interaction			
Single occurrence	Occasional	Regular	Continuous
Visitor use impacts in the summer are ongoing over the operating season. Development of new run or terrain development occurs as a single event. Grooming and avalanche operations continue through the winter season.			
3. Duration of Impacts			
Days or less	Weeks	Seasons	Permanent
Damage to alpine vegetation may last for years due to slow growing and recovery conditions.			
4. Reversibility			
At end of project	With mitigation	Long-term restoration	Irreversible



Mitigation measures can halt or reverse damage to alpine vegetation although full recovery may take many years. The ability to mitigate or restore potential impacts to vegetation will be dependent on the growing number of summer visitors and intensity of summer visitor use and the consequent ability to manage the impacts of what could be thousands of visitors per day as opposed to a few hundred in the past. Growing visitor impacts can be mitigated to a large degree through trail improvements, such as widening, hardening and the development of rest stops and viewpoints, as outlined in the Site Guidelines.			
5. Ecological Scale			
Site specific	Local feature	Local ecosystem	Landscape
Overall changes to alpine vegetation community structure or composition at an ecosystem scale are not anticipated, but impacts occurring throughout the trail system would constitute impact to a local feature. The scale of impact will be dependent on the growing number of summer visitors and intensity of summer visitor use and the improvements put in place to address increasing numbers and intensity of use.			
6. Ecosystem Context			
Modified	Resilient	Vulnerable	At risk
Alpine meadows vegetation is sensitive to disruption and easily damaged while being slow to recover. Many rare plants occur across the meadows landscape, and vegetation may be altered by variations in snowpack depth, density and melting rate resulting from winter operations. The spread of non-native, invasive vegetation is a significant concern.			
Significance			
Negligible	Predictable and manageable	Considerable impact, risk or uncertainty	
The potential for increased numbers and intensity of summer visitor use presents a key uncertainty within the Site Guidelines. The summer use of the trails system and hotel presents an exceptional opportunity for visitors to experience the Sunshine Meadows environment. Trail systems do not have infinite capacity to absorb visitor use and incidental impact. Total numbers of summer visitors have to be balanced with trail capacity, rest stops and viewpoints, and the ability to minimize trailside damage and off-trail travel when it occurs.			
The main potential impacts to vegetation from summer use and from run and terrain development are well known and understood. Planning and implementation of measures to avoid well-known impacts in advance of increasing visitor use is a key mitigation.			



The uncertainty around increasing summer-use visitor numbers and intensity of use makes it difficult to predict the likely level of impact to alpine vegetation communities. The gondola system could theoretically deliver thousands of visitors per day for summer use, similar to winter-use visitor levels. Without significant planning, control and mitigation, it would be reasonable to characterize the long-term cumulative impacts of summer use at that level of intensity as repetitive, long-term damage to a vulnerable local ecosystem where recovery would involve active restoration effort over many growing seasons.

It is clear from recent monitoring that even if current levels of summer visitor use are to continue, trail system improvements will have to be made in order to halt and reverse existing levels of damage. The Site Guidelines allow for this type of improvement, and approaches such as selective trail widening, trail bed and surface hardening, visitor pullouts, viewpoints and rest stops could do much towards mitigating current levels of impact, reducing the motivation to move off-trail, and providing for a more enjoyable experience.

The sensitivity of the Sunshine Meadows environment and the difficulty of restoration following damage make it imperative that trail system improvements are planned for and implemented in advance of permitting increased visitor use. It is far more difficult to fix damage to alpine environments once it has occurred than it is to strategically avoid the impacts through advanced planning in the first place. The mitigation and monitoring recommendations of the SEA in conjunction with the requirements of the Site Guidelines for long-range planning establish an adaptive planning approach to implementing gradual increases in visitor use that fall within the environmental carrying capacity of the trail system.

There is limited potential for the ski run and terrain development proposals of the Site Guidelines to impact alpine meadows communities with the potential exception of improvements to the Angel Traverse. Improvements to the ski-way are considered an exception under the *Ski Area Management Guidelines*. The conditions of the Site Guidelines do not permit cut and fill approaches to enhancing the ski-way, but they do permit site-specific alterations. Damage or destruction of vegetation is likely on a site-specific scale.

Summary of Residual and Cumulative Effects on Native Vegetation

Potential long-term cumulative effects of the Site Guidelines on forest composition and structure, including whitebark pine, are reasonably limited. Areas for potential new run and terrain development considered by the Site Guidelines are primarily below treeline and limited in potential extent in accordance with future design capacity limits.

It is expected that run development and subsequent seasonal maintenance of vegetation can be directed towards purposely enhancing growing conditions for whitebark pine, and towards maintaining the experiential values associated with old growth forest trees and stands. To a certain degree, clearing of vegetation in accordance with mitigating measures constitutes an alteration of forest composition and structure that reflects a state that is more consistent with the natural historical fire regime than are current conditions.



Potential new terrain modification is also limited by the Site Guidelines. Only minor terrain modification will be considered above the unbroken treeline anywhere on the ski hill, protecting conditions for upper subalpine trees such as whitebark pine and mature alpine larch stands. Any development of new ski terrain below treeline will minimize the need for grading or removal of native ground cover vegetation to the degree possible. Improvements to the Angel Ski-Way are considered an exception under the *Ski Area Management Guidelines*. The conditions of the Site Guidelines do not permit major terrain modification such as cut and fill approaches to enhancing the ski-way, but they do permit site-specific alterations. Damage or destruction of vegetation is likely on a site-specific scale.

Snowmaking, grooming and avalanche control are expected to have minimal interactions with the operation of new ski terrain. Snowmaking is limited by the Site Guidelines to existing areas or to areas immediately around day lodge facilities. Potential new terrain considered in the Site Guidelines will not expose sensitive alpine vegetation to the potential impacts of grooming. There are no circumstances associated with potential new terrain that are expected to require new avalanche control measures into areas beyond the current program.

The Site Guidelines proposal to remove the Bye Bye Bowl, Sunshine and Eagle Crest gains areas from the lease has clear benefits to the future security and certainty of alpine meadows communities over the long term. Removing the potential to bring forward development proposals in these areas in the future also limits the need for supporting infrastructure such as roads, lifts or utilities that would impact other alpine meadows communities. The proposal to remove the Meadow Park area from the current lease has little ecological benefit in terms of forest structure. The proposal to remove the Healy Corridor areas on either side of the Bourgeau base parking lot protects limited forest vegetation that provides movement cover and terrain stability for the Upper Healy Wildlife Corridor and may be considered a substantial environmental gain.

Impacts to alpine meadows communities, including whitebark pine, are primarily associated with increasing levels and intensity of summer visitor use. The sensitivity of the Sunshine Meadows environment and the difficulty of restoration following damage makes it imperative that trail system improvements are planned for and implemented in advance of permitting increased visitor use. The mitigation and monitoring recommendations of the SEA in conjunction with the requirements of the Site Guidelines for long-range planning establish an adaptive planning approach to implementing gradual increases in visitor use that fall within the environmental carrying capacity of the trail system.

Considering the full suite of Site Guidelines and mitigations of the SEA, it is anticipated that the expected ecological outcomes related to native vegetation diversity are likely to be attained.

- Ecological integrity considerations, including those related to fire cycles, old growth forest, whitebark pine and the Sunshine Meadows natural environment, will be addressed through an adaptive ski run and vegetation management system that retains native vegetation to the greatest degree possible and replicates natural landscape patterns in a way that facilitates wildlife habitat effectiveness.



- The dynamic approach to management and monitoring of whitebark pine is anticipated to result in the long-term increase in the distribution of whitebark pine across the Ski Area.
- Run clearing and vegetation management strategies are intended to reflect conditions representative of the historical fire cycle while respecting the aesthetic, experiential and educational values of old growth forest stands and trees where appropriate.
- Vegetation will be managed overall to maintain natural composition, diversity and pattern, to limit the spread of invasive non-native species, and to support rare plants and alpine plant communities.
- The intensity of summer visitor use will be monitored and managed to ensure that increases in visitor use proceed only when the capacity of trail infrastructure has been improved in advance and to ensure that natural values are not impaired by unplanned visitor use.

8.6 AQUATIC ECOSYSTEMS

Sunshine Village Ski Area relies upon local watercourses, including streams, a lake and a surface runoff reservoir for the supply of snowmaking and potable water. Sunshine Creek and Healy Creek watercourses are the receptors for treated wastewater discharge, and for surface runoff from service roads and parking lots. As first- and second-order mountain streams, Healy Creek and Sunshine Creek are characterized by relatively low volume and seasonally fluctuating flows. With limited natural water sources and fluctuating flow levels, Ski Area development and water/wastewater operations have the potential to influence the function of aquatic ecosystems through interactions with:

- Surface and subsurface flow regimes
- Water quality: wastewater and surface runoff
- Riparian habitat
- Habitat for westslope cutthroat trout and bull trout

8.6.1 Current Status – Surface and Subsurface Flow Regimes

The Sunshine Village Ski Area comprises large areas of steep, rugged terrain with numerous small high-gradient tributaries that feed larger catchment streams. The Healy Creek drainage area, upstream of the confluence with Sunshine Creek, covers 26.4 km² and is the only local watercourse with year-round flows. The intersection of Healy Creek with the Ski Area lease is minimal, with the creek running through the Ski Area only in the lower Gondola Corridor and along the south side of the base area parking lot. Although there are no current stream flow monitoring stations located on Healy Creek to provide continuous year-round data, seasonal flow patterns are likely to be comparable with similar nearby streams, such as Brewster Creek, where peak flows occur in June and minimum flows occur in February. Previous data collected on Healy Creek flows downstream of the confluence with Sunshine Creek showed average flows in November of 0.29 m³/s, with a minimum record of 0.19 m³/s (Eccles and Strom 1994). Healy Creek discharges into Brewster Creek shortly before the confluence with the Bow River.

Parks Canada permits water withdrawals from Healy Creek for snowmaking on the lower ski-out. Healy Creek both upstream and downstream of the Ski Area provides habitat for



westslope cutthroat trout and bull trout. Potential impacts to fish habitat resulting from water withdrawal are managed in accordance with the 10/90 Rule. Under the 10/90 Rule, on-site stream flow monitoring provides real-time data on variation in flow that informs withdrawal calculations. The 10/90 Rule allows for up to 10% of the stream flow to be withdrawn as long as the flow in Healy Creek is at or above 90% of the typical flow as monitored on a weekly basis. New weekly data is integrated into long-term typical flow data on an annual basis. When the flow in Healy Creek drops below 90% of typical flows, no further water extraction may take place. The 90% typical flows threshold acts as a minimum flow requirement for the protection of fish and fish habitat ensuring that Ski Area withdrawals do not result in abnormally low water levels. The 10/90 Rule management system acts to preserve the natural hydraulic cycle of wet and dry years and seasons, and to maintain flows that support the natural life cycles of westslope cutthroat trout and bull trout, other aquatic species, and riparian-dependent vegetation and wildlife.

Sunshine Creek runs entirely through the lease and is the largest tributary to Healy Creek. Sunshine Creek flows are ephemeral with surface flows restricted to late spring and early summer seasons in the Upper Village area (Eccles and Strom 1994). Flows near the confluence of Healy Creek have been noted later into the fall season as late as October (Mudry and Green 1977). The headwaters of Sunshine Creek arise in the catchment area known locally on the ski hill as Paris Basin. Spring runoff from Paris Basin is captured in three tiered reservoirs that provide potable and snowmaking water for the Upper Village facilities. Overflow from the reservoirs continues down the original course of the creek through the Waterfalls area behind the Upper Village hotel. Historically, Sunshine Creek flowed through what is now the Upper Village area. The stream course was redirected through a culvert in this area in the mid-1980s when the Upper Village was developed (Eccles and Strom 1994). Wawa and Delirium creeks, also ephemeral in nature, feed into Sunshine Creek below the Upper Village with a drainage area of 14.2 km² (Eccles and Strom 1994).

Rock Isle Lake is a high-elevation, small-basin lake located in Mount Assiniboine Provincial Park, B.C. The lake encompasses a drainage area of 154 ha and is fed by surface runoff and a subsurface aquifer. Rock Isle Lake overflows briefly during spring melt and drains through Larix Creek, a subterranean outlet stream that feeds Grizzly Lake. Rock Isle Lake was historically stocked with brook trout and a survey from 1987 suggested brook trout were the only species left in this lake (Fernet et al. 1987).

Although Rock Isle Lake is not located within the Sunshine Village Ski Area leasehold, it is connected to the Sunshine Village Ski Area reservoirs above the Upper Village by a partially buried pipeline. Water from the lake is used to augment Sunshine Village Ski Area reservoir levels as required during the winter operational season (Eccles and Strom 1994). Previous agreements with the B.C. Water Management Branch (Ministry of Environment, Lands and Parks, Nelson) permitted the Ski Area to withdraw up to 71.8 m³/day from Rock Isle Lake.

Rock Isle Lake is located west of the Continental Divide in the Pacific continental watershed. Transfer of water from Rock Isle Lake into the Sunshine Village Ski Area leasehold constitutes a mixing of water from the Pacific into the Hudson Bay continental watershed. A potential impact of mixing waters from ecologically distinct watersheds is



the transfer of aquatic organisms between watersheds, including parasites, diseases or invasive species.

8.6.2 Current Status – Water Quality

Water quality in Healy and Sunshine creeks is exposed to, and influenced by, Ski Area development and operations, and the physical attributes of the area. Effluent from the Upper Village wastewater treatment system and surface water runoff from the Bourgeau base area parking lot are key water quality considerations.

Wastewater Treatment

The Sunshine Village Ski Area wastewater treatment plant releases treated sewage effluent into Teepee Town Creek, an ephemeral tributary to Sunshine Creek. In turn, the also ephemeral Sunshine Creek feeds into Healy Creek. Sunshine and Teepee Town creeks are often dry for much of the winter operating season with the result that treated effluent is essentially deposited to ground, rather than to a flowing watercourse that facilitates dilution.

The *Banff National Park Management Plan* requires that effluent from park communities and outlying facilities meet standards described in *Environmental Stewardship Leadership Targets for Communities and Outlying Facilities in the Mountain National Parks*. Effluent monitoring data for the Sunshine Village wastewater treatment plant provided to Parks Canada for the period between 2015 and 2017 illustrates that most leadership targets are being met with the exception of plant output for Total Phosphorus (Figure 14). However, in the absence of dilution, it is appropriate to compare effluent to the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life (CWQG) which are intended to provide protection of freshwater life from anthropogenic stressors such as chemical inputs or changes to physical components. These guidelines are not normally used to evaluate the quality of wastewater effluent, but can be used to evaluate the effects of effluent once diluted into the receiving water. Considering Sunshine's effluent is not actually diluted for much of the year, we compared the effluent itself to these guidelines (Table 14). The fact that concentrations of dissolved chloride, nitrite and nitrate parameters exceeded CCME CWQG, would suggest that levels of these compounds in excess of CCME CWQG may be considered deleterious.

	Units	PC Leadership	CCME	Mean	Min.	Max.
pH	pH		6.5-9.0	7.61	6.92	8.09
Dissolved Chloride (Cl)	mg/L		120	79.98	2.9	140
Dissolved Nitrite (N)	mg/L		0.06	0.10	0.012	0.37
Dissolved Nitrate (N)	mg/L		13	57.86	5	98
Dissolved Iron (Fe)	mg/L		0.3	< 0.060	< 0.060	< 0.061



Biochemical Oxygen Demand (inhib.)	mg/L	< 10 (summer) < 20 (winter)		2.01	2	2.2
Total Suspended Solids	mg/L	< 10	> 5 from background	4.87	1	20
Dissolved Fluoride (F)	mg/L		0.12	< 0.050	< 0.050	< 0.051
Fecal Coliforms	MPN	< 20		334.45*	1	2400
Total Ammonia (N)	mg/L	< 1 (summer) < 5 (winter)		0.16	0.062	0.69
Total Phosphorus (P)	mg/L	0.15		0.47	0.055	1.6

*Note: While it appears that targets for Fecal Coliforms are not being met, the numbers reflect three months of high Fecal Coliform results that shifted the average above leadership targets. This treatment parameter was corrected, and coliform counts for all other months during this period were < 1 MPN.

Figure 14. Mean, minimum and maximum concentrations of wastewater parameters from Sunshine Village for the period July 2015 to April 2017 in comparison to Parks Canada Agency Leadership Targets.

In addition to treatment plant outputs, water quality data for Healy Creek has been collected and evaluated since 2006 to identify and quantify potential cumulative impacts. The Bowman (2013) study collected data on water chemistry, invertebrate diversity and abundance, and algae abundance, upstream and downstream of the confluence with Sunshine Creek, once a year in the fall from 2006 to 2013. Bowman's results revealed an overall increase in downstream total nitrogen concentrations and associated increases in algae, total invertebrates and pollution-tolerant chironomids (or midges) as well as a decrease in the abundance of pollution-sensitive mayflies (Figure 15).

Year	Water Chemistry						Algae			Benthic Macroinvertebrates										
	Total Phosphorus			Total Nitrogen			Chlorophyll a			Abundance			Mayflies			Chironomids				
	(ug/L)			(ug/L)			(ug/cm²)			(no./sample)			Mayflies			Chironomids				
	u/s	d/s	fd/s	u/s	d/s	fd/s	u/s	d/s	fd/s	u/s	d/s	fd/s	u/s	(%)	d/s	fd/s	u/s	(%)	d/s	fd/s
2006	0.5	1.3		33	32		3.55	2.99		1580	1615		60	42			12	16		
2007	2.0	2.0		39	91		1.06	1.99		1349	2467		52	57			10	15		
2008	3.0	3.0		45	80		0.32	1.21		959	1823		61	47			19	30		
2009	3.0	4.0		102	110		0.14	0.58		4480	2006		50	51			27	21		
2010	5.0	6.0		37	60		0.53	1.02		1555	10133		69	37			11	17		
2011	4.0	3.0	2.0	83	132	141	1.51	1.34	3.74	558	706	2067	31	16	30		44	71	55	
2012	5.0	4.0	3.0	133	139	128	0.13	0.11	0.60	1072	2692	19333	48	51	4		18	12	2	
*2013	1.0	1.0	8.0	106	113	183	0.21	2.21	2.08	1276	437	581	48	30	10		5	19	64	
mean	2.9	3.0	4.3	72	94.6	150.7	0.93	1.4	2.1	1604	2735	7327	52	41.3	14.8		18	25.2	40.3	
% change					31	109		54	130		71	357		-21	-72			38	120	
p value		0.37	0.18		0.01	0.01		0.06	0.10		0.18	0.06		0.02	0.00			0.06	0.06	

*100-Year Flood

Figure 15. Healy Creek nutrient monitoring from 2006 to 2013.



Recognizing the need to understand the seasonal cycle of nutrient loading in Healy Creek, Parks Canada initiated monthly monitoring of total nitrogen and total phosphorus in Healy Creek using the same water sampling sites as previous studies situated above and below the confluence with Sunshine Creek. Data collection on phosphorus and nitrogen was initiated in 2014 and is ongoing. Monthly nutrient sampling showed minimal difference between sites upstream and downstream of Sunshine Creek with the exception that nitrogen was higher downstream of Sunshine Creek confluence in summer months (Figure 16).

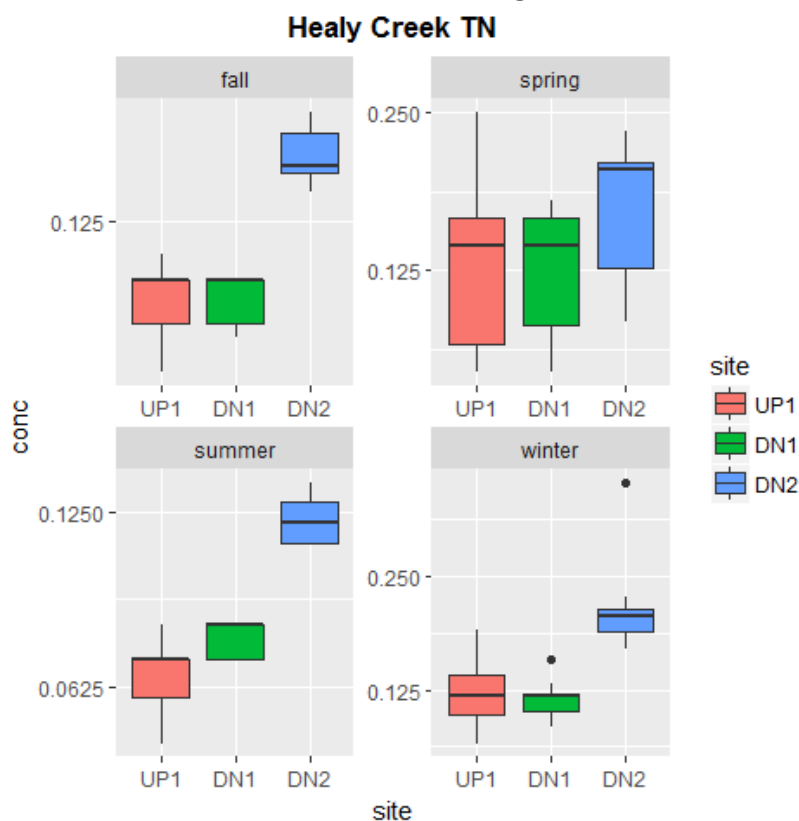


Figure 16. Total Nitrogen (TN; mg/L) concentrations upstream of the confluence of Sunshine Creek (UP1), immediately downstream of Sunshine Creek (DN1), and downstream of the gondola base parking lot (DN2).

Parks Canada also initiated a biomonitoring program in 2016 and 2017, using the Canadian Aquatic Biomonitoring Network (CABIN) bioassessment program to follow up on the similar work by Bowman (2013). Samples were collected from the same site used by Bowman (2013) downstream of Sunshine Creek as well as a control site upstream of Sunshine Creek. In both years, the site downstream of Sunshine Creek was “mildly divergent” from expected reference conditions. The monitoring site immediately upstream of Sunshine Creek was also deemed to be “mildly divergent” in 2016, but “in reference” in 2017. Although the downstream site was not within reference condition, “mildly divergent” is still considered good water quality and is only a trigger for further investigation (Bailey and Reynoldson 2011).



Location	Site Code	CABIN Assessment 2016	Stream Health 2016	CABIN Assessment 2017	Stream Health 2017
Upstream of Sunshine Creek	UP1	Mildly Divergent	Good	Reference	Good
Downstream of Sunshine Creek	DN1	Mildly Divergent	Good	Mildly Divergent	Good

Figure 17. Summary table describing, overall CABIN assessment, and stream health for Healy Creek upstream and downstream of Sunshine Creek in 2016 and 2017.

Parking Lot Runoff

Surface water runoff in the form of rain or snowmelt from the Bourgeau base area parking lot is a key consideration with respect to Healy Creek water quality. The parking lot surface is mostly gravel, and winter abrasives for vehicle and pedestrian safety are applied to the parking lot as necessary throughout the winter season, as with any similar operation. Erosion of both the parking lot surface and winter abrasive materials results in the introduction of silty, turbid water directly into Healy Creek. Contaminants such as road salts and hydrocarbons are often associated with fine sediment from the parking lots (Lee et al. 2004), and therefore, are also likely being introduced to the stream course via parking lot runoff. Parking lot snow clearing operations at times directly introduce snow, gravel and litter into the stream course. Litter along the stretch of the creek adjacent to the parking lot has been a common sight since at least 1994 (Eccles and Strom 1994).

Two aspects of parking lot runoff are of particular concern to downstream aquatic habitat quality: nitrogen and the associated biophysical habitat changes, and suspended sediments as measured by stream turbidity.

Nitrogen

Work by Bowman (2013) using an upstream and downstream study design, identified the Sunshine Village parking lot as a stressor on the local stream ecosystem. Mean concentrations of nitrogen were higher downstream than upstream of the parking lot (Figure 15). Algal abundance was also higher downstream, and the ratio of pollution-sensitive mayflies to pollution-tolerant chironomids was significantly lower downstream of the parking lot (Figure 15). Increased abundance of both algae and chironomids indicated that nitrogen concentrations are exerting biophysical effects on the stream ecosystem downstream of the parking lot. There was also some evidence that suggests there may be inhibitory effects, possibly from toxicity. For example, the unusually low proportions of mayflies (4%) and chironomids (2%) below the parking lot in 2012 could be indicative of contamination such as trace metals or hydrocarbons (Bowman 2013).



Parks Canada performed a follow-up biomonitoring assessment in 2016 and 2017 using the Reference Condition Approach (Reynoldson et al. 1997) and following the Environment Canada CABIN field sampling protocol. The downstream site used for monitoring above and below Sunshine Creek was also used as a control site for quantifying the effects of the parking lot as that site is representative of the water before entering the parking lot. These data showed the site downstream of the parking lot to be “divergent” in 2016, but in “reference” in 2017. In comparison, the upstream control site was either only “mildly divergent” or in “reference” in 2016 and 2017 (Figure 17). Mirroring the results of Bowman, monthly sampling of total phosphorus and nitrogen by Parks Canada since 2014 has identified that the parking lot is a significant source of nitrogen in all seasons (Figure 16).

Location	Site Code	CABIN Assessment 2016	Stream Health 2016	CABIN Assessment 2017	Stream Health 2017
Upstream of Sunshine Creek	UP1	Mildly divergent	Good	Reference	Good
Downstream of parking area	DN2	Divergent	Fair	Reference	Good

Figure 17.: Summary table, overall CABIN assessment, and stream health for Healy Creek upstream of the parking lot and downstream of the parking area in 2016 and 2017.

Suspended Solids

Suspended solids occur naturally and are integral components of aquatic systems. Suspended solids consist of silt, clay, sand, fine particles of organic and inorganic matter, soluble compounds and plankton. The amount of suspended solids in Banff National Park waters varies seasonally. For example, rainfall and snowmelt results in sediment input to watercourses during the spring runoff. Aquatic organisms are subjected to these variations and have adapted their life cycles to accommodate them. Anthropogenic activities have the potential to add unusually large amounts of sediment to a watercourse outside of typical seasonal inputs, potentially exceeding an organism’s adaptive ability to cope (Birtwell 1999).

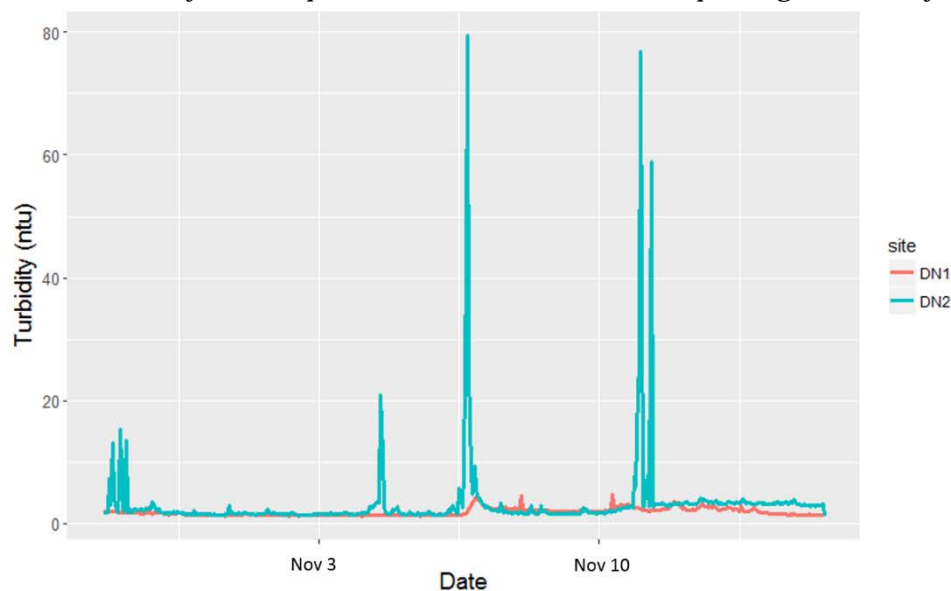
It is recognized that the response of aquatic organisms to excessive suspended solids is dependent on the magnitude and duration of the exposure (Newcombe and MacDonald 1991, Newcombe and Jensen 1996, Newcombe 2003). Large amounts of high-frequency data are required to quantify the magnitude and duration of sediment events. Turbidity loggers can be deployed unattended for extended periods of time, thereby providing the large, high-frequency data sets that are necessary to adequately address the duration and magnitude of sediment events. Turbidity is not a direct measure of total suspended solids, but rather a measure of the scattering effect that suspended solids have on light. Turbidity is the monitoring parameter of choice for biologists, hydrologists and resource managers looking to measure suspended solids (Newcombe 2003).



Turbidity monitoring by Parks Canada was conducted upstream and downstream of the parking lot at four time periods in 2014 and 2015. Outside of the spring runoff, downstream turbidity values were consistently higher than upstream values. Higher average values downstream of the parking lot were caused by episodic spikes in turbidity, likely due to rain and snowmelt during the spring and fall seasons (Figures 18 and 19). Turbidity values downstream of the parking lot exceeded both short-term and long-term exposure guidelines identified in the *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (Canadian Council of Ministers of the Environment (CCME) 2003). The guideline for turbidity is 8 NTU (nephelometric turbidity units) above background for short-term exposure (e.g., 24-hour period) and a maximum average of 2 NTU from background for longer-term exposure (e.g., 30 days; CCME 2003). To illustrate the application of the guidelines, from March 10 to March 14, 2015, mean downstream turbidity values were 17.4 NTU and the upstream mean was 2.4 NTU. This is a change of 15 NTU, which far exceeds both short-term and long-term CCME (Canadian Council of Ministers of the Environment) guidelines of 8 NTU and 2 NTU respectively. Maximum values during this same period were 164 NTU downstream, yet only 6.9 NTU upstream.

For the most part, there is little to no potential for sediments to settle or be filtered before entering Healy Creek. A low gravel swale and a vegetated buffer strip (1 m wide) between the parking lot and Healy Creek were developed as part of 2013 flood reclamation. Neither of these provide significant filtration or prevent litter, snow or gravel from being pushed over the berm and entering the stream course. Sediment traps at two locations in the parking lot have proven to be ineffective, and sediment-laden runoff is carried through these locations and directly into the creek.

Figure 18. Turbidity values upstream and downstream of the parking lot in Healy Creek during



one time period in 2014: October 28 – November 15. DN1 is a reference site upstream of the Sunshine Village parking lot, and DN2 is the impacted site immediately downstream of the Sunshine Village parking lot.

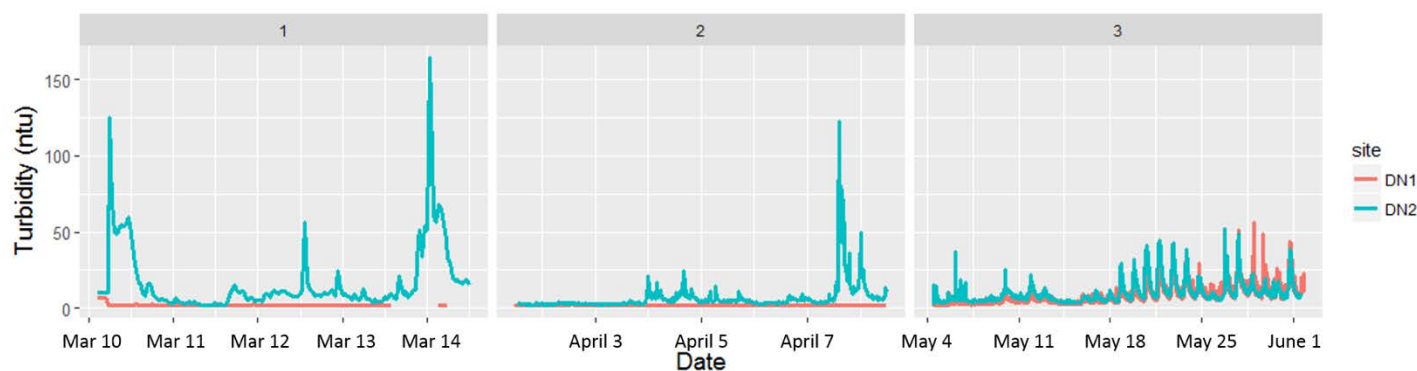


Figure 19. Turbidity values upstream and downstream of the parking lot in Healy Creek during three time periods in 2015: 1) March 10 – March 14, 2) April 2 – April 8, and 3) May 4 – June 1. DN1 is a reference site upstream of the Sunshine Village parking lot, and DN2 is the impacted site immediately downstream of the Sunshine Village parking lot.

Current Status – Riparian Habitat of Sunshine Creek and Healy Creek

Healy Creek is characterized by a steep gradient and confined channel, supporting a relatively narrow riparian zone (Eccles and Strom 1994). Vegetation along much of its length is dominated by mature coniferous forest rather than riparian shrubs (Eccles and Strom 1994). Healy Creek was substantially realigned during the 1960s and again in 1979 to accommodate the lower gondola terminal and expansion of the Bourgeau base area parking lot. A distance of approximately 1,200 m of Healy Creek has been relocated, channeled and reinforced to date. Near the gondola terminal, the stream is highly constrained by gabion baskets, and rock riprap reinforces the creek channel along much of the north bank. Natural streamside vegetation is non-existent along the entire length of the parking lot on the north bank of the creek while much of the south bank remains relatively undisturbed.

Reviews of riparian area management literature and practitioner studies have looked at the function of riparian buffers on temperature control, sediment and pollutant filtration, erosion control, and in-stream habitat for a variety of aquatic organisms (Johnson and Ryba 1992). Johnson and Ryba (1992) found that riparian buffers less than 10 m wide offer very little if any maintenance of ecological function. Based on available reviews and on consultation with Parks Canada's Aquatic Ecologist, a 30 m



buffer may be considered a minimum width consistent with forestry practices in many other jurisdictions. Recommended fixed buffer widths for many ecological functions of value to Parks Canada, such as wildlife movement and riparian bird habitat, commonly exceed 30 m and may extend to 200 m. Certain types of activities or facilities, such as petroleum or chemical storage and refueling activities, may typically require even greater buffers up to a minimum of 300 m.

Restoration of a minimal level of aquatic habitat function over the area of Healy Creek adjacent to the parking lot would likely require the restoration of a minimum 15 m buffer to provide for some level of shading, temperature control, riparian cover and habitat structure. Restoration of such a minimum buffer width would only be effective in combination with the implementation of engineered design features such as bio swales, sediment ponds or stormceptors that limit erosion, sedimentation and channelized flow, and that capture or filter suspended materials and contaminants.

Streamside vegetation along Sunshine Creek above the Upper Village has been interrupted by the development of water collection reservoirs and the development of village buildings and infrastructure. Below the Upper Village area, Sunshine Creek is largely although not completely undisturbed. Clearing of vegetation for the gondola, Wolverine lift, ski-out and power lines intercepts the creek channel at various locations. The lower ski-out route closely follows the Sunshine Creek channel or runs down the creek bed. Although not cleared in any sense, vegetation on the lower ski-out is managed to remove obstructive trees and branches to provide a clear and safe egress route.

8.6.3 Current Status – Westslope Cutthroat Trout and Bull Trout

Several species of fish, including native and introduced species, are located in streams and rivers within and around the Sunshine Village Ski Area. Of note are westslope cutthroat trout and bull trout, both of which are found in Healy Creek. Sunshine Creek and other watercourses within the Sunshine Village Ski Area do not provide suitable habitat for trout species (Eccles and Strom 1994).

Westslope Cutthroat Trout

The Alberta population of westslope cutthroat trout is listed as Threatened under provincial legislation and under Schedule 1 of Canada's *Species at Risk Act* (The Alberta Westslope Cutthroat Trout Recovery Team 2013). Factors contributing to population declines from historical levels are historical overharvest, stocking of other species leading to competition and genetic issues, and large-scale habitat changes and fragmentation. Parks Canada participated in a joint federal-provincial recovery team for westslope cutthroat trout that resulted in the completion of a provincial recovery plan and national recovery strategy. The national recovery strategy population and distribution objective for westslope cutthroat trout is to:

Protect and maintain the existing ≥ 0.99 pure populations at self-sustaining levels, and re-establish additional pure populations to self-sustaining levels, within the species original distribution in Alberta (Fisheries and Oceans Canada 2014).

The 2014 national recovery strategy for westslope cutthroat trout does not identify Healy Creek, or its tributaries, as critical habitat for the subspecies. However, the Healy Ponds



upstream of the Bourgeau base area parking lot in Healy Pass contain genetically pure strains of westslope cutthroat trout (Mark Taylor personal communication). As the significance of these genetically pure populations becomes evident, it is possible that the importance of Healy Creek as westslope cutthroat trout habitat will be re-evaluated in subsequent recovery strategies. However, regardless of the creek's status, Sunshine Village Ski Area activities that affect the downstream water quality and fish habitat of Healy Creek are important considerations for conservation of westslope cutthroat trout.

Extensive fish stocking occurred early in mountain parks history. It was common practice to stock hatchery cutthroat trout subspecies over existing natural populations of cutthroat trout that had been depleted from overharvest. Healy Creek was heavily stocked with westslope cutthroat trout from 1915 to 1964 (Eccles and Strom 1994).

Contemporary westslope cutthroat trout population numbers within Healy Creek are variable and are likely influenced by site-specific conditions within the watercourse. The Healy Ponds in Healy Pass contain westslope cutthroat trout, as does Brewster Creek downstream of the confluence with Healy Creek (Mudry and Green 1977). Respectively, these are areas located well above and below the Sunshine Village Bourgeau base area. It is undetermined how much westslope cutthroat trout in Healy Ponds use downstream habitat. However, Healy Creek, within proximity of the Sunshine Village Bourgeau base area, is not well populated with westslope cutthroat trout or any other species of fish. Sampling in the late 1970s and 1980s of Healy Creek near the Bourgeau base area found low numbers of bull trout and brook trout, and a single westslope cutthroat trout observation (Mudry and Green 1977, Fernet et al. 1987). The section of Healy Creek near the Bourgeau base area parking lot is generally considered to have limited spawning and resting habitat for trout, potentially associated with low winter flows and past disturbance for parking lot development, such as creek channelization (Eccles and Strom 1994).

Bull Trout

The conservation status of bull trout is under national review. In 2012, COSEWIC recommended that the Saskatchewan-Nelson rivers populations be listed as Threatened (COSEWIC 2012). Healy Creek and the Bow River are part of the South Saskatchewan River drainage, and bull trout populations in Banff National Park are part of the Threatened population. The COSEWIC assessment is typically one of the early steps leading to listing under Canada's *Species at Risk Act*. In 2014, Alberta upgraded the provincial status of bull trout from Special Concern to Threatened under the *Wildlife Act* (Environment Sustainable Resource Development 2014).

Similar to cutthroat trout, bull trout have undergone extreme declines throughout their range, including within Banff National Park. Many of the threats that have imperiled cutthroat trout are similar for bull trout, although a few key differences exist mostly related to differences in life history. Bull trout are less tolerant of warming waters than cutthroat trout, so high-elevation habitats such as those found in Banff National Park may play a very important role in future conservation initiatives.

The desired recovery outcomes for bull trout are expected to be similar to those for cutthroat trout, and they include the securing of existing populations and the expansion of the distribution, density and relative abundance of bull trout to the historical range.



Bull trout were historically widely distributed in Banff National Park, including in the connected streams, rivers and lakes in the Upper Bow River basin. Bull trout move to spawning areas during the late summer closer to base flow levels, while cutthroat trout move into spawning areas in the spring during peak flow periods. Lower water levels in late summer accentuate natural and man-made barriers to fish passage. Currently, bull trout are not found in the portion of Healy Creek that is within the existing leasehold, but they do occur in Healy Creek a short distance downstream of the leasehold boundary. Here, a significant waterfall on the creek below the Ski Area lease appears to have acted as a physical barrier and prevented bull trout from inhabiting reaches above the waterfall. Cutthroat trout in contrast were stocked in reaches above the waterfall, or they would otherwise also not likely be present in Healy Creek.

8.6.4 Existing and Potential Interactions and Impacts

A number of elements of the Site Guidelines summarized in Section 5 of this report have the potential to interact with the critical factors of the aquatic ecosystems as discussed above:

- Lease reconfiguration interacting primarily with flow regimes, surface runoff and riparian habitat.
- Increase in winter and summer visitor capacity and water use interacting primarily with flow regimes and water quality.
- Reservoir development interacting primarily with flow regimes, surface runoff and riparian habitat.
- New run and terrain development interacting primarily with flow regimes, surface runoff and riparian habitat.
- Current parking lots and parking lot expansion interacting primarily with flow regimes, surface runoff, riparian habitat and water quality.
- Cumulative effects of the above factors on westslope cutthroat trout and bull trout habitat.

Lease Reconfiguration

The Site Guidelines proposal to reduce the lease boundary in the Meadow Park area is intended to result in a substantial environmental gain. The reconfiguration of the lease in this area as proposed would reduce the lease boundary on either side of the Sunshine Creek corridor and in the undeveloped portions of the Meadow Park area to the north of the Wawa lift and runs. The intention of this reconfiguration would be to limit use and prevent further development, especially on the west side of the Sunshine Creek valley. Lease reduction in this area would be intended to provide additional security and certainty for the Sunshine Creek environment into the future and to return some leasehold lands to declared wilderness.

While the intent is to provide future certainty and protection for Sunshine Creek, the creek valley has already been intersected and modified by previously approved development elements, including the Gondola Corridor, ski-out and summer access road, Wolverine lift and power line. The portion of the lease below the Goat's Eye gondola terminal is already almost as narrow as it can pragmatically be to accommodate the current uses. Current width of the lease in this area is necessary to accommodate the



current gondola and ski-out routes, vegetation management such as hazard tree removal, and avalanche control.

The Site Guidelines include the potential to consider a second access lift within the Gondola Corridor to accommodate additional out-of-base skier capacity and as an emergency backup in the event of gondola mechanical issues. Construction of a second lift would likely require the full width of the current lease along the Gondola Corridor to accommodate consideration of the loading and turn stations, terrain, necessary angles and distance from the current gondola. The Site Guidelines also include provision for making improvements to the ski-out, for limited reservoir construction and for expansion of snowmaking coverage along the ski-out.

Adjusting the lease boundary reduction below the Goat's Eye area to accommodate pragmatic considerations for existing and proposed development and for operational needs is likely to result in a reduction so small as to result in negligible environmental gain for Sunshine Creek. It is also conceivable that reducing the lease boundary could result in greater impact to the creek if new and existing infrastructure are forced into a smaller footprint.

As an area within the existing lease, Meadow Park has been skied as sidecountry for many years. This existing sidecountry use is likely to continue consistent with the Alpine Bowls at Sunshine and with the approach taken to existing sidecountry skiing at the other mountain park ski areas. Sidecountry skiing in this area interacts negligibly with Sunshine Creek or aquatic ecosystems.

Removing the Meadow Park area from the lease precludes the potential development of lifts and runs in part of the Meadow Park area north of the existing Wawa runs. However, the Site Guidelines allow for the consideration of new runs and a lift in the area below and east of the existing Wawa runs. The potential area for developed runs and lifts to the north of the Wawa area is minimal. On its own, the limited potential for runs or lifts in the Meadow Park area would have little impact to flow regimes, surface runoff or riparian habitat along the creek beyond current levels. The resulting ecological gains are unlikely to be substantial in terms of aquatic ecosystem protection.

Increasing Visitor Capacity and Water Use

The Site Guidelines allow for the consideration of an increase in visitor capacity. An increase in visitor capacity will come with an associated increase in the need for potable and snowmaking water as well as an attendant demand on wastewater systems. Changes to water and wastewater system demands have potential implications for stream flow regimes and downstream water quality.

With respect to current winter operations, the current water supply system for the Village is sourced from the current reservoir system above the Upper Village. This system is recharged when necessary from Rock Isle Lake. The frequency and amount of withdrawal from Rock Isle Lake varies annually depending on snowmelt and precipitation levels. It is reasonable to expect that the need for recharge from Rock Isle Lake is likely to become more frequent if an increase of 2,000 visitors per day in the winter (roughly 30%) is realized.



Upgraded day lodge services, including upgraded food services and washroom facilities at a new Goat's Eye Day Lodge, are also likely to require additional water. The Site Guidelines also allow for the consideration of warming huts at Hayes Hill if developed, or at the old Great Divide lift building. These facilities will also require water but are uphill and distant from the Upper Village supply lines.

Snowmaking water for the Upper Village also comes from reservoirs. Increased visitation equates to increased impacts on snow cover in high-traffic areas and the potential need for additional snowmaking to ensure coverage. The need for additional snowmaking is also likely to extend to the ski-out through sections that are not accessible from the Healy Creek source.

An increase in summer visitor use could theoretically match that of winter visitation with the use of the gondola and hotel. Such an increase would suggest a similar need for potable water extended almost year-round. Until recently, summer use of potable water has been fairly limited as Upper Village visitor services were minimal, and the hotel was not operated in the summer season. An increase in summer use, visitor services and hotel operation can be reasonably expected to further draw down water from the reservoir system that would have otherwise collected for the winter season.

The need for additional potable and snowmaking water cannot be quantified at this stage of planning with any precision. However, it is reasonable to anticipate a significant increase in water demand based on a rough 30% winter capacity increase over current levels, an increase in service levels afforded by new lodge facilities, and growth in summer visitor use operations. The current system can likely provide potable water in terms of water resource sustainability. But the potential impact is likely to be reduced water levels in Rock Isle Lake, increased water capture from Paris Basin into the reservoir system, and decreased water running in Sunshine Creek.

The anticipated increase in the frequency of water transfer from Rock Isle Lake is not considered to increase the likelihood of potential transfer of aquatic organisms between watersheds, such as diseases or invasive species. However, it does highlight the need for, and the importance of, continuous monitoring to ensure that transfer of species does not occur, even though the risk is likely to be low.

As visitor use increases, it is reasonable to assume that wastewater needs and treatment volume will also increase. The increase in wastewater system demand happens at the same time as more surface water is being potentially captured and used, thereby reducing surface flows in Sunshine Creek needed to dilute and move treated wastewater. Wastewater needs will extend to the two potential warming huts and expanded services at Goat's Eye Day Lodge.

The likely increase in wastewater system demand is appropriately considered against the current situation where total nitrogen concentrations in Healy Creek below the Sunshine Creek confluence are notably higher than concentrations upstream, particularly in the summer. The Healy Creek ecosystem does show some effects of elevated nitrogen levels being mildly divergent from reference conditions while still remaining in good overall condition. If nothing else changes with respect to the current treatment system technology, it would be reasonable to assume that the increase in wastewater output associated with the increase in total winter and summer visitation will result in even



higher total nitrogen levels and increased divergence from both upstream and reference conditions.

In short, increased visitation, both winter and summer, can be anticipated to result in increased water use and a reduction in surface water flows through the capture or diversion of water from the Sunshine Creek watershed or from Rock Isle Lake. At the same time, increased visitation and water use equates with increased wastewater system demand and a treatment system that is designed to release to a watercourse with consistent surface flows. Recent monitoring illustrates that the efficacy of the current treatment system is somewhat less than desired with elevated total nitrogen levels beginning to manifest in mild biological changes to Healy Creek. Maintaining even the current levels of biological divergence in light of increased water use and reduced surface flows is likely to require some reconsideration of the current wastewater system.

Reservoir Development

Site Guidelines allow for the consideration of reservoirs for capturing surface water runoff in the Gondola Corridor and in the area of a new warming hut associated with Hayes Hill terrain development. Reservoir development and operation are expected to primarily interact with surface runoff, natural flow regimes and riparian habitat.

As a water management tool, the primary purpose of a reservoir is to collect water at high flow times to ensure the provision of water at low flow times. Reservoirs may be charged during times of high flow thereby minimizing impacts of withdrawing water from sensitive watercourses at low flow times. The situation at Sunshine Village Ski Area is somewhat unique as the watercourses in question are all ephemeral in nature, and withdrawal of surface water at sensitive times in the late fall and early winter is not feasible anyway. Accordingly, the use of reservoirs at Sunshine is an overall additive effect to the collection of water through existing reservoirs above the Upper Village, as opposed to a means of offsetting potential environmental impacts, or of ensuring water during low flow times. As a result, the main consideration is for maintaining ecosystem function while removing more water overall from the surface flow and stream system on the Ski Area.

Reservoirs are generally considered to be one of two types – either an impoundment or an off-stream reservoir. An impoundment is what is usually thought of when visualizing a reservoir. An impoundment uses a dam or berm to block a natural stream channel or watercourse creating a storage catchment the size of a pond to a large lake. Important to note is that an impoundment floods a natural watercourse channel, creates a new water body and fragments stream connectivity.

In contrast, an off-stream reservoir may use a variety of in-stream structures to divert water from a natural course and store it in a reservoir such as an off-stream surface pond or tank. An off-stream reservoir does not disrupt or flood the natural stream course overall, although various modifications are often made to facilitate the diversion of water.

Either type of reservoir can be designed to maintain downstream water flows, but to facilitate downstream flows, an impoundment has to be more than simply a containment berm. The dam or berm creating the impoundment must include structures that allow



for the flow through of water at various levels. An off-stream reservoir achieves the same purpose by its very intent. In general, an off-stream reservoir system may be considered to be of less overall environmental impact with greater flexibility to adjust to varying flows, less impact to the watercourse channel, and less fragmentation of aquatic and riparian habitat.

The purpose, and therefore the size, of reservoirs considered in the Site Guidelines is quite limited. The primary purpose of new reservoirs is to provide limited snowmaking on the ski-out, and to provide potable water and limited snowmaking in the area of a warming hut at Hayes Hill if developed. Of the two uses, snowmaking is likely to be the greatest consumer of water. The intended uses put the potential reservoirs in the order of pond or even tank size for potable water purposes.

Spring runoff will be the only reliable window for water collection. The amount of water needed for the purposes of limited snowmaking and potable water likely pales in comparison to the volume of snow and water equivalent flowing from the leasehold and Alpine Bowls licence of occupation area during this runoff window. Nevertheless, either type of reservoir removes water from the system and cumulatively adds to the potential impacts of increased water use and wastewater system demand discussed in the previous subsection.

The use of reservoirs may also be seen as a buffer against the potential impacts of climate change and an overall environment featuring reduced precipitation and surface water levels. With respect to Ski Area operations, the function of reservoirs as a response to reduced water availability is primarily one of operational sustainability, ensuring that water is available for visitor use and snowmaking. There is little to no ecological gain to reservoir development in an environment of increasingly limited natural water supplies. The only exception would be a reservoir located in a location that would replace direct surface water withdrawal from Healy Creek.

In short, the primary purpose of reservoirs envisioned under the Site Guidelines is to sustain visitor operations by ensuring water for potable and limited snowmaking uses. Reservoirs have the potential to help buffer Ski Area operations to a drier environment predicted by climate change. Reservoirs may also be necessary to facilitate growth in visitor use or desirable in terms of providing alternatives to existing water sources so that those sources are not taxed beyond their limits. The amounts of water needed for the limited purposes envisioned by the Site Guidelines are likely relatively small in comparison to total availability from Ski Area watersheds, and reservoirs can be designed to allow functional seasonal flows to continue in support of key ecosystem functions. While perhaps not significant on an individual basis, the development and operation of reservoirs is appropriately viewed as a cumulative additive effect to the potential impacts of increased visitor capacity, water use and wastewater systems demand on natural flow regimes and water quality.

New Run and Terrain Development

The Site Guidelines allow for the development of new ski lifts and terrain in a few areas within the current lease boundary, including Meadow Park (discussed above), Goat's Eye II and Hayes Hill. A canyon lift to parallel the gondola and modifications to improve the width and safety of the ski-out are also contemplated in the Site Guidelines.



Overall, it is anticipated that the intensity of development in terms of the number of new runs or lifts in the Meadow Park, Goat's Eye or Hayes Hill areas will be at a low to moderate level to stay within the design capacity limits of 8,500 skiers per day. Most of the potential terrain in these areas is below the unbroken treeline. Development of lifts and ski runs will involve the removal of tree cover for cleared lift corridors and ski runs or the thinning of tree cover for the development of glades. In some cases, it may be necessary or desirable to grade uneven terrain to provide for a safer ski experience, to remove hazards or to ensure even snow coverage. Clearing of tree cover, the clearing of understory and ground cover, and the modification of terrain through grading are all associated with increased surface runoff speeds and with potential sedimentation, soil erosion and terrain instability (see also Vegetation Section 8.5).

Each of the areas under consideration terminates along a valley bottom adjacent to Sunshine Creek or to the ephemeral drainages coming from Delirium Dive and the Alpine Bowls area.

While true riparian vegetation along these watercourses is limited, removal of vegetation along stream courses has the potential to additionally increase runoff speed, reduce filtering and increase erosion in the stream course itself.

The moderate slopes and terrain in the Meadow Park, Hayes Hill and Goat's Eye II areas are not anticipated to require significant clearing of ground cover or terrain modification that could not be effectively mitigated. Modifications along the ski-out have perhaps the greatest potential to further impact surface runoff, riparian habitat and flow regimes due to the steepness of terrain and proximity to Sunshine and Healy creeks. The steep slopes in this area are likely to require removal of ground cover vegetation and significant terrain modification in order to provide a wider ski-out or linking egress runs. As a result, potential sedimentation and slope failure are much more likely through this area as has been evidenced in the past along the ski-out. Unmitigated clearing of vegetation or soils may be reasonably expected to result in increased surface runoff speeds, erosion and sedimentation directly contributing to levels of suspended solids in Healy Creek. Design and mitigation measures are available to reduce the potential for slope failure and manage erosion in this type of location.

Parking Lot Management and Expansion

The Site Guidelines include consideration for limited modification and expansion of the existing gondola base parking lot including as the main elements the potential consideration of a multi-level parking structure and the development of a limited parking terrace expansion immediately along the existing northeast edge of the current lot. Expansion and operation of existing or new parking lots is likely to interact primarily with surface and subsurface flow regimes, water quality and riparian habitat.

As discussed earlier, current parking lot issues are primarily associated with surface runoff and suspended solids that enter the Healy Creek watercourse with little or no filtration from a natural riparian buffer or artificial filtration or settling system. Stream turbidity, total nitrogen and other aquatic life parameters are in considerably worse condition below the parking lot than above the parking lot.



Development of a multi-level parking structure has significant potential to add private vehicle parking capacity to help address the current demand in parking. A parking structure similar to those found in the town of Banff or at the Banff Springs Hotel would consume current parking surface footprint but add two to three upper levels and 200–300 private vehicle spots.

In terms of potential additional impacts to Healy Creek, a well-designed parking structure has a number of potential advantages over surface parking alternatives. The structure itself would provide enhanced roofed protection from direct precipitation, snowmelt and winter abrasives over the footprint of the structure. Such a facility has the potential to be more contained. There is less snow buildup, interior runoff can be captured and filtered, and winter abrasives minimized. A parking structure can add to parking capacity with minimal contribution to the release of sediments, contaminants or litter to the Healy Creek watercourse.

In terms of existing impacts to Healy Creek, a parking terrace is likely to add to current levels of impact. While the terrace location is across the current parking lot from Healy Creek, surface runoff from the terrace, like the rest of the existing parking area, ultimately drains into Healy Creek. Development of a parking terrace unavoidably increases the exposure of gravel surfaces and winter aggregates both over the parking terrace surface and upslope in association with retaining walls, vegetation removal or backslopes required for terrain stability above the terrace. Management of surface runoff would likely require a system of settling ponds, sediment traps, oil-water separators or filters, and a way to drain the terrace to the creek without crossing the existing parking lot surface.

There is little room in the existing parking lot for the development of settling ponds or sediment traps. Nor is there room to restore a significant riparian buffer. Although these types of runoff management systems would potentially improve environmental performance, the space they would consume from existing parking capacity is likely to offset any parking gain made through terrace development.

In short, a multi-level parking structure has potential to be designed and managed in such a way as to add significant private vehicle parking capacity with minimal contribution to the release of sediments, contaminants or litter to the Healy Creek watercourse. Without significant design and management mitigations, a parking terrace can be reasonably anticipated to add to current adverse impacts to the downstream ecosystem.

The potential impacts of a parking terrace could perhaps be offset through the restoration of a 15 m riparian buffer and the development of settling ponds at key drainage locations. This type of offsetting development and restoration would enhance riparian and aquatic habitat along Healy Creek and reduce the impacts of runoff and suspended solids in the creek. While clearly an ecological gain, terrace development and riparian restoration is unlikely to result in additional parking capacity for the Ski Area.

Cumulative Interactions with Trout Habitat



Key threats to westslope cutthroat trout documented as part of the recovery plan process fall into six broad categories:

- Invasive species (especially competing fish species)
- Adverse effects on habitat
- Consumptive use/exploitation
- Stocking
- Pollution
- Climate change (The Alberta Westslope Cutthroat Trout Recovery Team 2013).

Of these key threats, adverse effects on habitat, pollution and climate change are most relevant to the scope of Ski Area use and development considered in the Site Guidelines. The Site Guidelines elements discussed above have the potential to cumulatively interact with trout habitat affecting flow volumes, water quality, and physical in-stream and riparian habitat.

As discussed previously, increased visitation is clearly associated with increased water collection and consumption for potable and snowmaking purposes. The key time for water collection on the Ski Area is during spring runoff and early summer. While bull trout spawn during the late summer when water levels are closer to base flow, westslope cutthroat trout move into spawning areas in the spring during peak flow periods. With an overall potential increase in summer visitation and service levels, reservoirs may need to be recharged in the spring, and possibly during or following summer seasons.

The contribution of Sunshine Creek to flows in Healy Creek occurs primarily in the spring. As discussed previously, the volumes of water required for potable water and limited snowmaking purposes are likely to be relatively minor in comparison to the total snow volumes and water equivalent runoff from the Ski Area environment. Water collection from the Sunshine Creek watershed obviously removes some water from the Healy system. A key aspect of maintaining aquatic system integrity will be the design and use of reservoir systems that allow seasonal flows to continue at functional levels. Potential spawning habitat for westslope cutthroat trout upstream of the Sunshine Creek confluence will remain unaffected by water collection. The reach of Healy Creek below the Sunshine Creek confluence and past the Ski Area parking lot is not considered to be suitable spawning habitat due to previous development. If reservoir systems are managed to sustain functional peak flows, Ski Area water collection is likely to have a negligible influence on conditions that support cutthroat trout spawning further downstream.

As noted above, Ski Area water collection from Sunshine Creek occurs primarily during spring runoff. The creek is dry for much of the rest of the year making water collection unfeasible. As no water flows later in the season and no water is captured from the system, Ski Area activities are unlikely to affect base level flows for spawning bull trout downstream in late summer.

As discussed previously, the cumulative impact of existing wastewater treatment systems and parking lot runoff already have adverse effects on water quality in Healy Creek downstream of the Sunshine Creek confluence, and particularly below the parking lot. Increased demand on wastewater systems, new run and terrain development, and parking expansion may all be reasonably considered to add to existing impacts. Of these,



increased sedimentation and deleterious substances from parking lot runoff is likely to be the most significant contributor, and the most difficult to manage or mitigate.

Increased levels of total suspended solids are linked to many negative environmental impacts in aquatic ecosystems. They can introduce pollutants such as heavy metals and pesticides (Woitke et. al. 2003). Suspended solids can smother macroinvertebrates and fish spawning grounds. Suspended solids can affect the physiology of fish (e.g., irritation and damage to gills, harm to fish respiration) and the behaviour of fish (e.g., loss of homing ability) leading to reduced survival rates (Bash et. al. 2001). Increased suspended solids can also have negative effects on primary productivity and zooplankton populations (Lloyd et al. 1987), and on benthic communities (Young and Mackie 1991). High concentrations of suspended solids can cause direct mortality on fish adults, juveniles and eggs (Newcomb and Jensen 1996). Typically, contaminants such as trace metals and hydrocarbons are also associated with suspended sediments, although Parks Canada does not have any data on contaminants from the base area parking lot.

Impacts of degraded water quality and suspended solids combine with degraded physical habitat conditions along the length of the parking lot. In-stream habitat conditions are impacted by channelization and bank stabilization along the length of the lot. Habitat conditions are not well suited to feeding, spawning or fish movement. Riparian vegetation does not exist along the north bank of Healy Creek through the length of the parking lot to provide shading, cover, structure or food sources for fish.

8.6.5 Mitigating Measures

Ecological Management Parameters

Ecological management parameters serve as the on-the-ground benchmarks against which the environmental impacts of future development and use proposals will be assessed. In order to realize expected ecological outcomes important to aquatic ecosystems, the following ecological management parameters have been incorporated into the Site Guidelines:

- *Development does not impair the effectiveness of natural surface and subsurface water flows and watercourse connectivity.*
- Riparian and aquatic ecosystem processes function to maintain:
 - Riparian and aquatic habitat structure important to westslope cutthroat trout, bull trout or other rare and sensitive aquatic and riparian species.
 - In-stream flows and seasonal variability in support of aquatic fish and wildlife habitat.
 - Flooding and seasonal flow patterns that maintain riparian or streamside vegetation communities.
- Downstream, chemical, physical and biological parameters of water and aquatic habitat quality are restored and maintained in good condition relative to upstream sites or in comparison with mountain park reference sites.
- Cleared snow, litter or other debris are prevented from entering stream channels and are removed on a regular basis where occurring.



Water Management and Snowmaking Strategies

Strategies for the development and sustainable use of water are an important consideration for Ski Area development and management. A Water Management and Snowmaking Strategy will be required as part of the first Long-Range Plan and will include at a minimum:

- Ensuring reliable and sustainable water supply primarily through the use of multiple small sources and storage structures.
- Minimizing the need for direct, on-demand water withdrawal from Healy Creek.
- Ensuring the ecologically sustainable use of water from Rock Isle Lake in accordance with approval from B.C. Parks and interbasin water transfer considerations as approved by Parks Canada.
- Implementing water- and energy-efficient technologies with respect to water consumption for snowmaking, potable, grey water recycling and wastewater systems.
- Focusing snowmaking coverage on high-traffic locations and routes.
- Maintaining ecological parameters for aquatic ecosystems as outlined above.

Long-Range Planning and Operational Requirements

Long-range planning requirements are identified for changes to water collection and management, wastewater systems, runoff management, and habitat conservation and restoration to ensure that expected ecological outcomes are realized.

Water Collection and Management

- Long-Range Plan water management strategies, best management practices and environmental management systems are to collectively address the maintenance of minimum in-stream flow volumes, seasonal flow patterns, and fish habitat implications of water withdrawal from Healy Creek.
- Long-Range Plans and associated water strategies will address the potential impacts of climate change on water availability and hydrologic regimes specific to Sunshine Village Ski Area, including the identification of effective in-stream flow requirements necessary for the protection of fish habitat.
- *Ongoing application of the 10/90 Rule for water withdrawal from Healy Creek will be contingent on continuous flow monitoring that shows maintenance of effective in-stream flows required for cutthroat trout and bull trout habitat.*
- The design of water reservoir systems will account for maintaining seasonal variations in stream flow that support the needs of fish and riparian communities.
- Changes to snowmaking infrastructure and terrain covered by snowmaking, consistent with the Site Guidelines, are to be brought forward as part of a Long-Range Plan.
 - Expansion of snowmaking may be considered for the primary purpose of providing adequate snow coverage to ski-ways, high-traffic areas, collector runs and snow retention trouble spots below treeline.



- Expansion of snowmaking into areas above the unbroken treeline will not be considered in order to protect important upper subalpine and alpine vegetation and habitat.
- Water reservoirs in the Sunshine Meadows area will not be considered in order to protect important upper subalpine and alpine vegetation and habitat.
- The use of snowmaking nucleating additives, if considered, will be evaluated as part of the water management strategies and environmental management system.

Wastewater Systems

- Long-Range Plans will include an evaluation of the effectiveness of current wastewater systems in meeting water and aquatic habitat quality parameters as identified by Parks Canada.
- Evaluation of the wastewater system will include the appropriateness of the current wastewater system with respect to treated wastewater release to a dry streambed, and associated implications for downstream water quality.
- Where visitor use or design capacity is to increase, Long-Range Plans will demonstrate that the current wastewater treatment technology will continue to be effective, or will propose system improvements designed to ensure ongoing effectiveness.
- Ongoing monitoring of wastewater treatment plant outputs and downstream water quality will demonstrate continued effectiveness on a seasonal basis based on chemical, biological and ecological factors.

Runoff Management

Mitigation for runoff management is directed at reducing the current levels of suspended sediments entering Healy Creek and ensuring good habitat conditions as any future development takes place.

- Long-Range Plans will include measures designed to capture and filter existing parking lot runoff entering Healy Creek so that levels of suspended sediments are consistent with upstream reference levels and the *Canadian Water Quality Guidelines for the Protection of Aquatic Life*.
- Where new parking lot capacity is proposed, plans will include measures to ensure that increased levels of suspended sediments resulting from development continue to be consistent with upstream reference levels and the *Canadian Water Quality Guidelines for the Protection of Aquatic Life*.
- The development of multi-level parking structures, if proposed, will include drainage and filter systems that minimize the transport of sediments and other polluting materials into Healy Creek.
- Clearing for new or modified lift lines, utilities, ski-out improvements and egress run development in the Gondola Corridor will be planned and designed to maintain natural runoff patterns, stream channel structure and vegetation.
 - For any vegetation clearing or modification, Long-Range Plans will include measures to identify and avoid inherently unstable slopes and to ensure the stability of any modified slopes.



Habitat Conservation and Restoration

Mitigation for habitat conservation and restoration is directed at restoring and maintaining streamside habitat conditions and ensuring compliance with the protective measures of the *Canada National Parks Act* in the immediate future, and as any future development takes place.

- Immediate, active and ongoing measures to ensure the revegetation of the existing riparian buffer along the length of Healy Creek adjacent to the parking lot is to take place following the approval of Site Guidelines prior to the long-range planning process.
- Immediate, active and ongoing measures to prevent the deposition of in-stream snow from clearing operations, and to remove litter and debris from Healy Creek before it washes downstream is to take place following the approval of Site Guidelines and prior to the long-range planning process.
- Long-Range Plans will include ongoing measures to monitor, enhance and maintain the streamside shading, cover and habitat structure provided by the parking lot buffer as a stand-alone environmental management measure or as integrated with enhanced runoff management measures as described above.

Environmental Information and Impact Analysis Requirements

- Water withdrawal, reservoir design, and wastewater system design and operation will be informed by monitoring of seasonal and ephemeral stream flows of Sunshine Creek and tributaries along with permanent flows of Healy Creek.
- Reservoir size and capacity will be based on potable water and snowmaking calculations taking into account total expansion of summer and winter visitor use and expanded snowmaking terrain coverage.
- Potential impacts on Rock Isle Lake hydrology and fish habitat associated with increased visitor use and increased frequency or volume of water drawdown will be informed by accurate metering and drawdown measurements on the lake. Impact assessment will identify and consider any implications of interbasin water transfer systems.
- Current and ongoing operations and potential development will be informed through the continued monitoring of water quality parameters, including wastewater plant outputs and in-stream chemical, physical and biological indicators, and the monitoring of runoff and turbidity.
- Healy Creek habitat restoration will be based on annual riparian assessment that includes success of revegetation efforts and ongoing improvements to shading, cover and habitat structure.
- Ski Area water management strategies will address likely and developing climate change scenarios through an adaptive management approach based on ongoing monitoring of climate trends, including precipitation, temperature, snowpack and runoff, and surface and groundwater flows, at a scale relevant to Ski Area operations.



8.6.6 Residual and Cumulative Effects

The expected ecological outcomes that apply to mitigating potential impacts to aquatic ecosystems include:

- Land use decisions concerning the Ski Area contribute positively to Parks Canada ecological integrity goals in respect of vegetation management, wildlife connectivity and habitat protection, and species at risk protection and recovery.
- Terrestrial and aquatic habitat conditions for sensitive species, such as whitebark pine, grizzly bear, mountain goat, bighorn sheep, westslope cutthroat trout and bull trout, are maintained or improved to support healthy ecosystem function.
- Water quality is improved and protected in accordance with chemical, physical and biological parameters established by Parks Canada and with consideration for the implications of interbasin water transfer.
- Vegetation is managed to reflect natural composition, diversity and pattern, and to maintain function of sensitive soil-vegetation complexes, including those supporting rare plants, wet soils and alpine plant communities.
- Leadership is demonstrated in environmental management, stewardship, monitoring and best practices. Water withdrawal and wastewater treatment systems are designed and managed to provide certainty in operations and opportunity for potential design capacity increases accounting for climate change, water resource availability and downstream water quality scenarios.

The mitigations for aquatic ecosystems are intended to maintain variability in stream flow, to maintain effective in-stream flows and water quality, and to maintain habitat conditions that support aquatic and riparian flora and fauna. Residual and cumulative impacts following mitigations are evaluated with respect to the substantial environmental gain associated with the Meadow Park area, the impacts of water capture and use on surface and subsurface flow regimes, water quality with respect to wastewater treatment and surface runoff, and riparian and aquatic habitat conditions for westslope cutthroat trout, bull trout and other aquatic wildlife.

Residual and Cumulative Impacts – Meadow Park

As discussed earlier, the Site Guidelines allow for the development of a parallel lift to the gondola, widening of the ski-out and egress runs, and the potential for a new lift and runs in the Meadow Park area below the current Meadow Park runs. From the top of the Wawa lift, skiers and boarders have for decades accessed sidecountry terrain leading down and through the Meadow Park area, and the Ski Area patrols and manages public safety in these areas.

Removing undeveloped portions of the Meadow Park area is conceptually intended to serve as an environmental gain by removing the potential for development from the west side of the Sunshine Creek valley. Some development and use, however, already exists on the west side of the valley. Accommodating pragmatic considerations for maintaining existing visitor use, and allowing for proposed development as envisioned by the Site Guidelines would require additional development and continued operational use on the west side, particularly through the Gondola Corridor up to the Goat's Eye area.

Adjusting the lease boundary area to accommodate development and operational needs as considered under the Site Guidelines would result in a reduction so small as to result



in negligible environmental gain for Sunshine Creek. It is conceivable that pulling lease boundaries in too tightly could result in greater impact to the creek valley if both new and existing infrastructure are forced into an even smaller footprint. On its own, the limited potential for runs or lifts in the Meadow Park area would have little impact to flow regimes, surface runoff or riparian habitat along the creek beyond current levels. The resulting ecological gains are unlikely to be substantial in terms of aquatic ecosystem protection.

The main cumulative effects consideration for the Meadow Park area is that new lifts are not aligned in such a way as to essentially open up new lift-serviced terrain outside of the existing Ski Area boundary. A lift alignment that would provide direct access to sidecountry areas from the top terminal, and then provide return directly from the lower egress slopes of the Meadow Park sidecountry would be opening up areas outside the current lease as lift-serviced terrain. This consideration is not particularly an aquatics issue, however, and it is discussed further in Section 8.1 on wildlife corridors.

Residual and Cumulative Impacts – Surface and Subsurface Flow Regimes

The consideration of residual and cumulative impacts to surface and subsurface flow regimes takes into account the combined potential effects of water capture and use, including the use of existing and new reservoir systems, water withdrawals from Healy Creek and Rock Isle Lake, and potential increases in visitor use over summer and winter seasons.

The assessments of cumulative residual impacts are considered with respect to the nature, frequency and duration of potential impacts, the ability to manage or mitigate potential impacts, and the ecological scale and context of potential impacts. Cumulative residual impacts are categorized as negligible, as those that are predictable and manageable, or as those associated with considerable impact, risk or uncertainty.

Valued Component: Surface and Subsurface Flow Regimes			
Project/Environment Interaction: Water capture and use			
1. Nature of Impact			
Disturbance	Disruption	Alteration	Destruction
Water capture in reservoirs from the Sunshine Creek watershed, and withdrawal from Healy Creek and Rock Isle Lake, cumulatively constitute an alteration of surface flow regimes.			
2. Frequency of Interaction			
Single occurrence	Occasional	Regular	Continuous



Primary times for water capture are during spring runoff. Occasional withdrawal from surface water sources are used to recharge reservoirs or support early-season snowmaking.			
3. Duration of Impacts			
Days or less	Weeks	Seasons	Permanent
The potential effects of water capture or withdrawal occur primarily during the period of water collection or pumping. Effects of withdrawal from Rock Isle Lake may last longer depending on seasonal recharge rates.			
4. Reversibility			
At end of project	With mitigation	Long-term restoration	Irreversible
Potential impacts can be mitigated through reservoir design that allows for effective seasonal flows to continue. Management of stream flow withdrawal through the 10/90 Rule and monitoring of total volume withdrawal from Rock Isle Lake are expected to effectively mitigate the potential impacts associated with surface water extraction.			
5. Ecological Scale			
Site specific	Local feature	Local ecosystem	Landscape
Mitigation through design and water management is anticipated to restrict impacts of water withdrawal to localized stream sections, reservoir sites or intake sites.			
6. Ecosystem Context			
Modified	Resilient	Vulnerable	At risk
Mitigation through reservoir design and water management systems allows for effective water levels and flows to continue at key times and seasons for fish, aquatic ecosystems and riparian ecosystems. While westslope cutthroat trout and bull trout are listed species at risk, fish and fish habitat parameters are unlikely to be impacted by water collection or withdrawal.			
Significance			



Negligible	Predictable and manageable	Considerable impact, risk or uncertainty
Managing surface water withdrawal through the 10/90 regime for Healy Creek, and through total water licence volumes for Rock Isle Lake, provides a consistent and predictable approach to monitoring real-time water levels and adjusting withdrawals according to fish habitat needs. The design and operation of off-stream reservoir systems is a familiar application of water management technology and is contingent on effective flow monitoring data gathered in advance of Long-Range Plan proposals. Reservoir design and operation informed by flow monitoring is anticipated to allow for ecologically effective stream flows to continue during water collection operations.		

Long-term cumulative effects of water capture and use may be most effectively summarized as the occasional, seasonal or short-term alteration of ecosystem composition with respect to seasonal surface water flow volumes and lake levels. Reservoir design and water management measures are anticipated to effectively mitigate potential impacts to overall ecosystem composition, stream habitat structure or seasonal high-water processes.

The development and operation of reservoirs and the extraction of surface waters clearly represents a change to the aquatic environment that must be planned for, actively managed, monitored and enforced. With effective design and management, potential changes to aquatic ecosystem composition, structure or seasonal processes are unlikely to impact the function of aquatic systems in terms of providing flows to sustain riparian and aquatic vegetation, and wildlife and fish habitat needs. The expected ecological outcomes for aquatic ecosystems in the Site Guidelines are expected to be achieved.

It must nevertheless be emphasized that achieving expected ecological outcomes is contingent on the actual volumes of water required seasonally to support visitor use and snowmaking operations. While it is anticipated that there is likely to be sufficient water supply for the limited use and expansion considered in the Site Guidelines, there are likely to be natural limits to water supply that will inform regulated limits to water collection and use. The conclusions here do not assume unlimited potential for the collection and use of water. Long-Range Plan project and operational designs must be based on accurate predictions of evolving water needs and on accurate flow monitoring within the Sunshine Creek watershed to ensure that systems provide sustainable and predictable water supply while still achieving expected ecological outcomes.

Residual and Cumulative Impacts – Water Quality

The consideration of residual and cumulative impacts to water quality takes into account the combined potential effects of current and future wastewater treatment systems, and surface runoff effects including those related to new run and terrain development and



those related to current and future parking lot development and operations. Chemical, physical and biological parameters of water quality in Healy Creek are the primary focus.

The assessments of cumulative residual impacts are considered with respect to the nature, frequency and duration of potential impacts, the ability to manage or mitigate potential impacts, and the ecological scale and context of potential impacts. Cumulative residual impacts are categorized as negligible, as those that are predictable and manageable, or as those associated with considerable impact, risk or uncertainty.

Valued Component: Water Quality			
Project/Environment Interaction: Wastewater treatment and surface runoff			
1. Nature of Impact			
Disturbance	Disruption	Alteration	Destruction
Overall water quality monitoring illustrates that sites downstream of the Healy-Sunshine confluence are mildly affected by Ski Area wastewater outputs while sites downstream of the parking lot show substantial alteration from upstream reference sites in chemical, physical and biological water quality parameters and indicators.			
2. Frequency of Interaction			
Single occurrence	Occasional	Regular	Continuous
Water quality measures both upstream and downstream of the parking lot fluctuate on a daily to seasonal basis depending on surface runoff and seasonal flows patterns. Sites downstream of the parking lot are regularly impacted in terms of turbidity and show biological signs reflecting continuous levels of impact.			
3. Duration of Impacts			
Days or less	Weeks	Seasons	Permanent
The frequency of current interactions has resulted in measurable impacts that can essentially be considered permanent in the absence of improved parking lot runoff treatment measures.			
4. Reversibility			
At end of project	With mitigation	Long-term restoration	Irreversible



It is anticipated that any deficiencies in wastewater treatment outputs or release can be readily corrected with appropriate system upgrades or technologies. Systems and technologies also exist for managing parking lot runoff; however, these are expected to require significant amounts of land space for settling or filtration systems, or for the re-establishment of effective riparian buffers.			
5. Ecological Scale			
Site specific	Local feature	Local ecosystem	Landscape
Water quality impacts below the parking lot extend downstream on Healy Creek for an unknown distance but are unlikely to result in discernable ecological effects beyond the Healy-Brewster watershed.			
6. Ecosystem Context			
Modified	Resilient	Vulnerable	At risk
Both westslope cutthroat trout and bull trout inhabit the Healy-Brewster watershed downstream of the parking lot. Of the two species, bull trout are the most common and most likely to be impacted by poor water quality parameters – perhaps particularly by potential periods of high turbidity during spawning season. Cutthroat trout inhabiting reaches of Healy Creek above the parking lot are unlikely to be affected by degraded water quality. Reaches along and immediately below the parking lot are unlikely to serve as good-quality habitat as a result of physical habitat and water quality degradation. While either fish species may be vulnerable to potential Ski Area activities, it is not expected that Ski Area activities would put the continued persistence of either species in Healy Creek further at risk.			
Significance			
Negligible	Predictable and manageable	Considerable impact, risk or uncertainty	
The scale of the existing lot and the potential for even the limited terrace expansion envisioned in the Site Guidelines create lack of additional usable space required for known and effective runoff mitigations, such as settling ponds, bioswales or sediment filters. There may be some potential for underground stormwater solutions that would address some or all of the parking lot runoff; however, feasibility of these solutions for this parking lot size or location is not known. The uncertainty surrounding the potential for effective mitigation raises the risk of impact from both			



current and future parking lot operations to a level that is likely to further adversely alter habitat conditions for vulnerable fish species.

The long-term cumulative effects of wastewater treatment and surface runoff may be most effectively summarized as a regular, long-term alteration of habitat conditions for vulnerable, federally protected fish species at the scale of the local ecosystem. By far, most of the potential impact to water quality appears to be associated with surface runoff impacts from the existing parking lot. A key management challenge and uncertainty is that there is little space for the mitigation of current water quality impacts from the existing parking lot, let alone for parking lot expansion.

Chemical, physical and biological measures of water quality illustrate that parking lot runoff is having impacts on ecosystem composition (e.g., nitrogen), structure (e.g., suspended sediments) and function (e.g., algae growth, invertebrate populations). Without significant mitigation of current levels of impact, it is unlikely that either the ecological management parameters or the expected ecological outcomes of the Site Guidelines could be attained. Parking lot expansion is likely to incrementally increase current and future impacts while reducing potential space for mitigation measures or restoration of riparian buffers.

Residual and Cumulative Impacts – Riparian and Aquatic Habitat

The consideration of residual and cumulative impacts to riparian and aquatic habitat takes into account the combined potential effects of current and future parking lot development and use. Cumulative impacts to Healy Creek are the primary focus.

The assessments of cumulative residual impacts are considered with respect to the nature, frequency and duration of potential impacts, the ability to manage or mitigate potential impacts, and the ecological scale and context of potential impacts. Cumulative residual impacts are categorized as negligible, as those that are predictable and manageable, or as those associated with considerable impact, risk or uncertainty.

Valued Component: Riparian and Aquatic Habitat			
Project/Environment Interaction: Parking lot development and use; Run and terrain development			
1. Nature of Impact			
Disturbance	Disruption	Alteration	Destruction



<p>Parking lot development over time has resulted in the total destruction and modification of aquatic and riparian habitat along the north bank of Healy Creek for a continuous distance of approximately 1,200 m.</p>			
2. Frequency of Interaction			
Single occurrence	Infrequent	Regular	Continuous
<p>Interactions with habitat factors such as shading, cover, water temperature and habitat structure are continuous. The introduction of snow, litter and other debris is more seasonal but may be considered reasonably continuous over time.</p>			
3. Duration of Impacts			
Days or less	Weeks	Seasons	Permanent
<p>Past efforts to ensure the restoration of a vegetated and effective riparian buffer have been unsuccessful. The north bank of Healy Creek was destroyed during initial parking lot construction, and planned riparian berms and buffers were never developed. The 2013 flood exposed the remainder of the north bank to the parking lot removing what was left of vegetation cover. Impacts are essentially permanent.</p>			
4. Reversibility			
At end of project	With mitigation	Long-term restoration	Irreversible
<p>Impacts to riparian and aquatic habitat structure may only be reversed with long-term restoration effort. The degree of potential reversibility is directly linked to the width of riparian buffer and the density of vegetation cover between the parking lot and stream.</p>			
5. Ecological Scale			
Site specific	Local feature	Local ecosystem	Landscape
<p>With the exception of potential downstream temperature changes and increased suspended sediment, impacts to habitat structure are limited to the reach of the creek adjacent to the parking lot area. There is limited potential to affect upstream/downstream aquatic habitat connectivity as the downstream waterfall provides an existing impassible barrier for fish. Riparian habitat</p>			



connectivity for terrestrial wildlife is functionally destroyed on both sides of the creek bank as the south bank is completely exposed to the parking lot.			
6. Ecosystem Context			
Modified	Resilient	Vulnerable	At risk
Existing levels of habitat alteration from stream confinement and channelization, and from destruction associated with parking lot development effectively render the lower section of Healy Creek along and below the parking lot to the waterfall as unusable for westslope cutthroat trout or other fish species. Riparian habitat is important for many wildlife species, and while some animals may move across or around short disturbances, a stretch of over a kilometre may be considered unusable and impassible for many species.			
Significance			
Negligible	Predictable and manageable	Considerable impact, risk or uncertainty	
The destruction of over a continuous kilometre of streambed, bank and riparian habitat, and the alteration of habitat conditions on both sides of Healy Creek can only be reasonably considered to constitute a considerable environmental impact. The ongoing introduction of foreign materials into the creek adds to the impact of habitat destruction. The failure to establish even a minimal vegetated riparian berm and buffer since parking lot development almost 40 years ago creates a level of uncertainty that potential mitigations can or will be carried out effectively.			

The long-term cumulative effects of parking lot development and use on riparian and aquatic habitat may be most effectively summarized as the permanent destruction of habitat composition, structure and function over a continuous reach of over 1 km. Without significant restoration effort well beyond that of the last 40 years, the impacts can be considered essentially permanent. The degree of potential restoration possible is directly related to the width and degree of vegetation cover associated with a riparian berm and buffer.

Similar to the issues with surface water runoff from the parking lot, there is little room to restore a functional riparian buffer and to maintain, let alone increase, potential parking capacity. Without some level of riparian buffer restoration, combined with surface runoff mitigations as discussed previously, it is unlikely that the ecological management parameters or the expected ecological outcomes of the Site Guidelines could be attained.



Summary of Residual and Cumulative Effects on Aquatic Ecosystems

Strategic-level concerns with respect to managing Ski Area use and development for effective flow regimes or for wastewater system effectiveness are largely addressed through the application of ecological management parameters, long-range planning requirements, and environmental information and assessment requirements as outlined in the mitigation sections.

With respect to flow regimes, the Site Guidelines define a scope and scale of potential water collection use and development that is appropriate to limitations of the environment. Past and current monitoring has identified key issues with respect to wastewater systems output and impacts to Healy Creek water quality at the confluence with Sunshine Creek.

Both design knowledge and technology exist to deal with the potential issues of either water use or wastewater treatment. Site Guidelines conditions, along with long-range planning and environmental assessment requirements of this strategic environmental assessment, identify key issues and information requirements that must be addressed as Long-Range Plan proposals are brought forward. It is anticipated that the expected ecological outcomes of the Site Guidelines for downstream water quality, sensitive trout species and resource availability will all be attained with the application of Site Guidelines and mitigations for water use and wastewater treatment.

The primary factor influencing aquatic ecosystems in both the current and future scenarios is development and use of the parking lot. The narrow confines of the valley, the extent of current development, the past destruction of riparian habitat to the stream edge, and modification of stream banks mean there is little to no room for parking expansion, and little to no room for restoration or mitigation of impacts to surface runoff quality, riparian or aquatic habitat. There is currently not even room for a sufficient stream buffer for environmental protection purposes to ameliorate the impacts of snow clearing, litter, and debris directly entering Healy Creek.

Without space to restore or mitigate current environmental impacts, it is difficult to rationalize the ability to mitigate impacts of expanded parking, or even of intensified visitor use of the current parking lot. While the terraced parking concept in the Site Guidelines will not impact Healy Creek directly, it will increase the amount of disturbed ground and can only be seen to add to current levels of adverse impact. The restoration of densely vegetated riparian buffers of some substantial width, in combination with systems to reduce the impacts of surface runoff – particularly suspended sediments – is required simply to deal with existing impacts to downstream water quality, riparian and aquatic habitat, and fish habitat for westslope cutthroat trout and bull trout.

There seems, however, to be no simple way to accomplish these purposes without sacrificing existing parking footprint. At very least, parking lot expansion must be offset with improvements to water quality of runoff and habitat restoration just to maintain current conditions. At best, some of the impacts to Healy Creek could be offset by developing terraced parking away from the creek and restoring riparian buffer along the existing creek. Other terrain and wildlife issues are associated with terraced parking and are addressed in other sections on vegetation and wildlife corridors. A well-designed and well-managed parking structure could possibly be an ecologically neutral way to expand



parking within a contained footprint, with reduced surface runoff, and with the ability to capture and filter runoff and contaminants before release to the creek.

The proposed removal of Meadow Park from the lease provides little to no tangible gain with respect to impacts from the parking lot and does not serve in any tangible way as an offset for additional parking development.

It is unlikely that the ecological management parameters or outcomes associated with surface runoff water quality, riparian habitat, and habitat quality for westslope cutthroat trout and bull trout can be attained within the current scope of the Site Guidelines. Riparian and aquatic habitat connectivity, habitat structure for vulnerable and sensitive species, water quality, litter and debris are all likely to be adversely impacted by surface parking expansion or intensification of use in the current base area. While a parking structure may be designed to have a neutral impact on surface runoff quality, any expansion in surface parking, such as the proposed terrace concept, would have to be offset by lands for surface water mitigation and/or riparian restoration simply to maintain current levels of impact. From an aquatic ecosystem perspective, the latter approach could result in improved ecological conditions and should likely be considered in the Site Guidelines from an environmental management perspective. But such an approach is unlikely to result in an increase in parking capacity.

Solutions to the parking capacity problem may possibly be addressed through some level of riparian restoration and through innovative stormwater management solutions using modern technologies such as buried oil grit separators and filter beds. Without these types of solutions, there appears to be no tangible way to increase the surface parking capacity of the current base area parking lot without cumulatively increasing the impacts on the aquatic environment.

9 IMPACT ASSESSMENT – VISITOR EXPERIENCE

The assessment of valued components of visitor experience focuses on potential changes to both the built and natural environments, and on changing patterns of visitor use. Key elements of the Site Guidelines are considered with respect to:

- Safe, comfortable and enjoyable visitor experience
- Visitor education
- Viewscapes and visitor perceptions
- Wilderness character

9.1 VISITOR SAFETY, COMFORT AND ENJOYMENT

As an overall package intended to enhance the skiing and snowboarding experience, the potential development options that can be considered under the Site Guidelines are intended to provide:

- High-quality beginner, intermediate and challenging terrain options in all weather and visibility conditions



- Facilitated skier egress from the Upper Village and ski-out areas
- Managed sidecountry experiences to respond to identified target markets
- Balanced day lodge facilities and other services that meet industry standards
- Enhanced parking capacity, and reduced traffic congestion and foot distance from lifts

There are no published standards for ski terrain design, but Ski Area planners use common rules of thumb for run mix and terrain design that are intended to account for visitor comfort, aesthetics, skill levels, safety and general environmental concerns. Designers for modern ski areas typically plan so that a 35:65 ratio is maintained between cleared areas for ski runs and natural forest cover. As part of this approach, Ski Area designers typically design ski runs to fall within a 30–50 m width range depending on the desired level of skiing experience. Cleared runs are then typically spaced so that the distance between runs meets or exceeds the typical 30–50 m width of adjoining ski runs. This approach facilitates the needs of a variety of skier skill levels, maintains a comfortable aesthetic experience, maximizes snow retention, and reduces the potential for windthrow. Key areas that may be brought forward for new run development include Goat's Eye II, Hayes Hill and Meadow Park. New development in these areas may be expected to enhance the balance and variety of beginner to challenging terrain and to provide more sheltered alternatives to the Sunshine Meadows during poor weather and visibility days.

Improvements to existing skier egress and ski-out areas will improve narrow ski traverses and facilitate exit from the Upper Village to the Bourgeau base area. These developments may act to reduce overall congestion and enhance safety in existing terrain.

“Out-of-bounds” skiing has always been part of Ski Area management. However, recent advances in ski equipment have made ungroomed, natural terrain more attractive and accessible to a greater range of skiers. At the time of writing, the sidecountry and backcountry skier and snowboarder is the fastest growing segment of the equipment industry. Two of the biggest challenges for Ski Area and surrounding land managers with respect to sidecountry visitor safety are avalanche hazard and lost skiers. With respect to the managed sidecountry concept for the Alpine Bowls, the Site Guidelines emphasize a focus on skier and boarder avalanche education and on equipping properly for sidecountry terrain. Egress trails and signage are anticipated to capture most skiers and direct them back to the Ski Area. Avalanche control operations managed under a licence of occupation will continue to make the Alpine Bowls area safe for skiers while protecting Ski Area assets and visitors within the leasehold below. The elements of the Site Guidelines facilitate a safer and more enjoyable sidecountry experience while reducing avalanche risk and the potential for lost skiers.

Industry design standards are also incorporated into calculations for ski lift, food services and other commercial services capacity. The key purpose of industry standards is to provide enough space to prevent crowding and to prevent extended wait times for Ski Area customers based on the fifth- or tenth-busiest day of the season. The growth limits for commercial space and lift capacity established in the Site Guidelines are expected to accommodate Ski Area growth as well as maintain commercial space capacity near the upper limit of the industry standard to address crowding at day lodge



facilities in the Upper Village and the lack of a day lodge to serve the Goat's Eye area. The increase in commercial space with increased capacity can be expected to provide a more comfortable and enjoyable experience for skiers during peak holiday and weekend periods.

The Site Guidelines allow for the Sunshine Village Ski Area to consider a number of options intended to address parking challenges and to provide comfortable access to the gondola base in accordance with industry standards. These options include:

- Modifications to the existing parking lot, through the development of a multi-level parking structure, or terraced parking, or both
- Increased mass transit
- Potential people movers or lifts accessing the far end of the existing parking lot

These types of adjustments are a required component of the Long-Range Plan and may be expected to result in immediate improvements to visitor pedestrian safety, reductions in traffic congestion, and a more enjoyable experience.

The Site Guidelines proposals for ski terrain, commercial space growth limits and other resort balancing parameters for the Sunshine Village Ski Area are based on reasonable industry standards that are intended to ensure a comfortable, safe and enjoyable ski experience. It should also be noted that the design parameters for ski run width, distance between runs and developed/undeveloped terrain are less than, or similar to, the parameters required to maintain aquatic and vegetation integrity as well as wildlife habitat structure and wildlife movement as discussed previously. Options to improve parking within the existing base area will be designed to avoid impacts on the Upper Healy Wildlife Corridor effectiveness. Opportunities to enhance the skier experience will take place alongside environmental protection of aquatic, vegetation and wildlife components.

9.2 VISITOR EDUCATION

The Site Guidelines include direction on visitor educational and national park experience that supplements the ski experience and reinforces national park messages and management objectives consistent with existing park management direction. The Site Guidelines create expectations in the Long-Range Plan, and in the development of best management practices, for managing views, noise, external lighting, signage, advertisement and special events, for developing a heritage tourism and winter education strategy, and for encouraging a consistent architectural theme. These expectations are consistent with those required of communities and outlying commercial accommodations, and they will be fully evaluated as part of the long-range planning process.

Two aspects of the Site Guidelines offer potential opportunities for new and enhanced visitor education:

- Alpine Bowls sidecountry
- Summer-use program in the Sunshine Meadows and Upper Village



The formalization of managed sidecountry skiing in the Alpine Bowls under the licence of occupation will help to enhance visitor education, particularly with respect to mountain safety awareness. Fencing and signage provide opportunity for both notification and messaging to skiers about avalanche awareness, equipping for backcountry conditions, and other hazards and considerations. The inclusion of this area under a licence of occupation provides additional opportunities for educational programs focused on avalanche awareness and safe travel.

Enhancing the summer-use program in the Sunshine Meadows by improving access to the surrounding remote areas through improved trails and facilities, and through potential operation of the Standish lift, will provide similar opportunities to the existing program. The Sunshine Meadows offer unique opportunities for high-elevation hiking, interpretation and educational programming. Use of the Upper Village for overnight summer guests provides further opportunities for interpretation and educational programming, intended to connect visitors to Banff National Park.

Aside from the enhanced opportunities discussed above, visitor education in all seasons is an important component of gaining visitor co-operation and contribution towards achieving Ski Area ecological management parameters. The following educational objectives should be addressed in the visitor education program brought forward as part of the long-range planning process:

- Visitors are encouraged to follow practices that minimize grizzly bear disturbance and habituation, and that protect whitebark pine.
- Visitors are made aware of the sensitivities of westslope cutthroat trout and other sensitive species as they arise.
- Visitors support Ski Area environmental management initiatives such as water and energy conservation.
- Visitors connect with and support larger park management initiatives such as aquatic and wildlife habitat and wildlife corridor protection and enhancement.

9.3 VIEWSCAPES AND VISITOR PERCEPTIONS

Four primary strategic considerations are identified with respect to viewscales and visitor perceptions:

- New runs, glades and lift structures in the Goat's Eye II, Hayes Hill and Meadow Park areas and the Gondola Corridor
- Ski-way modifications including the Goat's Eye and Angel ski-ways
- Great Divide warming hut
- Potential development of a multi-level parking structure and terrace

Potential ski run development will involve clearing of new areas. These development features may be visible from within the Sunshine Village Ski Area and from the summer trail on Wawa Ridge. Existing ski runs are currently visible from Wawa Ridge.

Run development and vegetation management are dealt with in the Site Guidelines through ecological management parameters, general guidelines, and specific guidelines and conditions that apply to the Goat's Eye II, Hayes Hill and Meadow Park areas, and the Gondola Corridor. Overall, the Site Guidelines address potential visual and aesthetic



impacts with a focus on maintaining consistency with natural landscape patterns. Glading plans brought forward as part of a Long-Range Plan in these same areas are to mimic natural patterns that may be found in the natural landscape. It is anticipated that these guidelines and conditions will result in a vegetation pattern that falls within natural parameters and that also falls within ecological parameters for wildlife habitat and movement.

Ski-way modifications to Angel Traverse or Goat's Eye Traverse as considered in the Site Guidelines are designed to avoid major terrain modifications and especially the use of irreversible, linear, cut and fill development techniques. Although details will only come forward as part of Long-Range Plan designs, it is anticipated that design and construction approaches will be available that blend ski-way improvements into the natural landscape and avoid impacts that are visibly inconsistent with natural features.

The potential for a warming hut in the Great Divide area is expected to have limited potential for visual impact beyond the scope of the current building. The Site Guidelines require that a replacement building be contained on the existing footprint, and the definition of warming hut precludes the development of a larger structure.

The development of a multi-level parking structure may be the largest built structure within the base area. If built, it will have variable visual impact based on design and placement.

Runs, glades and structures have the potential to result in the visual and aesthetic interruption of natural mountain ridgelines from long distances. The Site Guidelines address visual considerations. The guidelines are intended to ensure that:

- Infrastructure provides convenient, comfortable and safe experiences for visitors while maintaining design character that blends into and connects visitors to the natural environment and reflects local mountain tradition, culture and design.
- Ski-way improvements are to blend into the lines and landscape of the surrounding area.
- Buildings are located and designed as to be visually unobtrusive from key perspectives outside of the Ski Area.
- Buildings and lift structures are designed and located to be low profile and to minimize or avoid clearing requirements.

9.4 WILDERNESS CHARACTER

The *Canada National Parks Act* (CNPA) permits the Governor in Council, by regulation, to identify any area of a park that exists in a natural state to be declared a wilderness area (CNPA 2000, 14 (1)). Once declared, the Minister may not authorize any activity to be carried on in a wilderness area that is likely to impair the wilderness character of the area (CNPA 2000, 14 (2)).

Large areas of Banff National Park have been declared as wilderness under the *Canada National Parks Act*, and the Sunshine Village Ski Area is surrounded by wilderness on all sides except for the portion connecting the Ski Area to the Trans-Canada Highway. New development within the Ski Area is not anticipated to result in substantially different impairments to surrounding wilderness areas. No new areas will be uniquely visible from



surrounding areas. Development within the Alpine Bowls will be limited and is not anticipated to impact the wilderness character of surrounding areas. Egress from the Alpine Bowls will be limited and will funnel skiers to existing developed areas of Goat's Eye.

9.5 VISITOR USE IMPACT SUMMARY

The assessment of valued components of visitor experience focuses on potential changes to both the built and natural environments, and on changing patterns of visitor use. Desired visitor experience outcomes and priorities of the Site Guidelines in support of the *Ski Area Management Guidelines* include:

- Develop and maintain authentic mountain national park experiences for visitors in all seasons at the Ski Area that focus on the natural features of the area, particularly the abundance of natural snow and terrain variety for snow sports, and the scenery and natural environment of Sunshine Meadows.
- Ensure a balance of Ski Area components in order to minimize congestion and crowding and maximize memorable visitor experience and connection.
- Strengthen the connection of Ski Area winter and summer visitors to Banff National Park and the World Heritage Site through enhanced heritage interpretation, learning opportunities and experiential opportunities about notable ecological aspects of the Ski Area.
- Maintain and, where feasible, restore visual and natural viewsapes and minimize other sensory disturbance, such as noise and vehicle traffic, for on-mountain and off-mountain visitors.
- In addition to the summer commercial visitor program, maintain convenient, facilitated public visitor access for hikers and skiers through the Ski Area to remote destinations including Mount Assiniboine Provincial Park in B.C., and Simpson and Healy passes in Banff National Park.

Key elements of the Site Guidelines were considered with respect to:

- Safe, comfortable and enjoyable visitor experience
- Visitor education
- Viewsapes and visitor perceptions
- Wilderness character

The elements of the Site Guidelines provide a range of expanded ski/snowboard opportunities that respond to imbalances in current ski terrain during poor weather and visibility days and to the needs of growing sidecountry and backcountry markets. These terrain adjustments are anticipated to enhance and balance the snow riding experience, to reduce congestion and to enhance safety. The inclusion of the Alpine Bowls provides managed opportunities for sidecountry riders. The enhanced winter opportunities envisioned by the Site Guidelines are focused on authentic mountain skiing and snowboarding experiences consistent with the tradition and nature of the mountain park environment.

The enhancements to the summer-use program offer opportunities for heritage interpretation and learning in the spectacular environment of Sunshine Meadows or in



the comfort of the Upper Village. The focus on high-elevation hiking and educational programming responds to the desired visitor experience outcomes of enhancing educational opportunities and of maximizing memorable experience and connection to Banff National Park and the World Heritage Site. Visitor activities on the upper mountain, such as hiking, sightseeing and heritage interpretation, are consistent with the tradition and nature of the mountain national park environment.

The Site Guidelines contain considerable measures aimed at minimizing the visual and sensory impacts of potential Ski Area development and use. It is expected that ski run, lift and facility development that occurs within the current Developed Area and lease, and that adheres to the measures in the Site Guidelines will not result in substantial changes to the ways that visitors experience and perceive the visual and sensory characteristics of the developed Ski Area and the wilderness character of surrounding areas.

10 IMPACT ASSESSMENT – INFRASTRUCTURE CAPACITY

Valued components for the evaluation of potential impacts to regional infrastructure capacity directly reflect the expected outcomes of the Management Guidelines outlined earlier in Section 4.7. The expected outcome related to infrastructure capacity is that sufficient capacity and environmental standards are met before growth can take place.

10.1 ROAD AND TRANSPORTATION SYSTEM CAPACITY, INCLUDING PARKING

The following discussion does not include the potential impacts of roads and associated traffic on wildlife or habitat connectivity. Wildlife issues have been fully addressed in previous sections of the strategic environmental assessment and are not considered further here. In particular, impacts to the Upper Healy Wildlife Corridor are addressed in Section 8.1. As a result, this section of the strategic environmental assessment focuses on the capacity of roads to handle current and potential increases in visitor use.

The Trans-Canada Highway and Sunshine Village access road were each considered with respect to potential impacts to driver safety and comfort. The potential for increased Ski Area traffic to trigger the need for upgraded or enhanced roadways was also considered.

Past and recent enhancements to the Trans-Canada Highway have considered the impacts of summer and winter traffic and taken into account potential increases in use from all sources. As the potential issues with the twinning of the highway have been previously considered, there is little potential for adverse impacts to driver safety and comfort, or little potential to trigger road upgrades or enhancements on the Trans-Canada Highway in order to handle increased Ski Area traffic.

Access to the Ski Area from the Trans-Canada Highway, the Bow Valley Parkway or from the town of Banff is by the Sunshine access road. The Sunshine access road is a two-lane scenic roadway considered to be a Class 2 road in accordance with the *Highway Capacity Manual* where the level of service is such that motorists do not expect to travel



at high speeds. The Site Guidelines stipulate that the Sunshine access road will provide sole visitor motor vehicle access to the Ski Area in winter and summer seasons. This roadway has provided an appropriate level of service for skiers and other visitors to the Ski Area for many years, and the capacity of this road is anticipated to meet foreseeable growth in visitation.

Parking lot capacity is a priority issue for the Ski Area that will need to be addressed prior to future growth of the ski hill. The Site Guidelines include the consideration of a parking terrace along the north edge of the existing lot and development of one or more multi-level parking structures in concert with a mass transit strategy and other demand management strategies as key for addressing current parking capacity shortfalls and anticipated increases in visitor use. Parking reconfiguration and structures to increase capacity are intended to improve visitor experience and to reduce potential congestion within the Bourgeau base area parking lot and along the Sunshine access road. As part of the first Long-Range Plan proposal, a Parking and Transportation Strategy will be required, consistent with the measures outlined in the Site Guidelines.

10.2 WATER SUPPLY AND DEMAND AND DOWNSTREAM WATER QUALITY

The Site Guidelines require that infrastructure capacity be in place prior to any on-hill visitor use capacity expansion or additional facilities. Potential issues related to wastewater and domestic water capacity will be addressed fully in Long-Range Plans that involve specific proposals for visitor use expansion. Environmental issues related to water quality, fish and fish habitat, and hydrology have been assessed in previous sections of the strategic environmental assessment. As a result, this section focuses on the capacity of existing systems to meet requirements of the Ski Area.

Wastewater at the Ski Area is currently captured and treated in the Upper Village sewage treatment facility, which uses an extended aeration system (Eccles and Strom 1994). The Site Guidelines allow for consideration of numerous additional facilities, including warming huts, washrooms and the Goat's Eye Day Lodge, that will need to develop self-contained sewage treatment or to include development of additional facilities that will ensure compliance with the Environmental Stewardship Leadership Targets in the *Banff National Park Management Plan* (2010). Long-Range Plans will include analysis of wastewater capacities and treatment effectiveness in comparison to anticipated increases in Ski Area water use and wastewater treatment requirements as part of the required water management strategies.

Water withdrawal occurs from an on-site reservoir in the Upper Village for domestic use, which is augmented by seasonal on-demand withdrawals from Rock Isle Lake. On-demand withdrawals from Sunshine Creek also occur for snowmaking. Historical withdrawals from Rock Isle Lake in excess of permitted values have been reported (see Eccles and Strom 1994), indicating potential seasonal and yearly water deficiencies. The Site Guidelines allow for consideration of a small reservoir within the Gondola Corridor to minimize withdrawals directly from Healy Creek and to provide better coverage for snowmaking along the ski-out areas. An additional small reservoir to service a future Goat's Eye Day Lodge and warming hut may also be considered. Demonstration of sufficient water sources and wastewater treatment capacity will be required as part of the



Long-Range Plan and a Water Management and Snowmaking Strategy. As specified in the Site Guidelines, proposed changes to water withdrawal limits and water management systems will require detailed professional analysis and independent peer review.

10.3 ELECTRICAL SUPPLY AND DEMAND

The *Ski Area Management Guidelines* indicate that electrical capacity increase can be considered but qualify this by requiring that “infrastructure must have sufficient capacity and meet environmental standards before Ski Area growth can take place”. The principal electrical power supply serving the Ski Area is the provincial power grid.

Significant additional electrical power need at the Ski Area is not anticipated with the addition of lifts and the expansion of visitor facilities as envisioned in the draft Site Guidelines. The capacity of the regional power grid that supplies Banff National Park is 40 MW, and current peak load from all sources in winter is 14 MW (email from B. Jones, Altalink Senior Environmental Coordinator to A. Kolesch, Manager, Land Use, Policy & Planning, January 21, 2015). The remaining 26 MW is expected to be well in excess of projected needs for the Banff National Park ski areas, communities and outlying commercial developments. Increased energy efficiency and conservation measures may also be reasonably expected to offset potential increased demand.

The Site Guidelines also require an Environmental Management and Monitoring Strategy, to be submitted as part of Long-Range Plans, which includes considerations for energy conservation and fossil fuel emissions.

Outcomes related to electrical supply and demand can be realized through the application of the Site Guidelines and the development of an environmental management strategy identified above. If additional power is required on-hill, alternative energy technologies such as clean power, green design or retrofitting of existing facilities, micro hydro or other minimal impact technologies may be considered as alternatives to local and regional utilities expansion.

10.4 VISITOR AND STAFF ACCOMMODATION CAPACITY

Ski Area employee housing is available in three on-site accommodation buildings with additional employees residing in surrounding communities, including Banff and Canmore. Growth and increased capacity of the Ski Area is likely to result in the need for additional staff and demand for staff housing. The *Ski Area Management Guidelines* (2006) require additional employee accommodation required as a result of potential growth and expansion of the Ski Area to be located in nearby communities.

The Banff and Lake Louise community plans and the outlying commercial accommodation (OCA) guidelines address local infrastructure capacity growth limits in relation to residential, seasonal and visitor accommodation. The need for additional staff as a result of Ski Area development will require careful consideration in relation to the current staff housing capacity of the community of Banff.

Visitor accommodation is currently provided in the Upper Village at the Ski Area, in the communities of Lake Louise and Banff, at OCAs and in the town Canmore outside the



Banff National Park east gate. Significant visitation to the Sunshine Village Ski Area is in the form of day skiers originating from Calgary and other nearby Alberta communities.

The need for additional visitor accommodation along the Canmore, Banff and Lake Louise corridor as a result of development and use at the Ski Area is not anticipated, although visitor accommodations in the communities of Banff and Lake Louise and in OCAs may reach occupancy capacity. The Long-Range Plan will need to demonstrate that growth at the Ski Area respects the existing growth limits established for the in-park communities and OCAs. Summer use as outlined in the Site Guidelines is not likely to result in the need for additional visitor accommodation.

Expected outcomes related to visitor and staff accommodation capacity can be realized through the application of the Site Guidelines as discussed above. Increased accommodation demand related to Ski Area growth will remain within the established infrastructure and environmental capacity defined in the Banff and the Lake Louise community plans, and in OCA guidelines.

10.5 ENVIRONMENTAL MANAGEMENT

To demonstrate leadership in environmental management, stewardship and best practices required by the Site Guidelines, an Environmental Management and Monitoring Strategy will be required. This strategy will include a process of ongoing monitoring and evaluation to improve environmental performance and reduce environmental impacts associated with Ski Area operations and activities. *Sustainable Slopes: The Environmental Charter for Ski Areas* (USA National Ski Areas Association) will form the basis of the strategy. The strategy will be brought forward as part of each Long-Range Plan and will address issues related to energy conservation, emissions and greenhouse gases, wastewater management, water conservation and quality, solid waste management and reduction, and integrated approaches to pests and invasive species. The strategy will help to ensure ongoing monitoring that will support adaptive management activities and continual environmental improvement and conservation. The incorporation of sustainable design principles and products into Ski Area development plans is intended to ensure resource use efficiency and conservation. The implementation of an Environmental Management and Monitoring Strategy is intended to ensure that Ski Area operational impacts are within accepted or agreed-upon environmental parameters and standards.

10.6 INFRASTRUCTURE CAPACITY IMPACT SUMMARY

Expected infrastructure capacity outcomes as outlined in Section 4.7 can be realized through application of the Site Guidelines and mitigations in this strategic environmental assessment. The strategies and mitigations outlined in the Site Guidelines and the strategic environmental assessment are intended to ensure that Ski Area resource use falls within existing infrastructure capacity. Where additional capacity is required, the mitigations are intended to ensure that the Sunshine Village Ski Area plans for additional capacity prior to any expansion and to ensure that resource use falls within existing environmental capacity.

The incorporation of sustainable design principles and products into Ski Area development plans is intended to ensure resource use efficiency and conservation. The



implementation of an environmental management system is intended to ensure that Ski Area operational impacts are within accepted or agreed-upon environmental parameters and standards.

11 FOLLOW-UP

A suite of planning, assessment and information requirements is identified throughout the strategic environmental assessment in relation to the development and assessment of Long-Range Plans. The most important of these are:

- Application of engineering, geotechnical, wildlife management and landscape design expertise in the design of potential parking terrace proposals (Section 8.1.3).
- Development of a summer-use carrying capacity to address the protection of Sunshine Meadows alpine environment, grizzly bear habitat use and disturbance thresholds, and wildlife corridor effectiveness (Sections 8.1.3, 8.2.3).
- Assessment of mountain goat habitat, seasonal habitat use, and potential sensitivities on Mount Bourgeau and other surrounding peaks, and in the parking lot area (Section 8.3.3).
- Development of an ongoing whitebark pine monitoring and site assessment program (see Section 8.5.3).
- Adaptive management of water use and water resources based on seasonal and ephemeral flow monitoring, and in response to changing environmental conditions (Section 8.6.5).
- Continued monitoring of water quality parameters including wastewater plant outputs and in-stream chemical, physical and biological indicators, and monitoring of runoff and turbidity (Section 8.6.5).
- Healy Creek habitat restoration based on annual riparian assessment that includes success of revegetation efforts and ongoing improvements to shading, cover and habitat structure.
- Developing climate change scenarios through an adaptive management approach based on ongoing monitoring of climate trends, including precipitation, temperature, snowpack and runoff, and surface and groundwater flows, at a scale relevant to Ski Area operations (Section 8.6.5).

Information from follow-up actions will be factored into subsequent stages of planning and used to identify and evaluate potential development options to be included in Long-Range Plans. The environmental assessment process will use the information gathered to build on the strategic environmental assessment, confirming or altering the conclusions as appropriate. The development of best management practices and the implementation of an environmental management system will also be important elements of future long-range planning and environmental assessment processes.

12 SUMMARY AND CONCLUSIONS

Potential impacts to valued components of ecological integrity, visitor experience and infrastructure capacity were identified and assessed in relation to desired outcomes of



the draft Site Guidelines. Desired outcomes were identified based on established legislation and policy direction for Parks Canada, including the *Banff National Park Management Plan* and the *Ski Area Management Guidelines*. Ski Area development that achieves the desired outcomes is considered to be consistent with policy and legislated direction.

12.1 ECOLOGICAL INTEGRITY

Desired Outcomes

With respect to the potential impacts of the Site Guidelines, ecological integrity will be maintained when the following desired outcomes are realized:

- Land use decisions concerning the Ski Area contribute positively to Parks Canada's ecological integrity goals in respect of vegetation management, wildlife connectivity and habitat protection, and species at risk protection and recovery. Each decision fully considers and addresses the ecological parameters identified for the Sunshine Village Ski Area in Section 5.1.
- Terrestrial and aquatic habitat conditions for sensitive species, such as whitebark pine, grizzly bear, mountain goat, bighorn sheep, westslope cutthroat trout and bull trout, are maintained or improved to support healthy ecosystem functioning.
- Water quality is improved and protected in accordance with chemical, physical and biological parameters established by Parks Canada, and with consideration for the implications of interbasin water transfer.
- Vegetation is managed to reflect natural composition, diversity and patterns, and to maintain function of sensitive soil-vegetation complexes, including rare plants, wet soils and alpine plant communities.
- Leadership is demonstrated in environmental management, stewardship, monitoring and best practices. Water withdrawal and wastewater treatment systems are designed and managed to provide certainty in operations and opportunity for potential design capacity increases accounting for climate change, water resource availability and downstream water quality scenarios.

Valued ecological components considered through the strategic environmental assessment (SEA) have included:

- Upper Healy Wildlife Corridor
- Grizzly bear
- Mountain goat
- Small mammal habitat, including lynx and wolverine
- Native vegetation, including whitebark pine and Sunshine Meadows communities
- Aquatic ecosystems, including westslope cutthroat trout and bull trout

A summary of the residual and cumulative effects associated with each of the valued components follows.



Upper Healy Wildlife Corridor

Two elements of the Site Guidelines can be considered to contribute positively towards ecological and visitor experience outcomes. The removal of large areas of the Healy Wildlife Corridor from the Ski Area lease, on both sides of the valley, is a clear environmental gain eliminating the potential for significant development proposals within the limited footprint of wildlife corridor habitat, while the potential development of a parking structure has clear benefits for visitor experience and convenience.

The potential environmental impacts to parking structures can largely be addressed through design. The Site Guidelines identify conditions for building and safety codes, visual and aesthetic impact, protection of aquatic systems and wildlife movement. A parking structure would require no new lands for development, and it may be effectively contained and its ongoing impacts, such as surface runoff, garbage and waste management, can be managed. Wildlife movement or habitat effectiveness are unlikely to be impacted by a well-located parking structure that avoids known movement routes.

The terraced parking concept and the potential for increases in summer visitor use have potential adverse residual and cumulative effects on wildlife movement and habitat use, particularly for the Bourgeau Slopes corridor. With the successful implementation of design parameters and mitigations associated with the terrace parking proposal, the physical impacts to wildlife corridors and habitat may be characterized as the permanent alteration of terrain structure important to local wildlife movement. The increase in physical parking footprint is likely, in turn, to extend the sensory disturbance footprint further into the existing undisturbed corridor, resulting in a small but adverse incremental impact on corridor use by sensitive wildlife species. In addition, there remain key uncertainties that have potential for impacts beyond terrain structure, and that may adversely impact ecosystem process and function. These include slope and terrain stability, potential slope failure and potential disturbance increase in summer.

Slope and terrain stability, including the potential for small- to large-scale slope failure and impacts to subsurface water flows, remains an issue even with the limited scale of the current terrace concept, which is much reduced in scale from past proposals. These types of impacts are difficult to predict, difficult or expensive to mitigate, and potentially irreversible.

Accidental impacts such as slope failure may be augmented by the uncertainty associated with the ability to design terraced structures that stay within the conceptual footprint envisioned by the Site Guidelines. Design and mitigation within the parameters of the Site Guidelines to maintain or enhance terrain stability, wildlife access and vertical movement, and minimal tree removal within the current disturbance footprint may be expensive or impractical. The reconfiguration of existing slopes may not result in the anticipated gains in parking capacity. None of these uncertainties can be fully assessed without further site investigation and professional design work.

Finally, potential growth in summer-use visitation is also a key uncertainty. The scope of the long-range planning process in the Site Guidelines includes identification of maximum visitation numbers but provides no interim guidance or limitations on incremental visitor growth prior to Long-Range Plan completion. Many years could elapse between the approval of Site Guidelines and the development and approval of a



Long-Range Plan during which summer visitation and use of the parking area are not subject to growth limits. Significant growth in summer use would likely increase the disturbance and displacement of wildlife to and from Bourgeau Slopes corridor habitat during what is currently a relatively low-use period for human influence on wildlife.

In conclusion, the removal of existing Ski Area lease lands within the Healy Wildlife Corridor can be considered as a clear environmental gain. While challenging, it may be possible to design and mitigate limited additional terraced parking along the east end of the parking lot that maintains the intended gain, but the effectiveness of potential design or mitigation is far from certain. Uncertainties associated with design failure, and/or significant increases in summer use within the parking area, may both have the potential to offset gains made through lease reduction. Accordingly, it is not clear that the expected ecological outcomes of the Site Guidelines will be achieved.

Grizzly Bear

The residual and cumulative impacts of Ski Area development and use on grizzly bear habitat security may be described as the potential, regular, seasonal disruption of a vulnerable species with implications at a local ecosystem scale and cumulative effects at a landscape scale.

The key uncertainty with respect to grizzly bear habitat security is the potential for undetermined levels of growth in summer visitor use. Individual bears may be quite resilient to human use and encounter within predictable circumstances. Creating predictable circumstances for grizzly bears is the key challenge with respect to current and future summer use. The Site Guidelines do contain numerous measures intended to limit and mitigate the impacts of summer visitor use, including the protection of low-use times and restrictions to the current trail systems. The Site Guidelines do not currently consider measures to limit potential growth in summer visitor use in advance of approved Long-Range Plans. It may take many years before a Long-Range Plan is completed following the approval of Site Guidelines, and the potential for unrestricted growth in summer visitation may be considered to be a significant oversight with potentially significant implications for grizzly bear habitat security.

Mitigations of the SEA add measures that are intended to further address the need for limiting visitation numbers prior to the long-range planning process, including:

- Identification of an interim carrying capacity based on desired visitor experience criteria and potential grizzly bear disturbance event thresholds.
- Implementation of a minimum group size during sensitive seasons or times of bear activity if bear use and encounters increase.
- Identification and regular monitoring of key seasonal bear habitat use and local bear activity.
- Public education efforts.

The Site Guidelines include parameters and conditions that address the seasons and timing of visitor use, limitations to the areas used, and a suite of long-range planning requirements. The Site Guidelines also require the identification of desired maximum visitation numbers through the long-range planning process, but these numbers are not linked to grizzly bear habitat requirements or other ecological criteria.



The Ski Area summer-use program presents a situation where most visitors attain access to the Sunshine Meadows environment through the Ski Area, but where most of the trail system and features of the environment that attract visitors, such as the numerous lakes scattered across the local landscape, are actually outside of the Ski Area lease. As a result, many of the potential management issues associated with summer visitor use, including potential bear-human interactions, result from Ski Area programs but fall outside of Ski Area management responsibility.

Consideration of Ski Area summer use is therefore more than just consideration for what is appropriate within, and desired by, the Ski Area operation itself. Key decisions on Ski Area summer use, combined with other visitor use of the greater Sunshine Meadows area in Banff National Park and Mount Assiniboine Provincial Park, have direct potential cumulative effects implications for grizzly bear habitat security and ecological integrity at local and regional landscape scales. As a result, summer use of the Sunshine Meadows area is most appropriately considered as a park management planning issue whose scope includes but also extends beyond the Site Guidelines and long-range planning process envisioned by the *Ski Area Management Guidelines*.

Considering the full suite of guidelines and mitigations of the Site Guidelines and SEA, it remains somewhat uncertain that expected ecological outcomes for grizzly bear will be attained. The Site Guidelines ensure that grizzly bear habitat security is maintained in the long term through lease reduction and elimination of potential development and use in currently undeveloped areas – particularly the Bye Bye Bowl area. The potential to improve grizzly bear foraging habitat away from areas of summer visitor use may be facilitated through new run development that alters vegetation structure in alignment with conditions expected of the historical fire cycle providing more open meadow habitat. Habitat improvement may draw bears away from human use areas but may also result in attracting more bears into and through the Sunshine area. Additional use of ski runs by foraging bears is difficult to predict and may best be considered a neutral effect.

Despite the potential gains, the potential to increase summer visitor use numbers outside of the long-range planning process creates significant uncertainty with respect to grizzly bear habitat security, levels of disturbance and potential for bear-human encounters. Although summer visitor use of Sunshine Meadows is a desirable experience supported by Parks Canada, the geographic and ecological scale of summer use extends considerably beyond the Ski Area boundaries. The scale of summer visitor use, combined with the ecological importance of the Sunshine Meadows, and the importance of maintaining grizzly bear habitat security, present issues that may be considered beyond the sole scope of Ski Area Site Guidelines or long-range planning processes.

Mountain Goat

The residual and cumulative impacts of Ski Area development and use on mountain goat habitat may be summarized as the occasional, limited disruption of movement patterns or habitat use. The environmental gain associated with the removal of lands within the Healy Wildlife Corridor enhances long-term habitat security. Avalanche control and backcountry skiing activities likely have little current impact on goats and are unlikely to change in terms of the nature, frequency or location of potential disturbance. The possible development of a parking terrace along the north edge of the parking lot has



some potential to restrict or alter goat movement from habitats above the parking lot to Healy Creek and beyond due to the vertical nature of retaining walls. These potential restrictions are expected to be mitigated through design that allows for goat passage through or over walls in association with established movement paths.

Although the physical movement of mountain goats through the base area can likely be facilitated through design, it is not clear how goats currently use the area in the summer, nor how significantly increased summer visitation, traffic and parking might impact summer season goat use. Research and information on summer season mountain goat use will be a key consideration in the development of summer-use carrying capacities in future Long-Range Plans. Despite the consideration of mountain goat use within the long-range planning process, the potential increase in summer visitor use in advance of approved Long-Range Plans is a key concern and a key uncertainty, just as it is for grizzly bears.

Considering the full suite of guidelines and mitigations, it is anticipated that the expected ecological outcomes related to mountain goats may be achieved under the Site Guidelines if growth in summer visitor use is restricted in advance of approved Long-Range Plans. Areas within the Upper Healy Wildlife Corridor will be removed from future development consideration, providing long-term security for mountain goat habitat within the Upper Healy Corridor. Backcountry skiing and avalanche control will continue at levels that minimize disturbance to mountain goats. Design of a terraced parking lot may facilitate continued goat movement through retaining walls and across the parking lot area to Healy Creek. Uncertainties with respect to summer mountain goat use of the Ski Area parking lot will be addressed as part of the development of summer-use carrying capacities in future Long-Range Plans. These measures are expected to ensure that hours of visitor use will continue to provide significant periods of low visitor use intensity through all seasons and to provide predictable times for mountain goats to move through the Ski Area parking lot and landscape.

It must be noted that the predicted success of the Site Guidelines and mitigations is contingent on restricting growth in summer visitor use in advance of an approved Long-Range Plan. Research and information on local mountain goat summer habitat use must inform Long-Range Plan decisions on summer visitor use carrying capacity, parking lot design, and summer visitor use management in order to maintain future certainty and security for resident mountain goats.

Small Mammal Habitat

The residual and cumulative impacts of Ski Area development and use on small mammal habitat may be summarized as the permanent alteration of one type of habitat to another. Closed and mature forest habitats will be replaced to a limited degree by open meadow and edge habitats associated with cleared ski runs. The application of development and mitigation techniques on developed ski runs that preserve native ground cover may be expected to maintain overall habitat effectiveness for small mammals in the summer season.

The Site Guidelines have been developed in recognition of the key factors that contribute to maintenance of small mammal habitat structure and function. Managing vegetation and run development in accordance with the Site Guidelines and best management



practices is anticipated to maintain a range of conditions that supports the expected range of wildlife species and wildlife movement, including small mammals, across the Ski Area.

Subnivean small mammals are likely to be the most affected by Ski Area operations associated with hardened snowpack, such as snowmaking and grooming. The application of best management practices for snow management and grooming, and the limited extent of new snowmaking can be expected to limit the potential spatial scope of impacts associated with these activities. However, high-traffic areas and frequently groomed areas with shallow snowpack are not expected to serve as effective habitat for subnivean wildlife.

Considering the full suite of guidelines and mitigations, it is anticipated that the expected ecological outcomes related to small mammal habitat will be achieved under the Site Guidelines. Although high-use areas are not likely to support wildlife in the winter season, small mammals may be expected to continue to occupy and move successfully through the Ski Area overall within a diverse patchwork of forest types, shrub and meadow to provide both living habitat and movement cover. The location and extent of potential new ski run development is unlikely to prevent the movement of wolverine, or the movement or inhabitation of the Ski Area by Canada lynx.

Native Vegetation

Potential long-term cumulative effects of the Site Guidelines on forest composition and structure, including whitebark pine, are considered minimal. Areas for potential new run and terrain development considered by the Site Guidelines are primarily below treeline and limited in potential extent in accordance with future design capacity limits.

It is expected that run development and subsequent seasonal maintenance of vegetation can be directed towards purposely enhancing growing conditions for whitebark pine, and towards maintaining the experiential values associated with old growth forest trees and stands. To a certain degree, clearing of vegetation in accordance with mitigating measures constitutes an alteration of forest composition and structure that reflects a state that is more consistent with the natural historical fire regime than are current conditions.

Potential new terrain modification is also limited by the Site Guidelines. Only minor terrain modification will be considered above the unbroken treeline anywhere on the ski hill, protecting conditions for upper subalpine trees such as whitebark pine and mature alpine larch stands. Any development of new ski terrain below treeline will minimize the need for grading or removal of native ground cover vegetation to the degree possible. Improvements to the Angel Ski-Way are considered an exception under the *Ski Area Management Guidelines*. The conditions of the Site Guidelines do not permit major terrain modification such as linear cut and fill approaches to enhancing the ski-way, but they do permit site-specific alterations. Damage or destruction of vegetation is not likely to exceed a site-specific scale.

Snowmaking, grooming and avalanche control are expected to have minimal interactions with the operation of new ski terrain. Snowmaking is limited by the Site Guidelines to existing areas or to areas immediately around day lodge facilities. Potential new terrain



considered in the Site Guidelines will not expose sensitive alpine vegetation to the potential impacts of grooming. There are no new circumstances associated with potential new terrain that are expected to require new avalanche control measures into new areas beyond the current program.

The Site Guidelines proposal to remove the Bye Bye Bowl, Sunshine Meadows and Eagle Crest areas from the lease has clear benefits to the future security and certainty of alpine meadows communities over the long term. Removing the potential for development in these areas in the future also limits the need for supporting infrastructure such as roads, lifts or utilities that would impact other alpine meadows communities. The proposal to remove the Meadow Park area from the current lease has little ecological benefit in terms of forest structure. The proposal to remove the Healy Corridor areas on either side of the Bourgeau base parking lot protects the limited forest vegetation that provides movement cover and terrain stability for the Healy Wildlife Corridor, and the proposal may be considered a substantial environmental gain.

Impacts to alpine meadows communities, including whitebark pine, are primarily associated with increasing levels and intensity of summer visitor use. The sensitivity of the Sunshine Meadows environment, and the difficulty of restoration following damage, makes it imperative that trail system improvements are planned for, and implemented, in advance of permitting increased visitor use. The mitigation and monitoring recommendations of the SEA in conjunction with the requirements of the Site Guidelines for long-range planning establish an adaptive planning approach to implementing gradual increases in visitor use that fall within the environmental carrying capacity of the trail system.

Considering the full suite of Site Guidelines and mitigations of the SEA, it is anticipated that the expected ecological outcomes related to native vegetation diversity are likely to be attained if growth in summer visitor use is restricted in advance of approved Long-Range Plans. Ecological integrity considerations, including those related to fire cycles, old growth forest, whitebark pine and the Sunshine Meadows natural environment, will be addressed through an adaptive ski run and vegetation management system that retains the function of native vegetation and replicates natural landscape patterns in a way that facilitates wildlife habitat effectiveness. The dynamic approach to management and monitoring of whitebark pine is anticipated to result in the long-term increase in the distribution of whitebark pine across the Ski Area. Run clearing and vegetation management strategies are intended to reflect conditions representative of the historical fire cycle while respecting the aesthetic, experiential and educational values of old growth forest stands and trees. Vegetation will be managed overall to maintain natural composition, diversity and pattern, to limit the spread of invasive non-native species, and to support rare plants and alpine plant communities.

The Site Guidelines indicate that the intensity of summer visitor use will be monitored and managed to ensure that increases in visitor use proceed only when the capacity of trail infrastructure has been improved in advance. As with grizzly bear and mountain goat, it must be noted that the predicted success of the Site Guidelines and mitigations for alpine meadows communities is contingent on restricting unplanned increases in summer visitor use in advance of an approved Long-Range Plan. Restricting the increase



of summer visitor use in advance of Long-Range Plans is a key element towards ensuring that natural values are not impaired by unplanned visitor use.

Aquatic Ecosystems

Strategic-level concerns with respect to managing Ski Area use and development for effective flow regimes, or wastewater system effectiveness, are effectively addressed through the application of ecological management parameters, long-range planning requirements, and environmental information and assessment requirements as outlined in the mitigation sections. With respect to flow regimes, the Site Guidelines define a scope and scale of potential water collection use and development that is appropriate to limitations of the environment. Past and current monitoring has identified key issues with respect to wastewater systems output and impacts to Healy Creek water quality at the confluence with Sunshine Creek.

Both design knowledge and technology exist to deal with the potential issues of either water use or wastewater treatment. Site Guidelines conditions, along with long-range planning and environmental assessment requirements of this SEA, identify key issues and information requirements that must be addressed as Long-Range Plan proposals are brought forward. It is anticipated that the expected ecological outcomes of the Site Guidelines for downstream water quality, sensitive trout species and resource availability will all be attained with the application of Site Guidelines and mitigations for water use and wastewater treatment.

The primary factor influencing aquatic ecosystems in both the current and future scenarios is development and use of the parking lot. The narrow confines of the valley, the extent of current development, the past destruction of riparian habitat to the stream edge, and modification of stream banks mean there is little room for surface parking expansion, and little room for restoration or mitigation of impacts to surface runoff quality, riparian habitat or aquatic habitat. Further, there is currently an insufficient stream buffer for environmental protection purposes to ameliorate the impacts of snow clearing, litter and debris directly entering Healy Creek.

Without space to restore or mitigate current adverse environmental impacts of parking, it is difficult to mitigate impacts of expanded parking or of intensified visitor use of the current parking lot. While the terraced parking concept in the Site Guidelines will not impact Healy Creek directly, it will increase the amount of disturbed ground and would add to current levels of adverse impact through increased erosion and runoff. The restoration of densely vegetated riparian buffers of some substantial width, in combination with systems to reduce the impacts of surface runoff, particularly suspended sediments, are required simply to deal with existing impacts to downstream water quality, riparian habitat, and habitat for westslope cutthroat trout and bull trout.

There seems, however, to be no simple way to accomplish the purposes of habitat restoration and improved runoff quality without sacrificing existing parking footprint. At the very least, any parking lot expansion must be offset with improvements to water quality runoff and habitat restoration just to maintain current conditions. At best, some of the impacts to Healy Creek could be offset by developing terraced parking away from the creek and restoring riparian buffer along the existing creek. Other terrain and wildlife issues are associated with terraced parking and are addressed in other sections



on vegetation and wildlife corridors. A well-designed and well-managed parking structure could possibly be an ecologically neutral way to expand parking within a contained footprint, with reduced surface runoff, the ability to capture and filter runoff and contaminants before release to the creek, the containment of garbage, and waste management.

The proposed removal of Meadow Park from the lease provides little to no tangible gain with respect to impacts from the parking lot and does not serve in any tangible way as an offset for additional parking development.

It is unlikely that the ecological management parameters or outcomes associated with surface runoff water quality, riparian habitat, and habitat quality for westslope cutthroat trout and bull trout can be attained within the current scope of the Site Guidelines. Riparian and aquatic habitat connectivity, habitat structure for vulnerable and sensitive species, water quality, litter and debris are all likely to be adversely impacted by surface parking expansion or intensification of use in the current base area. While a parking structure may be designed to have a neutral or even positive impact on surface runoff quality, any expansion in surface parking such as the proposed terrace concept would have to be offset by lands for surface water mitigation and/or riparian restoration simply to maintain current levels of impact. From an aquatic ecosystem perspective, the latter approach could result in improved ecological conditions and should likely be considered in the Site Guidelines from an environmental management perspective. But such an approach is unlikely to result in an increase in parking capacity.

Solutions to the parking capacity problem may possibly be addressed through some level of riparian restoration, and through innovative stormwater management solutions using modern technologies such as buried oil grit separators and filter beds. Without these types of solutions, there appears to be no tangible way to increase the surface parking capacity of the current base area parking lot without cumulatively increasing the impacts on the aquatic environment.

12.2 VISITOR EXPERIENCE

The assessment of valued components of visitor experience focuses on potential changes to both the built and natural environments, and on changing patterns of visitor use. Desired visitor experience outcomes and priorities of the Site Guidelines in support of the *Ski Area Management Guidelines* include:

- Develop and maintain authentic mountain national park experiences for visitors in all seasons at the Ski Area that focus on the natural features of the area, particularly the abundance of natural snow and terrain variety for snow sports, and the scenery and natural environment of Sunshine Meadows.
- Ensure a balance of Ski Area components in order to minimize congestion and crowding and to maximize memorable visitor experience and connection.
- Strengthen the connection of Ski Area winter and summer visitors to Banff National Park and the World Heritage Site through enhanced heritage interpretation, learning opportunities and experiential opportunities.



- Maintain and, where feasible, restore visual and natural viewscales and minimize other sensory disturbance such as noise and vehicle traffic for on- and off-mountain visitors.
- In addition to the summer commercial visitor program, maintain convenient, facilitated public visitor access for hikers and skiers through the Ski Area to remote destinations including Mount Assiniboine Provincial Park, and Simpson and Healy passes in Banff National Park.

Key elements of the Site Guidelines were considered with respect to:

- Safe, comfortable and enjoyable visitor experience
- Visitor education
- Viewscales and visitor perceptions
- Wilderness character

The elements of the Site Guidelines provide a range of expanded ski/snowboard opportunities that respond to imbalances in current ski terrain during poor weather and visibility days and to the needs of growing sidecountry and backcountry markets. These terrain adjustments are anticipated to enhance and balance the snow riding experience, reduce congestion and enhance safety. The inclusion of the Alpine Bowls provides managed opportunities for sidecountry riders. The enhanced winter opportunities envisioned by the Site Guidelines are focused on authentic mountain skiing and snowboarding experiences consistent with the tradition and nature of the mountain park environment.

The enhancements to the summer-use program offer opportunities for heritage interpretation and learning in the spectacular environment of Sunshine Meadows or the comfort of the Upper Village. The focus on high-elevation hiking and educational programming responds to the desired visitor experience outcomes of enhancing educational opportunities and of maximizing memorable experience and connection to Banff National Park and the World Heritage Site. Visitor activities on the upper mountain such as hiking, sightseeing and heritage interpretation are consistent with the tradition and nature of the mountain national park environment.

The Site Guidelines contain considerable measures aimed at minimizing the visual and sensory impacts of potential Ski Area development and use. It is expected that ski run, lift and facility development that occurs within the current Developed Area and lease, and that adheres to the measures in the Site Guidelines will not result in substantial changes to the ways that visitors experience and perceive the visual and sensory characteristics of the developed Ski Area and the wilderness character of surrounding areas.

12.3 INFRASTRUCTURE CAPACITY

The strategies and mitigations outlined in the Site Guidelines and the strategic environmental assessment are intended to ensure that Ski Area resource use falls within existing infrastructure capacity. Where additional capacity is required, the mitigations are intended to ensure that the Sunshine Village Ski Area plans for additional capacity prior to any expansion and ensures that resource use falls within existing environmental capacity.



Road and Parking Capacity

The Trans-Canada Highway and Sunshine Village access road were each considered with respect to potential impacts to driver safety and comfort, and the need for upgraded or enhanced roadways. Past and recent enhancements to the Trans-Canada Highway have considered the impacts of summer and winter traffic and have taken into account potential increases in use from all sources. The Sunshine access roadway is managed as a two-lane, low-speed scenic roadway and is anticipated to meet foreseeable growth in Ski Area visitation. As part of the first Long-Range Plan proposal, a Parking and Transportation Strategy will be required, consistent with the measures outlined in the Site Guidelines. Parking reconfiguration, parking structures and effective, convenient mass transit would improve visitor experience and reduce potential congestion within the Bourgeau base area parking lot and along the Sunshine access road.

Water and Wastewater

Water supply and wastewater management are key infrastructure capacity considerations and resource limitations. Natural water sources for Ski Area potable use, snowmaking and other operations are limited. The Site Guidelines allow for the limited development of new surface water collection reservoirs to supplement the existing reservoir system and withdrawals from Rock Isle Lake and Healy Creek. The issues associated with reservoir development have been discussed in significant detail as part of aquatic ecosystem effects and are not considered further here. Demonstration of sufficient water sources and wastewater treatment capacity will be required as part of the Long-Range Plan and a Water Management and Snowmaking Strategy. As specified in the Site Guidelines, proposed changes to water withdrawal limits and water management systems will require detailed professional analysis and independent peer review.

Wastewater system operation and performance has also been discussed as part of aquatic ecosystem impacts. Long-Range Plans are to include analysis of wastewater capacities and treatment effectiveness in comparison to anticipated increases in Ski Area water use and wastewater treatment requirements as part of the required water management strategies.

Increase in summer use represents the most significant potential issue to water and wastewater use and management in the Site Guidelines. Unrestricted growth in summer use in advance of a Long-Range Plan is likely to affect the capacity and operation of both water and wastewater systems. Changes in water use may impact ecosystems and the availability of water for Ski Area use in uncertain ways, potentially affecting water levels in Rock Isle Lake and in the existing reservoir system, and impacting the operation and performance of the existing wastewater system. Limitations to increased summer visitor use in advance of an approved Long-Range Plan is an important condition to be included in the Site Guidelines in order to ensure resource sustainability as well as the integrity of aquatic ecosystems.

Electrical Supply and Demand

The Site Guidelines require an Environmental Management and Monitoring Strategy, to be submitted as part of Long-Range Plans that includes considerations for energy conservation and fossil fuel emissions. Outcomes related to electrical supply and demand



are expected to be realized through the application of the Site Guidelines and development of the environmental management strategy identified above. If additional power is required on-hill, alternative energy technologies such as clean power, green design or retrofitting of existing facilities, micro hydro or other minimal impact technologies may be considered as alternatives to local and regional utilities expansion.

Visitor and Staff Accommodation

Growth and increased capacity of the Ski Area is likely to result in the need for additional staff and in demand for on-hill staff housing. The *Ski Area Management Guidelines* (2006) require additional employee accommodation, required as a result of potential growth and expansion of the Ski Area, to be located in nearby communities.

The need for additional visitor accommodation along the Canmore, Banff and Lake Louise corridor as a result of development and use at the Ski Area is not anticipated, although visitor accommodations in the communities of Banff and Lake Louise, and outlying commercial accommodations (OCAs) may reach occupancy capacity. The Long-Range Plan will need to demonstrate that growth at the Ski Area respects the existing growth limits established for the communities and OCAs.

Environmental Management Strategy

The implementation of an Environmental Management and Monitoring Strategy is intended to ensure that Ski Area operational impacts are within accepted or agreed-upon environmental parameters and standards. Strategies will be brought forward as part of each Long-Range Plan and will address issues related to energy conservation, emissions and greenhouse gases, wastewater management, water conservation and quality, solid waste management and reduction, and integrated approaches to pests and invasive species.

Summary – Infrastructure Capacity

The incorporation of sustainable design principles and products into Ski Area development plans is intended to ensure resource use efficiency and conservation. The implementation of an environmental management system is intended to ensure that Ski Area operational impacts are within accepted or agreed-upon environmental parameters and standards. The capacities of roadways, electrical supply, and staff and visitor accommodation are not anticipated to present issues that cannot be effectively managed with respect to the predicted visitor capacity increase of the Site Guidelines.

Water and wastewater capacity for expanded winter season operations can be effectively managed within the design and management parameters of the Site Guidelines and strategic environmental assessment. Potential increases in summer visitor use in advance of Long-Range Plans may further challenge any water supply and wastewater system operation issues.

12.4 CONCLUSION

Potential impacts to valued components of ecological integrity, visitor experience and infrastructure capacity associated with the draft *Sunshine Village Ski Area Site*



Guidelines for Development and Use were identified and assessed in relation to desired outcomes. To a large degree, potential strategic and cumulative environmental impacts have been anticipated and addressed through ecological management parameters and other conditions of the Site Guidelines. Many aspects of the Site Guidelines are expected to enhance visitor experience while taking into account potential adverse impacts to viewscape, scenery, sensory impacts and wilderness character. Ski Area development as envisioned by the Site Guidelines is not likely to trigger the need for regional infrastructure growth.

Substantial Environmental Gains

The Site Guidelines outline a set of substantial environmental gains in accordance with the provisions of the *Ski Area Management Guidelines* (2006), along with a suite of potential exceptions to those guidelines. Overall, the suite of land gains, including the removal of Bye Bye Bowl, Sunshine Meadows and Eagle Crest from the lease, and potential future development bode positive for the long-term security of highly significant alpine meadows vegetation and wildlife communities. Also protected are the viewscales and aesthetics and natural features such as spectacular wildflower displays that draw summer visitors to the area.

Land gains within the Upper Healy Wildlife Corridor may also be associated with enhanced long-term security for wildlife movement and resident wildlife habitat, particularly on the Bourgeau Slopes side of the corridor. The desired substantial environmental gain associated with the Meadow Park area as envisioned by the Site Guidelines is less clear, for both ecological and pragmatic reasons when considering the potential development scope of the Site Guidelines for this area.

The potential for a new canyon access lift paralleling the current gondola and the widening or improvement of the ski-out, coupled with increased winter skier capacity, are likely to require development and maintenance that extends the width of the current gondola lease corridor, making any reduction of the lease corridor in the Meadow Park area impractical or so slight as to be of little tangible value. The potential development of a lift and small set of ski runs below the current Wawa area also detracts from the footprint and potential ecological value of the Meadow Park gain. Sidecountry skiing access passes through terrain within the potential gain area, further rendering lease reduction in this area as impractical for operational and public safety reasons. And finally, there is no clear natural boundary from which to draw a new Meadow Park lease boundary that would provide more effective protection and take into account operational needs better than does the current boundary.

Exceptions to the Ski Area Management Guidelines

In association with environmental gains, the Site Guidelines outline a set of exceptions to the *Ski Area Management Guidelines*, including limited construction of water reservoirs, a parking terrace along the northeast edge of the parking lot, ski-out and ski-way improvements, and the limited development of new lifts and ski terrain below treeline.

The conditions of the Site Guidelines provide a predictable path for the potential development of reservoirs, ski-out improvements and new ski terrain that is not expected to result in significant adverse environmental impacts. These actions can likely



be developed and managed in such a manner that they do not interfere with the environmental gains associated with the lease reductions and the associated protection of alpine meadows communities, wildlife habitat and wildlife corridor function.

The parking terrace and improvements to Angel Ski-Way are associated with a level of uncertainty at the stage of conceptual planning found in the Site Guidelines. Additional site-specific information, planning and design are required in order to more confidently predict the potential impacts of either of these developments. The best-case scenario for either project will still result in site-specific alteration of terrain and vegetation and in small but incremental impacts to wildlife corridor effectiveness, aquatic ecosystems and alpine vegetation communities. Depending on their design, these projects may be seen to reduce to a certain degree the substantial environmental gains associated with lease reduction. Both projects should be considered aspirational in nature, given the inherent uncertainties at this stage of planning.

Key Issues and Considerations

The overall direction of the Site Guidelines may be considered to represent a positive direction for potential Ski Area development in alignment with the *Ski Area Management Guidelines*. However, a number of key issues should be taken into further consideration at the level of the Site Guidelines to ensure that the intended substantial environmental gains are realized, and that potential incremental cumulative impacts are limited prior to long-range planning stages.

The Site Guidelines delay the identification of limits to summer visitor use to Long-Range Plans, leaving the potential for visitor use growth in the interim essentially unrestricted. Without stated interim limits, it is theoretically conceivable that summer use, now in the hundreds, could achieve the same levels as winter visitation in the thousands in advance of any long-range planning process. Growth in summer visitor use is already a potentially significant concern for grizzly bear habitat security, alpine meadows vegetation, summer wildlife corridor function, and the integrity of the summer visitor experience itself. Unrestricted summer visitor use may also significantly change the use and management of water and wastewater with uncertain implications for Rock Isle Lake water levels, frequency of interbasin water transfer, and performance of wastewater treatment systems. As a minimum measure, it is recommended that the Site Guidelines restrict further summer visitor use growth at current levels in advance of the long-range planning process. Further, the potential scale of summer visitor use, the ecological importance of the Sunshine Meadows, and grizzly bear habitat security present issues that may be considered beyond the sole scope of Ski Area Site Guidelines or long-range planning processes and may be most appropriately directed to the park management planning process for key direction and decisions.

The development of the parking terrace concept is associated with substantial uncertainties. The actual scope and footprint of an engineered design, slope stability associated with the design, the potential permeability to wildlife, and overall impacts to wildlife movement and habitat use remain unknown at this stage of planning. The development of additional surface parking, including the terrace concept, is likely to contribute to existing adverse surface runoff and aquatic ecosystem issues. Monitoring demonstrates that surface runoff and aquatic ecosystem parameters need to be improved



now. Additional surface parking further complicates the ability to effectively address the current situation. Stormwater treatment technologies do exist for existing or expanded parking, but they may be difficult to implement and operate, be expensive or take up considerable space that would be consequently lost for parking.

From an environmental perspective, a multi-level parking structure is clearly the most effective solution to address the need for additional parking capacity within the scope of the current base area. A well-designed parking structure will have neutral impacts to vegetation, terrain stability, wildlife movement or habitat use, and may be designed to effectively capture and treat surface runoff and litter from within the structure footprint. A structure close to the gondola base would significantly enhance the visitor experience, eliminating the need for long walks or shuttles for hundreds of visitors. Development of a parking structure could reduce the need for additional surface parking to a smaller terrace or to an at-level expansion into the northeast slopes instead of a terrace. For all of the reasons discussed above, a parking structure may be appropriately considered to be a priority development for any proposed expansion in capacity.

Final Conclusions

Ski Area development as envisioned by the draft Site Guidelines is associated with substantial environmental gains to Parks Canada while allowing the Ski Area to expand and enhance both winter and summer visitor experiences in a manner consistent with the *Ski Area Management Guidelines*. It should be emphasized that potential environmental gains envisioned by the Site Guidelines may be reduced without further research, planning and assessment consistent with the mitigations of this strategic environmental assessment.

Key uncertainties with respect to growth in summer visitor use and to the development of a parking terrace or other surface parking expansion represent key issues that may not be adequately addressed within the scope of the current draft Site Guidelines. Without further direction in the Site Guidelines to mitigate these key issues, the potential for incremental and cumulative adverse impacts to aquatic ecosystems, grizzly bear habitat security, mountain goat habitat use, alpine meadows communities and wildlife movement are likely. The key issue may be addressed, however, through additional Site Guidelines parameters that limit the expansion of summer visitor use in advance of a Long-Range Plan.

Long-Range Plan proposals that meet the adjusted parameters and conditions of the Site Guidelines as recommended in this strategic environmental assessment can be expected to achieve desired ecological, visitor experience and sustainable infrastructure outcomes identified by the Site Guidelines and to achieve them in a manner consistent with the *Ski Area Management Guidelines*.



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Addendum to Section 8 of the Strategic Environmental Assessment of the Site Guidelines for Development and Use, Sunshine Village Ski Resort.

Upper Healy Corridor – *Environmental Considerations*

1. Upper Healy Corridor

In proximity to the existing base parking lot, the Upper Healy Corridor consists of the Bourgeau slopes on the north side of Healy Creek valley, the Eagle slopes to the south, and north and south forested slopes at the east end of the parking lot. As the Site Guidelines had included the lower Sunshine Creek valley for consideration as part of the Upper Healy Corridor, this area is also included for discussion.

1.1 Current Values and existing effects/limitations

Healy Creek Valley

The Bourgeau Slopes on the north side of the base parking lot provide significant year-round habitat for deer, bighorn sheep and mountain goat populations. Carnivores, including wolf, cougar and coyote, move through the Bourgeau Slopes where ungulate prey is available. From spring through fall, grizzly bears use the Bourgeau corridor slopes for foraging and as movement habitat.

The cooler, north facing Eagle Slopes provide movement cover for wary species such as wolverine. Forest and shrub (avalanche path) habitats along the base of the Eagle Slopes also run adjacent to the south side of Healy Creek, which is a benefit to Healy Creek water quality and aquatic habitats.

Forested habitats near the east end of the parking lot encroach on the road edge and serve as a junction where wildlife cross Healy Creek, the access road, or parking lot to move between the Bourgeau and Eagle sides of the Healy Creek Valley.

While the existing parking lot, access road and base area infrastructure have somewhat reduced the amounts, security and effectiveness of habitats in this portion of Healy Valley, data on the diversity of wildlife species present, and the extent of their habitat use and movements through the valley are testament to its remaining importance both locally and in a regional context.

Sunshine Creek valley

The Sunshine Creek valley is a relatively steep, narrow valley that ascends through to the Goat's eye base, village area and on to the Sunshine Meadows and Simpson Pass. The lower and middle portions of the Sunshine Creek valley contain dense, mature Engelmann spruce and subalpine fir forest that may provide cover for movements of more wary carnivores such as wolverine and lynx. Grizzly bear appear to use the lower Sunshine Creek valley far less in spring through fall than the Healy valley portions of the Upper Healy Corridor. This is likely related to terrain and forage habitat limitations, and to existing disturbances.

Sunshine Creek valley contains a moderate accumulation of linear disturbance features associated with Sunshine Village Ski Area operations and maintenance: year-round access road, power line, gondola, and ski out. These accumulated features and their operations have likely reduced partially habitat effectiveness and security for wildlife, in particular for the more wary species. With respect to regional connectivity and movements connecting the Healy and Bow valleys with the Simpson and Vermillion River valleys), wary species and others also have access to what may be less fragmented and more effective and secure habitats through the Healy valley above the parking lot, and in adjacent Howard Douglas and Fatigue Creek valleys.

1.2 Development (Exceptions/other factors) and Lease Reduction (Gain) Options

Bourgeau Slopes

The Site Guidelines allowed for the consideration of increased development (exceptions) with the objective of helping alleviate issues of imbalance in parking. These options included potential terraced parking, a parking structure in the existing lot, and/or mass transit. Terraced parking was to be located in partially disturbed habitats along the north edge of the existing lot. This could incrementally reduce habitat availability and effectiveness in the lower Bourgeau Slope, and could require significant terrain modification for slope grading and the construction of retaining wall. This could result in slope instability and associated public safety concerns.

Removal of the portion of lease overlapping the Bourgeau Slopes portion of the Upper Healy Corridor would constitute an important environmental benefit and gain for the Park by removing any future development or human activities and thus maintaining existing wildlife habitat security, effectiveness and movement capabilities. Inclusion of the lower slope in the lease reduction, and in turn removing the option for terraced parking, would benefit Visitor Experience by removing any potential for future significant terrain modifications.

A note on the Tram and potential impacts to the Bourgeau Slopes

Sunshine Village has also recently proposed a Tram from the base parking lot to Beauty Point and Goat's Eye Mountain. The location of the tram base building appears to overlap existing disturbed footprint within the parking lot. However, a counterweight may be required to be constructed into the lower Bourgeau Slopes, leading to further potential for significant terrain disturbance and some additional losses of wildlife forage, cover and movement habitats. The Tram building would additionally impact on the current parking imbalance and would likely lead to alteration in vehicle flow management. In this form, a Tram proposal could constitute a significant conflict with respect to existing parking imbalance and to the maintenance of both slope stability and wildlife habitats and movement terrain along the Bourgeau Slopes.

Eagle Slopes

While no development or exceptions are currently associated with the Eagle Slopes, lease reductions would set aside this area from any future development considerations, and thus would help maintain movement habitat security through the Upper Healy Corridor for more wary wildlife species such as wolverine. A lease reduction in this area would also ensure the maintenance of the forested buffer along the south banks of Healy Creek, thus helping to benefit future water quality and aquatic habitat objectives.

East End of Parking Lot

Lease reduction at the east end of the parking lot will help maintain existing forest cover for cross valley wildlife movements. Elimination of the terraced parking suggestion would remove the risk of harming the wildlife corridor with high and extensive retaining walls.

Sunshine Creek Valley

The Site Guidelines allowed consideration of parallel gondola development within Shine Creek valley to improve ski area access and egress potential. Ski out widening is also a consideration with respect to improved public safety. The potential return of the slivers of habitat along lower Sunshine Creek would not likely constitute a significant environmental gain for the Park. Should ski out widening for safety reasons and/or a future parallel gondola be pursued, the retention of existing lease width within the valley may prove beneficial for route planning and to help achieve safety and environmental management objectives.

1.3 Synthesis of Healy Creek Water Quality Issues, Riparian Buffering, and related Parking issues and options

Healy Creek water quality and aquatic habitats have been long impacted from runoff from the base parking lot, losses and insufficient reclamation of the protective riparian buffer along the length of the parking lot, direct deposition of snow and accumulated materials into the stream channel, and wastewater treatment issues. The Site Guidelines make clear that the design and implementation of effective solutions to ongoing impacts to Healy Creek water quality and aquatic habitats is expected as a matter of course and will not be considered as an environmental gain. This tenet applies to both the current situation and any future development and management scenarios.

To address the long-standing impacts on Healy Creek, different mitigation measures may need to be developed and implemented. Future parking lot scenarios not to mention a Tram could necessitate additional or alternative solutions. Basic requirements to address current issues likely will include:

- the continuation of the buffer, berming and re-vegetation initiative for proper protection of Healy Creek adjacent to the parking lot. A 30m wide buffer is a typical standard in forest management scenarios. Given the moderate parking lot slope, and an acknowledged need to strive for parking balance, a reduced buffer may be considered (ca. 10-15m). Buffer width will ultimately be determined through engineering design that takes into consideration other important factors such as buffer vegetation, soil stabilization and runoff catchment;
- runoff containment and management tools such as sediment traps located at designated runoff locations may be required, including
- maintenance and mitigation effectiveness monitoring by the ski area operator and reported on as part of the Environmental Management Strategy.
- Annual monitoring reporting by Sunshine Village including identification of options to address any concerns or shortcomings.

Riparian buffer restoration would lead to some reductions in current parking. This will necessitate the evaluation of alternative parking and transportation options. Any options need to ensure improvements to water quality and the restoration of aquatic and riparian habitats.

Terraced parking is not a feasible option. It would likely lead to incremental increases in

erosion and runoff into Healy Creek, and carries significant concerns around terrain and slope stability impacts as well as incremental losses of wildlife habitat. Some impacts could be offset by restoring the riparian creek buffer, but this in turn would likely negate any benefits to the current parking imbalance. Terraced parking would not likely be a feasible option, in terms of its location, in the context of the Tram proposal.

A well-designed and well-managed parking structure could possibly be an ecologically neutral way to expand parking within a contained footprint, with reduced surface runoff, the ability to capture and filter runoff and contaminants before release to the creek, and the containment of garbage and waste management. A parking structure located on a portion of the footprint of the existing parking lot would incur no new losses of terrestrial or riparian habitats. Flood protection for such a structure would likely be a requirement in considering impacts from the flood in 2013.

A parking structure option also carries with it concerns around visitor experience and potential effects to wildlife habitats and movement capability across and through the Healy valley. Situated within a portion of the existing footprint, an incremental loss of wildlife movement capability would be incurred (i.e., across the existing lot). This is not likely to be a significant impact given the disturbed, open nature of the existing lot. Forested and arguably more secure, cross-valley options are available both east of west of the existing lot. The presence of a built structure could impact on wildlife behavior and willingness to use adjacent habitats for foraging and movements along the valley, however, behavioural adaptations may occur over time. Appropriate structure design and siting, along with a comprehensive assessment of potential impacts and mitigations would be required as part of a Long Range Plan prior to approval.

A parking structure within the Healy valley could impact on Visitor Experience. Appropriate structure design and siting could mitigate potential negative impacts. This could include, for example, a design with modest height and natural materials, and sited west of and behind the base lodge.

Addendum to Section 8 of the Strategic Environmental Assessment Site Guidelines for Development and Use, Sunshine Village Ski Resort.

Meadow Park Lease Reduction - *Environmental Considerations*

1. Current Site Guidelines and the Sunshine Village proposal

Meadow Park is a 50 Ha area of land within the existing lease extending from the top of Wawa southeast and down slope to the power line cut and lower ski out along Sunshine Creek. The area contains contiguous, mature conifer forest.

Current Site Guidelines would allow limited lift run and glade expansion into the lower Meadow Park area east of and downslope from the “Elbow” outside of the developed area (July 11 SGs, pages 17 and 20). New lifts may be considered in association with new ski terrain in this portion of Meadow Park. The top elevation and location of new lifts will not result in direct lift access to areas in the portion of the Meadow Park area removed from the lease (Sec 6.3.8, pg 45).

Within the portion of Meadow Park west and north of the “elbow”, the Site Guidelines propose removal from the existing lease in order to:

- maintain the contiguous forest cover in this area for the movement of wary wildlife travelling to and from the Simpson Pass area.
- help control snowmelt and surface runoff to protect water quality and seasonal flow regimes for Sunshine Creek.

In contrast to the existing Site Guidelines, Sunshine Village has proposed a new lift straddling the current west lease boundary from near Goat’s Eye base southwest toward the top of the Wawa lift. This would result in an increase in the extent of cleared runs in Meadow Park, along with the new lift.

2. Re-evaluation

The following is a reassessment of the two main points of rationale - habitat security for wildlife movements; water quality in Sunshine Creek- that were used to support the removal of the majority of Meadow Park from the existing lease. As key VCs included in the SEA, vegetation and visitor experience are also included in the following discussion.

Wary Wildlife – habitat security and movements

The Meadow Park area north of Wawa contains dense mature conifer forest habitat. This includes subalpine fir, Engelmann spruce, subalpine larch and, potentially, whitebark pine. Wary wildlife include wolverine, grizzly bear, lynx and other species. An area’s value as secure habitat to facilitate movements by wary wildlife species is a function of several factors, including size, habitat qualities, terrain, and any human disturbances within or adjacent to the area of concern. The current SG suggests a significant environmental gain would be achieved in helping maintain secure habitat for the movement of wary species moving between Bow/Healy valleys and Simpson valley. While Meadow Park contains quality forested habitat that is likely used by a variety of species, this is likely

an overestimation of the Meadow Park's value and role in regional movements by wary species for a number reasons:

- Meadow Park has been skied as side-country for many years, thus having some past and ongoing effect on habitat security for winter active wary species (i.e., wolverine, lynx).
- The grizzly bear is a sensitive and wary large omnivore that occurs throughout the Sunshine area. Security model output for grizzly bear, as presented in the SEA, can also be used as a broad level indicator of human related disturbance on other wary species such as wolverine, lynx and wolf. Security model output for the Sunshine lease shows Meadow Park as currently un-secure habitat. This is due to disturbance zone buffering around linear features in the Sunshine Creek valley, including the access road, ski out and gondola, and around the village area.
- Meadow Park is a small area of land in relation to the sizes and distributions of habitats that facilitate regional movements by wary species.
- Small areas of secure habitat can be critical in alleviating movements through or around bottlenecks. Meadow Park is not situated in a key corridor bottleneck. The opposite may be true (see comment below).
- The Meadow Park's importance to regional wildlife movements is also affected by adjacent area habitats. This includes the village area to the south and Sunshine Creek valley to the north¹. Sunshine Creek valley likely supports less species and numbers of animals moving to and from Simpson Pass than larger, more intact adjacent valleys to the west (upper Healy west to Simpson Pass) and east (Howard Douglas). Sunshine Creek valley's inherent steep terrain, narrow valley, combined with the suite of existing linear disturbances (year round access road, gondola, power line, and ski out) likely provides diminished habitat value and security as movement habitat for wary species. This is a qualitative evaluation with some level of uncertainty due to a lack of monitoring and empirical data on wildlife activity in Sunshine Creek valley. Meadow Park, while no doubt seeing some use by a variety of species, is likely lessened in value in facilitating regional wary wildlife movements due to already diminished habitat values and security in adjacent areas.

¹ In the Site Guidelines, portions of Sunshine Creek valley are included as part of the Upper Healy Corridor evaluation and gain discussion. Hence, the topic of habitat value and security in facilitating wildlife movements in Sunshine Creek valley is also discussed in the re-evaluation of the Upper Healy Corridor.

Vegetation

- Key concerns are forest structure, whitebark pine, old growth larch, and rare plants. Old growth spruce and fir forest that occur in Meadow Park are overrepresented in BNP and common in SVSA. Excessive fire prevention has contributed to this. Opening up the forest for new runs may present as more typical of earlier forest regimes.
- Whitebark pine may occur in upper Meadow Park, but there are no known stands that would be significant relative to those elsewhere in the SVSA lease.
- A large stand of alpine larch occurs at higher elevation along Wawa ridge and extending northward above Sunshine Creek valley. Sunshine's proposed new lift along the west lease boundary, and any new runs above the Elbow, overlap a relatively small portion of the larch stand at its southern extent.
- Evaluation, mapping and run and lift design/siting would need to be completed in order to mitigate and/or avoid any measurable effects on larch and whitebark pine.
- Recent rare plant surveys showed most species along the Wawa ridge in open habitats.

Aquatics

- Sunshine Creek is a small, ephemeral tributary to Healy Creek, with flows occurring mainly in spring and early summer. Water quality and aquatic habitats in Sunshine Creek may be somewhat affected by wastewater treatment issues and some losses of riparian habitats for existing infrastructure (gondola, road, ski out).
- The current Site Guidelines had made allowance for potential run development in lower Meadow Park outside the developed area immediately east and downslope from the “Elbow”. Run development in similar forested terrain above Sunshine Creek in that portion of Meadow Park within the area to the north slated for lease reduction, would likely have similar scale of effects on Sunshine Creek water quality as from the area approved for run development.
- Overall, limited run development and maintenance in Meadow Park area would likely have little impact to flow regimes, surface runoff or riparian habitat along the creek beyond current levels. The resulting ecological gains from lease withdrawal are unlikely to be substantial in terms of aquatic ecosystem protection.

Visitor Experience

- Site Guidelines discuss the needs and benefits for increased ski terrain for novice skiers, and to provide additional overall terrain during whiteouts at higher elevations. Run development in Meadow Park would help achieve those goals.

Addendum to Section 8 of the Strategic Environmental Assessment Site Guidelines for Development and Use, Sunshine Village Ski Resort.

Goat's Eye III / Wildside Ski Lift - *Environmental Considerations*

Current Site Guidelines show the area where a new lift terminus is proposed is in an area delineated for lease reduction (Eagle Crest) and transferal to an LOC for purposes of avalanche control. The LOC, to my knowledge, does not allow a lift to be put in.

Lands above the top terminal of the Goat's Eye lift (Eagle Crest) will be removed from the lease and will become part of the Licence of Occupation for avalanche control. This adjustment to the lease will not be considered a Substantial Environmental Gain consistent with the Ski Area Management Guidelines;

The base of the new lift would be constructed within the existing lease but outside the developed area. New additional runs would be cut into existing (what appears to be) mature subalpine fir and spruce forest at lower elevation, and alpine larch and alpine communities at higher elevations.

Wildlife Effects

Mountain goat and bighorn sheep habitat security and effectiveness are already partially impacted by the presence of upper Goat's Eye I lift and associated winter ski activity. Goat use of the area, historically documented (ca. 1980's), is not well known currently. The Goat's Eye III would represent an incremental loss of habitat security and effectiveness which is not likely significant.

Wary species, in particular wolverine, will see an incremental reduction in habitat security and effectiveness due to additional loss of forest and increase in human activity footprint (winter). This species has shown to avoid ski areas in the mountain parks (e.g., tracking data at Lake Louise). Goat's Eye valley is an enclosed bowl with high elevation ridges encircling $\frac{3}{4}$ of its perimeter. Wildlife movements into and out of this area would most likely come via Sunshine Meadows via the village area, or Wawa Ridge and Sunshine Creek valley. Sunshine Creek valley and village habitats are already partially impacted due to existing development and some losses of forest structure (winter and summer). Movements in and out of Goat's Eye valley would also necessitate passage through the existing Goat's Eye base and existing winter activities. Addition of one new lift and clearing a few additional runs at the back of the valley would constitute an incremental loss of more secure forested habitat for wolverine, but would not be a significant measurable change due to existing limitations and characteristics.

For other wildlife species, such as grizzly bear and foragers/grazers such as deer or elk, additional run clearing will be modest and may actually improve habitat incrementally with the creation of juxtaposed open grass/shrub community and nearby closed forest habitat. Note that old growth spruce, fir and pine forest is over represented in Sunshine Area and the Park due partly to a long history of fire suppression. Limited run clearing may help imitate past natural fire regime effects.

Vegetation

New runs, lift base and towers and lift line at lower elevation would be located in what appears to be mature spruce and fir forest. This forest type is not rare and incremental losses not likely too important and/or may help imitate past natural fire regime effects. At mid and higher elevation, the lift and run clearing may impact on alpine larch trees and whitebark pine trees, and rare alpine vegetation species. Surveys would need to be required in the design and planning stage to mitigate or avoid such impacts before construction. The plausible amounts of forest/tree losses are not likely to be significant within context of Sunshine lease and broader region (Bourgeau massif).

Aquatics

The lift base appears to be located in the valley bottom near what may be an ephemeral channel. Field evaluation will be required to assess habitats and sensitivities. Siting and design would need to be done to mitigate potential water quality and aquatic habitat effects.

Visitor Experience

A new lift and few more runs increases ski capacity within Goat's Eye Area. Together with new lifts and runs in Hayes Hill, there will likely be a measurable increase in the numbers of skiers converging on what appears to be a collector trail on the valley bottom; this may create a safety and design issue.

Potential safety concerns/issues with placement of upper lift tower near to ridge line

Addendum to Section 8 of the Strategic Environmental Assessment Site Guidelines for Development and Use, Sunshine Village Ski Resort.

Sunshine Meadows Area - *Environmental Considerations*

The current Draft Sunshine Village Ski Area Site Guidelines for Development and Use - Strategic Environmental Assessment Draft for Public Review June 2018 characterizes the Sunshine Meadows as follows on page 87:

“The Sunshine Meadows are widely recognized as an exceptional example of an alpine vegetation community. The contiguous extent of the meadows is unparalleled within the mountain parks (Eccles and Strom 1994). The Sunshine Meadows are located on a large plateau and extend from Fatigue Pass, north to Mount Bourgeau and west to Healy Pass and the Monarch Ramparts (Achuff et al. 1986). Further, the meadows comprise a diversity of alpine vegetation, the botanical characteristics of which are a key aspect of the ecological value (Eccles and Strom 1994). In addition to the federally listed whitebark pine (*Pinus albicaulis*), 69 known rare plant species have been documented within Sunshine Meadows (Hirose and Fassina 2016).

A rare plant survey conducted by Tannas (2017) identified five species of sufficient conservation concern that their status is ranked and tracked by the Alberta Conservation Information Management System, with rankings ranging from S1 (highest level of concern) to S3, including: *Taraxacum scopulorum*, alpine dandelion (S1), *Arenaria longipedunculata*, sandwort (S2), *Botrychium simplex*, dwarf grape fern (S2), *Agoseris lackschewitzii*, pink false dandelion (S3), *Boechea lemmonii*, Lemmon’s rockcress (S3). The majority of the rare plants identified by Tannas were located along the Wawa Ridge. The exception was the pink false dandelion, which was found along the Simpson Pass East Trail (Figure 13 above).”

The first (apparently) scientific significance of the Sunshine Meadows was recognized by Dr. A. E. Porsild during his botanical investigations in Banff, Jasper and Waterton Lakes National Parks in 1945, 1946, 1951 and 1956. Dr. Porsild, was a Botany Scientist at the National Museum of Natural Sciences, part of the National Museums of Canada at that time. In 1959 he lead a BOTANICAL EXCURSION to Jasper and Banff National Parks, Alberta: alpine and sub alpine flora. In that report Dr. Porsild describes the planned two day field trip to the Sunshine Meadows. He also lists the 350 vascular plants he had identified there. Clearly, the Sunshine Meadows was the highlight of this prestigious “Botanical Excursion”. When I first arrived in the Sunshine Meadows in 1973, Dr. George Scotter, Botanist with the Canadian Wildlife Service was doing botanical studies there. I recall how he often spoke of Dr. Porsild’s plant discoveries and writings with significant admiration and reverence.

Isn’t it exceptional that as recently as 2016 and 2017 “rare” plants are being discovered, and written about, in the Sunshine Meadows.

Bruce Leeson
Environmental Scientist
26 Oct 2018

In my own personal experience, the Sunshine Meadows were a significant factor of world class value when the nomination application presentation was made to the UNESCO World Heritage Site Nomination Committee in Paris, France in spring of 1984. The Canadian Rocky Mountains National Park World Heritage site was confirmed in Brazil that October, and Dedicated by Prince Phillip at Lake Louise in summer 1985, the centennial of Canada's National Park system.

Bruce Leeson
Environmental Scientist
26 Oct 2018

Environmental Considerations – Tram and Tram Infrastructure

Significant Factors for Consideration

Native vegetation – Forest structure, White bark pine, Alpine meadows communities

Wildlife – Grizzly bear, Mountain goat, Small mammal habitat – forest, alpine meadows

Healy Corridor – summer wildlife movement, winter habitat for bighorn sheep and mountain goat

Aquatic Ecosystems – Surface and subsurface flow regimes, riparian habitat, water quality - Westslope Cutthroat and Bull trout habitat

Visitor Experience – Visitor sensory perceptions, connection to place

Range of Environmental Effects

Magnitude – Disturbance, alteration, damage, destruction

Permanence – single or infrequent event, multiple or recurring event, sustained, permanent or irreversible

Spatial extent – site-specific, local area, ecosystem level, landscape or region

Ecological context – non-native or modified site, common or managed system, uncommon or sensitive system, pristine/endangered/threatened

Visitor perception or character – indiscernible, natural or inconspicuous, artificial or obtrusive, built or constructed environment

Visitor opportunity – enhances existing experiences (terrain, service, safety, congestion), new winter outdoor recreation and summer education experiences, duplication/more of the same/expansion, - non-winter outdoor recreation, non-educational summer opportunities

Key Developments and Operations Tram Base	Potential Impacts on Significant Factors	Potential to Manage/Mitigate
<ul style="list-style-type: none">The lower base facility as presently proposed would be positioned on the north side of the existing parking lot at the location of the existing electrical infrastructure facility.Requires significant building construction to house base terminal machinery, tram cars, staging and loading areas for guestsTram base footprint estimated to be 500m² (20mx25m), with an additional 25% likely required for staging/perimeter (total footprint approximately 625m²)Building height likely 2-3 storiesThe Tram base project would eliminate some portion of existing vehicle parking stalls. The building alone likely would eliminate a minimum of 35-40 stalls. Staging and perimeter requirements could bring that loss to 50 stalls. Additionally, parking spaces would likely be lost to the new traffic circulation pattern that would be caused by the location of the lower tram building. Flood protection would be an additional space-consuming requirement.	<p>Vegetation, Wildlife, Healy Corridor</p> <ul style="list-style-type: none">Base building would be within the existing parking lot perimeter leading to no perceptible effects on vegetation, wildlife or the Healy Corridor. The base would, however, require significant excavation for counterweight anchoring. This would foreseeably occur in low elevation forest habitat that is part of the Healy wildlife corridor along the base of Mount Bourgeau. The amount of undisturbed terrain for excavation into the adjacent lower slope of Mount Bourgeau is unknown at this time. <p>Aquatic Ecosystems</p> <ul style="list-style-type: none">Lift base is situated away from Healy Creek so no direct impacts anticipatedTram base will require significant excavation and counterweight anchoring in unstable ground and high water table.High water table may be a geotechnical engineering concern (i.e., counterweight foundation, slope stability) <p>Visitor Experience</p> <ul style="list-style-type: none">Tram building is large but not out of scale or inconsistent in nature with respect to existing buildings	<ul style="list-style-type: none">➤ Tram counterweight would lead to some terrain disturbance and vegetation removal with an associated incremental impact on the size (width) of the Healy Wildlife Corridor.➤ Suitability and stability of proposed sites is primarily an engineering feasibility concern➤ Concerns that may be identified can presumably be addressed through geotechnical evaluation, engineering and design➤ Integration of Tram building design and materials with other base area buildings➤ Tram building could be combined with a parking structure to replace lost parking spots

	<ul style="list-style-type: none">• Could arguably contribute to sense of visitor arrival, intrigue and anticipation (personal)• Base would take up prime parking spots• Tram building could include some visitor services e.g. tickets sales to relieve congestion on busy days	
<p>Residual Effects – Tram</p> <p>The Base Terminal would be best characterised as a site-specific alteration of a previously disturbed and currently developed site. A necessary counterweight would presumably be built into the lower slope of Mount Bourgeau on the north side of the existing parking lot. While the tram base would lead to little or no ecological impacts, the counterweight would likely necessitate some terrain disturbance and an incremental loss of vegetation and wildlife habitat within the Healy Wildlife Corridor. The location exhibits a high water table, and terrain disturbance associated with construction of the counterweight may impact on subsurface water flows and slope stability. With respect to visitor experience, connection to place and visitor opportunity, the tram base would be an addition to an existing, partial built environment; it may have minimal incremental effects (positive or negative) compared to current visitor perceptions of the base area. Integration into design, visitor flow, and architecture of the overall base area has potential to be done in a way that could contribute to a sense of arrival and connection to place for many visitors, and relieve congestion on busy days. The tram base would lead to a loss of parking capacity and alteration in traffic flows, exacerbating the current parking imbalance and further underscoring the need for a comprehensive and forward looking resolution to this issue.</p>		

Key Developments and Operations Tram Line	Potential Impacts on Significant Factors	Potential to Manage/Mitigate
<ul style="list-style-type: none">• As proposed, runs up existing avalanche path – requires minimal tree clearing for ROW• One midway tower would be constructed, requiring significant terrain modification along the ridgeline for multiple footings. The tower would be 6x6m in area (36m2) and lead to the removal of approximately 30 trees• Off season tower service would be conducted by tram car or helicopter• Avalanche control must continue to take place below tram line for protection of base area• Rescue – rescue car design• License of occupation (re. aerial rights) required for alignment and avalanche control• Construction access – helicopter	<p>Native Vegetation</p> <ul style="list-style-type: none">• Tram line involves minimal tree clearing and multiple ground disturbances at one site for lift footings along an upper subalpine ridge• Potential for sensitive species to overlap proposed tower location, such as whitebark pine <p>Wildlife</p> <ul style="list-style-type: none">• Tram line involves minimal wildlife habitat destruction or alteration aside from single tower site• Some potential to disturb mountain goat or sheep habitat utilization <p>Healy Corridor</p> <ul style="list-style-type: none">• Tram line runs above non-fragmented forest cover and is anticipated to have little or no effect on wildlife movement below• Tram line not anticipated to impact on the Bourgeau Corridor on the north side of the valley or up Healy Creek valley <p>Aquatic Ecosystems</p> <ul style="list-style-type: none">• There are no interactions between the Tram line and Healy creek or other aquatic habitat <p>Visitor Experience</p> <ul style="list-style-type: none">• The Tram line will be largely indiscernible to visitors except for the mid line tower. This tower is anticipated to be quite tall (75-100 feet) and readily visible from the Sunshine Road and parking lot.	<ul style="list-style-type: none">• Tram line is engineered and regulated and there is no opportunity to affect the limited number of towers (1) or other aspects of design• The ridgeline tower site is located at a necessary engineering point and tower height will be dictated by design – no alternatives are available• No foreseeable impacts on the Healy Corridor, and no mitigation likely warranted• Further evaluation to assess potential for sensitive vegetation species on proposed tower footprint, and potential sheep and/or goats use of the local area. Any sheep or goat use of the area would necessitate a mitigation plan focused primarily on the construction phase to avoid disturbances (e.g., minor adjustments in project scheduling)• No foreseeable impacts on the Healy Creek aquatic habitats, and no mitigation required
<p>Residual Effects</p> <p>The tram line poses little risk of impact to the environment or visitor experience. The ridgeline tower site would be located at a necessary engineering point and tower height will be dictated by design; no alternatives are available. The tower would be situated in a location with relatively few environmental sensitivities. Pre-construction surveys would, however, be conducted to evaluate potential presence of sensitive vegetation and wildlife species, and to develop any necessary mitigation and/or monitoring plans. While perhaps minor from an ecological perspective the construction of the single tower necessarily includes destruction of trees and natural terrain over a 36m2 footprint. The tower itself is also the key potential impact to visitor experience and perception and can be expected to be highly visible from the Sunshine road and from anywhere in the base area. Tram towers are considerably larger than a normal lift tower, more similar to a hydro line tower requiring four footings and clearing of a much larger area beneath the tower.</p>		

Key Developments and Operations Tram Upper Terminal	Potential Impacts on Significant Factors	Potential to Manage/Mitigate
<p>Upper Tram terminal considerations include the terminal structure itself, associated lodge/restaurant, walkways and decks, summer use, visitor trails and viewing platforms, and supporting infrastructure including service, power, water and wastewater considerations. The project may also include terrain modification for easier skier egress.</p> <ul style="list-style-type: none">• The upper terminal would be located above treeline in the upper alpine on a SE facing slope just off a SW trending ridge of Goats Eye Mountain.• The tram terminal would be similar in size to the base terminal, approximately 2-3 stories in height and a footprint estimated to be 500m² (20mx25m), with an additional 25% likely required for staging/perimeter (total footprint approximately 625m²)• In addition to the upper Tram terminal, a day lodge is proposed high on Goats Eye Mountain. The footprint and form of the day lodge are unknown at this time. Presumably it would be a substantial structure.• Site preparation for both the upper tram terminal and the day lodge would require significant terrain modification for the foundation. This would include site levelling, excavation for building foundations, construction materials lay down area, construction machinery operation space, and surplus excavated materials disposal. Tram terminals are substantial structures – typically 2-3 stories tall and require much more material and construction than a ski lift terminal.• There is no road or constructed trail access for ground surface-based vehicles to the upper Goats Eye Mountain site at this time. Both construction and operations of the tram terminal and day lodge would foreseeably necessitate the construction and ongoing maintenance of a road from Goat's Eye base to the tram terminal and lodge high on Goat's Eye Mountain. Lodge operations would be supplied either by Tram or the new constructed road.• There are no utility services available to the upper terminal site closer than the temporary Goats Eye Day Lodge at the base of Goats Eye Mountain. Operations of the terminal and lodge would require the construction of infrastructure including potable water storage (including pressurized fire fighting water supply), wastewater storage, power supply, heating, and potentially communication and internet cable. A sufficient natural water supply for Goats Eye and an upper tram lodge is not available – a snowmelt, runoff catchment reservoir such as those that serve the Village area would be required. Once constructed, water and wastewater are to be transported via tram in specialized service cars.• The tram would be used in both winter and summer, with summer use associated with proposed sightseeing, walking trails, and a Beauty point lookout development. The plan includes tram and day lodge use in daytime through late evening hours. Summer use plans create a	<p>Terrain and Vegetation</p> <ul style="list-style-type: none">• Tram terminal and day lodge development will include major terrain modification and construction that will result in the permanent destruction of alpine vegetation within the footprint and immediate construction area. Similarly, any terrain modification for easier skier egress from the elevation of the tram upper terminal to the tree line would be unrepairable. Any significant terrain modification, particularly of a linear configuration would be highly visible when viewed from most places in and near the Sunshine Meadows.• The area of the terminal and lodge is well above treeline and vegetation impacted likely include lichens and sparsely distributed slow growing alpine vascular plants• Proposed visitor trails and viewing platforms down to Beauty Point will also result in the destruction of native alpine vegetation. Vegetation cover and diversity is greater at Beauty Point with greater (although uncertain) potential to impact rare species. It would be reasonable to estimate at least another 1000m² of trail and viewing platform development and associated vegetation destruction• A road from the Goats' Eye base to the tram and on to the top terminal of the existing Goat's Eye lift would require major terrain modification including significant cut and fill along the majority of the route. Road construction will extend impacts on native vegetation into the upper subalpine and into Whitebark pine stands <p>Wildlife</p> <ul style="list-style-type: none">• Tram terminal location and Beauty point serve as at least occasional habitat for Mountain Goat, Bighorn Sheep, and small mammals such pika, ground squirrels, and perhaps ground nesting birds• While Tram, lodge, trail and road development is unlikely to destroy habitat at a large scale it may render local habitat unusable due to disturbance and displacement associated with operations and summer visitor use• Some potential to disturb mountain goat or sheep habitat utilization – requires investigation <p>Healy Corridor</p> <ul style="list-style-type: none">• Construction of the upper Tram terminal is likely to involve heavy machinery and use of explosives. Noise and other sensory impacts may temporarily displace wildlife temporarily from movement through Healy corridors or through other areas adjacent to the construction site.• Operation of the Upper Tram terminal is unlikely to influence wildlife use and movement of the Healy corridor	<ul style="list-style-type: none">➤ Terrain disturbance and loss of sensitive alpine vegetation is considered permanent, with no effective means to mitigate, reclaim or restore. These losses would be associated with new infrastructure including the terminal, lodge, trails, viewpoint, access road, and utilities.➤ Some impacts may be avoided by trail routing around vegetation patches➤ Potential impacts of off-trail visitor use may be largely managed through education and monitoring as well as trail and platform design (but not likely to be eliminated)➤ Effects of road construction could be mitigated in the event all access to the terminal and lodge is achievable by helicopter (during construction) and tram or helicopter during operations. It is unknown if this approach would be feasible.➤ Construction in this area requires little more than siting considerations and the application of best management practices➤ Potential impacts to Goats and Sheep can be mitigated through pre-construction and construction phase monitoring, and development of a best management and monitoring plan based on results of surveys.➤ Seasonal and daily timing of operations and maintenance activities can be scheduled to avoid sensitive periods for wildlife (e.g., spring breeding and fall rutting).➤ Engineering, technology and design solutions are available to address potential issues and limit impacts to aquatic ecosystems

<p>significant new summer use and operational node in addition to Goat's eye lodge and Sunshine Village/Meadows area. Sunshine currently is offering to withdraw existing summer operations associated with the summer gondola, base lodge and facilities, and the Standish lift that provides access to the Sunshine Meadows lookout and designated trails.</p>	<p>Aquatic Ecosystems</p> <ul style="list-style-type: none">• The Tram terminal operation is unlikely to have any direct impacts to aquatic ecosystems – however the summer visitor program and lodge/restaurant will require a substantial water supply• As there is no naturally available water supply water will have to be developed through reservoir and surface runoff/snowmelt collection similar to the supply at Sunshine village – although likely somewhat smaller in scale• In combination with other potential reservoirs for snowmaking, and for a Goats Eye lodge supply, the Tram operation is likely to have some effect on seasonal flow regimes for Sunshine creek – the extent of impact or change is uncertain and requires considerable additional planning and investigation• The lodge and visitor operation will substantially add to load on wastewater systems – a significant system will be needed for Goats Eye lodge and the Tram operation located at Goats Eye or downhill at the Base area in order to limit water quality and habitat parameter impacts downstream in fish bearing Healy creek <p>Visitor Experience</p> <ul style="list-style-type: none">• The Tram and terminal lodge and trails presents new winter and summer visitor opportunities, with summer focused on the new high elevation viewpoint and lodge/restaurant facilities. While gaining an excellent viewpoint the experience is one facilitated by what must be characterized as a built facility that more or less duplicates similar other opportunities already existing in the mountain parks such as Sulphur Mountain• The most singular, unique summer season attraction to the Sunshine area is the Sunshine meadows – the Tram operation fails to connect visitors to this natural attraction and opportunity• Although the Tram and lodge/restaurant may be located as to avoid visual impacts from down the Valley towards Banff and the Trans Canada highway, the facilities will be highly visible from much of the ski area, from Healy and Simpson pass – for many non-ski-area visitors the obtrusiveness of the proposed facilities is likely to adversely impact their experience and connection to the natural features of the park• Public safety and enjoyment of the tram and upper terminus facilities would be affected by variable weather conditions during both winter and summer months. This can include fog, low cloud cover, whiteout conditions, and high winds. This may affect safety concerns around public egress, particularly in summer months, and the real feasibility of closing off current summer operations (Gondola, Lodge and Standish Chair).	
<p>Residual Effects</p> <p>The Tram terminus includes several sources of disturbance including the terminus along with a day lodge/restaurant, trails, viewpoint, and utilities and potentially a road development requirement proposal from Goat's Eye base to the new terminus near the top of Goat's Eye Mountain. As a whole, the project components constitute an irreversible alteration, damage and destruction of significant ecological and aesthetic viewscape factors within a locally sensitive alpine and upper subalpine area. This will included losses of alpine vegetation and subalpine vegetation, and major irreversible terrain modification. Summer visitor use, while largely contained, will have impacts to wildlife and vegetation that are known to be readily associated with any site supporting intensive visitor use.</p> <p>While the Tram provides access to an excellent viewpoint the experience is one characterized by a built facility that more or less duplicates similar other opportunities already existing in the mountain parks. While perhaps spectacular, the Tram location would fail to connect visitors to the main natural attraction of the area – Sunshine Meadows. And for many summer visitors to Sunshine Meadows, or to the Healy and Simpson pass areas, including patrons of the ski area, the visibility of the proposed facilities is likely to adversely impact their experience and connection to the natural features of the park.</p>		

Functional Considerations		
<div>Tram – Functional Considerations</div> <ul style="list-style-type: none">Functional considerations include out-of-base lift capacity and practical download capacityA large tram such as those at Squaw Valley or Jackson Hole can move roughly 650-800 people per hour – over 2.5 hours a tram at the upper end of this capacity could move 2000 additional people out-of-base and onto the mountainAn additional 2000 people would just address additional out-of-base capacity associated with a ski area capacity increase to 8500A tram with an upper terminal in the proposed location will have no practical contribution to skier egress as skiers would have to ride up the Goats Eye lift simply to ride down the TramGiven its intention for year round use, it is not unreasonable to expect use in the range of 100,000 to 200,000 visitors during the summer and early fall period. <div>Tram Avalanche Considerations</div> <ul style="list-style-type: none">Tram terminus facilities will not be subject to avalanche hazardAvalanche control activities will still have to take place on the slopes below and adjacent to the tram line and towersThis may require adjustments to the current PC use of helicopter control and ideally should be turned over to the ski area given the tram infrastructureTurning over avalanche control would require a license of occupation extension into this area		
Combined Project Residual Effects (Tram Base, Lift and Tower, and Terminus Project (terminus, lodge, viewpoint, trails, utilities and access road)		
<div>Magnitude: – The magnitude of environmental effects presented by the Tram proposal range from on-going disturbance to irreversible destruction. Alpine and subalpine vegetation will be permanently destroyed on a site-specific scale and on-going visitor use and operations will result in sustained disturbance and damage.</div> <div>Permanence: Tram – The effects of construction in the alpine and upper subalpine footprint of the tram proposal must be primarily considered as permanent and largely irreversible effects. The difficulty of construction in the upper terminal location and need for considerable amounts of terrain modification, combined with exceptional difficulty in reclamation or re-vegetation will result in a net loss in alpine vegetation. Harsh growing conditions and very slow growing plant species make successful reclamation or restoration highly improbable.</div> <div>Spatial extent: Tram – The Tram proposal will directly develop a couple thousand square meters of alpine vegetation and habitat at the top terminal location including the tram terminal itself, restaurant, (and day lodge) trail and viewing platforms. This development must be considered along with the construction and disturbance footprint of road and utility access, and water reservoir development. Road and utility development will involve roughly 4 km of terrain modification and disturbance to vegetation from Goats Eye base to the top of the Goats Eye lift past the tram top terminal. At roughly 6m wide (as a minimum groomed skiway width) this equates to a development footprint of about 2.4 ha. In terms of linear disturbance which is relevant to on-going operation impacts and sensory disturbance effects the Tram proposal including the road, trails and viewing platforms on Beauty point would have a footprint of roughly 4.6 km. Reservoir development may be reasonable reasonably expected to impact another 1-2 hectares (similar to the reservoir footprint at the Village area). All things considered, the spatial extent of potential impacts – both construction and operation can be most accurately described to occur at the site-specific and local levels. Properly reclaimed and managed following construction the development of the Tram lift is unlikely to have impacts at a local ecosystem or regional scale.</div> <div>Ecological context: – The main impacts of the Tram proposal which encompass the upper terminal, lodge/restaurant, trail and viewing platform, and access road all occur in the alpine or upper subalpine elevations of Goats Eye Mountain. Potentially significant vegetation disturbance is to slow growing alpine vascular plants at or above treeline, and to SARA listed Whitebark pine at upper subalpine elevations. Wildlife species potentially affected in an adverse manner include bighorn sheep, mountain goat and smaller alpine wildlife and bird species. Given the species involved and the harsh elevation, climatic and growing conditions, as well as the relatively small footprint of alpine ecosystems in the mountain parks, the ecological context at this location can be best described as sensitive. The Tram base counterweight component will also lead to incremental impacts on terrain, vegetation and wildlife habitats within the Healy Wildlife Corridor along the lower slopes of Mount Bourgeau north of the current parking lot.</div> <div>Visitor Perception and Opportunity: – The tram development is intended to serve as more than just lift conveyance to the upper mountain. It is intended to serve as its own experience as well as to facilitate a new summer visitor offer on the upper reaches of</div>		

<p>Goats Eye mountain. In this light the tram is most appropriately considered as a constructed viewpoint similar to the Jasper Skytram, Glacier Discovery walk or Sulphur mountain gondola. While the Tram may provide access to an excellent viewpoint the experience is one facilitated by a built facility that more or less duplicates similar other viewing opportunities already existing in the mountain parks.</p> <p>The Tram location does not connect visitors to the main natural attraction of the area at Sunshine Meadows. While “interpretation” signs or stations may be installed anywhere, there are no particular features or characteristics of the site, or broader viewpoint that would provide anything more than a generic educational opportunity. Some park users including summer patrons of the ski area and visitors to Sunshine Meadows or Healy and Simpson pass areas might perceive the developments at the top tram terminal as obtrusive. It is not unreasonable to suggest that the size and visibility of the proposed facilities is likely to adversely impact visitor experience and connection to the natural features of the park for off-site visitors.</p> <p>The Tram does certainly provide very quick and comfortable access to the Goats Eye area and would get skiers onto the mountain and skiing in only a few minutes. However the tram terminal location is not likely to function well for significant skier egress from the hill – simply due to the fact that a visitor would have to ride uphill on the Goats Eye lift and then transfer over to the Tram to ride downhill – a process that would be far more inconvenient than simply taking the ski out or the gondola from the Goats eye area.</p>	
<p>Summary: Tram</p> <p>Long term potential impacts of the Tram proposal may be defensibly described as permanent, local level, damage to sensitive alpine and subalpine vegetation, and disturbance to wildlife habitat within both undeveloped and currently developed locations across the west face of Goats Eye mountain, and in the Healy Corridor adjacent to the existing parking lot. Primary sources of impacts are the base counterweight, midslope tower, and the significant components associated with the terminus operation including the upper terminal, lodge/restaurant, decks, walkways and viewing platforms, trail to Beauty Point, construction of a service road from the Goats Eye base area and the need for additional utilities and infrastructure including the likely development of a water reservoir in the Goats Eye base area.</p> <p>In terms of construction level impacts the Tram proposal in its entirety involves relatively little tree removal, but instead requires significant terrain modification at multiple locations and across the face of Goats Eye mountain that may be considered to be permanent, and in many cases, irreversible. Restoration of destroyed or damaged alpine and upper subalpine meadow vegetation is considered to be essentially impossible in the harsh climate and growing conditions at upper elevations. Grading and blasting of terrain, although perhaps not significant from an ecological standpoint, is considered a permanent and irreversible change to natural terrain configuration, especially in alpine areas. Perhaps more significant than construction level impacts will be the shift from current low levels of winter use, to high levels of year round visitor and operational use. While not overstating the moderate importance of the area to wildlife, the impacts of intensive summer visitor use on wildlife and habitat are well know from other sites and can be reasonably expected to be similar at this location, including vegetation trampling, wildlife habituation and displacement.</p> <p>The Tram proposal is intended to address the out-of-base capacity issue as well as create a new year round visitor experience offer. While the tram ride and views would be spectacular, the proposal essentially replicates other similar experiences already available across the mountain parks. There is little to offer in terms of visitor education or interpretation that is unique to the site beyond generic messaging. And the proposal does not connect visitors in any way to the primary natural attraction of the area – Sunshine meadows.</p> <p>The tram base would lead to a loss of parking capacity and alteration in traffic flows, exacerbating the current parking imbalance and further underscoring the need for a comprehensive and forward looking resolution to this issue.</p> <p>An additional issue with the Tram concept during winter operations has to do with novice skiers arriving high on Goat's Eye because of the allure of the Tram, and subsequently having difficulty safely descending the mountain. This conceivably may bring demands to allow a constructed traverse across the face of Goat's Eye. At higher elevation, this would likely constitute significant, irreversible terrain modification.</p>	