

Eradicating Invasive European Fallow Deer from Sidney Island to Facilitate Sustained Forest Recovery

Detailed Impact Assessment

Gulf Islands National Park Reserve¹

DRAFT – July 2023



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Executive Summary

Sidney Island has a population of invasive European Fallow Deer (*Dama dama*) that is negatively impacting the ecological integrity of the forest ecosystem. Decades of over-browsing by the deer has degraded the forest understory and resulted in decreased abundance and diversity of native plants and wildlife. This includes the near or total loss of many native and culturally significant understory plant species and a significant reduction of songbirds. European Fallow Deer have also affected the native Black-tailed Deer (*Odocoileus hemionus*) population, which is the preferred species for local Indigenous hunters. Monitoring has identified Sidney Island as the least biologically diverse island compared to similar islands in the Southern Gulf Islands region.

The northern portion of Sidney Island is within Parks Canada's Gulf Islands National Park Reserve (GINPR). Since 2018, Parks Canada has been working collaboratively with W̱SÁNEĆ and Quw'utsun Nations, Sidney Island residents, the Province of British Columbia (BC), and Islands Trust Conservancy towards the goal of achieving sustained recovery of the Coastal Douglas-fir forest on SḴFÁMEN (Sidney Island). This collaborative project is a multi-pronged approach that includes the eradication of invasive European Fallow Deer (hereafter "the project"). For logistical and operational reasons, and to ensure the success of the project, the small population of native Black-tailed Deer will also be eradicated from Sidney Island during the project. The eradication will be carried out in three phases:

- **Phase 1 - Aerial and Ground Operations:** This phase is expected to consist of 10 days of aerial and ground activities, with the objectives of population reduction and reconnaissance to inform subsequent phases.
- **Phase 2 - Ground Operations:** This phase will occur over three to five months and will consist of professional marksmen and trained canine/handler teams completing the eradication operation on foot. Temporary fencing will be used to limit the deer's movements throughout the island.
- **Phase 3 - Biosecurity Monitoring and Adaptive Management:** This phase will begin as soon as Phase 2 concludes and will include the implementation of an adaptive management plan to rapidly detect and respond to possible, although unlikely, fallow deer re-invasions.

Alternatives to the project, including alternatives to achieve forest restoration and alternative methods for carrying out the deer eradication, were considered, and were found to be unfeasible based on technical, economic, and operational factors, as well as the preferences of the project partners.

This Detailed Impact Assessment (DIA) analyzes the potential effects of the project on the following Valued Components² (VCs):

Indigenous Harvest of Deer: Native Black-tailed Deer, the preferred target species for Indigenous hunters, have been reduced on Sidney Island due to competition with European Fallow Deer. Over the short term, the project will disrupt the Indigenous harvest of deer. This will be mitigated by offering hunting opportunities prior to and/or after Phase 1 and distributing the deer meat and hides collected from the project to local First Nations. Project partners have a shared interest in the re-establishment of

² Valued Components are specific environmental, economic, social, heritage, and health attributes that may be potentially impacted by the proposed project.

native Black-tailed Deer to Sidney Island, providing it does not compromise vegetation recovery. In the years or decades following the project, the project is expected to benefit Black-tailed Deer, which will support Indigenous hunting on Sidney Island.

Indigenous Culturally Important Plants: The restoration of the forest understory is intended to create conditions that will support a greater abundance of culturally important plants, thereby supporting traditional practices for local First Nations. Although undesirable effects from invasive species are possible, mitigations are in place to reduce the risk and the balance of effects is expected to heavily favour improvements in ecological integrity for culturally important plants.

Indigenous Cultural Artifacts and Culturally Significant Sites: The long and continuous ties of local First Nations to the Southern Gulf Islands is reflected in the Indigenous cultural artifacts and culturally significant sites on Sidney Island. The project has been designed to minimize ground disturbances. The two instances of ground disturbance (digging a shallow trench and using tent pegs for temporary fencing) will only occur in areas identified as low risk by Parks Canada Terrestrial Archaeologists and W̱SÁNEĆ cultural monitors. Additional mitigations, such as cultural resource awareness training for project team members and an Accidental Finds Protocol, help to avoid and minimize impacts to known sites and resources, appropriately manage accidental finds of cultural artifacts, and ensure appropriate behaviour in spiritually important locations. No residual adverse effects are predicted.

Forest Understory Vegetation: The project is expected to increase native plant species richness and cover in the forest understory and improve natural ecosystem processes such as forest regeneration. The removal of deer browse pressure will allow understory species to flourish and successful shrub and tree regeneration (seedlings developing, eventually, into mature individuals). The removal of deer browse pressure may also promote the growth of undesirable invasive plant species, primarily in open fields and forest-field transition zones. As with any ecosystem, species composition is expected to change over time, but proactive control of English Hawthorn and Scotch Broom are expected to mitigate the risk of their expansion following the project. In addition, with ongoing monitoring of native and non-native species responses in the understory, and an adaptive management framework in place, the project is expected to favor the recovery of native plant species and strengthen forest ecosystem processes. Some localized and short-term residual impacts from the project are possible, however the significance of residual adverse effects is negligible.

Birds: Impacts to birds have been minimized through project design and mitigations, however, some residual impacts are possible. Phase 1 is expected to cause short-term disturbances to resident birds and, although unlikely, if Phase 1 occurs after January 1st, nesting owls and Bald Eagles (*Haliaeetus leucocephalus*) could be disturbed. Impacts from ground operations are generally insignificant relative to typical levels of disturbance on Sidney Island, however minor disturbances to birds could result in Phase 2. Disturbances could include the noise and presence of ground crews and canines during higher than normal “hunting days” and altered bird foraging due to bait stations and deer carcasses or entrails. The significance of residual adverse effects is expected to be negligible given existing levels of disturbance on the island, the short duration of the project, and the expected long-term benefits for songbirds.

The legal obligations of the *Migratory Birds Convention Act (MBCA)* and *Canada National Parks Act (CNPA)* will be met, however, given the potential residual impacts to the Threatened Western Screech

Owl (*Megascops kennicottii*), Marbled Murrelet (*Brachyramphus marmoratus*), and Red Knot (*Calidris canutus roselaari*), a *Species at Risk Act (SARA)* permit will be acquired. A permit under the *BC Wildlife Act* will also be acquired for the possible minor, short-term disturbances to nesting eagles.

Black-tailed Deer: The project will result in the eradication of a small population of native Black-tailed Deer on Sidney Island. With mitigation measures in place, the significance of short- to medium- term residual impacts to Black-tailed Deer are negligible. In the years or decades following the project it is anticipated that Black-tailed Deer will naturally re-establish on Sidney Island. If this does not occur, Parks Canada is committed to facilitating a collaborative planning process for Black-tailed Deer reintroduction, if all project partners are supportive and reintroduction will not compromise forest understory recovery. The absence of European Fallow Deer and resulting vegetation recovery will create favourable ecosystem conditions for a future re-established population of Black-tailed Deer. A Black-tailed Deer Management Strategy has been developed to prevent a future re-established population from becoming hyperabundant on Sidney Island (as is the case elsewhere in the region).

Foothill Sedge (*Carex tumulicola*) is an Endangered species with critical habitat in the field areas adjacent to the Sidney Island campground. Short term impacts from ground operations will be reduced through mitigations, although there is a very small chance that individual plants could be damaged. Long-term effects of the deer eradication, from increases in invasive species, are possible but are being mitigated through proactive management of English Hawthorn (*Crataegus monogyna*) prior to the project, and adaptive management. A SARA permit will be acquired for Foothill Sedge.

Terrestrial Mammals: Impacts to terrestrial mammals have largely been avoided or reduced through project design and mitigation measures. Some ground operations, such as increased human presence, noise, and bait stations, deer carcasses and entrails, may have short-term impacts on terrestrial mammals, however, these are not expected to be significant given the pre-existing baseline levels of disturbance on Sidney Island. No long-term effects are anticipated. In the years or decades following the project, terrestrial mammals are expected to benefit from the forest recovery.

Visitor Experience: The quality of visitor experience to Sidney Island will be maintained; project operations will be short term and will largely avoid peak visitation periods. No residual impacts are anticipated. The process of ecosystem recovery on Sidney Island will provide a unique opportunity for visitors to learn about ecological integrity and restoration. Following the project, visitor experience will be enhanced through the opportunity for visitors to experience a recovered forest ecosystem with increased abundance and richness of native flora and fauna.

Parks Canada has determined that, with the implementation of mitigation measures, the project is not likely to cause significant adverse environmental effects on federal lands. While the project activities and mitigations discussed within the DIA may be applied across the entire project area, which includes both federally and privately administered lands, the decision on the significance of adverse effects and approval of the DIA applies only to the portion of Sidney Island that is within Parks Canada's authority.

Project partners, WSÁNEĆ First Nations, Member Bands of Quw'utsun Nation, First Nations with an interest in Sidney Island, stakeholders and the public will be consulted on the draft DIA. Feedback will be considered and incorporated into the DIA, as appropriate.

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1 Introduction

Sidney Island, the northern portion of which is within Parks Canada's Gulf Islands National Park Reserve (GINPR), has a population of invasive European Fallow Deer (*Dama dama*) that is negatively affecting the ecological integrity³ of the forest ecosystem. Decades of over-browsing by the deer has degraded the forest understory and has resulted in decreased richness⁴ and diversity⁵ of native plants and wildlife. This includes the near or total loss of many native and culturally significant understory plant species, a significant reduction of songbird abundance and diversity, and a reduction of the native Black-tailed Deer (*Odocoileus hemionus*) population. Academic monitoring and Parks Canada Agency's ecological integrity monitoring have identified Sidney Island as the least biologically diverse island compared to similar islands in the Southern Gulf Islands region (T. G. Martin et al., 2011; Parks Canada Agency, 2018a, 2019b).

Since 2018, Parks Canada has been collaboratively working with WSÁNEĆ and Quw'utsun Nations, Sidney Island residents, the Province of British Columbia (BC), and Islands Trust Conservancy, towards facilitating sustained recovery of the Coastal Douglas-fir forest on SKƐÁMEN (Sidney Island). This collaborative initiative is known as SKƐÁMEN QENÁŁ,ENEƐ SCÁ (SQS), which means "Taking Care of Sidney Island Project" in the WSÁNEĆ language of SENĆOƐEN, or as the Sidney Island Ecological Restoration Project (SIERP). SIERP is funded through Parks Canada's Conservation and Restoration (CoRe) program and is formalized via a Memorandum of Understanding between Parks Canada, the Province of BC, Islands Trust Conservancy, and Sidney Island residents, with letters of support from the WSÁNEĆ Leadership Council and Pauquachin First Nation.

1.1 Goals and Objectives

Through the SIERP, project partners⁶ have collaboratively developed shared goals and objectives for the conservation and restoration of Sidney Island ecosystems. The goal of SIERP is to achieve sustained forest recovery on Sidney Island. The SIERP Steering Committee and project partners, through years of research, discussions, and planning, developed the following objectives in order to meet this goal:

1. Collaboratively plan and implement eradication of European Fallow Deer (see Section 7.1 for a summary of the consideration of alternative approaches), and prevent European Fallow Deer re-invasion;
2. Collaboratively develop a forest restoration strategy, including invasive plant management and native plant restoration; and

³ According to the *Canada National Parks Act (CNPA)*, "ecological integrity" means, with respect to a park, "a condition that is determined to be characteristic of its natural region...." An ecosystem has integrity when it has the living and non-living pieces expected in its natural region and its processes (e.g., fire, flooding, predation) occur with the frequency and intensity expected in its natural region.

⁴ Species richness is defined as the number of species.

⁵ Diversity is defined as the number of species and how evenly distributed the numbers of each species are.

⁶ Parks Canada Agency, the WSÁNEĆ Leadership Council, Tsawout First Nation, Pauquachin First Nation, Sidney Island residents (Sallas Forest Strata), Islands Trust Conservancy, and the Province of BC. Representatives from Cowichan Tribes and Penelakut Tribe were actively involved until early 2021, after which they withdrew and deferred to representatives from the WSÁNEĆ First Nations.

3. Collaboratively develop a viable management strategy for Black-tailed Deer post eradication.

Given that SIERP is a larger project that includes multiple, complex components in a multi-pronged approach to ecosystem recovery on Sidney Island, each component of the overall forest recovery program has been evaluated independently⁷. For the purposes of this report, “the project” refers solely to activities associated with the first objective, the eradication of invasive European Fallow Deer.

This Detailed Impact Assessment (DIA) examines the risks and benefits of the proposed project on Indigenous rights and values, the ecological environment of Sidney Island, and visitor experience.

2 Direction from Legislation, Mandate, and Policy

The Parks Canada impact assessment process has been developed to fulfil legal obligations under the *Impact Assessment Act (IAA)* (Impact Assessment Act, 2019) as well as other legal and mandated obligations to protect and present Canada’s natural and cultural heritage. The policy framework, in addition to the *IAA*, requiring the completion of a DIA for the proposed project, are described below.

2.1 Canada National Parks Act and Parks Canada Mandate

The *Canada National Parks Act (CNPA)* (Government of Canada, 2000) is the primary legislative instrument guiding the management of national parks. It states:

“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.”

Ecological integrity is defined in the Act as “...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 Parks Canada mandate commits to protecting both natural and cultural heritage. Cultural heritage includes human works, objects, or places that are determined, based on their heritage value, to be directly associated with an important aspect or aspects of human history and culture. The heritage value of a cultural artifact or site is embodied in tangible and/or intangible character-defining elements. The conservation of heritage value must be a primary consideration in any intervention that may adversely affect cultural artifacts or places.

2.2 Draft Gulf Islands National Park Reserve Management Plan

Parks Canada Management Plans provide strategic, long-term guidance for park administration and management. The primary goal of these plans is to ensure a clearly defined direction for the maintenance and restoration of ecological integrity.

The Draft Gulf Islands National Park Reserve Management Plan (Parks Canada Agency, 2013) identifies objectives and strategies to address priorities identified by local First Nations, communities,

⁷ Separate Impact Assessment (IA) reports were generated for the management of invasive English Hawthorn (<https://iaac-aeic.gc.ca/050/evaluations/proj/80441>) and the re-establishment of native vegetation inside fenced protection zones (<https://iaac-aeic.gc.ca/050/evaluations/proj/81014>).

stakeholders, and the public. Priorities included building stronger cooperative approaches with First Nations for park reserve management, striving for collaboration, and making Indigenous knowledge foundational in decision making, as well as improving ecological integrity, focusing on connectivity and restoration in a fragmented environment with impaired natural processes.

The management plan identifies objectives for improving the condition of the broader ecosystem through active restoration, including a target of addressing the impacts of the invasive European Fallow Deer to improve outcomes associated with the forest understory health measure. The management plan also identifies objectives for protecting and recovering Species at Risk⁸ (SAR) through the implementation of a multi-SAR action plan for GINPR. Targets for having First Nations, organizations, communities, and visitors actively involved in projects that support ecological integrity restoration efforts are also established in the management plan.

2.3 Parks Canada Directive on Impact Assessment

The Parks Canada Directive on Impact Assessment (Parks Canada Agency, 2019c) describes the legislative and policy requirements to assess the impacts of proposed projects within Parks Canada protected areas. It requires an impact assessment occur when a project may have adverse effects. As part of the impact assessment process, several guiding principles are followed, including transparency and meaningful participation; Indigenous leadership opportunities and partnership; and robust evidence from rigorous scientific study and Indigenous knowledge.

There are several possible impact assessment pathways that can be pursued at Parks Canada. Given the high degree of interest from Indigenous partners, the Sallas Forest Strata community, and the public, and the potential for altered ecological composition, structure or processes, resulting in the impairment of ecosystem function if the presence of European Fallow Deer on Sidney Island is not addressed, an impact assessment via the DIA pathway has been selected⁹. This is the most comprehensive level of assessment and is appropriate for projects that require in-depth analysis. It requires more thorough public participation related to potential adverse effects, allowing the public, stakeholders, and Indigenous Peoples to have the opportunity to review and comment on the draft DIA. It may require the evaluation of alternatives or a follow-up monitoring program.

2.4 Parks Canada Policies Direction

The following general policy direction on alien species is provided by Parks Canada's Guiding Principles and Operational Policies - National Parks Policy section 3.2.11 (p. 35) (Parks Canada Agency, 2022b):

“All practical efforts will be made to prevent the introduction of exotic [alien] plants and animals into national parks, and to eliminate or contain them where they already exist.”

Further, Parks Canada's Wildlife Regulations (Government of Canada, 1981) prohibit the introduction of wildlife species that are not native into a national park.

⁸ The [Government of Canada](#) defines Species at Risk as an extirpated, endangered, threatened species, or a species of special concern.

⁹ The Parks Canada [Impact Assessment Guide](#) provides more detailed and technical information on the impact assessment process and pathways.

2.5 Sidney Island Spit Area Management Plan

The Sidney Island Spit Area Management Plan (Parks Canada Agency, 2009b) identifies that European Fallow Deer are one of the main stressors that are negatively impacting the ecological integrity of Sidney Island. It identifies that restoration projects to improve ecological integrity should be undertaken, including the development and implementation of plans for European Fallow Deer and Black-tailed Deer management. The management goals are to remove European Fallow Deer and maintain Black-tailed Deer at numbers within historic ranges

2.6 Directive on the Management of Invasive or Hyperabundant Species

European Fallow Deer on Sidney Island are considered an invasive species due to their negative impacts on the ecosystem and native species composition. “Invasive” species are those that are established outside of their natural past or present distribution, whose introduction and/or spread threaten biological diversity (Parks Canada Agency, 2019a). “Invasive” species modify habitat and native species composition to the point of significantly altering ecological function or negatively impacting socio-economic systems (Cadotte et al., 2006; Richardson et al., 2000). According to the Directive on the Management of Hyperabundant Wildlife Populations in Parks Canada’s Protected Heritage Places (Parks Canada Agency, 2019a), it is desirable to eradicate invasive species from National Parks, National Historic Sites, and National Marine Conservation Areas, when possible.

2.7 Convention on Biological Diversity

Canada is among 195 countries that are parties to the Convention on Biological Diversity (United Nations, 1992). The Guiding Principle for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species (principle #13) of this convention states that “Where it is feasible, eradication is often the best course of action to deal with the introduction and establishment of invasive alien species” (United Nations Environmental Programme, 2023).

2.8 Invasive Alien Species Strategy for Canada

The Invasive Alien Species Strategy for Canada (Environment and Climate Change Canada, 2007) is a national strategy which was developed in response to Canada’s participation in the Convention on Biological Diversity. A key strategy is management of established invasive alien species through eradication, containment, and control.

2.9 Invasive Species Early Detection Rapid Response Plan for British Columbia

The Invasive Species Early Detection Rapid Response Plan for BC (IMISWG, 2014) states that eradication is a supported and recommended approach. The strategy is based on the principle that “immediate eradication is the primary goal for rapid response but containment, or a long-term strategy to achieve eradication, may be necessary for widely established populations of terrestrial invasive species, or aquatic invasive species inhabiting large lakes or river systems.”

3 Description of Environment

3.1 Location and Size

Sidney Island is an 860-hectare (ha) (8.6 kilometer squared (km²)) island in the Gulf Islands between Vancouver Island and the southwest coast of BC.

3.2 Ecological Features

Sidney Island is within the Coastal Douglas Fir (CDF) moist maritime biogeoclimatic zone (Denise Cook Design + Planning et al., 2007), which is the rarest biogeoclimatic zone in BC, covering only 0.3% of the province (CDFCP, 2022). The CDF zone features islands, islets, sand spits, coastal bluffs, high escarpments, CDF forests (Parks Canada Agency, 2010, 2018b), as well as open meadows and grassy hilltops along drier rocky ridges. The provincially-Endangered Garry Oak (*Quercus garryana*) associated ecosystems are a unique feature of the CDF zone, occurring nowhere else in Canada (Centre for Forest Conservation Genetics & UBC Faculty of Forestry, No Date) (Nuszdorfer et al., 1991). Garry Oak ecosystems support a diversity of species including more than 100 SAR (Garry Oak Ecosystems Recovery Team, 2023).

The Sidney Island coastline consists largely of sand beaches, dunes, and eroding bluffs (T. Golumbia, 2008). A large lagoon and spit complex is present at the north end of the island, within the GINPR (T. Golumbia, 2008). A small island, known as Eagle Islet (or SKEKÉFÁMEN), sits within the Sidney Island lagoon (Figure 1). There are no significant surface water features on the island (i.e., rivers, streams, lakes, etc.), other than several man-made dugout ponds.

Due to intense post-colonial use of the island, the vegetation communities of Sidney Island are highly disrupted and consist predominantly of second and third growth (40-150-year-old) forests (Figure 1) (T. Golumbia, 2008). Selective logging practices left remnant veteran trees in some areas, including large Douglas Fir (*Pseudotsuga menziesii*) and Western Redcedar trees (*Thuja plicata*) (T. Golumbia, 2008). On the private portion of the island, much of the forest has been managed (planting replacement trees, spacing, pruning, and thinning). Across the whole island, the processes that historically shaped the CDF forests and the forest-meadow mosaics, such as wildfire and cultural burning, have been suppressed for over 100 years (Brown et al., 2022; Brown & Hebda, 2002; Lucas & Lacourse, 2013; Pellatt et al., 2015). The result is highly dense, uniform tree stands with closed canopy and reduced diversity because there are few forest openings to encourage understory growth (Halofsky et al., 2020).

Sidney Island's forest overstories are largely dominated by Douglas Fir, with occasional Grand Fir (*Abies grandis*) and Western Redcedar trees (Figure 1). Arbutus trees (*Arbutus menziesii*), unique in BC to the CDF, are interspersed throughout the Douglas-fir dominated stands. Select stands on the island are dominated by Western Redcedar or Bigleaf Maple (*Acer macrophyllum*) (Parks Canada Agency, 2022a). Due to historical logging followed by intense browsing by European Fallow Deer, a diverse forest understory on Sidney Island is largely absent, and there is little successful tree or shrub regeneration (where young individuals becoming established as reproductive adults) (T. Golumbia, 2008).

The only areas with Garry Oak trees on Sidney Island are within Sallas Forest Strata Corporation private land. These areas are heavily browsed by European Fallow Deer which has negatively impacted Garry Oak regeneration and altered the vegetation community (Skaien & Arcese, 2018, 2020). Eagle Islet also supports areas of Garry Oak and, although it is within the Sidney Island lagoon, these areas have also been heavily impacted by European Fallow Deer browse and invasive plants (Lawn, 2012).

Although Sidney Island historically had diverse wildflower meadow communities, that were likely opened/maintained through burning by the W̱SÁNEĆ People (Denise Cook Design + Planning et al., 2007), today the open, non-forested areas of the island (Figure 1) are better described as cultural

“fields” than wildflower meadows (Denise Cook Design + Planning et al., 2007). These areas no longer have the diverse structure and plant species composition characteristic of native meadow communities. Following intense post-colonial use of the island and the introduction of non-native forage crops, the open, non-forested areas of Sidney Island today are dominated by non-native Eurasian agronomic grasses, as well as invasive English Hawthorn (*Crataegus monogyna*) and Scotch Broom (*Cytisus scoparius*) shrubs. Other invasive plant species on the island include Himalayan Blackberry (*Rubus armeniacus*), English Holly (*Ilex aquifolium*), and English Ivy (*Hedera helix*).

The dominant coastal communities of Sidney Island include Dunegrass (*Leymus mollis*) and Glasswort (*Salicornia virginica*) Tidal Flats. These communities are located on the Sidney Spit, Hook Spit, and the shoreline around the lagoon (Figure 1). (T. Golumbia, 2008), although Hook Spit has significant quantities of invasive Scotch Broom.

The lagoon supports tidal mudflats, saltwater marsh, and Eelgrass (*Zostera marina*) communities. The sensitive Eelgrass beds provide habitat for a wide variety of marine wildlife, including a diversity of fish, invertebrates, including shellfish, and waterbirds (Parks Canada Agency, 2014).

Sidney Island is located on the Pacific flyway for migratory birds in the Americas (Denise Cook Design + Planning et al., 2007). In addition, the island’s lagoon, tidal mudflats, salt marsh, and dune complex are unique features within the Southern Gulf Islands, making these habitats important foraging and stopover habitat for birds during spring and fall migrations. These important habitats for birds on Sidney Island, in combination with Sidney Channel, which is the 4km wide channel between the Saanich peninsula and Sidney Island, have been designated as an internationally recognized Important Bird Area (IBA; IBA# BC047). The Sidney Channel has been designated as an IBA because it meets the criteria for national, continental, and global significance for supporting seabird breeding colonies, overwintering habitat (particularly for Brant (*Branta bernicla*) and shorebirds), and congregations of migratory species during the spring and fall (IBA Canada, n.d.). Another IBA, the Mandarte Island IBA (IBA# BC046), is also located just to the east of Sidney Island.

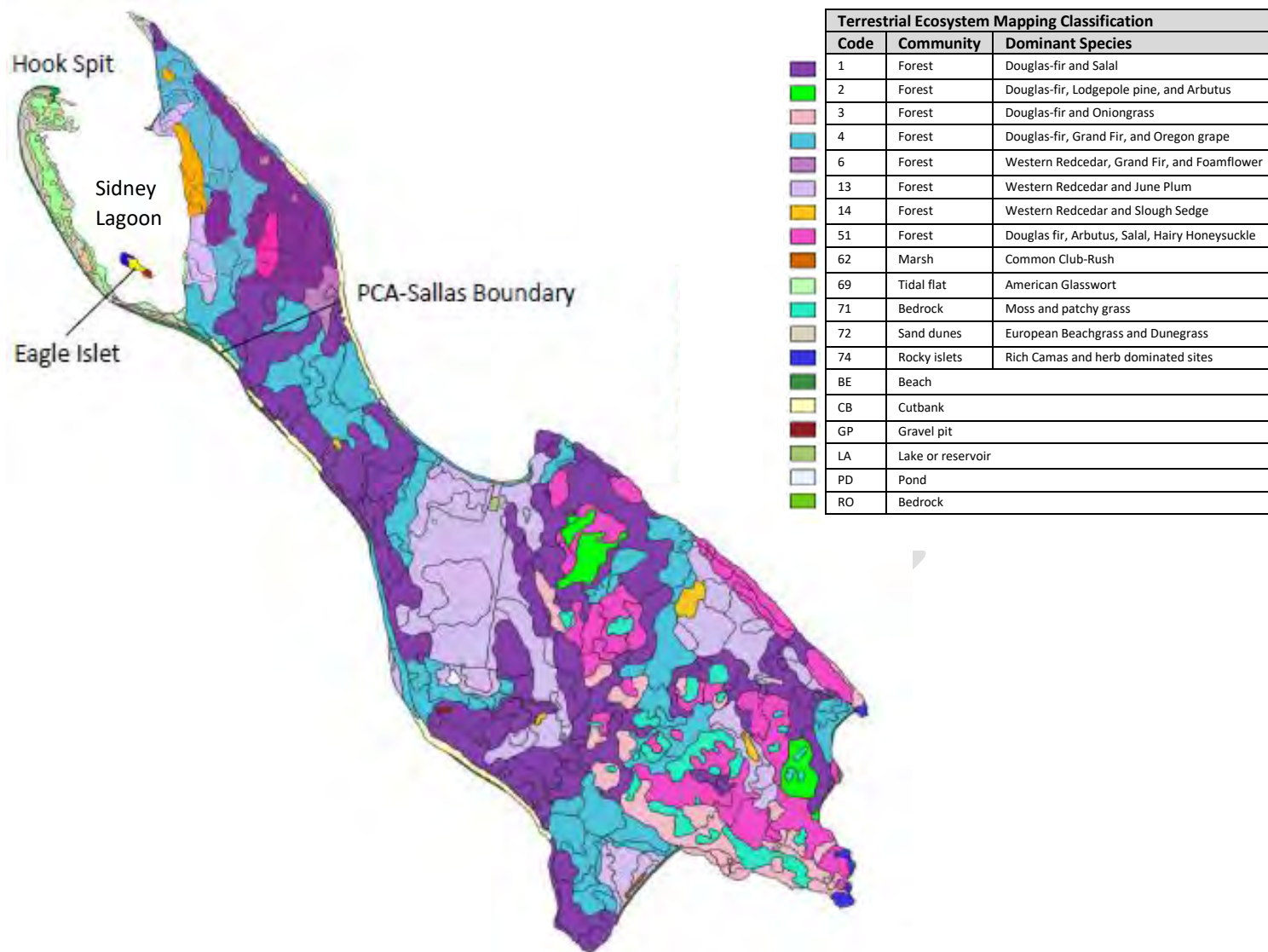


Figure 1. Terrestrial Ecosystem Mapping of Sidney Island, conducted for Gulf Islands National Park Reserve in 2007

4 Cultural Heritage

4.1 Cultural Heritage of Local First Nations in the Southern Gulf Islands

Indigenous Peoples have used and occupied the land and waters of the Southern Gulf Islands since time immemorial¹⁰ (Hebda et al., 2022). There are many local First Nations who have long and continuous ties to the Gulf Islands, including the W̱SÁNEĆ and Quw'utsun Nations, who have rights and responsibilities to the lands and waters of the region. Their knowledge of natural systems has been passed down from generation to generation through an oral tradition¹¹.

4.1.1 Traditional Renewable Resource Harvesting

Prior to European settlement and continuing into the present, local Indigenous Peoples had a complex harvesting regime which encompassed the sub-tidal and inter-tidal zones, as well as interior areas of the islands, including Sidney Island. In particular, they modified and managed ecosystems through cultural burning (regular fires) to improve fruit and root harvests and hunting opportunities (Arcese et al., 2014; Turner et al., 2013). The suppression of this practice, and other anthropogenic factors (logging, introduction of non-native species, etc.) have influenced vegetation communities and processes, and the availability of culturally important species. Meadow communities on Sidney Island may have been opened/maintained by the W̱SÁNEĆ people by burning (Denise Cook Design + Planning et al., 2007). These meadows were used to grow staple food plants, such as Camas (*Camassia quamash*), and to hunt Black-tailed Deer (Parks Canada Agency & SIERP Partners, 2022). Today, traditional harvesting of deer, shellfish and medicinal plants continues in the Southern Gulf Islands, including Sidney Island.

¹⁰ Indigenous oral history indicates that human occupation in this region predates known archaeological records, from a time so long ago that there is no memory of it (“time immemorial”). Recent research suggests that parts of Vancouver Island remained un-glaciated during the late Pleistocene and likely supported humans at least as far back as 18,000 years before present (Hebda et al., 2022).

¹¹ For more information, see: <https://wsanec.com/history-territory/>, <https://tsawout.ca/about-tsawout/>, <https://www.pauquachin.ca/culture>, <https://cowichantribes.com/about-cowichan-tribes/history>, or <https://www.pc.gc.ca/en/pn-np/bc/gulf/culture>

“The W̱SÁNEĆ People have occupied the Saanich Peninsula, Gulf Islands, San Juan Islands and surrounding area for thousands of years; they have used and stewarded Sidney Island for thousands of years. W̱SÁNEĆ Peoples once lived in the winter village of X̱ELXOLU on what is known, in BC geography, as Sidney Island (Figure 2). The islets named by settlers as Sallas Rocks, have been known to the W̱SÁNEĆ as XEXMELOSEN long before settler arrival. What Parks staff members call Eagle Islet, the W̱SÁNEĆ say is known better to them as S̱KÉKÉFÁMEN (Figure 2). When W̱SÁNEĆ People would paddle from their villages on the Saanich Peninsula and were crossing to their villages in the San Juan Islands, JSINTEN says the people would take a stopover at W̱YOMEĆEN to take a break (Figure 2). W̱YOMEĆEN means place of caution, perhaps this was a reminder to the W̱SÁNEĆ People to look after themselves in their travels. W̱IĆKINEM says his elders would harvest ferns on these islands, which were said to grow to heights taller than the height of an adult person. When you look at historical maps, you’ll see evidence of meadows, particularly in the area of what is now an airstrip. These meadowlands were places for W̱SÁNEĆ families to grow ḴŁO,EL, Camas. This Camas was a food staple to the W̱SÁNEĆ People. Many animals, such as deer, also enjoy the meadowlands to forage for food, and this was a prime opportunity for W̱SÁNEĆ hunters to harvest deer to feed their families. The wetlands would have drawn other hunters in the form of birds of prey like the hawks and would be great habitat for amphibians.

The W̱SÁNEĆ Peoples’ experience of Sidney Island would have been much more abundant in biodiversity of plants, amphibians, birds, and insects. It wasn’t long ago that a person could lay in a field among the hum of bees pollinating the meadow. And perhaps today you can still hear the frogs croaking during the WEXES moon (the second moon of the W̱SÁNEĆ new year). This moon tells us spring has arrived, and the flowers will be blooming, and that our canoe travels will be safer now that the fall and winter storms are over. This ṮETÁCES is a relative of the deep, placed in the sea by our creator X̱ÁLS to protect the W̱SÁNEĆ Peoples. And, X̱ÁLS bestowed, upon the W̱SÁNEĆ People, the responsibility to care for these relatives as well. Living on the islands, harvesting seafood, meat, plants, and medicines, tending to the meadows with controlled burns, and selectively harvesting logs for cedar longhouses and cedar canoes, and stripping cedar bark for baskets and clothing were all integral to the well-being of the W̱SÁNEĆ People and every area of the territory.”

- Extract from the SIERP Design Plan (SIERP Steering Committee 2022), by
Ś̱W,XELOSELWET Tiffany Joseph, W̱SÁNEĆ knowledge holder.



Figure 2. WSÁNEĆ Place Names

(Map courtesy of WSÁNEĆ Leadership Council)

4.2 Post-Contact Use and Current Anthropogenic Features

With the onset of colonization, Sidney Island was sub-divided, sold, and used in various ways, including as a private retreat for hunting European Fallow Deer, for brick manufacturing, agriculture, livestock production, quarrying, logging, as a communications station during World War II, and for private residences (Denise Cook Design + Planning et al., 2007).

Evidence of the various ways the island has been used over the centuries can still be observed in the island's landscape today, with the presence of open/cleared fields (e.g., the Campground Field, Radar Field, and Air Strip Field), remnants of the former Sidney Island Brick and Tile Company (at the south end of the lagoon), a historic village site and bunker, and second and third growth forest (Figure 3).

On the private portion of the island, in addition to private Sallas Forest Strata Community residences and properties, the island has man-made ponds, a network of roads and trails, a fire hall, air strip, marina (in Miner's Bay), dock (in GINPR), and viewing tower (Figure 3). A deer paddock and capture facility, used during previous deer-control efforts by the Sallas Forest Strata (see Section 7.1.2 for details), is also present in the centre of the island (Figure 3). A deer fence between the Sallas Forest Strata and park reserve, erected in the 1980s, was largely ineffective and now serves to delineate the property boundary (Figure 3) (T. Golumbia, 2008).



Figure 3. Anthropogenic Features of Sidney Island

(Map courtesy of Sallas Forest Strata)

4.3 Current Land Management

Sidney Island is within the traditional territory of W̱SÁNEĆ and Quw'utsun First Nations, who have inherent rights over the management of lands and resources within their territories. The island is additionally managed under multiple jurisdictions: Parks Canada has managed the northern 160ha of the island as part of the GINPR since 2003; Sallas Forest Strata Corporation manages the 'Common Property' within the privately-owned portion of the island; individual lot owners maintain jurisdictional authority over their privately-owned lands (located along the perimeter of the southern portion of the island); and Islands Trust Conservancy manages covenant sites in sensitive ecological areas (Figure 4). The Province of BC has jurisdiction over wildlife on private portion of the island.

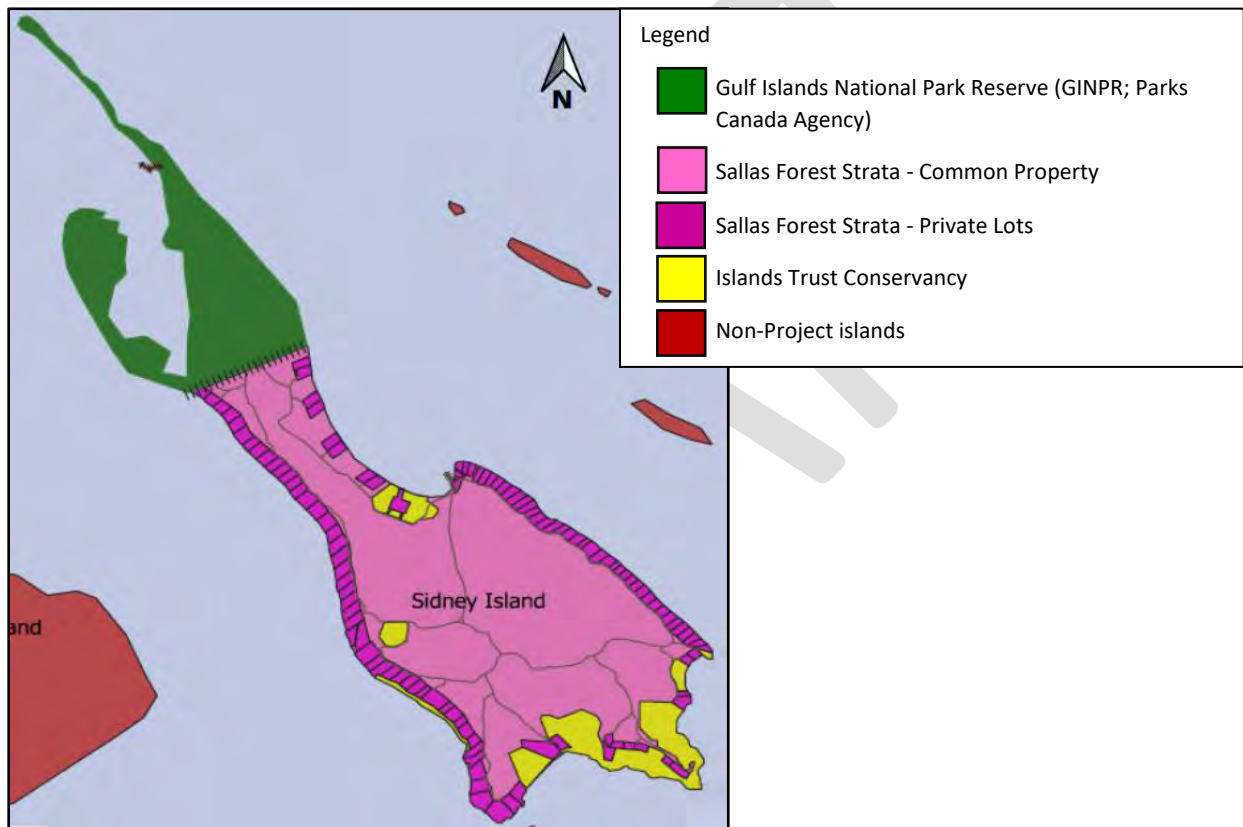


Figure 4. Sidney Island Jurisdictions

5 Need for the Project

5.1 European Fallow Deer Were Introduced to Sidney Island for Hunting

European Fallow Deer is a species native to the Mediterranean region that has been introduced by humans to new areas all over the world (Baker et al., 2017; Chapman & Chapman, 1997). European Fallow Deer are thought to have been introduced to Sidney Island for hunting several times between the early 1900s and 1940s, although dates vary according to sources (Denise Cook Design + Planning et al., 2007; T. Golumbia, 2008; Moody et al., 1994). Following their introduction, European Fallow Deer became established on Sidney Island and by the 1980s there were an estimated 630 to 1,500 individuals (Denise Cook Design + Planning et al., 2007). The current population size is unknown, but estimates range from 300 to 900 individuals (Johnston, 2020; K. Poskitt, personal communication, January 2021). Their impacts on island vegetation indicate that the population is too high for the forest to sustain.

5.2 European Fallow Deer Out-compete Native Black-tailed Deer

Due to aspects of their biology and behaviour, European Fallow Deer can out-compete native Black-tailed Deer, a species which is important for the Indigenous harvest of deer. European Fallow Deer are readily able to digest lower quality high fiber-, in addition to high quality low fiber-, plants (Johnston, 2020). This enables them to survive and flourish in areas even when high quality plant species have dwindled, increasing their populations to unsustainable levels (past their carrying capacity), and often resulting in emaciation, and starvation (Chapman & Chapman, 1997). Black-tailed Deer, on the other hand, are selective feeders that are dependent on having highly nutritional forage (Bunnell, 1990; Parker et al., 1999); starvation events have even been documented in Black-tailed Deer populations due to decreases in food quality rather than quantity (Taber & Dasmann, 1957). Reproduction in Black-tailed Deer is also correlated with nutritional quality of forage (Forrester & Wittmer, 2013; Taber & Dasmann, 1957).

"[Sidney Island] was well known for its abundance of Black tailed deer, a favorite meat of the WSÁNEĆ People. The Black tailed deer was appreciated, for its eating habits allowed for the sustainable growth of the plants and medicines used by our people."

- Eric Pelkey, Community Engagement Coordinator for the WSÁNEĆ Leadership Council, 2022

The behaviour of European Fallow Deer can also impact the survival of other deer species, like Black-tailed Deer. European Fallow Deer can actively exclude other deer from feeding grounds, interfere with female reproductive behaviours in the spring (i.e., birth and early maternal care), and cause increased vigilance which results in reduced foraging time (Ferretti et al., 2011; Focardi et al., 2006; Imperio et al., 2012).

The result of these differences in the species' biology and behaviour is that European Fallow Deer out-compete native Black-tailed Deer. This has been observed in the population dynamics of the two species on Sidney Island, with European Fallow Deer out-competing and out-numbering the native Black-tailed Deer.

5.3 European Fallow Deer Have Significantly Impacted Sidney Island Ecosystems

Despite ongoing efforts to control European Fallow Deer, decades of over-browsing have degraded the forest understory and resulted in decreased richness and diversity of native plants and wildlife, including the loss of many native and culturally significant understory plant species, and a significant reduction of songbird richness and diversity.

The forest understory has degraded to the point that Sidney Island is one of the least biologically diverse island in the Southern Gulf Islands region, including when compared to islands with hyperabundant native deer (Arcese et al., 2014; T. Martin et al., 2013; Parks Canada Agency, 2022a). There is a stark contrast between Sidney Island, where there is little forest understory vegetation, and deer-free Russel Island, where the forest understory vegetation is abundant (Figure 5). Though the contrast is less severe, there is also a difference between Sidney Island, with an established presence of invasive European Fallow Deer, and islands with hyperabundant native Black-tailed Deer (e.g., Saturna Island) (Figure 5).

The adverse ecosystem impacts observed on Sidney Island from European Fallow Deer are consistent with those observed in other areas. For example, one study of 66 sites throughout the Gulf and San Juan Island archipelagos and the mainland demonstrated that the cover, richness, and diversity of native shrubs is significantly (52-82%) lower in areas with abundant deer compared to areas with little or no deer (Arcese et al., 2014). Other studies of islands in Haida Gwaii found that deer eliminated certain plant species from shoreline communities (J. L. Martin et al., 2010), and overall vegetation cover was 10% compared to 80% on islands where deer had not been present (Stockton et al., 2005). Overall plant species richness was similar with and without deer, however, at the plot scale species richness declined by 20-50% (Stockton et al., 2005). The understory invertebrate and shrub-dependent songbird communities were also simplified on Haida Gwaii islands with deer (J. L. Martin et al., 2010). The adverse impacts of deer have also been observed across North America; a correlation between increasing deer populations and declines in 73 understory-dependent songbird species has been documented (Chollet & Martin, 2013).

Heavy browse from European Fallow Deer has also played a role in the spread and persistence of invasive plant species on Sidney Island. Scotch Broom, English Hawthorn and non-native grasses are particularly widespread. Invasive species have taken over habitats of native plant species, decreasing the abundance of native species and changing environmental conditions (water, light, nutrients) that favor the spread and persistence of invasive species. Invasive plants can establish and spread through a variety of means but heavy browse pressure, preferential foraging on more palatable native species, and changes to the physical and chemical makeup of soil due to over-abundant deer accelerates invasion and persistence of non-native plants (Gorchov et al., 2021).

"We have witnessed a rapid deterioration of natural vegetation and ecosystem on Sidney Island since the Fallow deer have been introduced. They are a truly invasive and voracious species, who eat everything, leaving nothing for the Black Tailed deer and other natural species native to the island."

- Eric Pelkey, Community Engagement Coordinator for the WSÁNEĆ Leadership Council, 2022

Sidney Island (heavy browse pressure from European Fallow Deer)



Saturna Island (heavy browse pressure from hyperabundant Black-tailed Deer)



Russel Island (deer-free)



Figure 5. Representative Photos of the Forest Understory Vegetation in the Park Reserve on Sidney Island Compared to Saturna Island (with hyperabundant Black-tailed Deer) and Deer-Free Russel Island

5.4 Previous Efforts to Control the European Fallow Deer Have Been Unsuccessful

The Sallas Forest Strata community, and its predecessor, Sallas Forest Limited Partnership, have been undertaking deer population management on Sidney Island since 1981 (Johnston, 2020). Methods employed by the community have included conventional hunting, live-capture/selling deer to farms, a commercial capture/culling program, and community and professional cull hunts (Johnston, 2020). Indigenous hunting of deer has also taken place in the park reserve on Sidney Island, further contributing to population control. Detailed records on deer removals for 1981 to 2023 indicate that 14,852 deer have been removed from the island by residents since 1981 (an average of 353 deer/year) (Hedley, 2022, 2023; Johnston, 2020).

Despite the effort and expense that has been dedicated to controlling the European Fallow Deer population on Sidney Island, the population has historically always rebounded following periods of low abundance (Johnston, 2020). According to aerial surveys the population was estimated to be around 700-1200 individuals in 1989 (T. E. Golumbia, 2010; Maurer, 1989), 900-1100 in 2005 (T. E. Golumbia, 2010) and between 1064-1164 in 2008 (T. E. Golumbia, 2010; Mercer, 2009). Estimates from a Sidney Island resident suggest that the population was around 2000 in 2010 (K. Poskitt, personal communication, January 2021). The current size of the population is unknown, but estimates range from 300 to 900 individuals (Johnston, 2020; K. Poskitt, personal communication, January 2021).

6 Partnership Building for Forest Recovery

6.1 Collaborative “One-Island” Approach

The GINPR encompasses the northern 160ha of Sidney Island, while the remaining 700ha are owned and managed by the Sallas Forest Strata Corporation, private landowners, and Islands Trust Conservancy. Because the forest ecosystem, European Fallow Deer, and other flora and fauna span land management jurisdictions on Sidney Island, Parks Canada facilitated the development of a collaborative, “one island” approach to forest recovery. Initial dialogue with prospective partners began in 2018.

6.2 Sidney Island Ecological Restoration Project Steering Committee

SIERP is a larger project that includes a multi-pronged approach to ecosystem recovery on Sidney Island. A SIERP Steering Committee was established in 2019 to facilitate a collaborative approach to managing native populations of plants, animals, and ecosystem processes impacted by invasive species.

6.3 Memorandum of Understanding for Sidney Island Forest Recovery

A Memorandum of Understanding (MOU) was signed by the Sallas Forest Strata, Islands Trust Conservancy, Province of BC, and Parks Canada in April 2020. The W̱SÁNEĆ Leadership Council and Pauquachin First Nation also provided signed letters of support. The MOU states that these organizations will work cooperatively to facilitate the recovery of the Sidney Island forests. Both the MOU and the letters of support provide clear direction to consider the removal of European Fallow Deer, in conjunction with vegetation recovery, to support sustained recovery of Sidney Island's forest ecosystem and enable the continuation of a native Black-tailed Deer population.

6.4 Sidney Island Ecological Restoration Project Working Groups

As part of the SIERP, Vegetation and Deer Working Groups were established in August 2020. The Vegetation Working Group was comprised of representatives from Parks Canada, the W̱SÁNEĆ

Leadership Council, Islands Trust Conservancy, and Sidney Island residents. The Deer Working Group was comprised of representatives from Parks Canada, the Province of BC, WSÁNEĆ Leadership Council, Pauquachin First Nation, and Sidney Island residents. Representatives from Cowichan Tribes and Penelakut Tribe participated until early 2021, after which they withdrew and deferred to WSÁNEĆ representatives.

The working groups were tasked with developing plans for achieving the three SIERP objectives (listed in Section 1). The Vegetation Working Group developed a Forest Restoration Strategy and a Monitoring and Stewardship Plan for Deer Exlosures for Sidney Island (SIERP Steering Committee & Parks Canada Agency, 2022). The Deer Working Group developed a European Fallow Deer Eradication Plan and a Black-tailed Deer Monitoring Strategy (SIERP Steering Committee & Parks Canada Agency, 2022). These documents were used in the development of the methods and mitigations for the project.

The documents developed by the SIERP Vegetation and Deer Working Groups include an adaptive management approach. Adaptive management involves monitoring the effects of a project, and adapting future actions based on the observed results. An adaptive approach is especially important in an ecological restoration context, since land managers/stewards are often dealing with unpredictable environmental conditions and dynamic, long-term ecological processes (Dorner, 2002).

7 Consideration of Alternatives

7.1 Potential Alternative Approaches for Achieving Sustained Forest Recovery

During early planning and design stages of this project, the SIERP Steering Committee and the Deer Working Group assessed different approaches for achieving the goal of sustained forest recovery on Sidney Island. Three potential alternative approaches were identified and compared; 1) no action, 2) European Fallow Deer population control, and 3) European Fallow Deer eradication. The analysis of these potential alternative approaches is summarized below.

7.1.1 No Action

Taking no action to control European Fallow Deer would mean that, while community hunting and/or Indigenous harvesting of deer could continue annually, it would not be completed with the goal of population control. No additional measures would be taken to control European Fallow Deer, and their populations would continue to persist uncontrolled on Sidney Island. There would be no correlation between observed impacts on the ecosystem and hunting intensity, and no monitoring of the population or browse impacts.

7.1.1.1 Taking No Action Would Not Support Sustained Forest Recovery

Taking no action would not contribute to the goal of achieving sustained forest recovery on Sidney Island. Despite annual deer hunts occurring on Sidney Island dating back to at least 1981 (in addition to periodic capture culls, and professional cull hunting) (Johnston, 2020), the European Fallow Deer population continues to persist and thrive. As a result, European Fallow Deer continue to impact the forest ecosystem and native Black-tailed Deer (see Sections 5.2 and 5.3 for more details).

7.1.1.2 Taking No Action Could Lead to Deer Famines

In addition to not achieving sustained forest recovery, taking no action is undesirable in terms animal welfare if European Fallow Deer experience emaciation, and starvation as a result of unsustainably high

population levels (Chapman & Chapman, 1997). This has been observed on Sidney Island in the past (Johnston, 2020).

7.1.1.3 Taking No Action is Counter to Indigenous Teachings

Finally, taking no action is undesirable from an Indigenous perspective, as it runs counter to teachings that the W̱SÁNEĆ Peoples are responsible for the stewardship of their traditional lands and waters.

"W̱SÁNEĆ People have a responsibility to be active stewards of our territory. As our Creator, XÁLS, transformed W̱SÁNEĆ People into all the other species he said, "QEN, T ṮFEN SCÁLEĆE (you look after your relatives)." This is an ancient law that governs the ṮET, ÁĆES (relatives of the deep), the places we call islands today."

- ẔAWIZUT Carl Olsen, WJOLELP Elder, Representative of the W̱SÁNEĆ Leadership Council, 2022

7.1.2 European Fallow Deer Population Control

Controlling the European Fallow Deer population would consist of conducting ongoing annual deer culls or using other control methods such as sterilization or contraception dosing for female deer (in addition to annual hunts). Under this alternative approach, European Fallow Deer would continue to persist on Sidney Island, although the population would be kept at low numbers. Control efforts would have to be maintained indefinitely to achieve sustained forest recovery.

7.1.2.1 Previous Efforts to Control the European Fallow Deer Have Been Unsuccessful

As discussed in Section 5.4, ongoing hunting and the use of multiple population control methods in the past have been unsuccessful at maintaining a European Fallow Deer population on Sidney Island that is low enough to be consistent with forest recovery. Sallas Forest Strata community records show that 14,852 deer have been removed from the island by residents since 1981 (an average of 353 deer/year) (Hedley, 2022, 2023; Johnston, 2020) and yet the current population is estimated to consist of 300 to 900 individuals (Johnston, 2020; K. Poskitt, personal communication, January 2021), which is still high enough to observe adverse browse impacts on forest health.

The continued population control of European Fallow Deer has contributed to some forest recovery in recent years compared to previous periods with higher populations; however, it is not a viable approach to achieving *significant* or *sustained* forest recovery on Sidney Island.

7.1.2.2 Population Control is Not Feasible Given the Ongoing Cost and Effort

Long-term control of a large population of European Fallow Deer is not feasible as it requires sustained/indefinite funding, effort, political will, and community support. Given the long-term nature of these kinds of projects, the cumulative cost and effort become prohibitively high. In addition, due to inevitable changes in funding, staffing, and project momentum over time, many population control efforts transform from annual to occasional control efforts (J. P. Parkes, 1990). When this happens, the target species population fluctuates widely over time based on funding and project status (J. P. Parkes, 1990). If population control efforts were to diminish in the future on Sidney Island, the population would rebound once again (see Section 7.1.2.1), and gains in forest ecosystem recovery would be reversed.

7.1.2.3 Population Control Results in More Cumulative Deer Killed

Continued population control is undesirable from an animal welfare perspective. Ongoing control would result in many more cumulative animal deaths than a one-time eradication. As noted, 14,852 were removed from Sidney Island in the 42 years between 1981 and 2023 (Hedley, 2022, 2023; Johnston, 2020). To effectively control the population in the future, a large proportion of the population must be removed each year. The cumulative number of deaths from ongoing population control would result in many more deaths in future decades and it is conceivable that over the next 42 years tens of thousands more deer would have to be removed.

7.1.2.4 Population Control is Undesirable from an Indigenous Perspective

Finally, ongoing control of deer is undesirable from an Indigenous perspective. It is preferable to eradicate European Fallow Deer completely from Sidney Island so that Black-tailed Deer can be re-established. Black-tailed Deer are a native species that has evolved within this ecosystem and they are the traditional and preferred target species for local Indigenous hunters (C. Olsen, personal communication, October 19, 2022).

7.1.3 European Fallow Deer Eradication

The third potential alternative approaches to achieving the goal of sustained forest recovery on Sidney Island is the complete eradication of all European Fallow Deer.

Eradication would consist of completely and permanently removing 100% of the European Fallow Deer from Sidney Island. This would be completed by globally recognized eradication specialists with extensive expertise and experience, following globally proven eradication techniques tailored for Sidney Island (see Section 7.2 for a discussion of alternative methods, and Section 9 for the project description).

7.1.3.1 Invasive Species Eradications are Highly Effective for Achieving Ecosystem Recovery

All SIERP project partners agree that deer eradication is the single most significant management action that can be undertaken to facilitate forest ecosystem recovery on Sidney Island. Eradication of invasive species from islands is a proven, highly effective conservation tool for achieving ecosystem and native species recovery (Gill, 2012; Spatz et al., 2022).

7.1.3.2 Eradication of European Fallow Deer from Sidney Island is Feasible and Achievable

Since 1872, 1550 eradication operations for various invasive taxa on 990 islands around the world have been attempted, with an 88% success rate. Ungulate eradications specifically (185 projects) have had a 92% success rate (Spatz et al., 2022). To assess the feasibility of eradication in the context of this specific project, a Sidney Island Eradication of European Fallow Deer Feasibility Study (Gill, 2012) was prepared for Parks Canada. This study assessed the feasibility of forest ecosystem recovery through deer eradication from Sidney Island by looking at the suitability and challenges of eradication. The study discusses successes and failures of various island eradications and provides six fundamental “rules” which maximize the probability of achieving a successful eradication operation (J. Parkes et al., 2002):

1. The operation must target all individuals in the population (down to the last individual);
2. Individuals must be removed faster than the population increases;
3. Re-colonization must be zero, or as close to zero as possible;
4. Social and economic conditions must be conducive to meeting all of the rules;

5. Where the benefits of management can be achieved without eradication, discounted future benefits should favour the one-off costs of eradication over the ongoing costs of control.
6. Ideally, individuals surviving the campaign should be detectable and dealt with before an increased population size becomes obvious.

The feasibility study (Gill, 2012), additional research, planning, Sidney Island Eradication Plan (SIERP Steering Committee & Parks Canada Agency, 2022), and partnership building efforts by Parks Canada and the SIERP Deer Working Group all indicate that the six rules can be followed on Sidney Island. In addition, an eradication project is a one-time operation and investment, as opposed to the long term and indefinite effort and investment required for population control. Therefore, an eradication of European Fallow Deer on Sidney Island is feasible and achievable.

7.1.3.3 Eradication of European Fallow Deer Meets Criteria for Ethical Wildlife Control

Eradication of a deer population is not something to be taken lightly. The Seven Principles for Ethical Wildlife Control (Dubois et al., 2017) was used by the SIERP Deer Working Group to evaluate whether it was appropriate and ethical to eradicate European Fallow Deer from Sidney Island (Table 1).

Table 1. Evaluation of European Fallow Deer Eradication on Sidney Island Using the Seven Principles for Ethical Wildlife Control

Principles for Ethical Wildlife Control ¹	Evaluation of European Fallow Deer Eradication on Sidney Island
1. Begin by Modifying Human Practices	Public education efforts by Sallas Forest Strata and Parks Canada have reduced conflict between people and deer by outlining behaviours to avoid such as feeding or approaching deer. While conflict can be reduced, no change in human behaviour can effectively solve the problem of invasive European Fallow Deer (<i>Dama dama</i>) over-browsing and causing extensive ecosystem degradation.
2. Justify with Evidence	Substantial evidence gathered by Parks Canada and academic peer reviewed research (e.g., Golumbia 2008) have confirmed the severe impact that European Fallow Deer have had on the Sidney Island forest ecosystem, which now has some of the lowest levels of plant and bird biodiversity in the Southern Gulf Islands region (Martin et al. 2011, Lawn 2015). Eradication of European Fallow Deer is the only approach that meets the objective of sustained forest ecosystem recovery.
3. Ensure Objectives are Clear and Achievable	The objective is to eradicate European Fallow Deer from Sidney Island to facilitate forest ecosystem recovery. Parks Canada conducted a feasibility assessment that confirmed eradication of European Fallow Deer from Sidney Island is technically feasible, considering animal behaviour, island geography, and preferred methods (Coastal Conservation 2012). The proposed methods have been tested through trials.
4. Prioritize Animal Welfare	Animal welfare is a critical aspect of this project. Eradication techniques will meet requirements from Parks Canada's Animal Care Committee and the Province of BC (including approval from licensed

Principles for Ethical Wildlife Control ¹	Evaluation of European Fallow Deer Eradication on Sidney Island
	<p>veterinarians), which involve minimizing animal stress and suffering. The project partners will also work with the Society for the Prevention of Cruelty to Animals (SPCA) to review methods and ensure high animal welfare standards.</p> <p>European Fallow Deer reproduce very rapidly. In the past 20 years, more than 14,000 deer have been killed through population control efforts, but the population has always rebounded (K. Poskitt, pers. comm.). Therefore, eradication is a more ethical approach given that hunting and culls, would result in a greater number deaths overall, while also failing to meet the objective of ecosystem recovery.</p>
5. Maintain Social Acceptability	<p>The plan to eradicate European Fallow Deer from Sidney Island will not proceed without support from all project partners, including local First Nations and. The project team will continue to reach out to all involved throughout the project to ensure all parties' values are respected.</p>
6. Conduct Systematic Planning	<p>Eradication planning is a continuation of the significant work already undertaken on the island by the Sallas Forest Strata community, First Nations, the Province of BC, and Parks Canada to reduce the population of invasive European Fallow Deer. It is supported by extensive research confirming a link between European Fallow Deer and the degraded forest ecosystem. Eradication provides the best opportunity for the forest ecosystems on Sidney Island to recover.</p>
7. Make Decisions on Specifics not Labels	<p>The decision to remove European Fallow Deer from Sidney Island is not based on the "invasive" designation of the species but rather on their negative impact on the Sidney Island forest ecosystem. European Fallow Deer reach higher densities than the Black-tailed Deer and remove much more of a forest's understorey. European Fallow Deer populations also quickly rebound due to high reproductive rates and lack of predation. It is for these key reasons that the SIERP Partners have determined that European Fallow Deer eradication provides the best opportunity for a sustained recovery of the forest ecosystems on Sidney Island.</p>

¹(Dubois et al., 2017)

7.1.4 Conclusion

Two of the potential alternative approaches, 1) no action, or 2) European Fallow Deer population control, are not viable for achieving sustained forest recovery on Sidney Island. Therefore, 3) European Fallow Deer eradication is the preferred option.

A summary of the consideration of alternative approaches, based on their ability to achieve the goal of sustained forest recovery, their consistency with the Parks Canada's mandate and policy, technical, economic, operational feasibility, is provided in Table 2.

Table 2. Summary of Consideration of Alternative Approaches to Achieving Sustained Forest Recovery

Alternative Options	Approach	Contribution to Objective (Sustained Forest Recovery)	Consistency with Parks Canada Mandate and Policy ¹²	Technical Feasibility (Is it possible?)	Economic Feasibility	Operational Feasibility and Other Considerations	Conclusion
No Action	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Recovery not possible; declining trend in ecological integrity of the forest is expected as the fallow deer population increases. 	<ul style="list-style-type: none"> Inconsistent Maintenance or restoration of ecological integrity is the first priority in management of parks (<i>Canadian National Parks Act (CNPA)</i>); policy provides direction for actions to control or eradicate invasive alien species 	<ul style="list-style-type: none"> Feasible No intervention involved 	<ul style="list-style-type: none"> Feasible No investment required 	<ul style="list-style-type: none"> Feasible No action is required; however, deer condition/health is negatively impacted when the population is high and forest understory vegetation will continue to be degraded. Sustained forest recovery is not possible in this approach. 	<ul style="list-style-type: none"> Not a viable alternative for Achieving Sustained Forest Recovery
European Fallow Deer Population Control	<ul style="list-style-type: none"> The approach to continued control would include methods used by the Sallas Forest Strata Community to date (Johnston, 2020), and could include conventional hunting, community and professional cull hunts using conventional hunting methods, and Indigenous hunting. 	<ul style="list-style-type: none"> Some temporary recovery possible; improving trend in ecological integrity expected in the short term with adaptive management of deer and forest recovery. Sustained long term forest recovery likely not possible because intense hunting pressure would need to be applied to the deer population in perpetuity. Once hunting pressure lets up, the deer population will rebound, as it has previously on Sidney Island. 	<ul style="list-style-type: none"> Less consistent Mandate and policy provide for the eradication of invasive alien species, when possible. Actions to control or eradicate invasive alien species are to be prioritized and based on best available evidence using adaptive management planning; project partners have prioritized eradication. 	<ul style="list-style-type: none"> Unknown There is uncertainty if a population control approach could effectively maintain the European Fallow Deer population below an appropriate threshold. Deer populations can quickly rebound when control pressure declines. Efforts on Sidney Island to control the population have removed a significant number of deer, but the deer population has always recovered in the past. 	<ul style="list-style-type: none"> Not feasible Long term investment is high and indefinite. 	<ul style="list-style-type: none"> Not feasible Parks Canada Agency (Parks Canada) funding and resources are not available for this approach for an invasive alien species where eradication is feasible. Depending on the tactics used, effective control would require a level of annual effort that is likely not operationally feasible. Sustained forest recovery is not possible in this approach. 	<ul style="list-style-type: none"> Not a viable alternative for Achieving Sustained Forest Recovery
Eradication of European Fallow Deer (the Project)	<ul style="list-style-type: none"> Eradication of European Fallow Deer would be completed using globally recognized eradication specialists with extensive expertise and experience. The eradication team would adhere to internationally accepted principles for humane and ethical wildlife control. 	<ul style="list-style-type: none"> Sustained forest recovery possible; sustained improving trend in ecological integrity expected with adaptive management of deer and forest restoration. Fastest rate of improvement, and greatest magnitude of improvement expected. 	<ul style="list-style-type: none"> Consistent Mandate and policy provide for the eradication of invasive alien species, when possible. Actions to control or eradicate invasive alien species are to be prioritized and based on best available evidence using adaptive management planning; project partners have prioritized eradication 	<ul style="list-style-type: none"> Feasible A Sidney Island Eradication of European Fallow Deer Feasibility Study (Gill, 2012) found that an eradication would be feasible on Sidney Island. An eradication on Sidney Island follows the six fundamental “rules” that must be followed to maximize the probability of achieving a successful eradication operation (developed by J. Parkes et al., 2002). Multiple studies and trials of methods have been conducted that have confirmed feasibility (see Section 7.1) 	<ul style="list-style-type: none"> Feasible Short term investment is high but finite; long term investment is low 	<ul style="list-style-type: none"> Feasible Funding and resources available for the project; requires a “one island” approach among project partners, which has been established via a Memorandum of Understanding (MOU) and approvals from project partners. 	<ul style="list-style-type: none"> European Fallow Deer Eradication (the project) is a feasible approach that is anticipated to achieve sustained forest restoration on Sidney Island. <u>Eradication of European Fallow Deer (the Project) is the preferred alternative.</u>

¹² For further detail see Direction from Legislation, Mandate, and Policy in Section 2

7.2 Potential Alternative Methods for Achieving Deer Eradication

As part of the project design process, seven potential methods for achieving the eradication of European Fallow Deer from Sidney Island were identified and assessed by the SIERP Steering Committee and Deer Working Group.

7.2.1 Conventional Hunting

7.2.1.1 Conventional Hunting Methods are Not Appropriate for Eradication

Common conventional hunting methods (e.g., stalking, tree stand or blind hunting) are not effective at eliminating a target species' population (Fraser, 2000). For example, a trial in South Australia using 65 hunters in a directed hunt over four days resulted in 44 deer shot. The number shot was estimated to be approximately equal to the annual population increase for European Fallow Deer and one-third of the annual increase for Red Deer (*Cervus elaphus*). In contrast, a four hour helicopter cull in the same area in 2007 using one professional aerial marksman resulted in 182 deer shot, which was estimated to be more than 90% of the population (Booth, 2009).

7.2.1.2 Conventional Hunting May Reduce Eradication Efficacy by Educating the Target Species

Conventional hunters have widely varying skills and abilities; generally, a small number of skilled hunters achieve the majority of kills (Booth, 2009). There is a risk, therefore, that less experienced hunters will target and miss the animal they are hunting, thereby educating them, making them warier to humans, and more difficult to detect and remove. Marksmen who are eradication professionals provide highly accurate shooting combined with knowledge of the target animal's behaviour and decision-making with the goal of eradication (J. Parkes et al., 2010). These skills are all critical for a successful eradication.

7.2.1.3 Conventional Hunting Typically has Incomplete Coverage of the Target Area

Conventional hunters generally target specific animals (e.g., bucks) and hunt during good weather and in easily accessible areas (i.e., avoiding thick vegetation or complex terrain such as steep slopes, cliffs) to maximize their likelihood of success (Booth, 2009). As the target animal population declines, it is more likely that animals will seek refuge in areas away from areas easily accessible to hunters (Booth, 2009).

7.2.1.4 Conventional Hunting is not Effective at Removing Target Animals at Low Densities

Hunting effort varies with deer density; when deer detection rates decline, most hunters either cease hunting or move to other areas (Nugent & Mawhinney, 1987). During an eradication operation, the general rule is that 90% of the effort is required to remove the final 10% of the target population (SIERP Steering Committee & Parks Canada Agency, 2022). The success of an eradication operation is therefore highly dependent on careful planning that ensures animals are not educated to the techniques being used and considers how the final 10% of the population will be removed. Using conventional hunters increases the probability of educating deer and is likely to make the later phases of the eradication more difficult and expensive.

7.2.1.5 Advantages

- Could increase community involvement and project support.
- The cost of conducting a conventional hunt is low.

7.2.1.6 Disadvantages

- Conventional hunting techniques may inadvertently educate the target species, making them wary of humans and further reducing the efficacy of the hunt.
- Conventional hunting techniques are unlikely to achieve the objective of complete deer eradication.

7.2.2 Live Capture and Control

There are two options with the live capture alternative: capture and translocate the deer to farms, or live capture and dispatch (i.e. euthanize). These are discussed in more detail below.

7.2.2.1 Live Capture and Translocation to Deer Farms

Live capture of deer would require the construction of small, portable or fixed capture sites, with or without bait, and use of the Sallas Forest Strata capture facility and/or building a new capture facility in GINPR (K. Poskitt, personal communication, April 2018). In the past, the Sallas Island community deer paddock and capture facility were used to capture deer to facilitate culls or to translocate European Fallow Deer to deer farms (Johnston, 2020).

There are a number of shortfalls which make live capture and translocation of deer unsuitable for eradication. First, it would not be logistically possible to capture every deer on Sidney Island, as many animals will become wary of entering traps or capture sites. Numerous studies have shown that live capture is relatively inefficient as a deer population reduction method, let alone as a population eradication method (Human Wildlife Conflicts Working Group, 2018). Second, translocation requires the containment and shipping of deer, which is highly stressful for the animals and may result in injuries and inhumane mortalities (Breed et al., 2019). Finally, this approach requires there to be a market for deer and for farmers to have the capacity to receive and maintain the deer in captivity. In the past, as deer populations were reduced the effort required to capture deer increased, and the economic feasibility of the operation decreased (Johnston, 2020).

7.2.2.2 Live Capture and Dispatch

For live capture and dispatch, deer would be captured in large, fenced capture sites, with or without bait, and held in the Sallas Forest Strata capture facility and/or a new capture facility in GINPR for dispatch by firearm or captive bolt gun. Numerous studies have shown that live capture is relatively expensive and inefficient as a deer population reduction method (Human Wildlife Conflicts Working Group, 2018). Live capture prior to dispatch results in more stress to the animals than dispatch without capture. As live capture is unlikely to achieve full eradication of a deer population (some individuals may be wary of entering traps), this method would likely also need to be paired with methods such as those proposed to be used in the project (i.e., canine/handler teams and marksmen).

7.2.2.3 Advantages

- Translocation of deer to farms would be a non-lethal form of deer control.
- Live capture and control has been used in the past.

7.2.2.4 Disadvantages

- Live capture of deer is risky for the deer as it is highly stressful and may result in injuries or inhumane mortalities.

- Live capture is not feasible as a population eradication method on its own, because it is not possible to capture every animal in the population. Some animals will be inherently wary of traps and others will become wary over the course of the operation.
- Live capture is expensive compared to other methods.
- Live capture is unlikely to achieve the objective of complete deer eradication without being paired with methods such as those proposed to be used in the project (i.e., canine/handler teams and marksmen).

7.2.3 Biological Control

Biological control is the control of a pest or pathogen by a biological method, such as the release of natural enemies from the native range of the pest species where the pest is naturally controlled below damaging levels (Dahlsten & Mills, 1999). Although biological control is generally considered one of the most effective and economical long-term approaches for managing invasive species (Reardon, 2018), it is not a viable option for European Fallow Deer eradication on Sidney Island. As the biological control agent brings the target species' population down, it becomes harder for the biological control agent to find/catch/remove the target species. This causes the biological control agent to also decline, which allows the target species to rebound (B.C. Ministry of Forests, 2017). Given this cyclical population dynamic between the two species, biological control is better suited to population management and complete eradication is not possible.

In addition, the two types of biological control that could be used for managing (not eradicating) deer, predators or pathogens, are not feasible on Sidney Island or in Canada, respectively. The introduction of predators such as Cougar (*Puma concolor*), American Black Bear (*Ursus americanus*), or Gray Wolf (*Canis lupus*) to Sidney Island would not be feasible due to the small size of the island relative to their large home ranges. Cougars, American Black Bears, and Gray Wolves require territories that are hundreds of square kilometers and may just leave the island shortly after being introduced (NatureServe, 2023b, 2023d, 2023e). There would also be safety concerns associated with releasing a large predator into a residential area. On the other hand, introducing a deer pathogen (i.e., virus, bacterium, or parasite) is not feasible as this form of control is currently only permitted for insects and plants in Canada (Mason et al., 2017). Control via a pathogen would therefore require an untenable investment in research, development, and regulatory approvals, and it is not a proven method.

7.2.3.1 Advantages

- Control of the target species is permanent, with the densities of populations of the biological control agent adjusting themselves in response to changes in target species density.
- Overall, the cost of biological control is low relative to other approaches, and expenses are incurred at the beginning of a program rather than on a continuing basis.

7.2.3.2 Disadvantages

- The objective of complete deer eradication is not feasible with biological control.
- Biological control is irreversible. Once the biotic agent is released and becomes established, it cannot be recalled, nor can it be limited to a particular location, such as Sidney Island.
- Slow acting (may take years or decades to be effective).
- Potential impacts on non-target species are unknown.

- Pathogen biological control is currently only permitted for insects and plants in Canada (Mason et al., 2017).

7.2.4 Toxicants

Using toxicants to eradicate invasive mammals consists of introducing poisonous chemicals into the environment for ingestion by the target species. Toxic baits pellets or vegetables, such as cubed carrots coated with 1080 (New Zealand Department of Conservation, 2020), can be aerially broadcast over large areas, or placed in ground-based bait traps (O'Malley et al., 2022). Toxicants applied to palatable browse plant species have also been used to control ungulate and marsupial pests. For example, in New Zealand gels containing 1080 (sodium monofluoroacetate) aerially applied or placed on leaves of palatable plant species successfully reduced high-density deer populations (Macdonald et al., 2019).

There are social and legal issues with the use of toxicants for IAS control. For example, 1080 is currently only approved for use in the provinces of Alberta and Saskatchewan to control coyotes (Pest Management Regulatory Agency, 2014). Toxicants for ungulates are not species-specific and thus cannot be used without placing non-target species at risk. In addition, no toxicants are currently approved for deer control in Canada. A product registration application to the Pest Management Regulatory Agency (PMRA) would be required and the process can be lengthy and expensive.

7.2.4.1 Advantages

- Cost effective from a staffing effort perspective.
- Can rapidly reduce the number of animals.
- Can be aerially distributed in remote areas.
- Effective for targeting trap-wary animals.

7.2.4.2 Disadvantages

- The objective of complete deer eradication is not feasible with the use of toxicants.
- There are no species-specific toxicants for deer. Therefore, there is potential for non-target impacts (e.g., primary and/or secondary poisoning of native species, including Black-tailed Deer, other mammals, birds, and domestic pets).
- No toxicants are currently approved for deer control in Canada.
- The use of toxicants for conservation projects tends to be highly controversial.
- Recovery of deer meat for human consumption would not be possible.

7.2.5 Sterilization and Contraception

There are three approaches that can be used to prevent or limit reproduction in large mammals, including surgical sterilization, contraceptive hormone implants, and immunocontraception (i.e., vaccination; oral contraceptives for large-scale use are not presently available) (M. Fraker & Schwantje, 2011). Reproductive control of deer, however, is not a viable method for deer eradication on Sidney Island. It is logistically challenging to implement, can be invasive/risky for the deer, and the deer would continue to impact the ecosystem (Human Wildlife Conflicts Working Group, 2018).

All three sterilization and contraception methods require capturing deer, which is stressful and dangerous for the deer and logistically challenging and costly (Human Wildlife Conflicts Working Group, 2018), especially as specific individuals, such as females that have yet to be treated, must be targeted.

Surgical sterilization is permanent, and only requires one intervention, but is the most invasive and time-intensive, requiring a veterinarian to use a general anesthetic and sterile surgical methods (M. Fraker & Schwantje, 2011). Given that it is so intensive, this method is not feasible for a large population.

Delivering contraceptive hormone implants or vaccines is less invasive, as it is done through darting or injection, but female deer must be repeatedly dosed and they become educated to the capture/trap methods over time, making recapture more difficult and costly (Human Wildlife Conflicts Working Group, 2018). One study found that a single dose of SpayVac™ achieved a contraceptive success rate of 100% in a small sample of deer over a three-year period (M. A. Fraker et al., 2002), however it remains unknown whether SpayVac™ would be effective over the course of a female's up to 16-year life span (The Mammal Society, 2023). Monitoring would be required to quickly determine whether deer were reproducing, and follow-up treatments would likely be necessary. Other contraceptive hormone products currently on the market are not 100% effective (e.g., GonaCon® is only 70% effective) (Human Wildlife Conflicts Working Group, 2018).

It is very difficult to achieve deer population reductions, let alone eradication, with sterilization or contraception. Research has shown that over 90% of the does in a population need to be made permanently infertile to achieve population reductions. This is difficult and costly to achieve in a population of several hundred individuals (Human Wildlife Conflicts Working Group, 2018). Furthermore, if the efficacy rate of the contraception used is less than 100%, deer populations may actually increase following treatment (Human Wildlife Conflicts Working Group, 2018).

Finally, given the typical life span of European Fallow Deer, it may take five to 10 years or more for treated populations to start to decline (Human Wildlife Conflicts Working Group, 2018). During this time the deer would continue to over-browse the vegetation and it could take decades more for any improvements to the forest understory vegetation on Sidney Island to occur.

7.2.5.1 Advantages

- Surgical sterilization and contraception are non-lethal forms of deer population control.

7.2.5.2 Disadvantages

- The objective of complete deer eradication is not feasible using sterilization and contraception.
- It will not be logistically feasible to capture every female deer on Sidney Island, which means that sterilization and contraception are not feasible means of achieving eradication.
- Sterilization or contraception are labour intensive and costly, especially for contraceptives which require repeated administration.
- Capturing female deer as well as repeatedly administering contraceptive implants or vaccines is stressful for deer and could cause injuries or mortalities.
- If the efficacy rate of the contraception used is less than 100%, deer populations may actually increase following treatment (e.g., GonaCon® is only 70% effective).
- Deer will continue to impact the vegetation on Sidney Island for decades.

7.2.6 Targeted Aerial and Ground Operations (the Project)

Many ungulate eradication projects utilize targeted hunting (with the objective of eradication, unlike conventional hunting) in conjunction with one or more other methods (e.g., aerial hunting, trained

hunting dogs, fencing, sentinel deer, etc.) to ensure the project is successful (Gill, 2012). The SIERP Deer Working Group took into consideration several globally proven best practices and methods based on efficacy, applicability to the Sidney Island environment, safety of the public and property, and regulatory and socio-political considerations (SIERP Steering Committee & Parks Canada Agency, 2022). Following this assessment, the SIERP Deer Working Group recommended two primary eradication methods for Sidney Island to maximize the probability of eradication success:

- Aerial hunting from a helicopter; and
- Ground hunting in temporary fencing zones, using trained canine/handler teams.

Aerial shooting from a helicopter has been used for more than 40 years to control deer populations around the world. It is a safe, proven, and cost-effective method of rapidly removing ungulates from islands (Carrion et al., 2007; F. Cruz et al., 2009). Aerial operations have been previously implemented in the Llgay gwii sdiihlda: Restoring Balance Project (Houston et al., 2021) and are widely recognized as a safe and cost-efficient eradication technique (Parks Canada Agency, 2021b). Based on unarmed, simulated aerial shooting trials that were conducted in 2018 (see Section 8.2), aerial shooting is especially well-suited for rapidly reducing deer numbers on Sidney Island due to the moderate forest canopy cover, especially in the late fall and winter when the leaves are off the trees.

Ground hunting, and the use of temporary fences and trained canine/handler teams is highly effective for detecting and locating remaining deer at a low density and confirming the success of eradication. The eradication operation would be completed by globally recognized eradication specialists with extensive expertise and experience.

7.2.6.1 Advantages

- Targeted aerial hunting and ground hunting are globally proven methods that have been used previously in successful ungulate eradication operations.
- Aerial hunting and ground hunting will rapidly decrease and eradicate the deer population.
- Ground hunting, and the use of temporary fences and trained canine/handler teams is highly effective for detecting and locating remaining deer and confirming the success of eradication.

7.2.6.2 Disadvantages

- High upfront/one-time cost (i.e., includes the cost of operating a helicopter and contracting eradication specialists).

7.2.7 Conclusion

Targeted aerial and ground operations (outlined Section 9) are the preferred method for achieving deer eradication. The other potential alternative methods are either not feasible or are not appropriate for achieving successful eradication of European Fallow Deer from Sidney Island to facilitate forest recovery. Potential combinations of these approaches are also not a feasible or a preferable alternative to the proposed project, as they would not allow for rapid eradication, detecting and locating remaining deer at a low-density, and confirming the success of eradication.

A summary of the consideration of alternative means to achieving deer eradication, based on their ability to achieve the objective of deer eradication, their consistency with the Parks Canada's mandate and policy, technical, economic, operational feasibility, is provided in Table 3.

Table 3. Summary of Consideration of Alternative Means to Achieving Deer Eradication

Alternatives	Approach	Contribution to Objective (Deer Eradication)	Consistency with Parks Canada Mandate and Policy ¹³	Technical Feasibility (Is it possible?)	Economic Feasibility	Operational Feasibility and other Considerations	Conclusion
Conventional Hunting	<ul style="list-style-type: none"> Conventional recreational and subsistence hunting targeting European Fallow Deer during the hunting season. 	<ul style="list-style-type: none"> While deer numbers may be reduced through conventional hunting, the methods (e.g., stalking, tree stand, or blind hunting) are not effective at eradicating a target species' population. 	<ul style="list-style-type: none"> Consistent Indigenous persons can harvest deer in GINPR; could contribute to eradication. 	<ul style="list-style-type: none"> Not feasible Conventional hunting is not an appropriate means for achieving deer eradication due to the difference in objectives and techniques of hunting vs eradication. Recreational hunting is not a tool that can be used to find and remove every animal. 	<ul style="list-style-type: none"> Feasible Low investment 	<ul style="list-style-type: none"> Conventional hunting is operationally feasible, however in terms of achieving a deer eradication, it is only feasible if the techniques used do not compromise the efficacy of eradication techniques by educating the deer to the eradication methods. The park closes annually to accommodate an Indigenous harvest of deer; there is a provincially regulated hunting season on Sallas Forest Strata lands 	<ul style="list-style-type: none"> Not feasible to achieve objective of deer eradication
Live Capture and Translocation to Deer Farms	<ul style="list-style-type: none"> Deer could be captured in small portable traps or large fenced capture sites, with or without bait, and held in the Sallas Forest Strata capture facility and/or a new capture facility in GINPR before being transported to deer farms. 	<ul style="list-style-type: none"> It is not possible to capture every animal in the population. Some animals will be inherently wary of traps and others will become wary over the course of the operation. Could contribute to eradication if paired with other techniques proposed in the project. 	<ul style="list-style-type: none"> Inconsistent Live capture and translocation facilitate the spread of invasive alien species. 	<ul style="list-style-type: none"> As some deer are inherently wary of traps and others will become wary throughout the operation, capturing deer becomes more and more difficult. The duration and effort required to live capture the entire deer population make this not technically feasible. 	<ul style="list-style-type: none"> Not feasible; Requires high investment in personnel over a long-time frame. Requires there to be a market for deer and for farmers to have the capacity to receive and maintain the deer in captivity. The economic feasibility of translocating deer to farms goes down as deer population declines (and the effort required to capture the remaining deer increases). 	<ul style="list-style-type: none"> Numerous studies have shown that live capture is inefficient as a deer population reduction method, let alone population eradication method (Human Wildlife Conflicts Working Group, 2018). Translocating fallow deer facilitates the spread of invasive alien species. Containment and shipping of deer has a higher risk of injury and mortality and precludes this option. 	<ul style="list-style-type: none"> Not feasible to achieve objective of deer eradication
Live Capture and Dispatch	<ul style="list-style-type: none"> Deer could be captured in small portable traps or large fenced capture sites, with or without bait. They could then be held in the Sallas Forest Strata capture facility and/or a new capture facility in GINPR for dispatch by firearm or captive bolt gun. 	<ul style="list-style-type: none"> It is not possible to capture every animal in the population. Some animals will be inherently wary of traps and others will become wary over the course of the operation. Could contribute to eradication if paired with other techniques proposed in the project. 	<ul style="list-style-type: none"> Consistent Could contribute to deer eradication. 	<ul style="list-style-type: none"> As some deer are inherently wary of traps and others will become wary throughout the operation, capturing deer becomes more and more difficult. The duration and effort required to live capture the entire deer population make this not technically feasible. 	<ul style="list-style-type: none"> Not feasible; Requires high investment in personnel over a long-time frame. 	<ul style="list-style-type: none"> Requires use of Sallas capture facilities and collaboration across jurisdictions or creating a capture facility in GINPR. Numerous studies have shown that live capture is inefficient as a deer population reduction method, let alone population eradication method (Human Wildlife Conflicts Working Group, 2018). 	<ul style="list-style-type: none"> Not feasible to achieve eradication Not feasible on its own to achieve eradication. Feasible as a tool to compliment other eradication techniques.
Biological Control	<ul style="list-style-type: none"> This would consist of releasing predators or pathogens (i.e., virus, bacterium, or parasite) into the environment to kill deer on Sidney Island. 	<ul style="list-style-type: none"> Complete eradication of the target species is not feasible with biological control. Biological control agent population densities adjust 	<ul style="list-style-type: none"> Uncertain There could be implications to neighboring jurisdictions, non-target species, and visitor safety. 	<ul style="list-style-type: none"> Not feasible. Predators are less effective at low deer densities and there is no way to keep them on the island when deer density is reduced (Sidney Island is much 	<ul style="list-style-type: none"> Uncertain Biological control would require an untenable investment in research, development, and regulatory permitting. 	<ul style="list-style-type: none"> Not logistically feasible. Releasing predators in a residential area is unlikely to be socially acceptable. Releasing a deer pathogen would be permanent and could affect 	<ul style="list-style-type: none"> Not feasible to achieve eradication

¹³ For further detail see Direction from Legislation, Mandate, and Policy in Section 2

		in response to changes in target species density.		smaller than typical predator home ranges). <ul style="list-style-type: none"> Introducing a deer pathogen is not feasible as non-predator biological control is currently only permitted for insects and plants in Canada. 		non-target species, and/or species outside of Sidney Island.	
Toxicants	<ul style="list-style-type: none"> This would consist of releasing lethal poison onto forage plants or toxic bait for consumption by deer. 	<ul style="list-style-type: none"> Uncertain Can rapidly reduce the number of animals. 	<ul style="list-style-type: none"> Uncertain There is not an approved product for consideration. 	<ul style="list-style-type: none"> Not feasible There are no toxicants approved for deer control in Canada. There are no specific toxicants for deer that would not kill or harm non-target wildlife. 	<ul style="list-style-type: none"> Toxicants can be cost-effective, however there are no toxicants approved for deer control in Canada. A product registration application to the Pest Management Regulatory Agency (PMRA) would therefore be required. The legal process for registration of a toxicant can be lengthy and expensive. 	<ul style="list-style-type: none"> There would be potential for poisoning of native species, including Black-tailed Deer, other mammals, birds, and domestic pets. The use of toxicants for conservation projects tends to be controversial and their use would likely cause opposition the project. Recovery of deer meat for distribution to local First Nations would not be possible with the use of toxicants. 	<ul style="list-style-type: none"> Not feasible to achieve eradication
Sterilization and Contraception	<ul style="list-style-type: none"> This would consist of surgical sterilization, or the use of contraceptive hormone implants or contraceptive vaccines to prevent the deer from reproducing. 	<ul style="list-style-type: none"> Eradication of the deer population would be possible, if all females (or all males) are sterilized. Eradication success is uncertain if contraceptives are used and depends on the contraceptive used as well as ongoing effort to administer it to all female deer. Eradication will be very slow; It may take five to 10 years or more for treated populations to start to decline. 	<ul style="list-style-type: none"> Consistent Could contribute to deer eradication. 	<ul style="list-style-type: none"> Not feasible It will not be logistically feasible to capture every female deer on Sidney Island, which means that sterilization and contraception are not feasible means of achieving eradication. Logistically challenging and unproven at a large scale with a wild population. 	<ul style="list-style-type: none"> Not feasible High, ongoing investment for European Fallow Deer lifespan (10-16 years); continued investment would be required for contraceptives. 	<ul style="list-style-type: none"> Not feasible Techniques require capture and surgery, or repeated captures to administer contraceptive. Not possible to capture or treat every female (or every male) in the population. Capturing female deer as well as repeatedly administering contraceptive implants or vaccines is stressful for deer and could cause injuries or mortalities. Deer will continue to impact the vegetation on Sidney Island for decades. 	<ul style="list-style-type: none"> Not feasible to achieve eradication
Targeted Aerial and Ground Operations (the Project)	<ul style="list-style-type: none"> Eradication specialists would complete aerial hunting from a helicopter, and ground hunting in temporary fencing zones, using trained canine/handler teams. 	<ul style="list-style-type: none"> The deer population would be reduced and eradicated rapidly. 	<ul style="list-style-type: none"> Consistent 	<ul style="list-style-type: none"> Targeted aerial hunting and ground hunting are globally proven methods that have been used previously in successful ungulate eradication operations. The methods have been developed to be suitable for the Sidney Island environment. 	<ul style="list-style-type: none"> Feasible Although there is a high upfront cost, it is a one-time cost (unlike other methods where it would be ongoing). 	<ul style="list-style-type: none"> Aerial hunting and ground hunting combined will rapidly decrease the deer population Ground hunting, and the use of temporary fences and trained canine/handler teams is highly effective for detecting and locating remaining deer at a low-density and confirming the success of eradication. SIERP project partners support the implementation of these methods. 	<ul style="list-style-type: none"> Targeted Aerial and Ground Operations are the preferred means for rapidly and humanely eradicating the European Fallow Deer from Sidney Island.

8 Assessments and Field Trials of Methods for Deer Eradication Project

Several assessments and field trials of methods proposed to be used during the deer eradication project were completed between 2018 and 2022 to support project planning, from the conceptual to operational planning stages. While important for project planning, these trials also helped demonstrate the proposed methods to island residents and inform their understanding of the project.

8.1 Night Hunting Assessment

A night hunting assessment, completed in September 2018, found that Sidney Island is well-suited to night hunting, based on the level of deer activity after dusk and the response of most deer to the approach or presence of a vehicle or boat (C. Gill, personal communication, September 2018).

8.2 Aerial Hunting Assessment

An aerial hunting assessment, also completed in September 2018, found that Sidney Island is well-suited to aerial hunting and presents opportunities to target deer in large open areas, as well as through the deciduous canopy (during leaf-off), and smaller forest openings, especially in the central and southeastern portions of the island (C. Gill, personal communication, September 2018).

8.3 Bait Preference Trial

A Bait Preference Trial was completed between November 2018 and January 2019 (Coastal Conservation & Parks Canada Agency, 2019). This trial found that whole kernel corn was the preferred bait type. Deer activity at bait stations was highest at night and lowest between 09:30 and 17:00. Deer activity was also higher in January than in November, suggesting that bait is more attractive later in the season, after frosts have reduced available forage (Coastal Conservation & Parks Canada Agency, 2019).

8.4 Temporary Fencing Trial

A temporary fencing trial tested non-lethal methods for moving and containing deer to determine their feasibility and effectiveness. The trial included testing the configuration of temporary fencing, fence gates, fence end deterrents, as well as the use of wildlife cameras (Tooby et al., 2022). The trial was completed between December 2021 and February 2022. Key findings from the trial were that:

- Deer avoided the fence and did not breach any of the barriers or deterrents trialed at fence openings or endings;
- No wildlife of any kind were entangled in the temporary fences;
- Human and vehicle traffic was able to easily pass through the temporary fencing and barriers;
- Barring deer movement through low tide zones is a challenge but auditory and visual deterrents are helpful; and
- The staff time required to set up and take down temporary fencing was estimated.

9 Project Description

9.1 Project Scope

Using a “one island” approach is key for the eradication of European Fallow Deer from Sidney Island, as the deer can move easily around the island, between lands under the jurisdiction of the various landowners and managers. The proposed project considers the entire island as a single entity, while recognizing that there are different jurisdictions and that some approaches or techniques will need to

be adapted in different locations for logistical, management, financial, or safety reasons. As such, the term “project area” within this report refers to the entirety of Sidney Island.

While the project activities and mitigations generated by the DIA may be applied across the entire project area, this DIA will only make a determination on the potential for significant adverse effects resulting from project activities on the portion of Sidney Island that is within Parks Canada’s authority, which is hereafter referred to as the “park reserve”.

9.2 Methods Selection and Summary

The proposed project methods were informed by literature, expert opinion, the Deer Eradication Plan for Sidney Island prepared by the Deer Working Group (SIERP Steering Committee & Parks Canada Agency, 2022), and the methods assessments and field trials completed on Sidney Island (Section 8). In addition, the proposed methods were informed by lessons learned from a deer eradication project undertaken by Parks Canada in Haida Gwaii (Gill & Irvine, 2016; Houston et al., 2021).

Prior to implementation, the selected eradication techniques will be reviewed and approved by the Parks Canada Animal Care Committee and the Province of BC. The BC Society for the Prevention of Cruelty to Animals (BC-SPCA) will also review selected techniques and will be provided the option to observe activities on site. Parks Canada has also sought feedback from the New Zealand Department of Conservation’s Island Eradication Advisory Group.

The eradication of European Fallow Deer from Sidney Island will be completed using a professional eradication team with support by Parks Canada staff (hereafter referred to as the “project team”), globally proven eradication techniques tailored to the population size at each stage, and approaches designed to minimize animal suffering. The primary methods proposed to eradicate European Fallow Deer on Sidney Island, described in further detail in the sections below, have been separated into three phases:

- Phase 1 - Aerial and Ground Operations: This phase is expected to consist of 10 days of aerial and ground activities, with the objectives of population reduction and reconnaissance to inform subsequent phases.
- Phase 2 - Ground Operations: Targeting deer remaining after Phase 1 with professional ground-based marksmen, highly trained canines/handlers, and temporary fencing zones; and
- Phase 3 - Biosecurity Monitoring and Adaptive Management: Post-eradication monitoring will be implemented, and an adaptive management Biosecurity Plan will be prepared. This plan will ensure that Sidney Island remains European Fallow Deer-free.

9.3 Concurrent Eradication of Native Black-tailed Deer

Native Black-tailed Deer will also be eradicated from Sidney Island during the project. Given the nature of the proposed project, the professional eradication team will not be able to reliably differentiate between European Fallow Deer and native Black-tailed Deer during the operation, and an attempt to do so could compromise the success of the eradication. In addition, confirmation of European Fallow Deer eradication using professional hunting dogs (see Section 9.10) is a critical last step of the project, which would not be possible if Black-tailed Deer were still present on the island.

The SIERP project partners initially considered capturing and penning Black-tailed Deer on the island during the project. Based on input from the BC-SPCA and eradication professionals, however, this was

ruled out as a viable option because Black-tailed Deer would have to be penned for the duration of the project (potentially from November 2023 to April 2025) and the risk of injury or inhumane mortalities of Black-tailed Deer would be too high. Therefore, all deer, including the relatively small number of native Black-tailed Deer, are proposed to be removed.

9.4 Phase 1: Aerial and Ground Operations

Phase 1 consists of approximately 10 days of aerial and ground activity within a two-to-three-week window. Aerial shooting is a globally proven strategy to achieve significant and rapid population reduction (Bengsen et al., 2022). This phase is also intended to provide the professional eradication team with the opportunity to become familiar with deer behaviour and the geographical layout of the project area, both of which will contribute to a successful and efficient Phase 2.

Aerial operations will be conducted by an experienced helicopter pilot, a GPS technician, and four highly skilled professional marksmen. Two marksmen in the helicopter will work systematically and in tandem with two marksmen on the ground. Throughout this phase, ground operations, where all marksmen operate together on the ground, without the helicopter, may be interspersed with aerial operations. It is likely that the marksmen operating on the ground will operate at night with the use of spotlights and thermal imaging (i.e., Forward Looking Infra-Red [FLIR]). There will also be a carcass recovery team operating on the ground in Phase 1 (see Section 9.9.1 for details).

Daily flying time is expected to be between three to six hours per day when weather is optimal. Flights will occur mostly around dawn and dusk, including pre-sunrise and post-sunset. Other flight times are possible, depending on deer density and changes in deer behaviour as the project progresses. Occasional non-shooting night flights will use thermal imaging to locate deer.

Both individuals and small groups of deer will be targeted. The preferred shot location will be a brain/cervical spine shot, when practical, followed by heart/lung shot. The latter should be performed if an accurate head shot is not possible (e.g., when shooting from a moving helicopter) and may be followed up with an immediate head shot if required to ensure no suffering (Canadian Council on Animal Care, 2003). The professional eradication team is trained and experienced in sharpshooting to ensure accurate and humane killing shots.

There may be opportunities for Indigenous harvesting of deer to occur within the park reserve during the typical hunting season, both preceding and following completion of Phase 1.

9.4.1 Spotlight or Forward Looking Infra-Red Shooting

High-powered spotlights that allow marksmen to detect the distinctive deer “eye shine” in the dark, or FLIR, which detects body heat signatures, may be used by professional marksmen to locate and dispatch deer at night. For this method, the project team will move about the island using a pick-up truck on approved roads, an ATV on approved roads and trails, and by foot. The advantage of using nighttime spotlight or FLIR is that, if employed correctly, deer do not associate the spotlight or FLIR with the risk of being dispatched, making this eradication method highly effective (Gill & Irvine, 2016; Houston et al., 2021; Parks Canada Agency, 2021b).

9.4.2 Public Safety Measures During Phase 1

The project team is developing a detailed Safety Operating Plan that will be finalized before the project. Some of the public safety measures for Phase 1 include:

- The operational team will liaise with a representative from Sallas Forest Strata to ensure they are aware of all on-island residents during the operation, including arrivals and departures. On-island residents will be advised in advance of the approximate timing and duration of all activities. A predefined line of communication between the project team and on-island residents will remain open for the duration of the operation, in addition to daily briefings.
- There will be no shooting on or into private lots.
- Notices will be placed around Sidney Island at landing sites to advise the public of project activities. There will be no public access into the GINPR during the project. Parks Canada staff will monitor the shoreline to be aware of any boats that have landed. Additional patrols by law enforcement may also be required in the park reserve during eradication closure.

9.5 Phase 2: Ground Operations

Following aerial operations, professional marksmen and trained canine/handler teams will be used to complete the eradication operation on foot. The team will consist of up to 10 professional marksmen/canine handlers and up to 10 trained dogs. There will also be a carcass recovery team operating on the ground in Phase 2 (see Section 9.9.1 for details). Temporary fences will be used to create zones across the island that can be methodically cleared of remaining deer.

A helicopter may be used during Phase 2 for the purpose of locating and pushing deer onto Sallas Forest Strata Common Property, for reconnaissance, or for night flights to confirm project success using FLIR imagery; however, it is currently not expected to be necessary.

There may be opportunities for Indigenous harvesting of deer to occur within the park reserve during the typical hunting season prior to Phase 2 beginning.

9.5.1 Temporary Fence Zones

Temporary fencing will be used during Phase 2 of the project to divide the island into smaller, manageable zones, restrict deer movement, and enable the professional marksmen and trained canine/handler teams to quickly detect and humanely dispatch deer. Staging and initial installation of fences will begin as early as July.

The initial proposed temporary fence plan for the island was prepared by White Buffalo Inc. (DeNicola, 2022). There will be approximately 18.5km of primary fencing, around the perimeter of the island, as well as approximately 14.5km of secondary fences through the interior of the island, which will create multiple zones, each approximately 24-80ha in size (Figure 6) (DeNicola, 2022). The specific location of fencing and size of the zones is expected to change as the operational team adapts to conditions.

Proposed fencing materials have been selected following fencing trials completed by Parks Canada staff from December 2021 to February 2022 (Tooby et al., 2022). Fencing will be made of approximately 3-meter (m) tall aquaculture netting with approximately 20 centimeter squared (cm²) mesh (Figure 7, Figure 8). To avoid permanent damage to trees, the netting will be attached to trees using ratchet straps, approximately 2.7m up the trunk. In locations without trees, free standing 3m tall T-posts set into boat or umbrella stands will be used. Guy wires held down by tent pegs will be used for stability, where permitted. The bottom of the netting will be laid along the ground and secured to nearby trees, affixed to the ground with tent pegs where permitted, or weighed down with logs or other objects, to prevent deer from going under the netting (Tooby et al., 2022) (Figure 9).

Gates will be set up to allow vehicles and pedestrians to cross netted areas using freezer curtain “doors” (Figure 9). When a zone is actively being operated in, gates will be closed to restrict access. During the fencing trials, freezer curtains were found to be effective for allowing vehicle and pedestrian access, while preventing deer movement (Tooby et al., 2022).

Although the trial found them to be unnecessary, cattle guards may be used at access points to restrict deer movements (Tooby et al., 2022). If used, cattle guards will consist of approximately 1x2m pieces of heavy metal grating laid down on the ground across the access point (Figure 9) (Tooby et al., 2022).

To reduce the likelihood of deer circumnavigating secondary fence ends, several strategies will be used, and combined, including ending fences at steep cliffs, extending fences out over sloped areas using cantilevered supports, extending fences past the high-tide level using sawhorses, rope, flagging tape, or cones with lights, and using deterrents such as wolf urine or noise machines (Tooby et al., 2022). Noise machines used would broadcast human voices at a volume typical of conversation in an outdoor setting.

Installation of temporary fencing will take advantage of existing roads, trails, footpaths, open areas, and fire breaks as much as possible to minimize the impact on the ecological and cultural values of the island. When there is no existing opening through which to hang the temporary fencing, the vegetation (excluding rare native plants or Culturally Modified Trees (CMTs)) will be pruned to create a shoulder width path or tunnel to a height of 2m.

Deer within each fencing zone will be systematically dispatched by professional marksmen. Once a zone is determined to be deer-free (e.g., by several sweeps with zero deer detections), its secondary fences will be taken down and re-located to create new zones.

The temporary secondary fences and deterrents at fence ends will be used to reduce the probability of deer moving into previously cleared zones. Wildlife cameras and patrols by detection dogs will be used to detect whether deer have breached a zone. Once the island has been declared deer-free, fencing will be dismantled.

9.5.2 Bait Station Shooting

Bait stations for deer may be placed in areas of known deer activity on the island in order to concentrate the deer for eradication and to also facilitate night spotlight or FLIR shooting.

Bait would consist of sterilized whole dried whole corn (the deer’s preferred bait, as determined through the bait trial (Coastal Conservation & Parks Canada Agency, 2019)). Although there is no guarantee that sterilized corn will be unable to germinate, no corn germinated during the Bait Preference Trial (Section 8.3), and bait has been used regularly on the island for deer hunting and there have been no recorded issues with the whole corn germinating. If bait stations are used, following their use, each site will be cleared of any germinating bait plants.

Trail cameras would be used to monitor deer behaviour and bait consumption at each bait station. Each bait station will be re-filled at the same time of day (e.g., two to four hours before dark) for several



Figure 6. Proposed Temporary Fencing Plan for Phase 2 of the Project (Blue = Primary fencing, Red and Black = Secondary Fencing) (DeNicola, 2022)



Figure 7. Aquaculture netting, similar to the netting which will be used to create the temporary fencing for the project (Tooby et al., 2022)



Figure 8. Aquaculture Netting as Installed During the Parks Canada Fencing Trials (Tooby et al., 2022)



Figure 9. Examples of Freezer Curtain “doors” and Cattle Guards at Pedestrian and/or Vehicle Accesses (Tooby et al., 2022)

weeks prior to the eradication operation to condition the deer and have them associate bait stations with food, not danger. The number and locations of bait stations will be finalized by the professional eradication team prior to implementation. At least one to two bait stations may be set every 50ha. Determining factors for bait station locations would include the ability of the professional marksmen to take accurate and humane killing shots, public and property safety, and ease of access.

9.5.3 Trained Canine/Handler Teams

Trained canine/handler teams will be used to complete Phase 2 of the eradication operation on foot. Up to 10 dogs may be used to detect the remaining deer on island. The dogs' keen sense of smell and ability to search large areas in a relatively short amount of time makes them especially effective in detecting deer at low densities. The dogs will be one of two types, used for hunting:

- Indicator dogs, which will work in proximity to the professional marksman. These tracking dogs will detect scent and track deer with the goal of positioning the marksmen to take a shot (Gill & Irvine, 2016; Parks Canada Agency, 2021b); and
- Bailing dogs, which will actively chase deer and corner the animal until the professional marksman arrives. Bailing dogs are normally used as the last eradication technique because there is a probability that the target animals may become educated to this approach if the bailing dog simultaneously engages two or more deer, but one escapes (Gill & Irvine, 2016).

Given that the dogs used for this project are highly trained professional working dogs, they are not expected to have any impact on non-target wildlife. Indicator and bailing dogs will not engage physically with the deer and will only follow the scent of the animal they are directed to hunt, so the likelihood of injury or harassment of non-target species by these working dogs is extremely low (Gill & Irvine, 2016; Parks Canada Agency, 2021b). In addition, each dog will be fitted with a GPS collar, which will allow the dog's handler to monitor the location and record the movement of the dog as well as the areas that have been searched.

9.5.4 Public Safety Measures During Phase 2

The project team is also developing a detailed Safety Operating Plan that will be finalized before the project. Some of the public safety measures for Phase 2 are described below.

As in Phase 1, shooting of deer during Phase 2 will be restricted to the park reserve, Sallas Forest Strata Common Property and Islands Trust Conservancy lands, as well as along the coastline/beaches below the high-water line. Using professional marksman with canine/handler teams is key to reduce public or property safety concerns. There will be absolutely no shooting on or into private lots. The temporary fencing will be used to move/contain deer away from coastal areas and private properties into Sallas Forest Strata Common Property areas where they can be safely and humanely dispatched. The bailing dogs can track the deer and move them away from public and residential areas (SIERP, 2021).

There will be no public access into the GINPR during the project. Notices will be placed around Sidney Island at landing sites and on temporary fences and at access points to advise the public of project activities. Within the Sallas Forest Strata community lands, there will be no access to areas that are closed for safety reasons. All access points to closed zones will be clearly signed to alert the public about the project and indicate that marksmen are actively shooting in the zone. Parks Canada staff will monitor the shoreline to be aware of any boats that have landed. Additional patrols by law enforcement may also be required in the park reserve during eradication closure.

9.6 Supplementary Methods

Adaptive management is key when considering factors such as possible unanticipated deer responses to the primary eradication methods selected, variations in physical terrain, by inclement weather, equipment malfunctions, unforeseen land access constraints (e.g., if activities unrelated to the project impact operations), or other challenges (e.g., trespassing in closed areas, regulatory requirements). Optional supplementary methods are available for use by the team, if necessary. These include the use of drop nets and the release of sentinel deer.

9.6.1 Drop Netting

Drop nets could be used to capture deer in open areas where they forage or seek refuge, though it is unlikely given the aversive behaviours demonstrated by deer under the current hunting program. Drop nets are large (12 to 30m wide) square nets suspended from poles at each corner, with weighted corners that can be remotely triggered for deployment. When triggered, the net drops straight down, capturing deer beneath, which are then dispatched with a firearm. To habituate deer to this structure, drop nets would be paired with bait stations.

9.6.2 Sentinel Deer

To detect the target species at low densities, surgically sterilized deer, fitted with radio telemetry collars and coloured ear tags/collars, may be released on the island. As European Fallow Deer are a social species, these “sentinel” deer will strive to seek out and join other deer on island, thus enabling the project team to locate any remaining individuals. The professional marksmen would dispatch all deer, leaving the sentinel to seek out more deer. Sentinel deer can also be used as a monitoring tool to confirm the eradication of the target species from the island. This method has a low likelihood of being used during the project. If sentinel deer are used, the methods would be reviewed and approved by the Parks Canada Animal Care Committee.

9.7 Transportation, Accommodation, and Equipment

9.7.1 Transportation

- The helicopter will likely be stationed at nearby Victoria International Airport; however, helicopter landing and fueling sites will be designated within the park reserve in the event they are required. Sites will be selected to minimize impacts to ecological and cultural features.
- The Sallas Forest Strata ramp and roads may be used to transport equipment required from a barge to Parks Canada lands, including:
 - Pick-up trucks;
 - 6-seater All Terrain Vehicles (ATVs) (in addition to ATVs already on the island);
 - Refrigerator trucks; and
 - Camp supplies (as necessary).
- Parks Canada boats will transport the project team and small equipment to GINPR. Vessels will be moored at the mooring buoys at Sidney Spit or will be bungee anchored at the Old Transport dock (Figure 3). Permission may also be requested to use the Sallas Forest Strata dock.
- Ground support project team members will move about the island using pick-up trucks on approved roads, ATVs on approved roads and trails, and by foot.

9.7.1.1 Fuel

Vehicles on Sidney Island are currently refueled at an existing PC compound within the park reserve, adhering to pre-established fueling procedures. This will continue during the project.

The helicopter will primarily refuel at Victoria International Airport, near Sidney Island, however, a small amount of aviation fuel may be stored in the park reserve if on-island fueling is necessary.

Fuel for the helicopter will be stored in a 208L (55 gal) fuel drum in a portable impermeable spill containment berm, in a secure location at least 100m away from water sources and sensitive sites. Refueling will also take place within/over a portable impermeable spill containment berm. A fuel spill kit capable of cleaning up 110% of the maximum volume of stored fuel will be kept immediately adjacent to the storage/refueling location. All personnel participating in the refueling process will be briefed on the Spill Response Plan, which will be prepared and approved by designated Parks staff in advance of the operation.

Transportation of fuel to and from the project site will adhere to the Transportation of Dangerous Goods Regulations (Government of Canada, 2022c).

According to the Ministry of Water, Land and Air Protection risk ranking assessment for land-based fuel facilities, storing fuel, as described above, is considered to have a low-risk for environmental impacts (Ministry of Water, Land and Air Protection, 2002).

9.7.2 Accommodations

9.7.2.1 Phase 1 Accommodations

Accommodations for ground support project team members during Phase 1 will either be in the town of Sidney or will consist of a tent camp located within the GINPR. The tent camp will be located in a previously cultivated and highly disturbed area, away from sensitive ecological and/or cultural sites. Potential accommodation sites were selected based on input from GINPR staff and WSÁNEĆ cultural monitors, to avoid SAR habitats and significant cultural sites. Personnel staying at the tent camp will use existing GINPR washroom facilities. Temporary self-contained shower units may be set up at this site as well; greywater will be contained and emptied as needed by a professional sanitary service company and disposed of off island.

9.7.2.2 Phase 2 Accommodations

Accommodations during Phase 2 will consist of self-contained trailers that include sleeping, cooking, eating, and self-contained washroom facilities. The trailer camp will be located in a previously cultivated and highly disturbed area, away from sensitive ecological and/or cultural sites.

Trailers will arrive at the project island via barge and will be towed to the desired location from there, taking care to select an overland travel route that minimises impact to the site (i.e., using pre-established roads whenever possible, or laying down wooden planks or boards to minimise rutting).

Wastewater will be collected and contained in black water tanks, which will be emptied as needed by a professional sanitary service company and disposed of off island. Other refuse/garbage created through the project will be collected and removed from the island and disposed off at the local landfill. No wastewater or garbage will be disposed of on Sidney Island or in the adjacent marine environment.

If necessary, site reclamation will take place after accommodation facility removal. Site reclamation may include the removal of invasive non-native vegetation and/or re-seeding of native vegetation in areas with bare soil due to foot traffic or other disturbance to surface soil levels.

9.7.3 Equipment

- Equipment will be staged and stored within the park reserve when not in use, with the exception of temporary fencing/gates that are being/are installed.
- Refrigerator trucks will be stationed within the park reserve and will be used to store deer carcasses until they can be distributed.
- When not working during Phase 2 of the project, the trained hunting dogs will be kept in camp.

9.8 Firearms and Ammunition

Firearms used during Phases 1 and 2 will be low caliber rifles with noise suppressors, which are devices that reduce the acoustic intensity (sound) of the gunshot.

In the past, ammunition was typically lead-based, but non-toxic alternatives such as copper have become more readily available. To prevent contamination of the environment, potential impacts to non-target species, as well as contamination of deer carcasses/meat for human-consumption, lead-free, copper-based ammunition will exclusively be used during the project.

The project team will contain bullet casings as much as possible during aerial operations and will retrieve bullet casings during ground operations whenever feasible. Project team members will retrieve missed casings if they are observed during ground activities.

9.9 Deer Carcass Management

9.9.1 Deer Carcass Recovery

During both Phases 1 and 2 a carcass recovery team will locate and retrieve deer carcasses using coordinates provided by the professional marksmen, when it is safe to do so. The carcass recovery team will consist of a maximum of 20 people and four vehicles. The team will remain on established roads, paths, and trails wherever possible. Carcasses in visible, high-use areas will be prioritized for removal and no carcasses will be left on or near the airfield. Some Carcasses that are inaccessible or cannot be located by the recovery team may not be recovered.

9.9.2 Management of Deer Carcasses for Meat

When recovery efforts do not impact the efficiency of the operation or pose a safety risk to the project team, deer carcasses will be harvested for meat. When feasible, some carcasses may be field dressed where they are found. When not feasible to field dress carcasses, carcasses will be retrieved, relocated to, and field dressed in a central processing area located in Radar Field.

Carcasses destined for human consumption will be stored in a refrigerator truck within the park reserve and then distributed to First Nations. A local indigenous contractor, together with Parks Canada staff, will be responsible for distribution of deer meat, hides, and other useful deer parts to local First Nations.

9.9.3 Management of Entrails and Unsalvageable Carcasses

When feasible to do so and/or when preferred by the harvester, animals will be field dressed in situ and with entrails left exposed for scavengers or covered with forest litter, as per Indigenous cultural norms.

When not feasible, or not preferred by the harvester, animals will be retrieved whole and field dressed at a central processing location in Radar Field where entrails will be disposed of in a trench. The trench will be dug prior to the beginning of the operation, likely with an excavator. The exact location within Radar Field will be determined in conjunction with cultural monitors and the Parks Canada archaeology team, who will conduct dig tests in summer 2023 to confirm the absence of subsurface cultural materials. The trench will be approximately 1m wide and up to 1.5m deep, with a total length of up to 50m. As the trench is filled with entrails, it will be covered with soil (by hand) to minimize smell and scavenging. At the end of the project, the remainder of the trench will be filled with soil.

If the carcasses cannot be reached and/or found they will be left in situ. If an unsalvageable carcass is located in a highly visible location on the island, it will be moved to a less visible location and left exposed for scavenging by wildlife.

Deer carcass remnants (~100 individuals each year) and entrails are routinely left exposed on the island during conventional deer hunts, primarily on the private portion of the island. With the carcass recovery, it is likely that project activities will result in less overall biomass available for scavenging than an average year of regular hunting activities (M. Janssen, personal communication, May 11, 2023b).

9.10 Confirming Eradication Success

Eradication success will be declared when there is negligible probability of any deer remaining on island. This would occur when professional marksmen and trained canine/handler teams no longer detect deer or fresh signs of deer on island after multiple sweeps. Remote wildlife camera arrays, possibly paired with bait stations, sentinel deer, or repeated nighttime helicopter flights, using FLIR technology, could also be used to confirm success of the project.

9.11 Phase 3: Biosecurity Monitoring and Adaptive Management

To achieve the goal of sustained forest recovery, it is important to ensure that European Fallow Deer do not return to, or re-establish on, Sidney Island (Gill & Irvine, 2016; Houston et al., 2021).

European Fallow Deer located on nearby James Island (2.5km west of Sidney Island) are a potential source of natural reinvasion, although global evidence suggests that European Fallow Deer do not readily disperse via swimming like Black-tailed Deer (Miller & Janssen, 2023). There are previous accounts of European Fallow Deer swimming between Southern Gulf Islands (such as the rumoured introduction of European Fallow Deer to Sidney Island from James Island in the 1930s (Denise Cook Design + Planning et al., 2007; Miller & Janssen, 2023)), however these accounts are unsubstantiated.

To assess the probability of European Fallow Deer reinvasion, Parks Canada entered into an agreement with the University of BC - Okanagan to conduct a genetic analysis of European Fallow Deer tissue samples from Mayne Island, James Island, and Sidney Island. The results of this analysis demonstrate that the deer on Sidney Island are significantly less genetically diverse than the other islands, likely due to their isolation (B. Burgess & Russello, 2022). There was no evidence of migration to or from any of the islands over the last several generations (B. Burgess & Russello, 2022). These results suggest that a natural European Fallow Deer reinvasion to Sidney Island is very unlikely (B. Burgess & Russello, 2022).

A Biosecurity Plan will be developed prior to the end of the eradication operation, which will provide methods for long-term monitoring for European Fallow Deer on Sidney Island, as well as guidelines for a rapid response if a European Fallow Deer reinvasion occurs. The biosecurity plan will include:

1. Monitoring for deer presence (e.g., monitoring for evidence of browse; fecal pellets)
2. Confirming deer species, if deer are detected (e.g., erecting bait stations with wildlife cameras)
3. Recommended tactics for the rapid removal of reinvaded fallow deer (e.g., a Parks Canada marksman operating with FLIR in and around known detection locations)

Once a biosecurity plan has been written and agreed upon by SIERP project partners, all necessary permit applications and impact assessment procedures will proceed such that rapid action is possible during the biosecurity year and onwards.

9.12 Timeline

The anticipated project timeline is outlined in the following sections and summarized in Table 4.

9.12.1 Phase 1: Aerial and Ground Operations

- Approximately 10 days total over a two-to-three-week period
- Intended to occur between November 1 and December 31, 2023
 - The exact timing will be dependent on contractor availability, weather, and predicted visitation by private landowners on the island.
 - Full contingency period extends to March 31, 2024
 - Popular visitation times (e.g., Christmas, March Break), will be avoided, when feasible.

9.12.2 Phase 2: Ground Operations

- Seven days a week over a three-to-five-month period between October 2024 and March 2025
 - Phase 2 is anticipated to largely consist of professional marksmen and trained canine/handler teams searching fenced zones, checking for and removing deer that remain after the Phase 1 population reduction.
- Project preparations (e.g., staging, installation of temporary fencing) may begin as early as July 2024
- April 2025 will serve as a potential extension/contingency period
- Demobilization (e.g., dismantling of temporary fencing) could last until May 2025.

9.12.3 Phase 3: Biosecurity Monitoring and Adaptive Management

- April 2025 onwards

9.12.4 Potential Time for Preparations and Demobilization

Some transportation and staging of equipment are anticipated to occur outside of the stated time windows Phases 1 and 2. Project preparations (e.g., installation of temporary fencing) as well as demobilization (e.g., dismantling of temporary fencing) may overlap with the operation, to reduce the overall duration of activities on the island.

9.12.5 Phase 2 Contingency Period

Contingency time is built into the timeline to account for possible delays due to inclement weather, on-island preparations, or slower than expected project progress. Other unforeseen circumstances, such as funding or socio-political challenges may also require timeline changes.

Table 4. Proposed Project Timeline

Year	Month											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2023												Phase 1
2024	Phase 1 Contingency						Phase 2 Preparation				Phase 2	
2025	Phase 2			Phase 2 Contingency	Phase 2 Demobilization	Phase 3: Biosecurity Monitoring (ongoing)						

10 Other Projects that Interact Cumulatively with the Proposed Project

SIERP is a larger project that includes a multi-pronged approach to ecosystem recovery on Sidney Island; one component of the SIERP is this project, which is the sole focus of this DIA. All other components of the SIERP are outside of the scope of this DIA and have the potential to interact cumulatively with the project. In general, the other parts of SIERP are intended to complement the eradication and contribute to sustained forest recovery. Other SIERP initiatives may serve as mitigations for project impacts to VCs.

11 Indigenous Consultation and Engagement

The Government of Canada has a legal duty to consult, and where appropriate, accommodate Indigenous groups when and where the Crown contemplates conduct that could adversely impact potential or established Aboriginal or treaty rights, as guaranteed by section 35(1) of the Constitution Act, 1982. In recognition of the critical role that Indigenous Peoples play in the protection of natural and cultural artifacts, all DIAs involve Indigenous consultation and engagement.

Indigenous consultation in DIAs is additional to, and separate from, other public engagement. As part of the process, the DIA must consider impacts that the proposed project may have on Indigenous Peoples as a result of environmental changes arising from the project, as well as any adverse impacts the project may have on Indigenous rights. Indigenous consultation is also about the incorporation of Indigenous knowledge (when offered) into the assessment of project-environment interactions. This knowledge has accumulated over generations of experience with the lands and waters and is considered alongside Western scientific knowledge throughout the assessment process.

The southern Gulf Islands are within the territory of the W̱SÁNEĆ and Quw’utsun Peoples, including specifically the W̱SÁNEĆ First Nations (Tsartlip, Tsawout, Tseycum, Pauquachin, and Malahat) and the Member Bands of Quw’utsun Nation (Cowichan Tribes, Halalt First Nation, Lyackson First Nation, Penelakut Tribe, and Stz’uminus First Nations). Sidney Island is also of interest to several other First Nations in the Southern Gulf Islands area, including the Esquimalt Nation, Lake Quw’utsun First Nation, Semiahmoo First Nation, Snaw-Naw-As First Nation, and Snuneymuxw First Nation.

Representatives from the W̱SÁNEĆ Leadership Council, Pauquachin First Nation, and Cowichan Tribes have been involved in this project since conception and planning of the project in 2018 (and hereafter are referred to as the “Indigenous project partners”). The project’s vision and objectives, and the proposed eradication methods, have been developed collaboratively with these representatives. All other Nations with an interest in Sidney Island were notified when the planning stage for this project began and were again notified when the impact assessment for this project began. In both cases, Nations were invited to participate or offer feedback.

Parks Canada has completed several visits to the project site with WSÁNEĆ cultural monitors, to learn how to operate respectfully in culturally sensitive areas and to concentrate activities (e.g., equipment staging and accommodations) in lower-risk zones. Parks Canada will continue to work closely with cultural monitors for the duration of the project to ensure best known practices are implemented throughout the operation.

WSANEC and Quw'utsun Nations have both expressed a strong desire for hunting mentorship and training opportunities for youth. Though the inclusion of youth in the meat recovery aspect of this project was proposed, Indigenous representatives agree that it is not the right learning environment. Parks Canada will work with the Nations to facilitate opportunities on other islands in GINPR.

The draft DIA will be provided to all the aforementioned First Nations for review and feedback. Prior to the review period, Parks Canada reached out to each Nation to identify the best way to share the report's outcomes with the Nation's representatives and/or leadership, as desired. Some Nations indicated a desire to meet and discuss the report; others preferred to review the report while it was being drafted; and others preferred only to review the final draft version.

11.1 Perspectives, Input and How the DIA Changed

Specific to the DIA process, Parks Canada worked with representatives from Pauquachin First Nation, and invited representatives from the WSÁNEĆ Leadership Council and Cowichan Tribes (the Indigenous project partners), to collaboratively identify VCs, desired outcomes, evidence to be considered, and necessary field work or background studies to be undertaken for the project.

Participation in the initial scoping workshops was limited; however, Indigenous Partners worked collaboratively on the development of the project's proposal and operational plan. Indigenous knowledge was shared during this process that has informed and been incorporated into the DIA. Based on the issues identified, three Indigenous Rights and Values VCs were identified (see Section 13.3.1).

Although invited to participate, no other Nations indicated an interest in participating in the DIA process. While the lack of participation may be partially attributed to capacity and/or competing priorities, it is possible that the "siloed" nature of the DIA process—as a distinct process separate from overall project planning—as well as the prescriptive, Western nature of the process, were also contributing factors (O. Cruz, personal communication, 2023). For future projects, a more holistic approach to project and impact assessment planning, informed more heavily by Indigenous worldviews and processes, may result in higher rates of participation¹⁴.

This section will be updated after further consultation and engagement on the draft DIA.

12 Public Engagement

Meaningful public engagement is fundamental to an effective, open, and transparent assessment process. It affords the DIA a more complete perspective by adding important insights, information, and values. It is based on the premise that those who are affected by a decision have a right to be involved in the decision-making process, and it promises that their contribution will influence the decision.

12.1 Engagement Activities

A Sallas Forest Strata community consultation period took place between May 14 and June 21, 2021. The SIERP draft Design Plan (SIERP Steering Committee & Parks Canada Agency, 2022), including proposed details for the project, was sent to all SIERP partner communities and organizations. In addition, SIERP team members met with partner communities and organizations to provide additional information as requested.

A 30-day period of public engagement was also run from May 17 – June 17, 2021. The public engagement period included proactive media releases to inform the public about the project.

An online Speaker Series, organised and hosted by an external contractor, was also launched in early March 2021 to explore key topics related to the project with the project partners. These sessions were recorded and posted on YouTube for viewing by members of the public, if desired¹⁵.

The Parks Canada project webpage was updated in May 2021 to serve as information repository for interested members of the media and public, and was updated again in May, 2022¹⁶. Additionally, some project partners have shared information about the project on their organisations' websites (e.g., the WSÁNEĆ Leadership Council, Coastal Conservation). Identified external stakeholders were also contacted directly during the public engagement period and offered the opportunity to ask questions or offer feedback on the proposed project.

12.2 Timing of Canadian Impact Assessment Registry Notifications

The timing of key public notifications related to the Canadian Impact Assessment Registry (CIAR) are:

- May 2021 - Posting of DIA notice and invitation for public comment (30 days) on the CIAR
- June 2021-February 2023 – DIA report drafted
- March 2023-May 2023 – Indigenous consultation on draft report begins
- June 2023 – Completion of draft DIA report
- July 4 – August 31, 2023 (60 days) – Indigenous consultation on draft DIA report
- July 24, 2023 – Update CIAR to announce availability of draft DIA for public review
- July 24 – August 23, 2023 (30 days) – Public review period for draft DIA
- October 30, 2023 – Anticipated notification of decision posted on the CIAR; final DIA report available to public upon request

12.3 Feedback Received and How the Project Changed

Feedback from the community consultation period and from the CIAR posting was compiled, grouped into similar themes, and analyzed to identify the main topics of public interest related to the project. The table Appendix 1 in provides the main topics of interest/concerns that were identified through the public engagement process and describes how the project was changed to address each concern. Many of the issues raised by the public during the engagement process were not within the scope of the DIA.

Additional feedback received following the Indigenous consultation and public review of this draft DIA will be considered and/or incorporated into the final DIA.

¹⁵ [SIERP Speaker Series YouTube Channel](#)

¹⁶ [Parks Canada SK̓TÁMEN QENÁŁ,ENEŹ SĆÁ Conservation and Restoration \(CoRe\) project](#)

13 Scope of Assessment

The objective of the DIA is to examine the project (eradication of European Fallow Deer) to determine how it will affect Indigenous rights and values, the ecological environment of Sidney Island, as well as visitor experience in GINPR. To accomplish this, the DIA does not attempt to identify or assess all potential environmental impacts arising from the proposal. Instead, a suite of VCs has been selected for assessment that reflects the key issues arising from legislation and policy direction from discussions with/input from Indigenous project partners. The DIA relies on existing information and research to inform the assessment process. Information gaps are identified, and future information requirements are noted. While low risk VCs are discussed, this DIA focuses on high and medium risk VCs.

13.1 Spatial Scope of Assessment

The analysis in this DIA assesses impacts from the project for the whole of Sidney Island. This is because the project and its potential impacts are under contractual control of Parks Canada (as leader and funder of the project). Avoidance and mitigation measures to prevent or minimize potential adverse effects from the project will similarly be implemented across the island, in recognition of Parks Canada's responsibility to ensure the project has the smallest possible overall impact. In other words, since Parks Canada requires a high standard of care in the park reserve, a high standard of care will be applied across the whole island, provided project partners agree.

Although the DIA is assessing impacts from the project for Sidney Island as a whole, the DIA will make a determination on the potential for significant adverse effects resulting from project activities on federal lands only (GINPR). And mitigation measures as they link to the significance determination are limited to the park reserve. The decision on the significance of adverse effects and approval of the DIA will apply only to the portion of Sidney Island that is within Parks Canada's authority (the park reserve).

13.2 Relevant Policy, Legislation, and Regulations

All projects undertaken by Parks Canada must adhere to relevant policies, legislation, and regulations. Within Parks Canada lands this typically only includes federal policies; however, other provincial or local policies may be applicable when a project includes components outside Parks Canada lands. To ensure the proposed project complies with all relevant policies, legislation, and regulations, a thorough review was completed, as summarized below.

13.2.1 Species at Risk Act

The federal *Species at Risk Act (SARA)* protects species listed with a status of Endangered, Threatened, or Extirpated on Schedule 1 of the Act (*Species at Risk Act, 2002*). The Act specifically, prohibits the killing, harming, harassing, capturing, etc. of these species (*SARA, s.32*), prohibits the damage or destruction of their residences (*SARA, s.33*), and critical habitat (*SARA, s.58*). *SARA* applies only to species on federal lands, lands under the authority of the Minister of Environment and Climate Change Canada (ECCC), Parks Canada lands, or to aquatic species anywhere they occur (Government of Canada, 2020). In addition to being protected under *SARA*, SAR migratory birds are also protected under the *Migratory Birds Convention Act* (Government of Canada, 2022a) (*see Section 13.2.2*).

13.2.1.1 Relevance to the Project

To ensure that the DIA thoroughly assess all potential impacts to rare species in Canada, all SAR, including those without legal protection under *SARA* (i.e. those listed under Schedule 1 as Special Concern, those not listed under Schedule 1, and/or listed by Committee for the Status of Endangered

Wildlife in Canada (COSEWIC)), are considered. There are several SAR listed under SARA and by COSEWIC within the GINPR and aquatic areas around Sidney Island (i.e. within the areas where SARA applies). For more details on the specific SAR considered in this DIA, see Section 14.

Parks Canada staff worked with the Species Conservation Team to complete a SARA Permit Decision Tool for the project (Appendix 2 **Error! Reference source not found.**). Based on this tool, it was determined that a SARA permit is required for the project due to potential (incidental) adverse effects to the Threatened Western Screech Owl (*Megascops kennicottii*), Marbled Murrelet (*Brachyramphus marmoratus*), and Red Knot (*Calidris canutus roselaari*), as well as the Endangered Foothill Sedge (*Carex tumulicola*) (also see Sections 14.6 and 14.8 for more details). A SARA permit will be acquired prior to commencement of the project.

13.2.2 Migratory Birds Convention Act

More than 450 native bird species inhabit Canada's natural and human-modified landscapes for at least part of their annual cycle (Government of Canada, 2022a). Most of these migratory birds, their nests, and eggs are protected under the federal *Migratory Birds Convention Act (MBCA)* and the *Migratory Birds Regulations* (Government of Canada, 2022a). Some migratory birds are excluded from the Act including osprey, eagles, harriers, and hawks (Accipitridiae), kingfishers (Alcedinidae), jays, crows, and ravens (Corvidae), vultures (Cathartidae), cormorants (Phalacrocoracidae), and owls (Strigidae), among others (Government of Canada, 2022a). Many of the birds not protected under the *MBCA* are protected under other provincial legislation and regulations, such as BC's *Wildlife Act* (see Section 13.2.6).

The Act and its regulations apply to all lands and waters in Canada, regardless of ownership. The Act and its regulations protect migratory birds, their nests, and eggs (Government of Canada, 2018).

13.2.2.1 Relevance to the Project

There are many migratory bird species, protected under the *MBCA* and its regulations, that occur within the project area. As such, the project must implement appropriate mitigation measures to avoid impacts to migratory bird species that contravene the *MBCA* and its regulations. There is no permitting process for impacts to migratory birds under the *MBCA* or *MBR*. Instead, the proposed mitigations for this project have been submitted to the Canadian Wildlife Service for feedback.

13.2.3 Canada National Parks Act

The *CNPA* (Government of Canada, 2000), is a federal law that regulates the protection of natural areas of national significance, and the activities that can occur within those areas. These regulations do not apply to lands outside of Parks Canada's administrative boundaries.

13.2.3.1 Relevance to the Project

A Restricted Activity Permit will be acquired for the project. This permit grants temporary and limited approval to person(s) conducting activities within national parks and national park reserves, under a Superintendent's orders, for the purposes of park management. A Restricted Activity Permit must specify the sections and subsections of the legislation applicable to the activities.

13.2.4 National Parks Wildlife Regulations

The National Parks Wildlife Regulations (Government of Canada, 1981), under the *CNPA*, regulate the types of activities that may occur in a Protected Heritage Place under the administration of Parks Canada. These regulations do not apply outside lands owned by Parks Canada.

13.2.4.1 Relevance to the Project

A Restricted Activity Permit will be acquired for the project.

13.2.5 National Parks of Canada Aircraft Access Regulations

Under the *CNPA*, the National Parks of Canada Aircraft Access Regulations (*NPCAAR*) (Government of Canada, 2013a) dictates the terms of aircraft access to national parks and park reserves.

13.2.5.1 Relevance to the Project

A restricted activity permit will be required for this project.

13.2.6 Wildlife Act

BC's *Wildlife Act* provides for the conservation and management of wildlife (mammal, reptile, amphibian or bird; not fish), including regulating trapping, hunting, and fishing, on all non-federal lands within the province (*Wildlife Act*, 1996).

13.2.6.1 Relevance to the Project

Parks Canada must acquire permission from the Province of BC to undertake project activities that contravene the *Wildlife Act* in all areas outside of Parks Canada administrative boundaries (i.e., the residential portion of the project island administered by the province). These permissions take the form of a General Wildlife Permit issued by the Fish and Wildlife Branch of the BC Ministry of Forests.

13.3 Valued Components

VCs are natural or cultural elements that may be affected by a proposed project, and include Indigenous rights and values, ecological components, or key elements of visitor experience.

13.3.1 Indigenous Rights and Values

Parks Canada DIAs will consider adverse effects to Indigenous rights, which stem from asserted or established Aboriginal or treaty rights (section 35 of the *Constitution Act* (Consolidation of Constitution Acts, 1867 to 1982, 2021), and the Douglas Treaties (Government of Canada, 2013b)).

Medium to High Risk Valued Components:

- **Indigenous harvest of deer** will be impeded within the park reserve during the project as well as immediately following the project, until a population of Black-tailed Deer is re-established.
- **Indigenous culturally important plants** are largely unavailable on Sidney Island as a result of intense deer over-browsing. The project purpose is to allow the forest understory vegetation to recover, which will support a greater abundance of culturally important plants. Project activities may disturb sensitive plant locations, particularly in the inter-tidal zone.
- **Indigenous cultural artifacts and culturally significant sites** include sub-surface cultural materials, CMTs, and sites of cultural or historical significance (e.g., burial sites, ancient or historical village sites). Sub-surface activities (the entrail trench and use of tent pegs for temporary fencing) have the potential to disturb cultural artifacts or significant sites. The project team may also encounter culturally significant sites on the island during ground operations.

13.3.2 Ecological Valued Components

In accordance with the *CNPA* definition of ecological integrity (Government of Canada, 2000), the native species and ecological communities of Sidney Island were considered for inclusion as ecological VCs. A high-level screening exercise was completed to assess whether SAR, species groups, or ecological

communities known to occur on Sidney Island, and with the potential to be impacted by the proposed project, should be included in the DIA analysis (Appendix 3). It was determined that the project has the potential to negatively impact the following ecological VCs, which are described further in the following sections:

Medium to High Risk Valued Components:

- **Forest understory vegetation**
- **Birds**
- **Black-tailed Deer**
- **Foothill Sedge**

Low Risk Valued Components:

- **Other terrestrial mammals**

13.3.3 Visitor Experience

Maintaining visitor experience within a national park is a key element of the Parks Canada mandate (Parks Canada Agency, 2002). Therefore, changes to the environment with the potential to affect visitor experience are considered within the scope of a Parks Canada DIA. The proposed project may have an impact on visitor experience through temporarily disrupting visitor's recreational use of Sidney Spit and the campgrounds. Given that the main phases of the project occur outside peak visitor periods for GINPR, the risk to visitor experience is considered low.

13.3.4 Other Archaeological Sites

In addition to Indigenous cultural sites and artifacts, there are other historic archaeological sites on Sidney Island, including a historic bunker and Sidney Island Brick and Tile Company foundations (Cohen, 2020). While there is potential for surface finds of historic cultural material during the project, the mitigations provided for Indigenous cultural artifacts and culturally significant sites are applicable to all historic archaeological sites. Therefore, other archaeological sites are not considered further.

14 Analysis of Impacts

14.1 Methods

The analysis of impacts is based on the research and planning work completed to date by the project partners, research, published literature, and expert opinion. The potential impacts from the project on each of the VCs were analyzed using the criteria below.

- **Benefits** - identifies positive outcomes to the VC
- **Adverse impacts** - identifies negative outcomes to the VC
- **Mitigation** - identifies measures that reduce the negative impacts to the VC
- **Monitoring** - identifies studies that will help us to understand the effects of the project and mitigations on the VC
- **Residual impacts** – identifies any potential negative impacts remaining after mitigation measures are implemented. The following factors are considered in assessing residual impacts and uncertainties:
 - Mitigations in place to reduce direct impacts from the project;
 - Uncertainties in achieving the desired outcome; and

- The balance of desirable and undesirable effects.
- **Contribution to desired outcome** - identifies how the project contributes to the desired outcome for the VC. For example, the project may support, contradict, or have no effect on the desired outcome.

14.2 Indigenous Harvest of Deer

14.2.1 Introduction

14.2.1.1 Description of Baseline Conditions

Indigenous hunters have the right to hunt in GINPR and the Sidney Island park reserve is closed to visitors annually from November to February for Indigenous hunting of deer. This hunt is important for the preservation of cultural teachings, connecting to territory, and passing along necessary skills, as well as for acquiring food.

Although the native Black-tailed Deer are the preferred target species for local Indigenous hunters (Carl Olsen, representative of the W̱SÁNEĆ Leadership Council, personal communication, October 19, 2022), the deer population on Sidney Island is currently comprised predominantly of invasive European Fallow Deer, which out-compete and suppress the native Black-tailed Deer (Ferretti et al., 2011; Focardi et al., 2006; Imperio et al., 2012; Johnston, 2020). Therefore, hunting of the preferred Black-tailed Deer is impeded.

The project's vision and objectives, and the proposed deer eradication methods, have been developed collaboratively with Indigenous project partners. Representatives from the W̱SÁNEĆ Leadership Council, Pauquachin First Nation, and Cowichan Tribes have been involved in SIERP since conception of the project in 2017. The W̱SÁNEĆ Leadership Council and Pauquachin First Nation provided signed letters supporting the restoration of the Sidney Island forests and meadows, including the consideration of deer eradication.

14.2.1.2 Project-Valued Component Interactions

Preliminary planning in collaboration with Indigenous project partners has identified a shared interest in removing invasive European Fallow Deer and facilitating re-establishment of native Black-tailed Deer on Sidney Island, in a way that does not compromise vegetation recovery (i.e., the deer and vegetation should be in balance).

During the project, the Indigenous harvest of deer on Sidney Island will be impeded, as it will occur during the typical Indigenous deer hunting season. Following the project, the Indigenous harvest of deer on Sidney Island will be impeded as there will be no deer on the island. In the years or decades following the project, Black-tailed Deer are expected to re-establish on the island. In the absence of competition from European Fallow Deer, this preferred species is anticipated to become more abundant and available for Indigenous hunting.

"The transformation story of SMÍET (deer) illustrates our responsibility to, and our relationship with, deer... The lesson [is that] through our relationships with other species, we play an important role in shaping the territory."

- ẔAWIZUT Carl Olsen, WJOLELP Elder, Representative of the W̱SÁNEĆ Leadership Council, 2022

14.2.1.3 Desired Outcome

In the years or decades following the project, a population of native Black-tailed Deer is re-established and maintained in a sustainable manner on Sidney Island, allowing for Indigenous harvest of the preferred Black-tailed Deer from the island.

14.2.2 Analysis

14.2.2.1 Impacts and Mitigations

14.2.2.1.1 *Project Activities will Directly Impact the Indigenous Harvest of Deer*

The project will directly impact Indigenous harvest of deer during the project, by directly interfering with the typical hunting season and reducing the number of deer on the island. For safety reasons Indigenous hunters will not be able to hunt within the project area during Phase 1 of the project and again during Phase 2 of the project, including mobilization and demobilization periods. Indigenous harvest of deer on Sidney Island deer following Phase 1 of the project will also be impacted by a reduced number of deer.

Mitigations:

Hunting Opportunities Prior to Phases 1 and 2

There will be opportunities for Indigenous hunting of deer within the park reserve within the typical Indigenous hunting season (November to February) prior to and/or after Phase 1, depending on the exact timing of Phase 1 activities. (Although ongoing Indigenous hunting on the island during the project may make deer shyer, this is not expected to affect the project's success given that the project will be using very different methods to those used by Indigenous hunters.) The harvest of deer during these periods will be facilitated through clear communication between Parks Canada and Indigenous project partners.

In addition to hunting opportunities on Sidney Island, Parks Canada will inform Indigenous hunters about the project, advise them of project timelines, start dates, etc., and encourage and facilitate hunting in other suitable areas during the project, as necessary.

Deer Meat and Hide Distribution to Local First Nations

A carcass recovery team, led by Indigenous community members and supported by Parks Canada staff, will work systematically with the project's operational team to collect deer carcasses throughout the project area (see Section 9.9.2). Indigenous community representatives, together with Parks Canada staff, will distribute deer meat, as well as hides and other useful deer parts, to local First Nation communities at the ends of Phases 1 and 2.

As meat harvesting will be led by Indigenous community members, the First Nations Health Authority (FNHA) is the authority on food safety standards, rather than the Canadian Food Inspection Agency (CFIA). Parks Canada is working with the FNHA ensure that food safety standards are adhered to. Prior to the operation, all deer harvesting team members will be provided the opportunity to obtain customized training to standardize field dressing, though individual preference may vary based on traditional teachings.

14.2.2.1.2 *Indigenous Harvest of Deer will be Impeded by the Lack of Deer on Sidney Island*

Following Phase 2 of the project, Indigenous harvest of deer will be directly impacted as there will be no deer on Sidney Island until a population of Black-tailed Deer is re-established. The duration of this

impact is uncertain; however, it is anticipated that in the years or decades following the project Black-tailed Deer will passively re-establish on the island (for additional details, see Section 14.7.2.1.3). The eradication of European Fallow Deer, along with the expected recovery of forest understory vegetation, is expected to support a larger population of Black-tailed Deer than is currently present on Sidney Island.

Mitigations:

- Native Black-tailed Deer are hyperabundant on other islands in this region. In the years or decades following the project, the passive re-establishment of Black-tailed Deer on Sidney Island is anticipated based on prior movement patterns within the Southern Gulf Island region (Burgess & Russello, 2022). If passive re-establishment does not occur, SIERP project partners may consider active re-establishment, if supported by all partners and if active re-establishment does not compromise forest recovery.
- The future re-establishment of Black-tailed Deer will allow for their continued harvest by Indigenous groups on Sidney Island.

14.2.2.2 Residual Impacts/Uncertainties

Impacts to Indigenous hunting during the project are expected to be largely reduced through the identified mitigations. A residual adverse effect is the lack of deer on Sidney Island following the eradication, until such time that Black-tailed Deer can be re-established in a sustainable manner. This residual impact has been assessed using the criteria provided in Table 5. The significance of this residual impact is considered is predictable and manageable.

Table 5. Residual Impact Assessment Criteria for Indigenous Harvest of Deer

Duration of Impacts			
Day or less	Weeks	Seasons	Permanent
The duration before Black-tailed Deer re-establish on Sidney Island is uncertain. Over the long term, the project is expected to benefit a future re-established population of Black-tailed Deer, through improved habitat conditions and a lack of competition with European Fallow Deer. A healthier re-established Black-tailed Deer population is expected to support Indigenous harvest of deer on Sidney Island.			
Reversibility			
No Change	Short Term	Long Term	Irreversible
It is expected that Indigenous harvest of deer on Sidney Island will resume when Black-tailed Deer re-establish. Therefore, although the exact duration of impacts is unknown at this time, the impact is temporary and is not expected to have long term consequences.			
Ecological Scale			
Site Specific	Local Feature	Local Ecosystem	Population
The project impacts to Indigenous harvest of deer are limited to the local ecosystem scale (Sidney Island). This is the appropriate scale for the desirable effects of ecosystem recovery.			
Ecosystem Context			
Modified	Resilient	Vulnerable	At Risk
Deer, including Black-tailed Deer, which are the preferred species for harvest, are hyperabundant on other Southern Gulf Islands. Therefore, although deer will not be available for harvest on Sidney Island following the project for an unknown duration of time, Indigenous harvest of deer can continue on a broader regional scale.			
Frequency			
Rare	Occasional	Repeated/Intermittent	Continuous
The interaction between the project and the Indigenous harvest of deer on Sidney island will be a one time occurrence.			

Predicted Significance			
Negligible	Predictable and Manageable	Impacts within Threshold, with Risk or Uncertainty	Impacts Exceeds Thresholds
<p>Indigenous partners have collaborated on the development of SIERP and the deer eradication project. As a result, potential impacts to Indigenous harvest of deer have been weighed against the expected outcomes of the project and have been found to be acceptable. Mitigations are in place to reduce the impact of the project on Indigenous harvest of deer during each year of the project. Residual adverse effects are predictable and manageable. In the years or decades following the project, it is expected that the forest ecosystem will recover, and the Black-tailed Deer will re-establish on Sidney Island, supporting Indigenous harvesting of the preferred native Black-tailed deer species.</p>			

14.2.3 Conclusion

The project will disrupt Indigenous harvest of deer in the park reserve during Phases 1 and 2, however, the impacts are expected to be largely reduced through identified mitigations.

Following the project, Indigenous harvest of deer will be impacted by the lack of deer on Sidney Island. The significance of this residual impact is considered predictable and manageable.

In the years or decades following the project the desired outcome is expected to be achieved; once a native Black-tailed Deer population is re-established, Indigenous harvest of this preferred deer species will be possible on Sidney Island once again.

14.3 Indigenous Culturally Important Plants

14.3.1 Introduction

14.3.1.1 Description of Baseline Conditions

Local Indigenous Peoples (primarily W̱SÁNEĆ) previously harvested food, medicine, and materials from Sidney Island (SIERP, 2021). Indigenous knowledge holders from W̱SÁNEĆ Leadership Council and Pauquachin First Nation have observed that the presence of European Fallow Deer on Sidney Island has reduced or eliminated opportunities to harvest culturally important plants and has also deeply affected the ability of Indigenous People to steward the native ecosystems (C. Olsen, personal communication, 2022; E. Pelkey, personal communication, 2022). Decades of heavy browsing pressure from European Fallow Deer on Sidney Island has largely cleared the forest understory of native plant species that are palatable to deer. Other than within exclosures, Indigenous culturally important plants are also now largely rare or absent from Sidney Island (T. G. Martin et al., 2011; E. Pelkey, personal communication, 2021). For example, of 32 plant species identified by Indigenous project partners as being culturally important (Appendix 4), 59% (19 species) are thought to be no longer found on Sidney Island and another 22% (seven species) are present but rare.

14.3.1.2 Project-Valued Component Interactions

Culturally important plants are largely unavailable for traditional harvest on Sidney Island due to decades of intense over-browsing by deer. The project, through the removal of European Fallow Deer, is intended to restore the forest understory vegetation and create conditions that will support a greater diversity, abundance, and distribution of culturally important plants on Sidney Island. This will support traditional practices involving plants for the W̱SÁNEĆ, Cowichan Tribes, and other local First Nations.

Indigenous project partners have expressed concerns that project activities have the potential to directly impact culturally important plants, particularly those in sensitive shoreline and inter-tidal areas.

14.3.1.3 Desired Outcome

Known occurrences of Indigenous culturally important plants are maintained or improved over the long term and the overall availability (diversity, abundance, and distribution) of culturally important plant species increases. (See also the desired outcome for forest understory vegetation in Section 14.5.1.3).

14.3.2 Analysis

14.3.2.1 Impacts and Mitigations

14.3.2.1.1 Removal of Deer Will Benefit Indigenous Culturally Important Plants

The project is anticipated to result in benefits for culturally important plants through the desired improvements in ecological integrity of the forest understory vegetation (e.g., increasing understory cover, diversity of native species, improving shrub structure, increasing recruitment of tree seedlings). See Section 14.5.2.1.1 for additional information.

14.3.2.1.2 Impacts from Project Ground Activities on Existing Culturally Important Plants

Impacts to existing culturally important plants from ground activities during the project may include vegetation removal during the construction of temporary fences, disturbances from ATV, human, canine or deer movements, and the risk of invasive species introduction (this is similar to those identified for forest understory vegetation; see Section 14.5.2.1).

Mitigations:

The mitigation strategy for impacts to existing culturally important plants from ground activities are generally similar to those identified for forest understory vegetation (see Section 14.5.2) and include:

- Avoiding the known locations of key culturally important plant occurrences during ground activities, wherever possible (primarily in the "day-use" and coastal sands ecosystem areas, where plants like KEXMIN and Silky Beach Pea are found);
- During installation of temporary fencing, the amount of vegetation clearing will be minimized to the greatest extent possible through fence site location selection;
- Scheduling the majority of ground activities between October and March to ensure that most native plant species are dormant (Polster 2010) and will be less at risk of being damaged;
- Wherever possible established roads and trails will be used for transporting materials/equipment, to reduce the potential for trampling or damaging plants; and
- GINPR clean equipment protocols will be implemented to reduce the potential for spreading invasive species to locations with culturally important plants.

14.3.2.1.3 Impacts from Project Ground Activities on the Inter-tidal Zone

Potential impacts to the inter-tidal Zone around Sidney Island, which is thought to be particularly sensitive, may occur during the project due to disturbances from boats landing on the shoreline or from ATV, human, canine, or deer movements.

Mitigations:

- During the project, the majority of marine vessels will be moored on existing buoys and docks.
- Any non-dock landing areas for marine vessels will be selected to avoid known Eelgrass bed sites and other sensitive species.
- Parks Canada will provide the project team with maps of the shoreline area showing sensitive sites and potential hazards (e.g., shallow water; rocks) to be avoided.
- Vehicular traffic will be avoided in inter-tidal areas as much as possible.

14.3.2.1.4 Removal of Deer May Lead to Increases in Invasive Species

Decreased browsing by deer may lead to increased invasive plant species abundance and distribution. Invasive species could out-compete and negatively impact culturally important plants.

Mitigations:

- Mitigation measures for the potential increases in invasive plant species on culturally important plants are generally similar to those identified for forest understory vegetation (Section 14.5.2).
- Proactively managing English Hawthorn and Scotch Broom to mitigate the risk of significant expansion and to increase opportunities for native vegetation to successfully re-establish after the proposed project.
- Implementing an adaptive management monitoring and response framework.
- A number of deer exclosures have already been planted with culturally important species selected by Indigenous project partners. Following the project, these planted areas will provide a source of seeds, allowing these species to naturally propagate and spread outside the exclosures and also allowing for possible manual seed collection and sowing.

14.3.2.1.5 Removal of Deer May Have Unanticipated Ecosystem Effects

See the Forest Understory Vegetation Analysis, Section 14.5.2.1.4, for a discussion of potential unanticipated ecosystem effects and mitigations.

14.3.2.2 Residual Impacts/Uncertainties

The project is intended to benefit native forest understory species. Although undesirable effects from invasive species are possible, mitigations are in place to reduce the risk, and the balance of effects is expected to heavily favour improvements in ecological integrity, which will include benefits to culturally important plants. See Section 14.5.2.2 for an analysis of residual impacts on understory vegetation.

14.3.3 Conclusion

Although undesirable effects from increases in invasive species following the project are possible, mitigations are in place to reduce the risk, and the balance of effects is expected to heavily favour improvements in the abundance and distribution of culturally important plant species.

The desired outcome will be achieved: known occurrences of Indigenous culturally important plants will be maintained or improved in the years or decades following the project, and the overall availability (diversity, abundance, and distribution) of culturally important plant species is expected to increase. This will support traditional practices of WSÁNEĆ, Quw'utsun, and other local First Nations.

14.4 Indigenous Cultural Artifacts and Culturally Significant Sites

14.4.1 Introduction

14.4.1.1 Description of Baseline Conditions

The long and continuous ties of W̱SÁNEĆ and Quw'utsun Peoples to the Southern Gulf Islands is reflected in the Indigenous cultural artifacts and culturally significant sites within the GINPR and Sidney Island. Within the GINPR, more than 30 archaeological sites have been recorded (Sumpter et al., 2008). Indigenous cultural materials on SḴÁMEN (Sidney Island) include sub-surface and surface materials, such as artifacts or artifact pieces, chipped-stone lithic artifact sites, shell middens, evidence of the ancestral village site of ʔELXOLU, and CMTs. Additionally, there are a number of ancestral burial sites on SḴÁMEN (Sidney Island). Some cultural sites are known, though this sensitive cultural information is not widely shared, under guidance of W̱SÁNEĆ and Quw'utsun partners.

14.4.1.2 Project-Valued Component Interactions

There are two planned instances of sub-surface ground disturbance during the project: 1) digging a shallow trench (approximately 1m wide, and up to 1.5m deep and 50m long) to bury entrails in, and 2) the use of tent pegs to secure guy wires to stabilize temporary fencing in areas without trees and/or to secure the bottom edge of the fencing to the ground in the absence of trees. Ground activities during the project have the potential to impact Indigenous cultural artifacts and culturally significant sites that are sensitive to soil disturbance or erosion. If not avoided, the project team may also come into contact with sensitive areas such as burial sites.

14.4.1.3 Desired Outcome

The integrity of cultural artifacts and culturally significant sites on Sidney Island is maintained.

14.4.2 Analysis

14.4.2.1 Impacts and Mitigations

14.4.2.1.1 Impacts from Project Activities

- Damage or disturbance to sub-surface cultural artifacts and culturally significant sites from soil disturbance and erosion due to:
 - Ground activities (deer, human, or canine movement/soil scuffing)
 - Installation of freestanding T-posts for temporary fencing in areas without trees
 - Use of tent pegs to secure guy wires to stabilize temporary fencing and/or secure the fencing to the ground in areas without trees
 - ATV-use on trails
 - Digging a shallow trench for entrails

Mitigations:

- The project team will work with Parks Canada's Cultural Heritage and Terrestrial Archaeology teams, and representatives from the Indigenous project partners to avoid known Indigenous cultural artifacts and culturally significant sites in the park reserve, as appropriate. This will include taking the following steps:

- Visible cultural features will be noted on maps for the project team and flagged as "sensitive" (without specifying why, to protect proprietary or sensitive Indigenous knowledge);
- Known inconspicuous features such as anthropogenic rock deposits and cultural shell deposits or features in areas prone to erosion will be flagged or fenced so that the project team will avoid them;
- Parks Canada staff conducted walk-throughs with cultural monitors to identify locations where accommodations and equipment would be temporarily stationed, to ensure these locations were clear from known cultural sites or sites with a high potential for sub-surface cultural materials; and
- Parks Canada staff worked with W̱SÁNEĆ cultural monitors to identify potential location to dig the trench, away from known sensitive sites. Parks Canada staff will work with Parks Canada Terrestrial Archaeologists to conduct testing to confirm that the site recommended by cultural monitors is suitable (i.e., there are no cultural heritage materials found during shovel tests).
- CMTs along the temporary fence lines will be identified and avoided (i.e., will not be used as posts and will not be de-limbed).
- Tent pegs will only be used in locations that are approved by Parks Canada Terrestrial Archaeologists and W̱SÁNEĆ cultural monitors.
- If increased traffic is suspected near the day use area, midden sites will be fenced off to prevent disturbance, and ground covers will be laid down to prevent rutting in sandy or soft areas.
- To prevent rutting of sandy and erosion-sensitive areas:
 - Existing roadways, trails, and previously disturbed areas will be used where possible;
 - Off-trail access will be kept to a minimum; and
 - Soils that are erodible/prone to rutting will be avoided with ATVs, or protected by laying down boards or ground covers.
- After visiting SKTAMEN with Tsawout cultural monitors, they advised adding some additional gravel/surfacing materials down over one section of the existing trail/road, as there is one known site of cultural materials right next to the road. The extra material ensures that regardless of conditions, no vehicle traffic will rut into soil where cultural material was previously found.
- Parks Canada staff have been in contact with the Province of BC's Archaeology Branch regarding the necessity for permits outside of the park reserve (S. Coulson, pers. comm, June 22, 2022). As there is no digging or sub-surface ground disturbance ("land-altering activities") planned outside the park reserve, there is no requirement for permits under the *Heritage Conservation Act*.
- To ensure that the project team is aware of proper procedures in the event that new cultural artifacts are found during the project, an Accidental Finds Protocol has been prepared (Appendix 5). This protocol will be provided to the project team to be used in the event that artifacts are found when Parks Canada Terrestrial Archaeologists or Cultural Heritage staff are not present.

14.4.2.1.2 Impacts from Project Personnel

Project team members may not be aware of appropriate protocols for behaviour in sensitive areas such as burial sites, or may inadvertently work in areas with sensitive burial cairns. During the project, team members could also find and disturb or handle cultural artifacts.

Mitigations:

- Prior to both Phase 1 and 2, all team members will be required to complete appropriate cultural resource awareness training. This will include training them on how to behave respectfully in areas with burial sites, following the direction provided by Indigenous project partners.
 - Parks Canada staff have confirmed with W̱SÁNEĆ cultural monitors that pre-operation cultural protocol training is recommended for the project team, and this training will be provided by W̱SÁNEĆ cultural workers.
- Project team members will follow the Accidental Finds Protocol (discussed in Section 14.4.2.1.1, and provided in (Appendix 5).
- Prior to the start of the operation, W̱SÁNEĆ leadership and cultural staff have recommended that a drum circle and cultural burn be done to start the work off in a good way (C. Joseph, personal communication, February 2023b; E. Pelkey, personal communication, February 2023; A. Underwood, personal communication, February 2023). Parks Canada staff will provide support for these activities.
- The presence of W̱SÁNEĆ cultural workers/spiritual monitors will be requested for the duration of Phase 1, per recommendations from W̱SÁNEĆ cultural monitors (C. Joseph, personal communication, February 2023a).

14.4.2.2 Residual impacts/Uncertainties

After mitigation measures are implemented, no residual impacts from the project on Indigenous cultural artifacts and culturally significant sites are anticipated.

14.4.3 Conclusion

Overall, the project design and mitigations measures identified will ensure that the integrity of cultural artifacts and culturally significant sites on Sidney Island is maintained.

14.5 Forest Understory Vegetation

14.5.1 Introduction

This VC is focused on the forest understory vegetation community of Sidney Island, including interactions with invasive species. There are no SAR plants in the forest. Given that vegetation communities in the fields and the field-forest transition zones on Sidney Island are dominated by non-native/invasive species, these areas, as they relate to forest health, are discussed in the analysis. The fields and field-forest transition zones themselves, however, are not considered VCs.

14.5.1.1 Description of Baseline Conditions

European Fallow Deer, in the absence of apex predators on Sidney Island, have become sufficiently abundant to alter and degrade the diversity and structure of the forest understory vegetation. This is reflected in the “poor” ecological integrity condition rating for understory vegetation health, which is one of Parks Canada’s measures of forest health in GINPR (Parks Canada Agency, 2022a).

14.5.1.1.1 Species Richness and Diversity

Compared to other islands within the park reserve, Sidney Island has the lowest number of native shrubs as well as the lowest amount of shrub cover (~87% less cover and ~64% fewer native shrubs detected than islands without any browse (Parks Canada Agency, 2019b). Other heavily browsed islands also have relatively few native shrubs and low shrub cover, but Sidney Island still ranks lowest. The same ranking pattern has been found in other studies of browse impacts on Southern Gulf Island vegetation (Arcese et al., 2014).

The native shrub species that are present in abundance are those that are less palatable to deer, such as Salal (*Gaultheria shallon*) and Trailing Blackberry (*Rubus ursinus*). In the majority of Sidney Island's forest, regionally common native shrubs such as Ocean Spray (*Holodiscus discolor*), Saskatoon Berry (*Amelanchier alnifolia*), Snowberry (*Symphoricarpos albus*), and shrubs in the huckleberry genus (*Vaccinium*), are rare within the understory. The groundcover plant community is fairly homogenous and is largely characterized by less palatable native species including Sword Fern (*Polystichum munitum*), Oregon Grape (*Mahonia nervosa*), Stinging Nettle (*Urtica dioica*), and non-native Orchard Grass (*Dactylis glomerata*) (Parks Canada Agency, 2009a, 2019b, 2022a). Native flowering plants, such as Miner's Lettuce (*Claytonia perfoliata*) and Western Foamflower (*Tiarella trifoliata*) are present as groundcover in limited quantities. There are no known SAR plants in the forest.

14.5.1.1.2 Lack of Tree and Shrub Regeneration

Healthy forest ecosystems depend on complex forest structure – a variety of tree species, tree heights, and densities, as well as successful recruitment of new trees to perpetuate future forests. Prolonged lack of recruitment simplifies forest structure in the present as well as the future which has severe consequences for vegetation, wildlife, and other key components of the ecosystem (Lindenmayer et al., 2014; Nuttle et al., 2014; Spies, 1998, 2004).

Successful tree and shrub regeneration has been largely prevented in the Sidney Island forest by European Fallow Deer for multiple decades. In 2022, a Parks Canada forest health survey showed that tree species are reproducing as there are numerous 1–2-year-old seedlings, but none (other than Grand fir) are growing or surviving beyond those initial years due to deer browse. Successful growth of deciduous tree seedlings, like those of Garry Oak, Bigleaf Maple (*Acer macrophyllum*), and arbutus, is rare within the project area (Parks Canada Agency, 2009). Seedlings of coniferous species (Douglas Fir, and Western Redcedar) are also browsed to the point of mortality as soon as they reach 5-10cm tall. Grand fir, a less palatable species, also shows sign of browse but not enough that it is prevented from continued growth. Arbutus, which is unique to CDF forests and is considered a key ecosystem indicator, is currently largely represented on Sidney Island by mature individuals except a few seedlings and saplings that are inaccessible to deer (Arcese et al., 2014; Parks Canada Agency, 2022a). In general, average tree seedling height on Sidney Island is similar to other islands with hyperabundant Black-tailed Deer but is approximately 95% lower than islands without any deer (Table 6) (Parks Canada Agency, 2018a).

14.5.1.1.3 Altered Forest Understory Structure

In CDF forests, the understory should form a structurally complex layer between the overstory trees and forest floor. Through the physical structure (e.g. differing heights, density of foliage, etc.) and production of nectar, fruit, and foliage for foraging, a complex forest understory provides habitat for many species of native birds, mammals, and insects (University of British Columbia, 2019).

The structural complexity of the forest understory on Sidney Island has been altered due to the loss of regenerating trees, shrubs, and ground cover plants to deer browse. This simplification negatively impacts many ecological features, including wildlife abundance, wildfire behaviour, and nutrient cycling. Historical logging on Sidney Island resulted in dense, uniform forest canopies which block sunlight and contribute to reduced understory diversity. However, fenced deer exclosures erected in 1989 demonstrate substantial shrub growth and diversity – in stark contrast to sites just outside the fenced areas. This demonstrates that deer browse, not the canopy, is the dominant threat to understory health.

Deer browse can also alter the structure of existing plants. For example, Ocean Spray shrubs growing in conditions of low deer-browse are typically spherical in shape with abundant twigs and leaves filling out the shrubs' form (Arcese et al., 2014). Under moderate and heavy levels of deer browse, however, Ocean Spray shrubs become umbrella-shaped, with twigs and leaves remaining only on the highest branches that are out of reach by deer (Arcese et al., 2014). When this occurs across multiple plant species within a landscape, it has a profound effect on wildlife habitat quality and resource availability.

14.5.1.1.4 Capacity for Successful Regeneration

There is strong evidence that the species that remain on Sidney Island are still producing seeds, but browse pressure prevents them from growing into saplings and maturing individuals. First, the number of tree species producing seedlings on Sidney Island is equivalent to other islands in the area, including those without deer (Parks Canada 2019) (Table 6). Second, the number of tree seedlings per hectare is the highest of all the islands studied in the area, including being 7-9 times higher than the seedlings per hectare on islands without deer (Parks Canada 2019) (Table 6). This suggests that Sidney Island has strong potential for recovery and that tree and shrub regeneration will resume after deer eradication.

The number of shrub species on Sidney Island is the lowest of all islands within the park reserve (Parks Canada 2019) (Table 6) and some shrub species have been browsed into local extinction, halting seed production by these species. Therefore, shrub regeneration may not resume on a wide scale following deer eradication and restoration of the shrub layer may require some interventions (see Section 14.5.2.1.3).

Table 6. Gulf Islands National Park Reserve 2019 Forest Understory Health Data¹

Island	Deer or Other Ungulates	Browse Pressure	Number of Shrub Species	Trees		
				Number of Seedling Species	Tallest Seedling Height (m)	Seedlings /Hectare
Portland Island	None	LOW	18	4	1.01	230
Russell Island	None	LOW	20	4	0.85	188
Prevost Island	Sheep, possibly Deer or Goats	HIGH	8	4	0.04	393
D'Arcy Island	Black-tailed Deer (hyperabundant)	HIGH	12	4	0.04	640
Pender(s) Island	Black-tailed Deer (hyperabundant)	HIGH	8	1	0.59	63
Tumbo Island	Black-tailed Deer (hyperabundant)	HIGH	9	9	0.04	1100

Island	Deer or Other Ungulates	Browse Pressure	Number of Shrub Species	Trees		
				Number of Seedling Species	Tallest Seedling Height (m)	Seedlings /Hectare
Saturna Island	Black-tailed Deer (hyperabundant), Goats	HIGH	9	5	0.05	611
Sidney Island	Invasive European Fallow Deer, Black-tailed Deer	HIGH	3	5	0.05	1771

¹(Parks Canada Agency, 2019b, 2020a)

14.5.1.1.5 Invasive Species

Forests on Sidney Island are generally lacking vegetation. Non-native/invasive plant species present consist of grasses, annual flowering plants, and occasional shrubs. Invasive species, such as English Hawthorn and Scotch Broom, are currently concentrated in the open fields (i.e., the Campground Field, Radar Field, etc.), and are present in the forest-field transition zones. As a result, hawthorn and Scotch Broom may spread into forest edges.

14.5.1.2 Project-Valued Component Interactions

There are two main interactions between the project and forest understory vegetation: interactions from ground activities during the project, and interactions due to the removal of deer-browsing pressure on invasive plant species.

14.5.1.3 Desired Outcome

The desired outcome for forest understory vegetation is an improving trend in forest ecological processes and functioning, measured using Parks Canada’s Ecological Integrity Monitoring forest understory parameters.

14.5.2 Analysis

14.5.2.1 Impacts and Mitigations

14.5.2.1.1 Removal of Deer will Benefit Forest Understory Vegetation

The eradication of deer will relieve plants from deer browse pressure, which is currently the primary threat to the ecological integrity of forest understory vegetation on Sidney Island. In the absence of browse, trees and understory vegetation will be able to successfully recruit new individuals and grow. The composition of forest understory vegetation will no longer be determined by “palatability to deer” which will lead to a broader range of species able to survive and fulfill their ecological roles.

Removal of herbivores can lead to rapid recovery of native plant populations (Zavaleta et al., 2001) and it is anticipated that Sidney Island could support a much more robust vegetation community than it currently does. Not only do islands with similar environmental conditions but with little to no deer support higher plant richness, diversity and cover (T. G. Martin et al., 2011), but several studies on Sidney Island demonstrate that vegetation recovery is possible following deer eradication. Five years after an intensive cull to reduce deer density, average native species richness within survey plots had

nearly doubled, from approximately three to six species, and native plant cover had increased by 30% compared to pre-cull conditions (University of British Columbia, 2019). Few highly palatable species established over the course of the study likely due to the scarcity of reproductive plants (University of British Columbia, 2019). This highlights the potential need for interventions such as planting or seeding rare or absent species. Overstory tree species are reproducing (although not able to survive being browsed) and the number of tree seedlings per hectare is the highest of all the islands studied in the area (Table 6) (Parks Canada Agency, 2018a, 2019b, 2022a)(Parks Canada Agency, 2018a, 2019b, 2022a)(Parks Canada Agency, 2018a, 2019b, 2022a). This demonstrates that, in the absence of deer, a variety of tree species will be able to successfully regenerate and develop into the future forest.

Over the course of several decades, multiple deer exclosures have been established on Sidney Island and these provide additional insight into the pace of vegetation responses. Between 2014 and 2018 native plant cover doubled to 23% inside maritime meadow deer exclosures, while non-native plant cover declined by half (from ~60% to 30%) (Arcese et al., 2018). Outside the exclosures, native plant cover was less than 10%, increasing slightly in 2018 as deer numbers declined due to intensive culling. The non-native species cover outside of exclosures remained at around 50% (Arcese et al., 2018). Native species dominance inside deer exclosures is thought to result from native species being better adapted to the environment (University of British Columbia, 2019).

In 2021, 23 different species of native shrubs and deciduous trees (200 individuals) were transplanted into exclosures within forested areas and, as of 2022, over 95% of individuals have survived and continue growing (Parks Canada Agency, 2022a). New recruitment of native trees and shrubs (not planted by Parks Canada or partners) continues to occur within the exclosures due to the protection from browse pressure (B. Miller, personal communication, April 2023). Increases in diversity, richness, plant cover, high rates of transplant survival, and natural recruitment suggests that vegetation on Sidney Island can and will begin the process of recovery in the absence of deer.

14.5.2.1.2 Impacts from Ground Activities During the Project

Direct but small-scale impacts to forest understory vegetation may occur during project ground activities due to:

- Disturbance or trampling of vegetation from ATVs, the project team, or canine/handler teams;
- Removal of/damage to vegetation during the construction of temporary fences in Phase 2;
- Increased risk of spreading invasive plants during transportation of materials and equipment around the project area; and
- Possible introduction of or spread of non-native and invasive plant species at bait stations.

Mitigations:

- Wherever possible established roads and trails will be used for transportation of materials/equipment.
- Whenever possible, the project team will avoid trampling sensitive native plant species during the project by selecting less sensitive routes. Trails and roads will be used when possible.
- The majority of ground activities are scheduled between October and March when the most Sidney Island plant species are dormant and less sensitive to disturbances (Polster 2010).
- During the construction of temporary fences the project team will, whenever possible:

- Erect fences in areas that minimize the amount of vegetation clearing required (e.g. use existing roads and trails);
- Avoid disrupting high-value native plants (e.g., Garry Oak, wildflower species, native shrubs, native saplings);
- Use broad ratchet straps to attach the temporary fences to trees to reduce risk of damaging tree bark/trunks/limbs; and
- Use proper pruning techniques to limit the damage to trees that are trimmed.
- GINPR clean equipment protocols will be implemented during the project to ensure that materials and equipment are cleaned before being used on the island, as well as between sites, on the island, as appropriate.
- Follow-up monitoring will be completed by Parks Canada to locate any invasive plant species introduced or spread through the project and control their proliferation. Particular attention will be paid to accommodation and equipment staging areas.
- Bait stations will be:
 - Stocked with sterilized whole dried whole corn to avoid un-desirable germination of corn;
 - Cleaned and remediated following their use; and
 - Monitored after the project so any germinated plants are quickly detected and removed.

14.5.2.1.3 Removal of Deer May Lead to Increases in Invasive Species

With palatable plant species currently lacking on Sidney Island, European Fallow Deer consume less palatable species like the invasive hawthorn and Scotch Broom. Following the eradication of deer, and in the absence of other management actions, invasive plant species could increase in abundance and distribution, primarily in open fields and forest-field transition zones. From there, they have the potential to spread outward from forest-field transition zones and into the surrounding forest where environmental conditions are suitable, though long-term establishment in more densely forested areas is unlikely. The potential effects of deer eradication for invasive plant species present on Sidney Island and the resulting risks to native species or ecosystems are analyzed in Table 7.

The significance of this threat to the short and long-term outcomes of vegetation recovery is uncertain and location dependant. Other non-native herbivore eradications have resulted in undesirable increases in non-native plant species (Abbott et al., 2000; Bullock et al., 2002; Klinger et al., 2002; S. North & Bullock, 1986; S. G. North et al., 1994). In nearly all documented cases where non-native plants co-occur with non-native herbivores on islands, herbivore removal has had mixed results for the native vegetation (Zavaleta et al., 2001). It is important to note, however, that the current suppressive effect of deer browse on invasive plant species such as Scotch Broom and English Hawthorn is relatively mild compared to earlier periods. In the early 2000s, when the European Fallow Deer population peaked at over 2000 individuals, the total lack of native vegetation resulted in significant browse pressure on even unpalatable invasive plant species. In the last 15 years, as the deer population has steadily declined due to control efforts, the availability of more palatable species has increased. As a result, there has been a surge in invasive vegetation growth on the Sidney island. Since the deer population is currently relatively low, the browse pressure on invasive species is relatively low. Therefore, the removal of browse pressure through the deer eradication will likely result in small, but not necessarily explosive, additional growth of invasive plant species.

Table 7. Potential Impacts of European Fallow Deer Removal on Invasive Plant Species on Sidney Island¹

Invasive Species		Current Population Size or Distribution	Potential Effect of Deer Eradication
Common Name	Scientific Name		
English Hawthorn	<i>Crataegus monogyna</i>	<ul style="list-style-type: none"> • Very abundant in open fields • Increasing in abundance over the last several decades 	<ul style="list-style-type: none"> • Possible rapid expansion into forest-field transition zone. • From forest-field transition zone, this species could move further into the forest. • It is not expected to establish/thrive in interior forest due to low light levels in dense forest. • If overstory conditions change, e.g., density decreases, English Hawthorn could establish in those patches of forest.
Scotch Broom	<i>Cytisus scoparius</i>	<ul style="list-style-type: none"> • Very abundant in open fields • Increasing in abundance in forest-field transition zone 	<ul style="list-style-type: none"> • Possible rapid increase in forest-field transition zone. • It is not expected to establish/thrive in interior forest due to low light levels in dense forest. • If overstory conditions change, e.g., density decreases, Scotch Broom could establish in those patches of forest.
Himalayan Blackberry	<i>Rubus armeniacus</i>	<ul style="list-style-type: none"> • Concentrated in patches around margins of the open fields • Expanding into forest-field transition zones 	<ul style="list-style-type: none"> • Possible rapid increase in forest-field transition zone. • From forest-field transition zone, Himalayan Blackberry could move further into the forest. • It is not expected to establish/thrive in interior forest due to low light levels. • If overstory conditions change, e.g., density decreases, Scotch Broom could establish in those patches of forest.
English Holly	<i>Ilex aquifolium</i>	<ul style="list-style-type: none"> • Low to moderate abundance throughout the forest on Sidney Island 	<ul style="list-style-type: none"> • Expansion following deer eradication is possible but unlikely. Its expansion is largely dependent on absence of native vegetation due to heavy deer browse, rather than being released from browse pressure itself (it is not heavily browsed by deer).
English Ivy	<i>Hedera helix</i>	<ul style="list-style-type: none"> • Rare on Sidney Island 	<ul style="list-style-type: none"> • Expansion following deer eradication is possibly but unlikely. Its expansion is largely dependent on absence of native vegetation due to heavy browse pressure rather than absence of deer browse (due to its unpalatability to deer).
Other non-native grasses and forbs	N/A	<ul style="list-style-type: none"> • Dominant and widespread in all open fields on Sidney Island 	<ul style="list-style-type: none"> • Possible rapid expansion of non-native grasses and forbs into the forest-field transition zone. • Not expected to establish/thrive in interior forest due to low light levels.

¹(Miller & Madsen, 2020; Parks Canada Agency, 2019b; Skaien & Arcese, 2018)

Mitigations:

Proactive Management of Invasive Species

Prior to the implementation of the proposed project, Parks Canada and the Sallas Forest Strata community are taking steps to control English Hawthorn and Scotch Broom. These species were

identified as invasive species prioritized for management as they are very abundant in the open fields and are increasing in abundance in forest-field transition zones. By removing individuals in the open fields, the reproduction cycle will be disrupted in an attempt to slow their expansion after the project. Seeds of both species have accumulated in the soil seed bank making regeneration likely. A disruption to the reproductive cycle, however creates opportunities for native vegetation to successfully re-establish and for strategic native species transplanting.

Hawthorn management trials were conducted within the park reserve and on Sallas Forest Strata Common Property to evaluate removal and control methods (Miller & Madsen, 2020). Based on these trials, best practices for English Hawthorn management were identified. In 2022 and 2023 Parks Canada has been undertaking extensive Hawthorn removal within the Campground Field and Radar Field. Hawthorn removal in the Airstrip Field within Sallas Forest Strata Common Property will also occur, if approved by the community.

Parks Canada contracted a third-party restoration specialist to develop a Sidney Island Scotch Broom Management Plan (Maslovat & Archer, 2022) that identifies priority management areas across Sidney Island and site-appropriate methods (e.g., cutting plants at the root collar). Parks Canada and the Sallas Forest Strata have been following this management plan and removing Scotch Broom from priority areas on the island. As of January 2023, removal has been underway in the park reserve, and Scotch Broom has been removed by a contractor from all priority areas in the Sallas Forest Strata lands (B. Miller, personal communication, January 31, 2023).

Adaptive Management

An adaptive management approach will be implemented following the project to monitor and manage invasive species, as detailed in the SIERP Design Plan (SIERP Steering Committee & Parks Canada Agency, 2022).

The primary monitoring program that will be used to detect changes in vegetation in response to European Fallow Deer eradication is the Forest Understory Health (FUH) measure, usually conducted by GINPR's Ecological Integrity team. This monitoring program, implemented from 2017-2019, has been redesigned to better describe multiple facets of forest health, such as forest structure, species composition, and resilience to disturbance in addition to effects of browse pressure. Permanent plots have also been redistributed to better assess vegetation in the forest-field transition zone, which was previously excluded from the FUH measure. The suite of sub-measures includes overstory tree diameter and height according to species, measures of tree seedling abundance and height according to species, shrub abundance and height according to species, forb and grass cover, and browse pressure on tree seedlings and shrubs.

Pre-eradication baseline data includes data from the 2017-2019 survey as well as the redesigned survey, which was conducted by the project team in 2022. The project team will conduct the survey each year from 2023-2025 to observe short-term trends during and immediately following eradication. Following the completion of the project, this measure will be implemented approximately every five years by GINPR's Ecological Integrity team.

To practice adaptive management, it is important to establish thresholds related to areas of concern such as invasive species growth in the forest understory, such that management actions can be triggered as appropriate. At permanent forest monitoring plots, English Hawthorn has

been observed in seedling form, but to date has not successfully progressed to shrub or mature tree form. If English Hawthorn is detected in shrub or tree form during future FUH surveys, management action should be taken, as this indicates that hawthorn seedlings have successfully developed into larger class sizes rather than being outcompeted by native vegetation. Similarly, Scotch Broom has not been detected at forest monitoring plots to date. If future FUH surveys reveal that Scotch Broom is growing in forest plots at equal or greater heights than native vegetation, management action should be taken. This would indicate that Scotch Broom seedlings have established and are not being outcompeted by native vegetation. Both English Hawthorn and Scotch Broom are mostly likely to be observed in plots located in or adjacent to the forest-field transition zone and would indicate encroachment into more forested areas.

There are currently no established vegetation monitoring measures for fields on Sidney Island. To date, PC staff observations and anecdotal data have driven field unit-level conversations about invasive vegetation management, including current management actions (e.g., current Scotch Broom and Himalayan Blackberry control). Parks Canada staff observations will continue to inform the need for future management actions.

Management actions are subject to available funding and resources. Strategies that may be used as part of a response framework are outlined in the SIERP Design Plan (SIERP Steering Committee & Parks Canada Agency, 2022), including the establishment of a multi-partner committee to oversee the response, removal of individual plants, or creating unfavorable growing conditions for invasive species by actively transplanting native shrubs or deciduous trees. Future invasive species management will continue to follow the best management practices developed for English Hawthorn (Miller & Madsen, 2020) and the Sidney Island Scotch Broom Management Plan (Maslovat & Archer, 2022).

Other Strategies Contributing to Vegetation Recovery

Biosecurity monitoring during Phase 3 of the project (Section 9.11) and the Black-tailed Deer Management Strategy (Section 14.7) (Parks Canada Agency & SIERP Partners, 2022) are two other adaptive management plans that will indirectly contribute to vegetation recovery on Sidney Island by ensuring the long-term success of the eradication.

Further, there is a recognition in the SIERP Design Plan (SIERP Steering Committee & Parks Canada Agency, 2022) that additional active management strategies may be needed to support or accelerate recovery via natural processes, and to mitigate potential undesirable effects. Some proactive measures are being taken to reduce the need for additional active management. For example, in 2021 10 deer exclosures were planted with native deciduous trees, shrubs, and seeded with wildflowers that were prioritized by Indigenous project partners. Following the project, these planted areas will act as a source of native plant seeds, allowing these species to naturally propagate and spread outside the exclosures and allowing for possible manual seed collection and sowing. Native deciduous trees and shrubs will also be planted on Sidney Island post-eradication to supplement natural recovery and repopulate areas where English Hawthorn is being removed with the intention of creating unfavourable conditions for English Hawthorn re-establishment. Funding for seed collection and replanting work has been secured through the federal 2 Billion Trees initiative and is currently available until 2028.

14.5.2.1.4 *Removal of Deer May Have Unanticipated Ecosystem Effects*

Ecosystems are a complex web of inter-related moving parts, and it is difficult to predict the overall impact of any one action. Factors outside of human control (e.g., weather; transient wildlife populations) will also contribute to long-term outcomes. Given the level of complexity present in the ecosystem, it is impossible to have fully understand every potential variable. Examples of complicating factors that may result in unanticipated effects include:

Long Time Scales

In a disturbed ecosystem, the successional trajectory that will unfold can be unpredictable and long term; recovery of palatable species and diverse future forests can take decades if interventions do not occur (Tanentzap et al., 2009, 2011, 2012).

Changing Dominant Species

Species composition is fluid through time. Pioneer species that initially respond to the release of browse suppression over the short term will be replaced over the long term (years and decades) with later successional species.

Seed Bank and Species Potential for Domination by Less-palatable Plants

European Fallow Deer are long established on Sidney Island and the extent to which changes to biotic and abiotic parts of the ecosystem and processes can be reversed is unknown.

Disturbance of an ecosystem (e.g., from deer) can exceed the capacity of species to recover, resulting in permanent changes even when the disturbance is reduced (Hobbs and Norton 1996), or altered successional trajectories. For example:

- Deer reduce local seed sources of palatable plant species (Cote' et al. 2004), and this may be an important bottleneck in restoring disturbed ecosystems. The seed bank on Sidney Island has not been studied but may have a low abundance of seeds for native species that are palatable to deer, following decades of heavy deer browse.
- Less-palatable plants (native and invasive) that established during high deer densities may inhibit the regeneration of other more palatable species through competition for light or nutrients, resulting in altered successional trajectories (de la Cretaz & Kelty 2002; Husheer et al. 2006). For example, on Sidney Island, Salal is a less-palatable native species that dominates in the forest understory and could influence recovery and succession. Less-palatable invasive species could also have this effect.

Climate Change

Changes in vegetation dynamics post-eradication will also be occurring in the context of a changing climate. Climate change is bringing increased summer drought, extreme seasonal temperatures, extreme weather events, as well as sea level rise (SIERP 2021). All these factors could affect the recovery of plant species in the forest understory. However, many of the vegetation species found within the Gulf Islands are at the northern extent of their range and thrive in much warmer and drier conditions than those found locally. Vegetation recovery in the context of this project is not defined by the presence a static list of species but rather improvement to structural and functional elements of the forest.

Mitigations:

- The native species planted in deer exclosures on the island will serve as a seed source.

- Monitoring of a suite of measures of forest understory vegetation health, including invasive species richness and cover, will be implemented to quantify the effects of the project and to potentially detect any undesirable trends with invasive species.

14.5.2.2 Residual Impacts/Uncertainties

14.5.2.2.1 Residual Impacts from Ground Activities During the Project

Direct impacts to forest understory vegetation will largely be mitigated through project design and timing (see Section 14.5.2.1.1). Some short-term, localized impacts on vegetation are expected, especially in areas where pruning/clearing is necessary for the installation of temporary fencing. Evidence of vegetation regrowth is expected within one or two growing seasons and will be supported by the removal of browsing pressure. In the broader context of long-term vegetation change post-eradication, this residual impact is not considered significant.

14.5.2.2.2 Potential Undesirable Increases in Invasive Species

The most likely undesirable effect of the deer eradication on forest understory vegetation is increased invasive species richness and cover. Pro-active measures will limit the impact from key invasive species after completion of the project: invasive English Hawthorn and Scotch Broom will be significantly reduced prior to the project, diminishing the risk of rapid growth in the fields where they are currently abundant and further expansion into the forest-field transition zones. Parks Canada’s FUH survey will be used to monitor invasive species within forested areas. As during pre-project, observations by Parks Canada staff will provide supplemental information about invasive plant growth in non-forest areas.

14.5.2.2.3 Uncertainties in Achieving the Desired Outcome

Although the project is expected to result in conservation gains for forest understory vegetation (i.e., an improving trend in measures of ecological integrity), given the complexity of the ecosystem, there is inherent uncertainty in how the ecosystem may change after eradication. Native vegetation has already been transplanted on the island and significantly more replanting will occur in subsequent years in an attempt to augment natural recovery. Climate change may alter the composition of forest understory vegetation but those outcomes are beyond the control of the project. Regional climate projections are being considered when developing planting strategies.

14.5.2.2.4 Balance of Desirable and Undesirable Impacts

Overall, the project is expected to benefit forest understory vegetation. Mitigation measures are expected to limit or avoid undesirable impacts resulting from the project, such as impacts from ground activities, increases in invasive plant species, or others resulting from inherent uncertainties. Residual impacts resulting from the project are anticipated to be minimal (see Table 8) and the net effect of the project will be positive, resulting in improvements in ecological integrity of Sidney Island forests over the long-term.

Table 8. Residual Impact Assessment Criteria for Forest Understory Vegetation

Duration of Impacts			
Day or less	Weeks	Seasons	Permanent
The duration of residual impacts to forest understory vegetation from Phase 2 of the project (vegetation clearing, pruning, and disturbance) is expected to be limited to one or two growing seasons.			
The duration of residual impacts from potential increases in invasive species on Sidney Island is unknown. With proactive management of invasive English Hawthorn and Scotch Broom and Parks			

Canada’s ongoing forest health survey monitoring and the implementation of an adaptive management strategy for invasive species control, the effects are not anticipated to be permanent.			
Reversibility			
No Change	Short Term	Long Term	Irreversible
The forest understory vegetation is expected to begin recovery from direct impacts from Phase 2 of the project (vegetation clearing, pruning, and disturbance) within one to two growing seasons.			
No Change	Short Term	Long Term	Irreversible
The duration of residual impacts from potential increases in invasive species on Sidney Island is unknown and could be long term. Provided that mitigation measures are implemented (proactive management of key invasive species, and Parks Canada’s adaptive management strategy), however, the effects are not anticipated to be permanent.			
Ecological Scale			
Site Specific	Local Feature	Local ecosystem	Population
The project impacts to the forest understory vegetation are limited to the local ecosystem scale (Sidney Island). This is the appropriate scale for the desirable effects of ecosystem recovery.			
Ecological Context			
Modified	Resilient	Vulnerable	At Risk
Sidney Island is within the Coastal Douglas fir (CDF) biogeoclimatic zone, moist maritime (CDFmm) subzone, which is the rarest biogeoclimatic zone in BC (Meidinger & Pojar, 1991) and supports provincially unique native communities and species (e.g. the Garry Oak (<i>Quercus garryana</i>) ecosystem and Arbutus (<i>Arbutus menziesii</i>)). The forest understory vegetation is already in a severely degraded state due to decades of over-browse by the European Fallow Deer; therefore, despite the limited duration of negative impacts, the overall effect on forest understory vegetation is expected to be positive and long-lasting.			
Frequency			
Rare	Occasional	Repeated/Intermittent	Continuous
The residual impacts to forest understory vegetation from Phase 2 of the project (vegetation clearing, pruning, and disturbance) will only occur during the project and are therefore considered “rare”.			
Rare	Occasional	Repeated/Intermittent	Continuous
Potential impacts from invasive species following the project will be ongoing and “continuous” in the absence of deer browse. The long-term implementation of Parks Canada’s adaptive management strategy, which includes monitoring and a response framework, will be key to controlling the impacts from invasive species in the Sidney Island forest understory.			
Predicted Significance			
Negligible	Predictable and Manageable	Impacts within Threshold, with Risk or Uncertainty	Impacts Exceeds Thresholds
The project is expected to achieve the desired result of improving the ecological integrity of forest understory vegetation. Undesirable impacts from increases in invasive plant species following the project are possible and there is some uncertainty in the outcome given the complexity of the ecosystem, however, these impacts are anticipated to be manageable because of the pro-active invasive species management and Parks Canada’s forest health survey that will monitor invasive species within the forest over the long term (decades).			

14.5.3 Conclusion

Impacts from project activities are largely reduced through mitigations; however, some localized and short-term residual impacts are expected where vegetation clearing/pruning is required for the temporary fences.

The elimination of deer browse may promote the growth of undesirable invasive plant species. Proactive management of English Hawthorn and Scotch Broom, Parks Canada's ongoing forest health survey monitoring, and the implementation of an adaptive management strategy for invasive species control are expected to mitigate impacts from invasive species in the long term.

This project is expected to achieve the desired outcome for forest understory vegetation. Through the removal of deer browse, Parks Canada's Ecological Integrity Monitoring forest understory parameters are expected to improve in the years or decades following the project.

14.6 Birds

14.6.1 Introduction

14.6.1.1 Description of Baseline Conditions

14.6.1.1.1 Species at Risk

Twelve bird species listed on SARA Schedule 1 may occur on Sidney Island or in the surrounding marine environment for at least some portion of their annual cycle. See (Table 9) for a list of these species, their statuses, habitat requirements, and brief descriptions of their habitat use on/around Sidney Island.

14.6.1.1.2 Marine Birds

The Sidney Channel and Mandarte Island IBAs (IBA Canada, n.d.) around Sidney Island provide important habitat throughout the year for many species of ducks, geese, grebes, loons, mergansers, seabirds, gulls, and terns (Bird Studies Canada, 2017; eBird, 2023b). A total of 66 species of waterfowl and marine birds has been reported from on/around the island (eBird, 2023b).

Although most areas along the south coast of the Strait of Georgia have relatively few marine birds in the summer, the Sidney channel and Sidney Island lagoon support large flocks of seabirds, and are well known locations for murrelets, auklets, cormorants, and gulls (IBA Canada, n.d.).

The marine habitats of the IBAs surrounding Sidney Island are particularly important for birds during the migratory and overwintering periods, from September to April (Cruickshank, 2017). During the spring migration there are large concentrations of birds including Brant (IBA Canada, n.d.), which is not listed under SARA but has a conservation ranking of S3 in BC (NatureServe, 2023a). During fall migration, there are large concentrations of Brandt's Cormorants (*Urile penicillatus*), which is not a SARA-listed species but has a conservation ranking of S1 (NatureServe, 2023f).

The marine environment around Sidney Island is also significant habitat for wintering waterbirds, including seaducks and seabirds (J. Russell, personal communication, July 30, 2021). Brandt's Cormorant and Brant have both also been observed from the Sidney Spit and Sidney lagoon during the winter

months (eBird, 2023b). During the winter, these species rely on Sidney Island's eelgrass beds for foraging and roost along the relatively undisturbed shoreline (Cruickshank, 2017).

14.6.1.1.3 Shorebirds

The Sidney Spit, Hook Spit, and the shoreline around the lagoon and along the west side of Sidney Island are included in the Sidney Channel IBA (IBA Canada, n.d.). The inter-tidal zone, tidal mudflats, and shorelines in these areas provide important habitat for shorebirds. Sidney Spit is an important migration stopover and wintering site for shorebirds. A total of 37 species have been reported to eBird for the Sidney Spit and lagoon (eBird, 2023b).

Shorebirds use Sidney Island as a stopover during migration. During the southward migration, the highest concentration of shorebirds is in late July/August to September (Cruickshank, 2017; J. Russell, personal communication, July 30, 2021). During the northward migration the highest concentration of shorebirds is from mid-April to mid-late May (Cruickshank, 2017). There are also some individuals or flocks present in the late fall or winter (eBird, 2023b). Species observed during the winter months on Sidney Island include Black-bellied Plover (*Pluvialis squatarola*), Black Oystercatcher (*Haematopus bachmani*), Black Turnstone (*Arenaria melanocephala*), Dunlin (*Calidris alpina*), Killdeer (*Charadrius vociferus*), Least Sandpiper (*Calidris minutilla*), Spotted Sandpiper (*Actitis macularius*), and Sanderling (*Calidris alba*) (eBird, 2023b).

Spotted Sandpiper and Killdeer are known to breed in the open sandy habitats of the Sidney Spit and Hook Spit (Cruickshank, 2017). These species nest in the general nesting period for birds, between March 30 and August 16, with peak nesting from May 14 to July 21 (Environment and Climate Change Canada, 2018).

14.6.1.1.4 Passerines and Other Terrestrial Birds Including Raptors

A total of 106 passerines and other terrestrial birds, including raptors, have been reported from on/around Sidney island (eBird, 2023b). Many of these species that occur on Sidney Island are migratory and are only present on Sidney Island from approximately April to October, depending on seasonal weather. Other species (62 reported) are year-round residents and occur on the island throughout the winter (eBird, 2023b) (Appendix 6).

Bird Nesting Period

The general nesting period for birds in the Southern Gulf Islands is March 30 to August 16, with peak nesting occurring from May 14 to July 21. Atypical nesting, such as during years with unusual weather, may occur as early as March 16 or as late as August 17 (Environment and Climate Change Canada, 2018). Year-round resident passerines (e.g. Hutton's Vireo (*Vireo huttoni*), Purple Finch (*Haemorhous purpureus*), Chestnut-backed Chickadee (*Poecile rufescens*), Red-breasted Nuthatch (*Sitta canadensis*), Anna's Hummingbird (*Calypte anna*) (Cruickshank, 2017)) regularly start nesting in March (Environment and Climate Change Canada, 2018)

Early Nesting Birds (Owls and Eagles)

Several non-migratory birds start nesting during the winter months. Great Horned Owl, Barred Owl, and Northern Saw-whet Owl may start nesting as early as January or February (Caswell, Lower Nicola Indian Band, & Hilton, 2008; Caswell, Lower Nicola Indian Band, Tyson, et al., 2008a, 2008b). None of these owls have reported observations on Sidney Island (eBird, 2023b), however, that does not mean they are absent. Species lists may not be comprehensive, as observers may not be present in the right time or

place to observe owls (i.e., observers may not be conducting targeted night-time surveys for owls), or observers may not report all the species they observed.

There are approximately five to eight pairs of Bald Eagles (*Haliaeetus leucocephalus*) currently nesting on Sidney Island (M. Janssen, personal communication, May 11, 2023a). Bald Eagles typically begin nesting in March, but may start nesting as early as January (Ministry of Environment and Climate Change Strategy, Ecosystems Branch, 2018).

Impacts of European Fallow Deer on Sidney Island's Songbirds

Songbird abundance and richness on Sidney Island are currently affected by the condition of the forest understory. Sidney Island has the least diverse community of songbirds in the Southern Gulf Islands region (T. G. Martin et al., 2011; Parks Canada Agency, 2020b). The degraded understory has low plant diversity, and low structural diversity due to heavy deer browse, which limits food resources and habitat for songbirds. As a result, songbirds that depend on understory vegetation for foraging and nesting habitat are rare or absent on Sidney Island.

The declines observed on Sidney Island are consistent with large-scale trends of declining bird abundance. Declines in bird abundance across North America correlate with increases in deer abundance (Chollet & Martin, 2013). The observed bird declines are thought to have been driven by heavy deer browsing reducing birds' territory quality, food supply, individual condition, and reproductive performance by increasing predation rates and eliminating nesting substrates (Arcese et al., 2014).

14.6.1.2 Project-Valued Component Interactions

Although Phase 1 and 2 are scheduled to occur outside the primary bird nesting period, mitigations will be implemented reduce potential impacts to bird species that are present on or around Sidney Island during Phases 1 and 2 (Table 9). This includes five species listed on SARA Schedule 1 that may occur on Sidney Island or in the surrounding marine environment (Appendix 3). The likelihood of negative impacts on birds may increase if either phase extends into the contingency periods (January to March 2024 for Phase 1 and April 2025 for Phase 2) (Table 9). Phase 2 project preparations and demobilization may also occur during the primary breeding bird period (as early as July 2024 or as late as May 2025, if necessary) (Table 9).

14.6.1.3 Desired Outcome

All bird populations on Sidney Island and in the surrounding marine environment are maintained throughout the project. Structural habitat and food resource availability for songbirds birds is improved in the years or decades following the project, leading to increased abundance and richness of songbirds on Sidney Island.

14.6.2 Analysis

14.6.2.1 Impacts and Mitigations

Potential impacts to birds, and the associated mitigation measures discussed below were developed following the guidance in the Draft Parks Canada Guidance on Reducing Risk to Migratory Birds (Parks Canada Agency, 2021a) as well as guidance from internal (Parks Canada) and external experts (e.g.,

Canadian Wildlife Service representatives). Note that in all cases, potential impacts are temporary and occur at an individual (rather than population) level.

14.6.2.1.1 *Removal of Deer Will Benefit Songbirds*

In the years or decades following the project, improvements in the ecological integrity of the forest understory are expected to benefit songbird abundance and richness on Sidney Island. The absence of heavy deer browse is expected to increase the diversity and abundance of understory plant species and increase the structural diversity within the understory (see Section 14.2). In turn, the forest understory will provide food sources and habitat that are currently lacking for understory-dependent songbirds. Over time this is expected to increase the abundance and richness of songbirds found on Sidney Island.

Changes in herbivory have been observed to affect understory-dependent birds in other systems. For example, a cull of approximately 80% of introduced deer on Haida Gwaii resulted in increased cover and richness of understory vegetation and this ultimately led to an increased abundance and richness of understory-dependent bird species (Chollet et al., 2016).

To evaluate the effects of the project on understory-dependent songbirds on Sidney Island, the abundance and richness of songbirds will continue to be monitored every three years by the GINPR Ecological Integrity team following the deer eradication.

14.6.2.1.2 *Impacts from Aerial Operations*

Birds on/around Sidney Island may be habituated to ongoing disturbances from air traffic around Sidney Island as it is directly under the active airline route from the nearby Victoria International Airport and there is an active airfield on the island. Aerial operations during Phase 1, however, are anticipated to be more intense as they will include repeated, low altitude helicopter flights around the island, which have greater potential to impact birds. Phase 1 aerial operations will be of short duration, limited to approximately 10 days occurring within a two-to-three-week period in November and December.

Aerial operations of the helicopter have the potential to impact all bird species or groups that are on Sidney Island or in the surrounding marine environment in November or December (Table 9). This includes five SAR:

- Marbled Murrelet (Threatened; known to be present in the waters surrounding Sidney Island in the Sidney Channel IBA during the winter (eBird, 2023b));
- Red Knot (Threatened; occasionally observed during the winter on the Sidney Spit and around the lagoon (eBird, 2023b));
- Western Screech Owl (Threatened; known to occur on Sidney Island up to the early 2000s, but it is unknown whether it is still present (Ledger, 2022));
- Great Blue Heron (*Ardea Herodias fannini*) (Special Concern; known to overwinter on the island and forage along the coastline and in the inter-tidal zone (eBird, 2023b)); and
- Horned Grebe (*Podiceps auritus*) (Special Concern; occasionally observed from the Sidney Spit and in the lagoon (eBird, 2023b)).

Table 9. Proposed Timing of Project Activities in Comparison to Seasonal Bird Activities in/around Sidney Island

	Month											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Project Timing												
2023												Phase 1
2024	Phase 1 Contingency						Phase 2 Preparation			Phase 2		
2025	Phase 2		Phase 2 Contingency	Phase 2 Demobilization	Phase 2 Biosecurity (ongoing)							
Bird Seasonal Activity Periods On/Around Sidney Island¹												
Species at Risk												
Barn Swallow (Threatened)			Light Pink	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Light Green	Light Green	
Great Blue Heron (Special Concern) ⁵	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Horned Grebe (Special Concern) ³	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Marbled Murrelet (Threatened) ²	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Olive-sided Flycatcher (Special Concern)			Light Pink	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Light Green	Light Green	
Red Knot (Threatened) ⁴	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Western Screech Owl (Threatened) ⁶	Light Green	Light Green	Light Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Light Green	Light Green	Light Green	Light Green
Marine Birds												
Marine Birds	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Shorebirds												
Migratory Shorebirds ⁷				Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Light Green	Light Green	
Overwintering Shorebirds ⁷	Light Green	Light Green	Light Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Light Green	Light Green	Light Green	Light Green
Passerines and Other Terrestrial Bird Species, Including Raptors												
Barred Owl, Great Horned Owl, Northern Saw-whet Owl, Bald Eagle	Dark Green	Dark Green	Dark Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Non-Migratory/Resident Birds	Light Green	Light Green	Light Green	Light Green	Dark Green	Dark Green	Dark Green	Dark Green	Light Green	Light Green	Light Green	Light Green
Migratory Birds			Light Pink	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Light Green	Light Green	Light Green	Light Green

¹Light green = Active season and migration periods; Dark green = Nesting season (General Nesting Period of March 30 to August 16), Light Pink = potential early arrival period for migratory birds.

²No Marbled Murrelet nesting locations have been found on Sidney Island as there are no suitable old growth nesting trees.

³The Horned Grebe does not nest on Sidney Island; it mainly breeds east of the coastal mountains (COSEWIC, 2009).

⁴The Red Knot does not nest on Sidney Island. It occurs in small numbers in coastal BC during migration and during the winter (COSEWIC, 2020).

⁵There are no known Great Blue Heron nesting colonies on Sidney Island.

⁶It is unknown whether Western Screech Owls still occur on Sidney Island.

⁷Most migratory shorebirds do not breed on Sidney Island. Spotted Sandpiper and Killdeer breed on the Sidney Spit and Hook Spit (Cruikshank 2017).

Helicopter impacts to birds could be through bird mortalities or injuries from direct strikes, disturbances to birds with the loud noise and/or rapid movements of the helicopter, or through the high velocity downwash air currents created by the helicopter flying low over the landscape. Helicopter flights at night could also be disrupting the nocturnal activity and foraging patterns of nocturnal birds like the Western Screech Owl, Great Horned Owl, Barred Owl, and Northern Saw-whet Owl.

If Phase 1 extends into the contingency period of January to March 2024, the helicopter could also impact early nesting bird species (Great Horned Owl, Barred Owl, and Northern Saw-whet Owl, or Bald Eagle) or resident passerines that may start nesting in March (Environment and Climate Change Canada, 2018). During this period, the helicopter could disturb breeding adults off their nests and potentially decrease nest success. Bald Eagles, for example, which may begin nesting as early as January, respond to low-level helicopter flights by flushing from roosts or nests and showing agitated behaviour (Anderson, 2007; Watson, 1993).

Mitigations:

- With Phase 1 occurring outside of main bird nesting period, impacts from aerial operations to migratory birds are avoided.
- Helicopter flights in Phase 1 will be limited to fewer than 10 days within a two-to three-week period, thereby limiting the duration of potential impacts.
- The helicopter will avoid herding deer towards the Sidney Spit, Hook Spit, and lagoon whenever possible to avoid project activities in these sensitive areas to minimize impacts to marine and shorebirds.
- The intention is to complete Phase 1 by the end of December to avoid the nesting season for all birds (including Great Horned Owl, Barred Owl, and Northern Saw-whet Owl, or Bald Eagle). If Phase 1 is extended into January to March, additional mitigation measures will be implemented (see Section 14.6.2.1.6 for mitigation measures for nesting birds).
- Given the potential residual impacts to the Threatened Western Screech Owl, Marbled Murrelet, and Red Knot, a SARA permit will be acquired.

14.6.2.1.3 Impacts from Boats

Despite the potential disturbances to birds, boat traffic during the project is not expected to result in a significant increase in disturbances compared to pre-existing baseline levels of disturbance. The winter months are typically quieter than the spring, summer, or fall, but there is still regular boat traffic. Parks Canada staff boat to the island during the winter and Indigenous hunters travel to and from the park reserve by boat during the hunting season (with at least 128 boat trips to and from the island ferrying Indigenous hunters occurring in 2022, for example (S. Coulson, personal communication, June 2, 2023)). In addition, on the private side of the island, marine traffic, from small vessels to barges, occurs year-round. During the summer months and shoulder seasons (April-May and September), Sidney Island is an extremely popular boating destination. During this time, boating activities associated with the project will be negligible in relation to the volume of recreational boating in the area.

Mitigations:

- During boat travel, project staff will watch for, and, where possible, give a wide berth to, any marine birds to minimize the risk of flushing and disturbing them.
- When travelling in the lagoon, project boats will travel at a low speed to minimize wake.

- Boats will be moored or docked at pre-established sites including the mooring buoys at Sidney Spit, bungee anchored at the Old Transport dock (shown on Figure 2), or the Sallas Forest Strata dock, with permission.
- If other boat anchoring and landing locations are required during the project, they will be selected to minimize interference with bird staging, overwintering, foraging, roosting, or nesting sites.

14.6.2.1.4 Impacts from Temporary Fencing

There is potential for birds to be impacted if vegetation is trimmed or pruned for the installation of temporary fences during the breeding bird period (in the Phase 2 preparation period, July to October 2024). The project team will aim to avoid trimming or pruning vegetation within the nesting period for birds (March 30 to August 16; Environment and Climate Change Canada, 2018) as much as possible. Though the installation will begin as early as July, the project team will prioritize the erection of fencing along routes that do not require vegetation removal (e.g., on existing trails and roads) until after August 16th. Impacts from vegetation trimming or pruning during the general nesting period for birds could include the damage or destruction of bird nests, or disturbances to nesting birds. It should be noted that the risks to breeding birds associated with vegetation trimming or pruning is anticipated to be low, given that there are so few birds currently nesting in the degraded forest understory on Sidney Island.

Impacts to birds could also result from presence of the temporary fences themselves. The temporary fences will remain in use throughout Phase 2, potentially from October 2024 to March 2025, and into the Phase 2 contingency period in April 2025, if necessary. While no entanglements of any wildlife were observed during trials completed by Parks Canada from December 2021 to February 2022 (see Section 4.2.2), there is a very low risk that fences could result in bird entanglements, injuries, or mortalities. Birds that would be at risk from the fences themselves include Western Screech Owl (if present on the island), and resident and migratory (March and April) passerines and other terrestrial bird species, including raptors.

Mitigations:

- If temporary fencing installation occurs in July and early August, personnel will begin with routes that minimize the need for vegetation trimming as much as possible (e.g., will begin with erecting temporary fencing on existing roads and trails).
- If vegetation trimming is required inside the general nesting period for birds, a breeding activity survey will be conducted by a Qualified Environmental Professional (QEP) along the proposed fence line ahead of crews installing fences. If an active nest is observed by the QEP, the temporary fence will be routed around the nest, and that area will be avoided as much as is operationally feasible. See Section 14.6.2.1.6 for additional mitigations for nesting birds.
- The aquaculture netting used for the temporary fencing is visible to birds, has a large mesh size (approximately 20cm² mesh), and will be installed as taut as possible to reduce the risk of bird entanglements.
- Given that no entanglements were observed during the Parks Canada temporary fencing trial, surveys of the fence lines for entangled wildlife are not expected to be necessary. If an entanglement is observed during Phase 2 operations, however, fence surveys will be initiated immediately to ensure entangled birds are rapidly detected and released. Parks Canada staff will

also examine the fence to determine whether changes to the fence are required to prevent future entanglements.

14.6.2.1.5 General Impacts from Ground Operations

There is potential for some impacts to birds from ground operations during the project. Impacts could arise from noise (gunshots, team members, dogs, generators, trucks, ATVs, and noise machines at fence ends), the physical presence of project team members and dogs in bird habitats, and high-powered spotlights for nocturnal owls, if used. The significance of potential impacts, however, is anticipated to be low relative to the existing levels of baseline activity on the island, and due to their short duration.

Phase 1 and 2 (October to March)

In a typical year, there are existing baseline levels of disturbances to resident and migratory birds from from October to March on Sidney Island due to annual deer hunts and the ongoing activities of Sallas Forest Strata Community members (Table 10). The Indigenous deer harvest occurs annually within the park reserve from November to February. The Sallas Forest Strata Community also hosts a deer hunt within the Sallas Forest Strata Common Lands between October and March. There are also ongoing disturbances from October to March on the island from minor construction/maintenance projects, continued vehicle traffic, the use of ATVs, generators, and the presence of Sallas Forest Strata community members, including people and dogs walking the trails, and spending time in the forest, or on beaches (Table 10).

Phase 1 ground operation disturbances to resident/overwintering Sidney Island birds will be minor compared to ongoing island activities, and of short duration, occurring within a two-to-three-week period in November and December. Should Phase 1 extend into the contingency period (January to March 2024), which overlaps with the nesting period of early nesting bird species, additional mitigations will be implemented (see Section 14.6.2.1.6).

Phase 2 is anticipated to result in less intense disturbances to resident/overwintering birds than Phase 1. This is because Phase 2 is anticipated to largely consist of professional marksmen walking through fenced zones checking for and removing any remaining deer. Phase 2 will be longer in duration than Phase 1, however, and may result in more “hunting days” than a typical hunting season on Sidney Island (Table 10). This is considered acceptable given that Phase 2 will be a one-time occurrence (one season), the intensity of operations are intended to be less than Phase 1, and the significance of potential impacts is anticipated to be low relative to the existing levels of baseline activity on the island.

Phase 2 Preparations, Contingency, and Demobilization (April to September)

Given the existing level of baseline activity already occurring on the island from April to September, the disturbances from Phase 2 preparations, contingency, and demobilization ground operations to resident, migratory, or breeding birds, including Barn Swallow and Olive-sided Flycatcher, are not anticipated to be significant.

Ground operation activities that may occur during the Phase 2 preparation and demobilization period may include transporting, staging, and removing equipment and materials and the installation and removal of temporary fences. During these activities, there could be disturbances to resident, migratory, or breeding birds, including Barn Swallow and Olive-sided Flycatcher, from the presence of project team members in bird habitats, from noises due to vehicles, ATVs, generators, and project team members.

Disturbances to birds during the Phase 2 contingency period would be the same as during Phase 2, as described above. Additional considerations for nesting birds are provided in Section 14.6.2.1.6.

The potential impacts from any ground operations occurring from April to September are not expected to be significant in the context of typical, ongoing disturbances on the island. During the summer months and shoulder seasons (April to September) every year, the park reserve is visited by more than 25,000 tourists, recreational users, and boaters (D. Gray, personal communication, 2021). During this peak season, the campground and beaches are heavily used, there is extensive use of the fields and trails by campers, hikers, and dog-walkers. The Sallas Forest Strata lands are also busy between April and September, with increases in the number of residents and community members coming to the island. This correlates with increases in the use of generators, construction/renovation projects, vehicle and ATV traffic, as well as people and their dogs using the trails or spending time on beaches.

Mitigations:

- Project activities will avoid the Sidney Spit and Hook Spit to the greatest degree possible (these areas are not heavily used by deer and can be blocked off with the use of temporary fencing).
- Project activities within the lagoon will be minimized, and deer will be directed away from the lagoon and spit areas whenever possible.
- All firearms used during the project will have noise suppressors to reduce the noise level of gunshots as much as possible.
- If used during the project, high-powered spotlights, which could disturb Western Screech Owl, Barred Owl, Great Horned Owl, and Northern Saw-whet Owl, will be aimed parallel to the ground to avoid lighting up the forest canopy.
- Additional mitigations for nesting birds are provided in Section 14.6.2.1.6.

14.6.2.1.6 Impacts to Nesting Birds

Nesting birds could be impacted from vegetation removal for temporary fences, the increased presence of humans, or human activities, in/around nests. Increased levels of disturbance could increase the energy required for adult birds to successfully rear young (i.e., if they are repeatedly flushed from nests or use valuable energy for defending their nests), could increase the risk of birds abandoning their nests or young, or could impact the fitness of offspring (Remacha et al., 2016).

Mitigations:

- The project has been designed to largely avoid impacts to birds by avoiding the Southern Gulf Islands region bird nesting period (Environment and Climate Change Canada, 2018).
- Disturbances to nesting birds throughout the project will be short term.

Early Nesting Birds (Owls and Eagles)

The intention is for Phase 1 to be complete before January to reduce impacts to early nesting owls and eagles. If Phase 1 occurs later than January 1st disturbances to nesting owls and eagles could include the noise and high velocity downwash air currents from the helicopter.

Although Phases 1 and 2, could disturb nesting owls and eagles through the presence of ground crews in/around nesting habitat. as well as noise from gunshots in/around nesting habitat, as described in Section 14.6.2.1.5 and Table 10, disturbances from ground activities during the project are not anticipated to be significant relative to existing levels of baseline activity on the island.

Mitigations:

- In accordance with recommendations from the BC Senior Wildlife Biologist (West Coast Region – Fish and Wildlife Branch) (S. Marshall, personal communication, June 2023), if Phase 1 activities are to occur between January and March, known eagle nests will be surveyed to determine whether/which nests are active. The locations of active nests will be provided to the aerial operations team so that they can avoid flying over them as much as possible.
- During ground operations between January and March, teams will watch for and document any active owl and eagle nests. If active nests are observed, their locations will be documented and they will be avoided as much as operationally feasible.
- Before the project commences, a permit under the BC Wildlife Act will be obtained in recognition of the short-term disturbances that are possible for eagles and owls (S. Pendergast, personal communication, May 15, 2023).

All Other Nesting Birds, Including Migratory Birds

Year-round resident passerines that regularly start nesting in March could be disturbed by project activities in Phase 2 or Phase 1, in the unlikely event that it extends into March 2024. Phase 2 contingency (April 2025), preparation (July to October 2024), and demobilization periods (May 2025) could impact birds during the general nesting period (from March 30 to August 16) (Environment and Climate Change Canada, 2018), including the SAR Barn Swallow and Olive-sided Flycatcher. As described in Section 14.6.2.1.5 and Table 10, however, disturbances from ground activities during the project are not anticipated to be significant relative to existing levels of baseline activity on the island.

Potential Phase 2 preparation (July to October 2024) and demobilization activities (May 2025) will only occur once in a given area and will be of short duration (i.e., crews may be in a given area for up to several hours). The activities will largely also occur on roads and trails that are normally used frequently during this time. Therefore, potential preparation and demobilization activities are not considered to have the potential for significant negative impacts to nesting birds.

Mitigations:

- Beginning in mid-March, and throughout the duration of the project, the project team will watch for signs of ground and shrub-nesting birds in the forest understory and in fields. If active nests are observed, their locations will be documented and they will be avoided as much as operationally feasible.
- In the unlikely event that an active Western Screech Owl nest is observed during the project, all work in that area will immediately cease, the Parks Canada project manager will be notified, and a QEP will be consulted to establish an appropriate buffer zone around the nest. Buffer areas will be left undisturbed from all project activities until a QEP determines there is no further activity at the nest.
- The proposed mitigations for this project that relate to migratory birds have been submitted to the Canadian Wildlife Service for feedback and confirmation they are appropriate.

14.6.2.1.7 Impacts from Altered Foraging Behaviour

Bait stations, if used, could result in impacts to birds due to altered foraging behaviour, habituation to unnatural food sources, or health impacts from an altered diet (if, for example an individual switches from a diverse diet to a corn-based diet). Bait stations could impact granivorous bird species due to the presence of whole kernel corn at bait stations or owls, whose rodent prey may become

attracted/habituated to bait stations. Scavenging species, such as eagles, crows or ravens, may exhibit altered foraging behavior patterns due to the increased prevalence of deer carcasses and entrails on Sidney Island as a result of the project.

Mitigations:

- The length of deployment of the bait stations as well as the amount of bait used will be restricted to the three to five-month period of Phase 2, to minimize long-term impacts on habituation of non-target birds and rodents.
- Bait stations will be cleaned and remediated following their use.
- The carcass recovery team will locate, field dress, and retrieve as many deer carcasses as possible for human consumption, limiting the number of carcasses left in the forest.

14.6.2.2 Residual impacts/Uncertainties

Although impacts to birds will be minimized through project design and mitigation measures, they will not be completely avoided. Residual impacts could include:

- Short-term disturbances to resident/non-migratory birds from the noise, movements, and high velocity downwash air currents of the helicopter flying over Sidney Island for 10 days within a two-to-three-week in November and December (and potentially in January to March);
- Minor disturbances to birds from ground operations for approximately three- to five-months between October and March in Phase 2, including the noise and presence of ground crews, canines, and increased deer movements over more “hunting days” than in a typical season;
- If Phase 1 occurs later than January 1st disturbances to nesting owls and eagles could include the presence, noise and high velocity downwash air currents from the helicopter.
- Minor and short-term disturbances to nesting birds from project ground operations; and
- Altered foraging patterns or habituation due to the presence of bait stations, if they are used during Phase 2 of the project, as well as deer carcasses and entrails for scavenging bird species.

The significance of the residual adverse effects is expected to be negligible given existing levels of disturbance on the island, the short duration of the project, and in the context of benefits for songbirds that are expected as the forest understory vegetation recovers in the years or decades following the project. The residual impacts have been assessed using the criteria provided in Table 11.

Table 10. Estimated Baseline Levels of Potential Sources of Disturbances to Birds in a Typical Year on Sidney Island Compared to During the Project (October-March and April-September)

Potential Source of Disturbance to Birds	October – March			April – September	
	Typical Year ¹	Phase 1	Phase 2	Typical Year ¹	Phase 2 Preparations, Contingency, Demobilization
Number of cars or pickup trucks on island roads	10/week	4	4	50/week	3
Number of trucks (diesel, delivery trucks, construction, excavator, etc.) driving on island roads	5/week	1-2 (Refrigerator truck)	1-2 (Refrigerator truck)	10/week	1 (Excavator for carcass trench)
Number of ATVs on roads or trails	5/month (Off trail)	4	4	10/month (Off trail)	4
Number of Generators Operating	20 (Periodically; from households, building projects)	2 (Refrigerator truck, and generator for camp)	2 (Refrigerator truck, and generator for camp)	50 (Periodically; from households, building projects)	2 (Refrigerator truck, and generator for camp)
Number of Dogs on Island Trails	10/week	0	Up to 10 (Trained hunting dogs)	Up to 10/day	0
Number of People Walking/Talking in the Forest	10/week	Up to 24 (Up to 4 professional marksmen and 20 deer carcass recovery team members)	Up to 30 (Up to 10 professional marksmen and 20 deer carcass recovery team members)	~1,500/week (25,000 people between June and September visit GINPR)	6
Number of “Hunting Days”	90 (54 in GINPR; 36 on Sallas Forest Strata Lands)	10	Up to 181	n/a	n/a
Number of Hunters	242 to 267 (190 Indigenous hunters in GINPR; 52-77 hunters on Sallas Forest Strata Lands)	4 (Professional marksmen)	10 (Professional marksmen)	n/a	n/a

¹(Sallas Strata Council Representative, personal communication, May 19, 2023)

Table 11. Residual Impact Assessment Criteria for Birds

Duration of Impacts			
Day or less	Weeks	Seasons	Permanent
The duration of disturbance from the project in Phase 1 is limited to a short period (occurring within two-to-three-weeks) during the winter. Disturbance from Phase 2 of the project will occur the following year, but over a period of three- to five-months. Specific areas of Sidney Island will only experience project activities when those particular fenced zones are targeted for eradication.			
Reversibility			
No change	Short Term	Long Term	Irreversible
Sources of potential disturbance to birds are temporary, and as a result, the impacts from increases in physiological stress, less productive foraging, and disruption of foraging patterns, are not expected to have long term consequences.			
Ecological Scale			
Site specific	Local feature	Local ecosystem	Population
The project impacts to birds are limited to the local ecosystem scale (Sidney Island and surrounding marine environment). This is the appropriate scale for the desirable effects of ecosystem recovery.			
Ecological Context			
Modified	Resilient	Vulnerable	At risk
Sidney Island and the surrounding marine environment provide significant bird habitats and support many migratory and resident bird species, as well as several Species at Risk (SAR). The island is located on the Pacific flyway for migratory birds in the Americas (Denise Cook Design + Planning et al., 2007). The Hook Spit, Sidney Spit, and lagoon, provide unique habitats within the Southern Gulf Islands, making these areas important foraging and stopover habitat for birds during spring and fall migrations. These important habitats for birds on Sidney Island as well as the Sidney Channel are internationally recognized as an Important Bird Area (IBA). Songbird richness and abundance on Sidney Island is negatively impacted by the deteriorated condition of the forest understory and has the least diverse songbird community in the Southern Gulf Islands region due to browsing by invasive fallow deer (T. G. Martin et al., 2011; Parks Canada Agency, 2020).			
Frequency			
Rare	Occasional	Repeated/Intermittent	Continuous
The frequency of potential impacts on birds from the project will vary by project phase. Phase 1 likely will have a higher frequency of interaction during the short 10-day period. Phase 2 will likely have a lower frequency of interaction as fenced zones are dealt with individually over three-to five- months.			
Predicted Significance			
Negligible	Predictable and manageable	Impacts within threshold, with risk or uncertainty	Impacts exceeds thresholds
Based on the above criteria and the long-term conservation gains that are expected for forest songbirds from forest understory vegetation recovery, the significance of the residual adverse effects is expected to be negligible.			

14.6.3 Conclusion

Through project design, timing, and mitigation measures, the desired outcome for all bird populations will be achieved; direct impacts to birds resulting from the project will be minimized and all bird populations on/surrounding Sidney Island will be maintained.

Although there will be short-term residual impacts on resident/non-migratory birds from Phases 1 and 2 of the project, the significance of residual adverse effects is expected to be negligible, given existing levels of disturbance on the island, the short duration of the project, and the long-term benefits.

Through removal of deer browse, the long-term outcome of the project is expected to result in the desired outcome for songbirds being achieved, with increased native plant species richness and cover in the forest understory leading to increased abundance and richness of songbirds.

The legal obligations of the MBCA and CNPA will be met, however, given the potential residual impacts to the Threatened Western Screech Owl, Marbled Murrelet, and Red Knot, a SARA permit will be acquired. A permit under the BC *Wildlife Act* will also be acquired for the minor, short-term disturbances that are possible for eagles on Sidney Island.

14.7 Black-tailed Deer

14.7.1 Introduction

14.7.1.1 Description of Baseline Conditions

Black-tailed Deer are native to North America, ranging from Texas to California in the south and from Manitoba to Alaska in the north (Hammerson, 2011). The species is considered “secure” globally, within Canada, and within BC (Hammerson, 2011). Black-tailed Deer population densities vary across the Southern Gulf Islands region, but the species is considered abundant within the region and even hyperabundant on several islands within the Gulf and San Juan Islands (Beckett et al., 2022; Blood, 2000; T. G. Martin et al., 2011).

Black-tailed Deer populations can become hyperabundant due to the absence of apex predators, such as Cougar, Black Bear, or Gray Wolf, and due to modern restrictions or prohibitions on hunting (Arcese et al., 2014). Where ungulates like Black-tailed Deer are abundant, they are implicated in the degradation of native vegetation communities and processes, causing cascading ecosystem effects (Côté et al., 2004; Mcshea et al., 2003).

Native Black-tailed Deer, unlike European Fallow Deer, can readily disperse without human-assistance by swimming between islands in Southern Gulf Islands region. This is illustrated in Haida Gwaii where Sitka Black-tailed Deer populations are highly related throughout the entire archipelago, indicating that deer disperse frequently and widely (B. T. Burgess et al., 2022). Distances up to 2.5km between islands do not appear to hinder Black-tailed Deer dispersal in Haida Gwaii (B. Burgess & Russello, 2022).

The current population of Black-tailed Deer on Sidney Island is unknown, but it is small relative to the European Fallow Deer population (Parks Canada Agency, 2021b). This is reflected in the number of

Black-tailed Deer that have been harvested from the in the Sallas Forest Strata Lands between 2017 and 2023 (Table 12) (Hedley, 2022, 2023). Black-tailed Deer are also encountered on a much less frequent basis, further suggesting that they are less abundant than European Fallow Deer (B. Miller, personal communication, May 16, 2023; E. Pelkey, personal communication, 2022).

The population of European Fallow Deer is thought to have contributed to low numbers of native Black-tailed Deer due to competition for resources and negative behavioural interactions. This pattern is observed in other locations where European Fallow Deer interact with other deer species. European Fallow Deer can actively exclude other deer from feeding grounds, interfere with female behavior in spring (which coincides fawning season), and increase vigilance of other deer which reduces their time for foraging. This negatively impacts the survival of other deer (Ferretti et al., 2011; Focardi et al., 2006; Imperio et al., 2012).

Table 12. Annual Number and Percent of Black-tailed Deer Harvested in the Sallas Forest Strata Lands (2017-2023)¹

Year	Total Number of Deer Harvested	Black-tailed Deer	
		Number Harvested	Percent of Total Harvest (%)
2017/18	183	4	2.6
2018/19	100	4	4.0
2019/20	81	3	3.7
2020/21	95	2	2.1
2021/22	92	1	1.1
2022/23	75	9	12

¹(Hedley, 2022, 2023)

14.7.1.2 Project-Valued Component Interactions

Along with the eradication of European Fallow Deer, the project will result in the eradication of a relatively small number of native Black-tailed Deer from Sidney Island (for rationale on the concurrent Black-tailed Deer eradication, see Section 9.3).

14.7.1.3 Desired Outcome

The humane eradication of all deer from Sidney Island leads to sustained forest restoration such that, over the long term, habitat for native Black-tailed Deer is improved and can support a sustainable healthy population of Black-tailed Deer.

14.7.2 Analysis

14.7.2.1 Impacts and Mitigations

14.7.2.1.1 A Relatively Small Number of Individual Black-tailed Deer will be Removed During the Project

To ensure the project’s success, Black-tailed Deer are proposed to be eradicated along with European Fallow Deer from Sidney Island. This has direct impacts on the individual deer being shot. Capturing and penning Black-tailed Deer during the project was initially considered by the project team, however

species and wildlife animal care experts advised that it would be more humane to shoot the deer rather than capture and pen them for the project's duration (for more on rationale, see Section 9.3). While the exact number of individual Black-tailed Deer that will be removed is not known, the population is relatively small compared to European Fallow Deer.

Mitigations

- The project has been designed to limit or avoid suffering by individual deer (i.e., as compared to live capture-translocation or live capture and dispatch; see Section 7.2 for details).
- The professional eradication team is trained and experienced in sharpshooting to ensure accurate and humane killing shots.
- Project methods will be reviewed and approved by the Parks Canada Animal Care Committee, the Province of BC, the BC-SPCA, as well as an international eradication advisory board, prior to implementation.

14.7.2.1.2 The Existing Black-tailed Deer Population on Sidney Island will be Removed

Immediately following the project, and for an undetermined amount of time, there will be no Black-tailed Deer population on Sidney Island. The removal of the Black-tailed Deer will not have any adverse effects from an ecological or species perspective. The absence of all deer on Sidney Island will facilitate the restoration of the understory forest plant community and provide benefits to other species by increasing the availability of food and habitat. The removal of one small population will not have a detrimental impact on the species. Black-tailed Deer are widespread and abundant in the Southern Vancouver Island/Gulf Island region (Beckett et al., 2022; Blood, 2000; T. G. Martin et al., 2011). There is a desire among Indigenous project partners and within the Sallas community to have a healthy Black-tailed Deer population on Sidney Island in the future.

Mitigations

- Black-tailed Deer will be free to naturally re-establish on Sidney Island following the project. There are multiple islands around Sidney Island with robust Black-tailed Deer populations. As Black-tailed Deer readily swim and disperse between islands (Burgess & Russello, 2022), it is anticipated that a population will naturally re-establish on Sidney Island in the years or decades following the project (Parks Canada Agency & SIERP Partners, 2022).
- If Black-tailed Deer do not naturally re-establish, once the ecosystem has recovered sufficiently enough to support a Black-tailed Deer population Parks Canada is willing to meet with SIERP project partners to discuss options for actively repopulating the island with Black-tailed Deer.

"The deer will know when the island has recovered enough to be a good home for them, and that's when they'll come."

- Carl Olsen, representative of the WSÁNEĆ Leadership Council, 2020

14.7.2.1.3 Over the Long-term, Habitat for Black-tailed Deer will be Improved on Sidney Island

Over the longer term, eradication of European Fallow Deer is expected to create improved conditions on Sidney Island which will support a viable, healthy population of Black-tailed Deer. This will be achieved through improved food resource availability and habitat quality for the deer, as well as through the removal of competition and negative behavioural interactions with European Fallow Deer.

14.7.2.1.4 Potential for Re-established Black-tailed Deer to become Hyperabundant on Sidney Island

Given the high potential for Black-tailed Deer to naturally re-establish on Sidney Island and the lack of apex predators, there is potential for Black-tailed Deer to become hyperabundant, as has occurred in populations elsewhere in the Southern Gulf Islands region (Beckett et al., 2022; Blood, 2000; T. G. Martin et al., 2011). As with any deer, the hyperabundance of Black-tailed Deer can negatively impact ecosystems in the Gulf Islands of BC (Arcese et al., 2014; T. G. Martin et al., 2011). Research has shown that limiting deer densities to 0.08 individuals/ha (Arcese et al., 2020) or <0.1 individuals/ha (T. G. Martin et al., 2011) in small island ecosystems is likely to allow the persistence of most palatable plant species. For Sidney Island, this equates to less than 68 to 86 individuals.

Mitigations

- A Black-tailed Deer Management Strategy has been developed by the SIERP Partners to be implemented following the project (Parks Canada Agency & SIERP Partners, 2022). The strategy provides a simple, practical approach that will allow Parks Canada, First Nations, and Sallas Forest Strata residents to collectively monitor the ecological impact of deer browse on Sidney Island to inform management actions (Parks Canada Agency & SIERP Partners, 2022).
- The proposed approach of the Black-tailed Deer Management Strategy is to:
 - Use multiple indicators to determine the relationship between Black-tailed Deer abundance and ecosystem integrity, including monitoring:
 - Browse pressure on vegetation (measurements of browse on- and growth of- shrubs and tree seedlings);
 - Annual deer harvest numbers and hunter effort;
 - Manage the Black-tailed Deer population through community hunts on Sallas Forest Strata lands and First Nations hunts within the park reserve; and
 - Hold periodic meetings with the SIERP Partners to share monitoring results and discuss any necessary changes to hunting intensity.

14.7.2.2 Residual impacts/Uncertainties

With mitigations applied, the project is expected to have adverse residual impacts on Black-tailed Deer on Sidney Island over the short and medium term. The significance of this impact is negligible in the context of the regional Black-tailed Deer population. Over the long term (years or decades), the project is expected to benefit a future population of Black-tailed Deer on Sidney Island. The duration of the Black-tailed Deer eradication is uncertain and will depend on how quickly Black-tailed Deer naturally repopulate Sidney Island, and/or when they may be actively re-populated according to the rate of vegetation recovery. The residual impacts have been assessed using the criteria provided in Table 13.

Table 13. Residual Impact Assessment Criteria for Black-tailed Deer

Duration of Impacts			
Day or less	Weeks	Seasons	Permanent
The eradication of Black-tailed Deer is not intended to be permanent. The duration of their eradication is expected to be at minimum one or two years. It will support vegetation recovery, which will in turn create conditions that can support a future Black-tailed Deer population on the island. Over the long-term, strategies are in place to mitigate the risk of the Black-tailed Deer population becoming hyperabundant.			

Reversibility			
No change	Short Term	Long Term	Irreversible
The eradication of Black-tailed Deer is reversible over the long term as the population is expected to re-establish on Sidney Island; either naturally or through human assistance.			
Ecological Scale			
Site specific	Local feature	Local ecosystem	Population
The project impacts to Black-tailed Deer are limited to the local ecosystem scale (Sidney Island). This is the appropriate scale for the desirable effects of ecosystem recovery.			
Ecological Context			
Modified	Resilient	Vulnerable	At risk
The provincial status of Black-tailed Deer is secure, and the species is hyperabundant elsewhere in the Southern Gulf Islands region. As a result, the eradication of the small population on Sidney Island is not considered significant. Their eradication from Sidney Island supports the recovery of a degraded ecosystem, which over the long term, is expected to support a healthy population of Black-tailed Deer.			
Frequency			
Rare	Occasional	Repeated/Intermittent	Continuous
Eradication of Black-tailed Deer will occur only once, during the project.			
Predicted Significance			
Negligible	Predictable and manageable	Impacts within threshold, with risk or uncertainty	Impacts exceeds thresholds
<p>Direct impacts to individual Black-tailed Deer have been mitigated through the selection of humane, animal care-committee-approved methods.</p> <p>Impacts to the Black-tailed Deer population on Sidney Island have been addressed through commitments that have been made to ensure Black-tailed Deer are re-established on Sidney Island in the years or decades following the project, either through natural immigration or through the development and implementation of a formal plan for reintroduction. Following their re-establishment, hyperabundance of Black-tailed Deer will be prevented through implementation of the Black-tailed Deer Management Plan. As a result, the residual adverse effects are predictable and manageable on Sidney Island.</p>			

14.7.3 Conclusion

The desired outcome will be achieved; the humane eradication of all deer from Sidney Island is expected to facilitate forest restoration such that the habitat will be able to support a sustainable healthy Black-tailed Deer population.

The significance of short- to medium-term residual adverse impacts to Black-tailed Deer are negligible.

In the long term, the habitat for Black-tailed Deer on Sidney Island is expected to improve.

Black-tailed Deer are expected to naturally re-establish on Sidney Island. Parks Canada has also committed to discussing actively re-establishing Black-tail Deer on Sidney Island, once the ecosystem has recovered sufficiently.

A Black-tailed Deer Management Strategy has been developed by the SIERP Partners to prevent a re-established population from becoming hyperabundant on Sidney Island.

14.8 Foothill Sedge

14.8.1 Introduction

14.8.1.1 Description of Baseline Conditions

Foothill Sedge is a slow-growing and long-lived perennial evergreen plant native to western North America from southern BC to central California (COSEWIC, 2008a). While considered stable in the United States, Foothill Sedge is currently listed as Endangered under Schedule 1 of the *SARA* in Canada. COSEWIC re-assessed Foothill Sedge in 2022 and down-listed its status to Special Concern, however, the status under *SARA* has yet to be updated (Government of Canada, 2022b).

Southern BC represents the northern edge of Foothill Sedge's range. It grows in moderately moist to moist meadows and associated Garry Oak woodlands unique to the semi-Mediterranean climate of southeastern Vancouver Island, BC (COSEWIC, 2008a). Foothill Sedge flowers and fruits in mid- to late summer (COSEWIC, 2008a). Threats to Foothill Sedge include habitat conversion, encroachment by other native and invasive plant species, recreational and land management activities, grazing, and erosion/bank slumping (COSEWIC, 2008a).

There are estimated to be several thousand mature Foothill Sedge individuals in BC, occurring in 16 different populations (Government of Canada, 2022b). One of the populations in BC occurs on Sidney Island, where critical habitat has been mapped in the field areas adjacent to the campground. Although the Sidney Island population currently experiences disturbance from deer and high levels of recreational activities within the Campground Field, surveys completed in 2011 and 2014 suggest the population is stable (Parks Canada Agency, 2018b). Invasive English Hawthorn is establishing and degrading the habitat in this area and is a threat to Foothill Sedge on Sidney Island. Ecosystem restoration, including the management of woody invasive species like English Hawthorn, is one of Parks Canada's approaches to achieving the recovery objectives for Foothill Sedge (Parks Canada Agency, 2018b).

14.8.1.2 Project-Valued Component Interactions

Critical habitat for Foothill Sedge, as well as individual plants, in the Campground Field have the potential to be impacted by ground operations occurring during the project. There is also the potential for invasive species, which are already present in the area, to increase further following the project.

14.8.1.3 Desired Outcome

Foothill Sedge critical habitat and individuals remains undisturbed throughout the project such that the population is maintained. In the long term, invasive plant species in the critical habitat, do not increase in abundance or cover following the deer eradication.

14.8.2 Analysis

14.8.2.1 Impacts and Mitigations

14.8.2.1.1 Potential Impacts to Foothill Sedge Critical Habitat from Ground Operations

Short-term impacts to Foothill Sedge critical habitat could occur during project ground operations. The tent camp accommodations in Phase 1, some vehicle parking, and equipment storage areas will be located within Foothill Sedge critical habitat in the Campground Field. Although potential impacts could include soil compaction, disturbance, increased erosion, or potential introduction or spread of invasive

plant species, the impacts are expected to be negligible relative existing conditions given that the Campground Field is an active campground.

Mitigations:

- Wooden planks or boards will be laid down over soft ground surfaces, wherever necessary, to minimise creating ruts.
- Site reclamation (i.e., seeding any bare/disturbed soil with native species) will take place following the project, as necessary.
- GINPR clean equipment protocols will be implemented to reduce the potential for introducing or spreading invasive species within the Foothill Sedge critical habitat.
- Given the potential, albeit small, risk of impacts to individual Foothill Sedge plants during ground operations, a SARA permit will be acquired.

14.8.2.1.2 Potential Impacts to Foothill Sedge Individuals from Ground Operations

Short-term impacts to Foothill Sedge individuals could occur during project ground operations. Plants could be crushed or damaged by temporary accommodation camps or equipment storage areas, or they could be damaged or trampled by vehicles, ATVs, ground crews, or canines.

The potential impacts from ground operation disturbances and trampling on individuals are not anticipated to be severe. This is because Foothill Sedge is considered stable on Sidney Island despite already being subject to ongoing trampling by deer and high levels of recreational use. In addition, in horticultural/garden settings Foothill Sedge is known to be a “tough”, “durable” species that is tolerant of trampling and is often mowed and used as a lawn substitute (Gardenia, 2023; Missouri Botanical Garden, 2023). Despite its hardiness, with equipment being stored and project staff potentially staying within the critical habitat area, there remains a small chance that individual Foothill Sedge plants could be damaged during ground operations.

Mitigations

- The project is occurring outside the Foothill Sedge’s active growing and reproduction period.
- Accommodations for project team members, vehicle parking, and equipment storage areas will be set up away from areas where Foothill Sedge is known to occur.
- Prior to any ground operations occurring, locations known to have high densities of Foothill Sedge will be fenced-off using highly visible orange plastic snow fencing. Like the temporary fencing described in Section 9.5.1, the snow fencing will be attached either to trees or to free-standing posts set into boat stands or umbrella stands (not pounded into the ground). This fencing will ensure that the areas occupied by Foothill Sedge are visible and can be avoided.
- The project team will be provided with maps of known Foothill Sedge locations so they can be avoided during operations.

14.8.2.1.3 Potential Impacts on Foothill Sedge from Increased Invasive Species After Deer Removal

Impacts to Foothill Sedge could arise in the years or decades following the project from competition with invasive plant species, which could increase in abundance and distribution following the deer eradication. English Hawthorn could be especially problematic for Foothill Sedge given that it is currently very abundant in open fields on Sidney Island and occurs within Foothill Sedge critical habitat.

Mitigations:

- The mitigations for reducing impacts to Foothill Sedge from increases in invasive species will largely be the same as for forest understory vegetation. These include proactive management of invasive species and implementing an adaptive management approach following the project to monitor and manage invasive species. For more details, see Section 14.5.2.1.3.
- GINPR clean equipment protocols will be implemented during the project to ensure that materials and equipment are cleaned before being used on the island, as well as between sites, on the island, as appropriate. This will reduce the potential for introducing or spreading additional invasive species within the Foothill Sedge critical habitat.
- The project team will survey known Foothill Sedge locations post-operation to observe any short-term impacts to existing populations. Post-project, Foothill Sedge populations are anticipated to be monitored every three years by the GINPR Ecological Integrity team.

14.8.2.2 Residual impacts/Uncertainties

Short term impacts from ground operations during the project will largely reduced through the implementation of mitigations measures, although a there remains a very small chance that individual plants could be trampled or damaged during ground operations of the project.

Long-term effects of the deer eradication on Foothill Sedge from increased invasive species abundance and cover are possible but are mitigated through proactive management of invasive English Hawthorn and Parks Canada’s long-term adaptive management approach for controlling invasive species.

See Table 14 for an assessment of residual impacts.

Table 14. Residual Impact Assessment Criteria for Foothill Sedge

Duration of Impacts			
Day or less	Weeks	Seasons	Permanent
The duration of residual impacts from ground operations during the project will be short term, occurring only during the project.			
Day or less	Weeks	Seasons	Permanent
The duration of residual impacts from potential increases in invasive species on Sidney Island is unknown, however provided that mitigation measures are implemented (proactive management of key invasive species, and Parks Canada’s adaptive management strategy), the effects are not anticipated to be permanent.			
Reversibility			
No Change	Short Term	Long Term	Irreversible
Given that Foothill Sedge is known to be a “tough”, “durable” species that is tolerant of trampling and disturbance, and that the population is currently thought to be stable, the duration of residual impacts from ground operations is anticipated to be short term and highly reversible.			
No Change	Short Term	Long Term	Irreversible
The duration of residual impacts from potential increases in invasive species on Sidney Island is unknown and could be long term. Provided that mitigation measures are implemented (proactive management of key invasive species, and Parks Canada’s adaptive management strategy), however, the effects are not anticipated to be permanent.			
Ecological Scale			
Site Specific	Local Feature	Local ecosystem	Population
The project impacts to Foothill Sedge are limited to the local ecosystem scale (Sidney Island). This is the appropriate scale for the desirable effects of ecosystem recovery.			

Ecological Context			
Modified	Resilient	Vulnerable	At Risk
Within Canada, there are only 16 known populations of Foothill Sedge, all of which occur in BC (COSEWIC, 2008). Therefore, the population on Sidney Island is significant in the broader ecological context and is at-risk from the proposed project.			
Frequency			
Rare	Occasional	Repeated/Intermittent	Continuous
The frequency of residual impacts from ground operations during the project will be occasional, occurring only during the project.			
Rare	Occasional	Repeated/Intermittent	Continuous
Potential impacts from invasive species following the project will be ongoing and “continuous” in the absence of deer browse. The long-term implementation of Parks Canada’s adaptive management strategy, which includes monitoring and a response framework, will be key to controlling the impacts from invasive species in the Sidney Island forest understory.			
Predicted Significance			
Negligible	Predictable and Manageable	Impacts within Threshold, with Risk or Uncertainty	Impacts Exceeds Thresholds
The project is expected to achieve the desired result of avoiding disturbance to critical habitat of Foothill Sedge from the project. Although undesirable impacts from increases in invasive plant species following the project are possible, these impacts are anticipated to be largely manageable, provided Parks Canada’s adaptive management strategy continues over the long term.			

14.8.3 Conclusion

Short term impacts from ground operations during the project will largely reduced through the implementation of mitigations measures, although a there remains a very small chance that individual plants could be trampled or damaged during ground operations of the project.

Following the project, potential impacts from increases in invasive species, particularly from English Hawthorn, will be mitigated through proactive management of English Hawthorn prior to the project, and ongoing adaptive management of invasive species.

Given the potential, albeit small, risk of residual impacts to individual Foothill Sedge plants during ground operations, a SARA permit is required for Foothill Sedge.

14.9 Other Terrestrial Mammals

14.9.1 Introduction

14.9.1.1 Description of Baseline Conditions

14.9.1.1.1 Species at Risk

Four mammal species listed on SARA Schedule 1 may occur on Sidney Island or in the surrounding marine environment for at least some portion of their annual cycle. See (Appendix 3) for a list of these species, their statuses, habitat requirements, and habitat use on/around Sidney Island.

14.9.1.1.2 Bats

There are nine bat species that may occur on Sidney Island (iNaturalist, 2023; Stephanie Coulson, personal communication, March 7, 2023), including one species listed as Endangered on SARA Schedule 1 (Little Brown Myotis (*Myotis lucifugus*)) (B.C. Ministry of Environment, 2016; Government of Canada, 2021a) (see Appendix 3 for additional information on Little Brown Myotis).

Bats are active from approximately April until November, with peak activity periods occurring in June/July when they give birth, and in September, with mating and feeding/fattening for hibernation (B.C. Ministry of Environment, 2016). Bats require roosting and foraging/drinking habitats, which can vary by species and season. Roosting habitats include dead and dying trees, stumps, or furrows on the surfaces of live trees (Silver-haired Bat). Bats in BC are largely aerial insectivores, so foraging habitats are those with plentiful insect populations, such as wetlands, riparian habitats, streams, etc. (B.C. Ministry of Environment, 2016).

Bats generally hibernate from November until end of March (B.C. Ministry of Environment, 2016) in buildings, mines, caves, or rock crevices (B.C. Ministry of Environment, 2016). Four of the bat species with the potential to occur on Sidney Island may have suitable hibernation habitat on Sidney Island, either in buildings (Big Brown Bat (*Eptesicus fuscus*), California Myotis (*Myotis californicus*), Long-eared Myotis (*Myotis evotis*), Yuma Myotis (*Myotis yumanensis*)) or rock crevices (Big Brown Bat) (B.C. Ministry of Environment, 2016). Migratory bat species (Northern Hoary Bat (*Lasiurus cinereus*) and Silver-haired Bat (*Lasionycteris noctivagans*)), typically arrive back in BC in May and June (Brigham, 2021) and migrate south in late August or early September (B.C. Ministry of Environment, 2016).

14.9.1.1.3 Other Terrestrial Mammals

In addition to Black-tailed Deer, five other common native mammals are known to occur on Sidney Island: American Mink (*Neogale vison*), North American River Otter (*Lontra canadensis*), Common Raccoon (*Procyon lotor*), American Red Squirrel (*Tamiasciurus hudsonicus*), and Deer Mouse (*Peromyscus maniculatus*). Cougars and Vancouver Coastal Sea Wolves (*Canis lupus crassodon*), are also occasionally present on the island (iNaturalist, 2023; Stephanie Coulson, personal communication, March 7, 2023), although the island is too small to support resident populations.

These species inhabit the forest, wetland, and shoreline habitats that occur across Sidney Island. Two of the mammal species, North American River Otter and American Red Squirrel, are diurnal (active during the day), while the other three species are crepuscular (active at sunrise and sunset). All five species are active throughout the year (NatureServe, 2023g, 2023f, 2023i, 2023j, 2023h). American Mink and North American River Otter are carnivores/piscivores, while Common Raccoon is an opportunistic omnivore, and American Red Squirrel, and Deer Mouse are granivores/frugivores (NatureServe, 2023g, 2023f, 2023i, 2023j, 2023h).

14.9.1.2 Project-Valued Component Interactions

All mammal species that are active throughout the year on Sidney Island have the potential to be affected by project activities. Given that there are no anticipated long-term effects from the project and there are no more complex interactions, mammals are considered a low-risk VC. Therefore, a less-detailed analysis of impacts has been completed.

Bats are not expected to be active during the winter months when Phase 1 and 2 are proposed to occur. Four bat species may have hibernation habitat on Sidney Island either in buildings or rock crevices,

however, these habitats are not anticipated to be disturbed during the project. Phase 2 preparation, contingency, and demobilization periods may overlap with the bat active period, however, ground operations during Phase 2 are not anticipated to negatively impact bats in their roosting sites or foraging habitats. Therefore, Bats are not considered in the analysis.

14.9.2 Analysis

14.9.2.1 Impacts and Mitigations

14.9.2.1.1 Impacts from Aerial Operations

The helicopter used during Phase 1 operations of the project has the potential to impact all terrestrial mammals active during the winter. Disturbances from helicopter include the loud noise and/or rapid movements of the helicopter and the high velocity downwash air currents created by the helicopter flying low over the landscape. Crepuscular mammals could be impacted by the morning and dusk helicopter flights, while night-flights could specifically impact nocturnal mammals (American Mink, Common Raccoon, and North American Deer Mouse) by disrupting night-time activity and foraging.

Mitigations:

- Helicopter flights in Phase 1 will be limited to 10 days within a two-to-three-week window, thereby limiting the duration of potential impacts.

14.9.2.1.2 General Impacts from Ground Operations

The effects of human-caused disturbances on mammals depend on the type, intensity, and extent of disturbance and vary between species, but in general long-term disturbances can lead to a loss of functional diversity and result in a shift to nocturnal behavior of mammals, particularly by omnivores and carnivores (Li et al., 2022). Increased noise in the environment can result in altered vocal behaviour, reduced abundance (i.e. preference for less noisy habitats), impacts on individual fitness, and changes in vigilance, foraging behaviour, and overall structure of ecological communities (Shannon et al., 2016).

Ground operations during the project (including Phase 2 preparations, contingency, and demobilization) have some potential to disturb terrestrial mammals through noise (from gunshots, team members, dogs, generators, trucks, ATVs, and noise machines at fence ends), and the physical presence of project team members and dogs in the forest and other habitats. If used, high-powered spotlights also have the potential to disturb nocturnal terrestrial mammals. However, ground operations are not expected to result in a significant increase in disturbances relative to pre-existing baseline levels of disturbance on Sidney Island (see Section 14.6.2.1.5 and Table 10).

Mitigations:

- The project has been designed such that potential impacts will be short term:
 - Phase 1, the more intense portion of the project, will occur for only approximately 10 days within a two-to-three-week window in November and December;
 - Phase 2, the less intense portion of the project, will last approximately three to five months between October 2024 and March 2025.
- All firearms used during the project will have noise suppressors to reduce the noise level of the gunshot as much as possible.

14.9.2.1.3 Impacts from Altered Foraging Behaviour

Normal foraging and movement patterns of terrestrial mammals may be impacted during the project as bait stations, deer carcasses, and entrails from field-dressed deer may attract or habituate wildlife.

Mitigations:

- The length of deployment of the bait stations as well as the amount of bait used will be restricted to the three to five-month period of Phase 2, to minimize long-term impacts on habituation of non-target wildlife.
- Bait stations will be cleaned and remediated following their use.
- The carcass recovery team will locate, field dress, and retrieve deer as many deer carcasses as possible for human consumption.

14.9.2.1.4 Impacts from Temporary Fencing

Temporary fencing used during Phase 2 of the project may impede movement by terrestrial mammals, or result in entanglements, which could result in injuries or mortalities.

Mitigations:

- No entanglements of any wildlife were observed during trials completed by Parks Canada from December 2021-February 2022 (see Section 7.1).
- The aquaculture netting used for the temporary fencing is visible to terrestrial mammals, has a large mesh size (approximately 20cm² mesh), to allow smaller mammals to pass through, and the fencing will be installed as taut as possible to reduce the risk of entanglements.
- Given that no entanglements were observed during the Parks Canada temporary fencing trial, surveys of the fence lines for entangled wildlife are not thought to be necessary. However, if an entanglement is observed, fence surveys will be initiated immediately to ensure entangled wildlife are rapidly detected and released. Parks Canada staff will also examine the fence to determine whether changes to the fence are required to prevent future entanglements.

14.9.2.2 Residual impacts/Uncertainties

The presence of bait stations, deer carcasses and entrails, may affect terrestrial mammals, however, the duration of impacts is short, and no long-term effects are anticipated.

14.9.3 Conclusion

Impacts to terrestrial mammals have largely been avoided or reduced through project design and mitigation measures.

Ground operations during the project not expected to result in a significant increase in disturbances to terrestrial mammals relative to baseline levels of disturbance on Sidney Island.

The presence of bait stations, deer carcasses and entrails, may affect terrestrial mammals, however, the duration of impacts is anticipated to be short.

Over the long term, terrestrial mammals will benefit from the forest restoration through increased availability of food and habitat, and overall terrestrial mammal populations on Sidney Island will be maintained.

14.10 Visitor Experience

14.10.1 Introduction

14.10.1.1 Description of Baseline Conditions

The Sidney Island park reserve is a well-known and beloved destination. The GINPR 2005 Survey of Visitors and Residents estimated that nearly 16,000 visitors come to the Sidney Spit during from June through early September, data that was supported by 2006 ferry ticket sales and camping, mooring buoy and dock registrations. Recent estimates are that the annual number of visitors now exceed 25,000 people (D. Gray, personal communication, 2021). The range of recreational activities currently enjoyed by visitors to GINPR include boating, including mooring boats, kayaking, camping, hiking, picnicking, beach exploration, walking dogs, photography, scuba diving, geocaching, birdwatching, whale/marine mammal viewing, crabbing, and recreational fishing (Parks Canada Agency, 2010).

14.10.1.2 Project-Valued Component Interactions

The proposed project may have an impact on visitor experience by temporarily disrupting visitor use of the Sidney Spit and campgrounds during off-peak visitation periods (in Phases 1 and 2).

Although the recreational enjoyment (viewing) of deer on Sidney Island may also be altered as a result of the project, with no deer on Sidney Island after the eradication, this is unlikely to affect visitor experience as visitors are currently unlikely to see deer during their time in the park reserve. Deer on Sidney Island are very shy and tend to stay away from areas of high visitor use (M. Janssen, personal communication, May 11, 2023c). Therefore, any changes to recreational enjoyment of deer by park visitors, through the eradication of deer, is not considered a project-VC interaction. Following completion of the project, recreational enjoyment of all other wildlife is expected to increase due to increased abundance and quality of wildlife habitat.

There are no anticipated long-term effects from the project and no complex interactions. Therefore, visitor experience is considered a low-risk VC and a less-detailed analysis has been completed.

14.10.2 Analysis

14.10.2.1 Impacts and Mitigations

The park reserve (including mooring buoys adjacent to Sidney Island) will be temporarily closed to visitors during the operational periods of Phase 1 and 2 for safety reasons. For Phase 1 this will include approximately 10 days over a two-to three-week period starting in November, with the intention of being completed by the end of December 2023. For Phase 2 the park reserve closure will be daily for a three- to five- month period between October 2024 and March 2025, with a potential extension into April 2025. No park reserve closures will be necessary during project preparation (July to October 2024) or demobilization periods (April to May 2025).

When the park re-opens to visitors following each phase of the eradication, the temporary storage of equipment (fences, storage containers) may detract from visitor enjoyment during the short term. Following the project, signs of the eradication, such as carcasses, skeletal remains of deer, or leftover bullet casings (the majority will be collected and removed) may disturb visitors, if observed.

Mitigations:

- To reduce impacts to park visitors, Phases 1 and 2 will occur during the typical Indigenous deer hunting season, when the park reserve is already closed to visitors, and outside the peak visitation period from June to early September.
- The carcass recovery team will locate, field dress, and retrieve as many deer carcasses as possible, especially in areas that are accessible and likely to be frequented by visitors.
- The project team will contain bullet casings as much as possible during aerial operations and will retrieve bullet casings during ground operations.
- The project will build awareness and support through outreach and education about ecological integrity and the impacts of invasive species on Indigenous culturally important plants, culture, and native ecosystems. Outreach and education could include publishing information on Parks Canada's website, on social media, posting interpretive signs on the island, and working with project partners to discuss the project with the public (e.g., Shaw Centre for the Salish Sea).
- In the years or decades following the project, opportunities for the recreational enjoyment of native flora and fauna on Sidney Island are expected to increase due to forest ecosystem recovery and increased abundance and quality of wildlife habitat.

14.10.2.2 Residual impacts/Uncertainties

Impacts to visitor experience from project operations will be short term and largely reduced or avoided through project design and mitigation measures; no significant residual impacts are anticipated.

14.10.3 Conclusion

The quality of visitor experience to Sidney Island will be maintained; project operations will be short term and will largely avoid the peak visitation periods; no residual impacts are anticipated.

In the years or decades following the project, visitor experience is expected to be enhanced through the opportunity for visitors to experience a recovered forest ecosystem with increased abundance and richness of native flora and fauna.

15 Follow-up Monitoring and Adaptive Management

As discussed throughout this DIA, several monitoring and adaptive management plans have or will be developed to evaluate, monitor and manage changes to multiple ecosystem components that may result from the project. These plans are summarized below and are discussed in the relevant sections throughout the DIA.

- **Biosecurity Plan** – This long-term plan will be developed to detect potential future European Fallow Deer reinvasions on Sidney Island, and to provide guidelines for a rapid response to a reinvasion (see Section 9.11 for details).
- **Sidney Island Scotch Broom Management Plan** (Maslovat & Archer, 2022) – This plan identifies priority management areas across Sidney Island and describes site-appropriate methods for invasive species removal.
- **Forest Understory Health Monitoring** - Changes in vegetation following European Fallow Deer eradication will be monitored through GINPR’s ongoing Ecological Integrity monitoring program. The FUH measure is currently being redesigned to include parameters which better capture and monitor changes to forest health (see Section 14.5.2.1.3 for details).
- **Monitoring and Stewardship Plan for Deer Enclosures for Sidney Island** – Project partners developed this plan to maintain and monitor vegetation within deer enclosures on Sidney Island (SIERP Steering Committee & Parks Canada Agency, 2022). The data collected in deer enclosures may provide a useful reference as the forest ecosystem recovers following deer eradication.
- **Songbird Monitoring** – The abundance and richness of songbirds on Sidney Island will continue to be monitored every three years by the GINPR Ecological Integrity team following the project.
- **Black-tailed Deer Management Strategy** – This strategy has been developed to monitor Black-tailed Deer on Sidney Island following their re-establishment in the future and lays out an adaptive management framework for preventing the species from becoming hyperabundant (see Section 14.7.2.1.4 for details).
- **Foothill Sedge Monitoring** – The *Multi-Species Action Plan for Gulf Islands National Park Reserve* (Parks Canada, 2018) includes the monitoring of Endangered Foothill Sedge every three years.

16 Detailed Impact Assessment Determination

Sidney Island has a population of invasive, European Fallow Deer that is negatively impacting the ecological integrity of the forest ecosystem. Decades of over-browsing by European Fallow Deer has degraded the forest understory and resulted in decreased abundance and diversity of native plants and wildlife, including the near or total loss of many native and culturally significant understory plant species, a significant reduction of songbird abundance and diversity, and a reduction of the native Black-tailed Deer population. Academic monitoring and Parks Canada’s ecological integrity monitoring have both identified Sidney Island as the least biologically diverse island in the Southern Gulf Islands region.

The northern portion of Sidney Island is within Parks Canada’s GINPR. Parks Canada and project partners have collaboratively developed shared goals and objectives for the conservation and recovery of the Sidney Island forest ecosystem. A key component is the proposed eradication of European Fallow Deer. This will be accomplished by a professional eradication team in two phases which include aerial and ground operations over 10 days in November and December 2023 (Phase 1) and professional marksmen and trained canine/handler teams completing the eradication operation on foot over three- to five-

months between November 2024 and March 2025 (Phase 2). Temporary fencing will be used during Phase 2 to limit the deer's movements on the island. A third phase immediately following Phase 2 will include the ongoing implementation of an adaptive management plan to ensure the island remains fallow deer-free. Alternatives to the project, including alternatives to deer eradication and alternative methods for carrying out the deer eradication, and were found to not be feasible based on technical, economic, and operational considerations, as well as preferences of the project team.

This DIA analysis makes a determination of the potential adverse impacts of the proposed project on key VCs on the federal lands of Sidney Island (GINPR). The VCs determined to have potential interactions with the project are and the conclusions of each analysis are summarized below.

Indigenous Harvest of Deer: Native Black-tailed Deer, the preferred target species for Indigenous hunters, have been reduced on Sidney Island due to competition with European Fallow Deer. Over the short term, the project will disrupt the Indigenous harvest of deer on Sidney Island. This will be mitigated by opportunities for Indigenous harvest of deer prior to Phases 1 and 2 and the distribution of deer meat and hides from the project to local First Nation communities. Project partners have a shared interest in the re-establishment of native Black-tailed Deer to Sidney Island, providing it does not compromise vegetation recovery. In the years or decades following the project, the project is expected to benefit Black-tailed Deer, which will support Indigenous hunting on Sidney Island.

Indigenous Culturally Important Plants: The restoration of the forest understory is intended to create conditions that will support a greater abundance of culturally important plants, thereby supporting traditional practices for local First Nations communities. Although undesirable effects from invasive species are possible, mitigations are in place to reduce the risk and the balance of effects is expected to heavily favour improvements in ecological integrity for culturally important plants. Additional strategies such as enclosure planting of culturally important species also support the desired outcome for culturally important species. As for understory vegetation in general, the risk of residual adverse effects is low in the context of expected long-term ecosystem recovery.

Indigenous cultural artifacts and culturally significant sites on Sidney Island demonstrate the long and continuous ties of W̱SÁNEĆ, Quw'utsun, and other local First Nations to the Southern Gulf Islands. The project has been designed to minimize ground disturbance, so the risk to subsurface cultural artifacts is low. The two instances of ground disturbance (digging a shallow trench and using tent pegs for temporary fencing) will only occur in areas identified as low risk by Parks Canada Terrestrial Archaeologists and W̱SÁNEĆ cultural monitors. Mitigations are identified to avoid and minimize the risk of disturbance to known sites, appropriately manage accidental finds of cultural artifacts, and ensure appropriate behaviour in spiritually important locations. No residual adverse effects are predicted.

Forest understory vegetation is expected to increase in species richness and cover as a result of the removal of deer browse pressure. Some localized and short-term residual impacts from the project are possible, however the significance of residual adverse effects is negligible. The removal of deer browse pressure will allow understory species to flourish and successful shrub and tree regeneration. The growth of invasive plant species, primarily in open fields and forest-field transition zone, is a possible undesirable outcome of deer browse removal. Proactive control of English Hawthorn and Scotch Broom are expected to mitigate the risk of their expansion following the project. Ongoing monitoring of native and non-native species responses in the understory, and adaptive management will also help to facilitate the recovery of the forest understory and forest ecosystem processes.

Birds may be experience short-term disturbances during the project. Phase 1 is expected to cause short-term disturbances to resident birds and, although unlikely, if Phase 1 occurs after January 1st, nesting owls and Bald Eagles could be disturbed. Impacts from ground operations are generally insignificant in the context of baseline levels of disturbance on Sidney Island, however minor disturbances to birds in Phase 2, could include the noise and presence of ground crews and canines during higher than normal “hunting days” and altered bird foraging due to bait stations and deer carcasses or entrails. The significance of residual adverse effects is expected to be negligible given existing levels of disturbance on the island, the short duration of the project, and the expected long-term benefits for songbirds.

The legal obligations of the *Migratory Birds Convention Act (MBCA)* and *Canada National Parks Act (CNPA)* will be met, however, given the potential residual impacts to the Threatened Western Screech Owl (*Megascops kennicottii*), Marbled Murrelet (*Brachyramphus marmoratus*), and Red Knot (*Calidris canutus roselaari*), a *Species at Risk Act (SARA)* permit will be acquired. A permit under the *BC Wildlife Act* will also be acquired for the possible minor, short-term disturbances to nesting eagles.

Black-tailed Deer will also be eradicated from Sidney Island during the project. The project has been designed to limit or avoid suffering by individual deer through the implementation of humane methods. Given that the species is secure and even hyperabundant elsewhere in the Southern Gulf Islands region, the eradication of the small population on Sidney Island is not considered significant. In the years or decades following the project it is anticipated that Black-tailed Deer will naturally re-establish on Sidney Island. Parks Canada is committed to facilitating a collaborative planning process for Black-tailed Deer reintroduction if natural re-establishment does not occur. The absence of European Fallow Deer and resulting vegetation recovery will create improved ecosystem conditions for a future re-established population. To prevent a future re-established population from becoming hyperabundant on Sidney Island (as is the case elsewhere in the region), a management strategy has been developed.

Foothill Sedge is an Endangered species with critical habitat in the field areas adjacent to the Sidney Island campground. Short term impacts from ground operations will be reduced through mitigations, although there is a very small chance that individual plants could be damaged and, as such, a SARA permit will be acquired for Foothill Sedge. Long-term effects of the deer eradication, from increases in invasive species, are possible but are being mitigated through proactive management of English Hawthorn and adaptive management. The project team will also survey known Foothill Sedge locations after the project to document any short-term impacts. Following the project, Foothill Sedge populations are anticipated to be monitored every three years by the GINPR Ecological Integrity team.

Terrestrial Mammals: Impacts to terrestrial mammals have largely been avoided or reduced through project design and mitigation measures. Some ground operations, such as increased human presence, noise, and bait stations, deer carcasses and entrails, may have short-term impacts on terrestrial mammals, however, these are not expected to be significant given pre-existing baseline levels of disturbance on Sidney Island and the short duration of impacts. No long-term effects are anticipated. In the years or decades post-project, terrestrial mammals are expected to benefit from the forest recovery.

Visitor experience will be temporarily disrupted by the project, although operations will be short term and will largely avoid the peak visitation period to the island. Additional mitigation measures to limit impacts to the island’s aesthetics (e.g., collecting bullet casings and deer carcass recovery) ensure that there are no significant residual impacts. The project will provide a unique opportunity for visitors to learn about ecological integrity and restoration. In the years or decades following the project, visitors

will be able to experience a recovered native forest ecosystem with increased abundance and richness of native flora and fauna.

Taking into account the careful project design and implementation of mitigation measures outlined in the DIA, Parks Canada has determined that the project is not likely to cause significant adverse environmental effects on federal lands. This notice of determination is being issued by Parks Canada under the *IAA*. While the project activities and mitigations generated by the DIA may be applied across the entire project area, the decision on the significance of adverse effects and approval of the DIA apply only to the portion of Sidney Island that is within Parks Canada's authority.

Project partners, WSÁNEĆ First Nations, Member Bands of Quw'utsun Nation, First Nations with an interest in Sidney Island, stakeholders and the public will be consulted on the draft DIA. Feedback will be considered and incorporated into the DIA, as appropriate.

DRAFT

17 Recommendation and Approval

Prepared by:

Jennifer McCarter, Impact Assessment Scientist

Date (YYYY/MM/DD)

Recommended by:

Project Manager

Date (YYYY/MM/DD)

Recommended by:

Park/Site Manager III

Date (YYYY/MM/DD)

Approval signature:

Approver

Date (YYYY/MM/DD)

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Appendix 1 Public Feedback

Public Feedback		Summary of Initial Response from Parks Canada ¹	Relevance to the Project/Detailed Impact Assessment (DIA)	Changes to the Project/DIA
Theme	Description			
Project Context	<ul style="list-style-type: none"> How does the project align with other deer management and/or restoration plans in the region? How will the restoration contribute to regional, national, or even global conservation goals? 	<ul style="list-style-type: none"> Although there are currently no other European Fallow Deer (<i>Dama dama</i>) management projects occurring in the Gulf Islands, the project has been informed by other island invasive mammal management projects from around the world. The Sidney Island forest recovery will contribute to protecting Coastal Douglas-fir ecosystem, which is one of the most endangered ecosystems in Canada. 	<ul style="list-style-type: none"> The issues raised through this feedback were considered by Parks Canada (Parks Canada) and Sidney Island Ecological Restoration Project (SIERP) partners during the initial scoping of the project. 	<ul style="list-style-type: none"> None
Restoration Without Eradication	<ul style="list-style-type: none"> Are the vegetation recovery components of the proposal contingent on the eradication of European Fallow Deer? Are future collaborative restoration initiatives between Parks Canada and Sidney Islanders contingent on the eradication of European Fallow Deer? 	<ul style="list-style-type: none"> Parks Canada has been clear that the funding for vegetation recovery outside the park reserve will not be continued unless there is an approved plan to eradicate European Fallow Deer; it would not be a good use of taxpayer dollars to proceed with new plantings if they are likely to be eaten by the deer. Parks Canada welcomes opportunities to work collaboratively with communities such as those on Sidney Island on an ongoing basis, even if funding is not available. 	<ul style="list-style-type: none"> These concerns do not affect the proposed deer eradication project. 	<ul style="list-style-type: none"> None
Ecological Justification for Eradication	<ul style="list-style-type: none"> Respondents inquired whether there was enough evidence to demonstrate that eradication is necessary in order to achieve forest recovery, or whether alternative means of wildlife control be used to support the same recovery outcomes as eradication (without removing European Fallow Deer). Can forest recovery take place with the presence of a small herd (and if so, how small)? 	<ul style="list-style-type: none"> While reduction of the European Fallow Deer population has already enabled some ecosystem recovery, SIERP Partners were clear that eradication is required for full recovery. Historically, the deer population has always rebounded if culling or hunting pressures are reduced. European Fallow Deer are not native, have demonstrated their ability to significantly degrade forest ecosystems, and are likely to rebound if not eradicated completely. 	<ul style="list-style-type: none"> The issues raised through this feedback were considered by Parks Canada and SIERP Partners during the initial scoping of the project, however alternatives to deer eradication are considered within the DIA. 	<ul style="list-style-type: none"> Parks Canada and SIERP Partners thoroughly considered alternatives to deer eradication. For more information see Section 7.



Public Feedback		Summary of Initial Response from Parks Canada ¹	Relevance to the Project/Detailed Impact Assessment (DIA)	Changes to the Project/DIA
Theme	Description			
Consideration of Alternative Means of Population Reduction	<ul style="list-style-type: none"> • Are there alternative management options (e.g., translocating European Fallow Deer to other areas; ongoing control via hunting; non-lethal control options; no control at all)? • What about the moral implications of eradication? • Most of this feedback indicated that eradication should be considered as a last resort, if and when other management options are not sufficient to achieve the recovery objectives outlined, and only if justified. 	<ul style="list-style-type: none"> • Parks Canada policy is that alien species that negatively impact ecosystems should be removed (eradicated) as a first option. • Other options are only considered if eradication is not socially or logistically feasible. • There are ethical considerations associated with all of the alternative methods, including taking no action (i.e., given that in the past the European Fallow Deer have become over-populated, emaciated and/or have starved). • The most significant positive impact is achieved by removing the threat all together. Additionally, eradication requires a high-but-finite upfront investment of resources, compared to the low-but-indefinite investment of resources required for sustained application of control methods. 	<ul style="list-style-type: none"> • The issues raised through this feedback were considered by Parks Canada and SIERP Partners during the initial scoping of the project, however alternatives to deer eradication are considered within the DIA. 	<ul style="list-style-type: none"> • Parks Canada and SIERP Partners thoroughly considered alternatives to deer eradication, including 1) taking no action, and 2) implementing other population control measures. Alternative means for achieving deer eradication were also considered. • For more information see Section 7.
Ethics of Eradication	<ul style="list-style-type: none"> • The moral implications of eradicating individual European Fallow Deer (their interests (e.g., interest in survival, in avoiding suffering, in propagation of the species) must be given moral weight and considered alongside human interests (e.g., interest in ecological recovery, interest in facilitating increased food security via the re-introduction of edible species). • Assessing the humaneness of the proposed eradication methods (e.g., possible stress that animals may experience as a result of being herded by human-canine teams or by being contained by fencing). 	<ul style="list-style-type: none"> • The SIERP Partners were clear from the outset that the project must be designed to ensure the humane and ethical treatment of all wildlife on Sidney Island and to follow the seven principles for ethical wildlife control (see Table 1; Dubois <i>et al.</i> 2017). • The proposed project methods will be reviewed by the Parks Canada Animal Care Committee, the Province of British Columbia (BC), and the BC Society for the Prevention of Cruelty to Animals (BC SPCA) to ensure they are humane and avoid or minimize stress to the deer. • The project will not proceed without approval by the Parks Canada Animal Care Committee. • The BC-SPCA will be on-site before and during the operation, to observe animal care procedures. 	<ul style="list-style-type: none"> • The issues raised through this feedback were considered by Parks Canada and SIERP Partners during the initial scoping of the project, and during the development of the project methods, to ensure that the project is completed humanely according to national animal care standards. 	<ul style="list-style-type: none"> • Ethical issues surrounding the proposed project are considered throughout the DIA, including in the rationale for the project (see 5), the proposed project methods (Section 9), and the consideration of project alternatives (Section 7).
Ecological Impacts of	<ul style="list-style-type: none"> • How will potential impacts to non-target species (including Black-tailed Deer (<i>Odocoileus hemionus</i>)), sensitive 	<ul style="list-style-type: none"> • The Parks Canada DIA process is the structured, legal process by which these types of considerations are 	<ul style="list-style-type: none"> • The concerns raised related to this issue, are discussed throughout the DIA 	<ul style="list-style-type: none"> • The purpose of this DIA is to identify, assess, and mitigate potential impacts to Valued



Public Feedback		Summary of Initial Response from Parks Canada ¹	Relevance to the Project/Detailed Impact Assessment (DIA)	Changes to the Project/DIA
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Eradication Activities	ecosystems, or other ecological components be identified, assessed, and mitigated.	identified and assessed, and through which appropriate mitigations will be developed.		<p>Components (VCs), which include ecological and cultural artifacts, and key elements of visitor experience.</p> <ul style="list-style-type: none"> See Section 13.3 for a list of all identified VCs, and see Section 14 for the analysis of impacts to VCs, which includes mitigation measures.
Resource Investment	<ul style="list-style-type: none"> How much will the project cost Sallas Forest Strata community members (including monetary costs, costs in terms of labour, and potential damages resulting from the project or legal fees)? How much will the project cost Parks Canada and how will the costs be distributed between the project components (i.e., eradication vs. restoration) 	<ul style="list-style-type: none"> The project would be financed through the federal SKĪFÁMEN QENÁL,ENEŁ SĆÁ (SQS) Conservation Restoration (CoRe) project (formerly called the Fur to Forest Project). Sallas Forest Strata community members and SIERP Partners have already dedicated a significant number of volunteer hours on project planning and coordination. These representatives also noted that an on-site project liaison should be a paid position. Sallas Forest Strata community members and SIERP Partners will have the opportunity to continue contributing to the project, if desired. Parks Canada is working with Sallas Forest Strata landowners to ensure that they are appropriately indemnified against any accidental damages. 	<ul style="list-style-type: none"> The cost has no relevance to the DIA 	<ul style="list-style-type: none"> None
Vegetation Restoration Objectives	<ul style="list-style-type: none"> Respondents inquired about specific restoration objectives related to: <ul style="list-style-type: none"> invasive plant management, the reintroduction of/access to culturally significant plants, and how restoration activities will be monitored and evaluated for success. 	<ul style="list-style-type: none"> The challenge of invasive plants is significant, and there is neither the funding nor the person-power to remove all invasive plant species. The Vegetation Working Group identified key invasive plants for removal, including English Hawthorn (<i>Crataegus monogyna</i>) and Scotch Broom (<i>Cytisus</i> sp.). Indigenous partners have played an important role in helping to identify appropriate species for cultural food and medicines; these will be planted in exclosures with the intent that, following the project, they will spread island wide. It is the intent of Parks Canada that 	<ul style="list-style-type: none"> The issues raised through this feedback are directly relevant to the analysis of impacts to the forest understory vegetation (Section 14.2) and Indigenous culturally important plants (Section 14.3). 	<ul style="list-style-type: none"> Given the uncertainty and potential residual impacts to forest understory vegetation, and to monitor the outcome/success of the project, Parks Canada has developed an adaptive management forest understory vegetation monitoring plan (see Section 0).



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Theme	Description			
		<p>Indigenous Peoples will have enhanced access cultural food and medicine plants within the park reserve as an outcome of the project.</p> <ul style="list-style-type: none"> The Vegetation Working Group was tasked with the development of a long-term vegetation monitoring plan, to monitor the success rate for planted species. 		
Opportunities for Local Hunters	<ul style="list-style-type: none"> Respondents inquired about potential opportunities for hunters to participate in the European Fallow Deer eradication. 	<ul style="list-style-type: none"> The Deer Working Group noted that hunting and eradication are very different activities. For the effectiveness of the operation, the eradication will be carried out by professional, experienced eradication contractors. 	<ul style="list-style-type: none"> This feedback has no relevance to the DIA 	<ul style="list-style-type: none"> None
Harvesting Meat	<ul style="list-style-type: none"> Several local residents indicated a desire to ensure that as much meat as feasible will be harvested and shared with communities or individuals experiencing food insecurity. 	<ul style="list-style-type: none"> The harvesting of meat is very important to project partners. Where carcasses can be safely collected, they will be processed and all recoverable materials (e.g., meat, hides, antlers, hooves) will be given to local First Nations communities, with a priority on providing meat to individuals experiencing food insecurity. 	<ul style="list-style-type: none"> The issues raised through this feedback were considered by Parks Canada and the SIERP Partners during the initial scoping of the project, and during the development of the project methods. 	<ul style="list-style-type: none"> None
Safety and Security	<ul style="list-style-type: none"> Sallas Forest Strata community members provided feedback pertaining to the safety/security of themselves and their properties during the operation. 	<ul style="list-style-type: none"> Sallas Forest Strata community members, along with SIERP project partners will be involved in the development of the criteria by which contractors will be assessed and selected. A summary of safety procedures will be developed and be made available to Sallas Forest Strata community members prior to a project decision being made. 	<ul style="list-style-type: none"> The issues raised through this feedback were considered by Parks Canada and the SIERP Partners during the development of the project methods. This includes the decision to avoid aerial operations over residential areas and to restrict shooting to non-residential areas. 	<ul style="list-style-type: none"> None
Autonomy and Access to Private Land	<ul style="list-style-type: none"> Sallas Forest Strata community members were concerned about contractors accessing their properties during the operation and whether or not permission would be required. 	<ul style="list-style-type: none"> Permission will be obtained through access agreements with each residential property owner. There will be no shooting of deer within residential areas. Trained canine/handler teams may access private lots (with permission) to corral deer to areas where shooting can occur. 	<ul style="list-style-type: none"> The issues raised through this feedback were considered by Parks Canada and the SIERP Partners during the development of the project methods. This includes the decision to restrict shooting to non-residential areas. 	<ul style="list-style-type: none"> None
Contracting Process	<ul style="list-style-type: none"> Respondents inquired about the procurement of eradication specialists and liability requirements. 	<ul style="list-style-type: none"> Parks Canada has led an open call for qualified eradication experts. SIERP Partners were included in developing evaluation criteria. 	<ul style="list-style-type: none"> This feedback has no relevance to the DIA 	<ul style="list-style-type: none"> None



Public Feedback		Summary of Initial Response from Parks Canada ¹	Relevance to the Project/Detailed Impact Assessment (DIA)	Changes to the Project/DIA
Theme	Description			
Queries Pertaining to Operations	<ul style="list-style-type: none"> Respondents inquired about ground operation details, including where will personnel be accommodated and how will they move around the island. 	<ul style="list-style-type: none"> Trialing is essential for a project such as this, as it help uncover any barriers to success and to enable the project to move forward as effectively and efficiently as possible. The various trials (e.g., fence trials) that have been completed also allow the community to see/understand those components of the project ahead of the operation. Contractors will be provided with accommodation within the park reserve and will travel around the island using pickup trucks and ATVs on existing roads and trails. 	<ul style="list-style-type: none"> The issues raised through this feedback were considered by Parks Canada and the SIERP Partners during the development of the project methods. 	<ul style="list-style-type: none"> None
Feasibility Assessment (Biosecurity)	<ul style="list-style-type: none"> Respondents inquired about the likelihood of re-invasion of European Fallow Deer from neighbouring islands and questioned whether it was possible to preserve the Black-tailed Deer population during operations. 	<ul style="list-style-type: none"> A Biosecurity plan will be developed and implemented to rapidly detect and respond to re-invasion by European Fallow Deer. Preserving the Black-tailed Deer population was considered but rejected as it was not supported by the Province of British Columbia (BC) or the BC-SPCA. The Deer Working Group recommended that Black-tailed Deer be allowed to naturally re-populate the island. 	<ul style="list-style-type: none"> The issues raised through this feedback are directly relevant to the analysis of impacts to the Black-tailed Deer (Section 14.7) 	<ul style="list-style-type: none"> Over the longer term, there is a commitment to discuss reintroduction of Black-tailed Deer to Sidney Island if it is possible to do so without compromising the recovery of the vegetation understory. The Black-tailed Deer Management Plan for preventing hyperabundance has also been developed and approved by project partners. Alternative means of managing Black-tailed Deer on island during the eradication of European Fallow Deer were initially considered and rejected, based on feedback from the BC-SPCA as well as eradication professionals. Parks Canada worked with UBC-O to assess the likelihood of re-invasion from neighbouring islands, based on genetic analysis. The results of this study indicate



Public Feedback		Summary of Initial Response from Parks Canada ¹	Relevance to the Project/Detailed Impact Assessment (DIA)	Changes to the Project/DIA
Theme	Description			
				that the risk of re-invasion is low (see Section 4.3.9).

¹Detailed responses to each feedback theme are provided in the SIERP Design Plan (Parks Canada Agency & SIERP Partners, 2022)

Appendix 2 Species at Risk Decision Tool

Parks Canada place where the activity will occur	Species at risk affected by the activity:	Title of activity (e.g., Trail development in Blue Meadow):
Sidney Island, Gulf Islands National Park Reserve	Foothill Sedge; Western Screech Owl; Red Knot; Marbled Murrelet	Eradication of invasive European Fallow Deer from Sidney Island
Part A – Does a SARA permit need to be considered for this activity?		
<p>1. Will residual adverse effects of the activity (effects that will still occur even after mitigation measures are implemented) contravene a SARA prohibition for a listed endangered (En), threatened (Th) or extirpated (Ex) species, its residence or its critical habitat? (If more than one species will be affected, then clearly delineate the effects on each species).</p>		
<p>SARA prohibitions: Section 32 - Cannot: kill, harm, harass¹⁷, capture, or take an individual; possess, collect, buy, sell or trade an individual or any part or derivative of an individual; Section 33 – Cannot damage or destroy a residence; Section 58 – Cannot destroy any part of critical habitat¹⁸; Section 80 - Cannot carry out an activity that is prohibited under an emergency order.</p>		
<p>The long-term ecological restoration resulting from proposed activities will likely be a net gain for species at risk within the area of activity (Sidney Island). All operational personnel will use a georeferenced map designating areas of concern so that SAR and associated habitat can be avoided. See below for individual species effects. See Schedule D (attached) for an overview of eradication operations.</p> <p>Foothill Sedge (<i>Carex tumulicola</i>) – Endangered: Individual sedge plants exists in the meadow areas in the vicinity of the Sidney Island campground. We do not expect the area to be highly trafficked during eradication efforts, so critical habitat should not be degraded. However, there is potential for impact to individual plants due to foot traffic (human, canine, or deer) during ground activities. Residual impacts from invasive plant growth once released from browse pressure is possible but being pre-emptively mitigated via the removal of high-threat invasive species in Foothill Sedge critical habitat. A SARA permit is required for Foothill Sedge.</p> <p>Western Screech Owl (<i>Megascops kennicottii</i>) - Threatened: This species formerly bred on Sidney Island up to early 2000s, but it is unknown if it's still present. There is potential for project activities to overlap with this species' breeding season (potential in March) and noise from the helicopter, human activity, gunshots, or dogs could negatively impact individuals. A SARA permit is requested for this species.</p> <p>Red Knot (<i>Calidris canutus roselaari</i>) - Threatened; Marbled Murrelet (<i>Brachyramphus marmoratus</i>) – Threatened: No nesting locations for these species have been found on Sidney Island. These species have</p>		

¹⁷ A 2008 legal opinion concluded that it could be validly argued that any activity which causes even one individual of a wildlife species, on just one occasion, to be disturbed, alarmed, distressed, or molested, constitutes “harassment” under SARA.

¹⁸ Critical habitat destruction results if a portion of the critical habitat is degraded, either permanently or temporarily, by activities occurring either internal or external to the critical habitat, such that the habitat function provided by the degraded portion is no longer available to the species when needed.

occasionally been observed in the surrounding waters during their overwintering season, which could overlap with project activities. Disturbance from helicopter operation or ground activities could flush these species if they are present. **A SARA permit is required for these species.**

If at any point it is found that project activities are affecting those species at risk for which a SARA permit has not been issued, by harassing, harming or killing individuals or damaging residences or critical habitat, this will be immediately reported to the Project Manager and these activities will cease until appropriate additional mitigation measures are found or a Species at Risk permit is obtained.

Yes. There are residual adverse effects of the activity that will contravene a SARA prohibition. Continue to Question 2.

No. There are NO residual adverse effects of the activity that will contravene a SARA prohibition.

Southern Resident Killer Whales (*Orcinus orca*) - Endangered: Project activities are terrestrial, with no intention to dispose of any materials in the marine ecosystem. Southern Resident Killer Whales spend the majority of late fall through spring, when the project activities are proposed, away from the inland waters around Sidney Island. The marine vessel traffic associated with the project will not occur within the Interim Sanctuary Zones as identified by the Interim Order of the *Canada Shipping Act*. No project vessel will come within 400m of any orca, as per the mitigation measures identified in the Interim Order. Violation of SARA prohibitions are not expected for Southern Resident Killer Whales during the proposed activities so **a SARA permit is not required for this species.**

Contorted-pod Evening-primrose (*Camissonia contorta*) - Endangered: Critical habitat for this species, as identified in the species' recovery strategy, exists at the northernmost tip of the sand spit on Sidney Island. This relatively exposed area of the island, frequently cut off by tides and is rarely visited by deer. The use of helicopters could result in rotor downwash that displaces sand in this critical habitat but the area will be made inaccessible to deer during project activities and therefore the helicopter will not fly low over this area. The Recovery Strategy states "Contorted-pod Evening-primrose appears to tolerate light levels of sand erosion and deposition and may require such disturbances in order to escape competition (Fairbarns, pers. obs.)." Helicopters will avoid the area and traffic in adjacent areas will create no more than light levels of sand erosion and deposition. As a result, **a SARA permit is not required for this species.**

Edwards' beach moth (*Anarta edwardsii*) - Endangered: Critical habitat for this species, as identified in the species' recovery strategy, exists in the coastal sands ecosystem habitat found on the Hook Spit and Sidney Spit areas of Sidney Island. The COSEWIC Assessment and Status Report states that the species appears to produce a single annual brood with the flight period extending from mid-May through July. Due to the avoidance of the area by helicopters (see contorted-pod evening-primrose justification above) and general eradication activity occurring outside of the species' flight period, **a SARA permit is not required for this species.**

Little Brown Bat (*Myotis lucifugus*) - Endangered: Other than white nose syndrome, the greatest threat to Little Brown Bat is habitat loss. This project does not impact critical habitat or residences of Little Brown Bat, and the long-term results of these activities are likely to be beneficial to the species. The large mesh size and thick ropes of the temporary fencing used during project activities will be highly visible to echolocating bats and the rigidity of the materials used will prevent entanglement. Previous field trials of the fencing resulted in no entanglements, so no impacts to individual Little Brown Bats is expected. Surveillance of fence lines will be conducted to detect and release entangled wildlife. **A SARA permit is not required for little brown bat.**

Barn Swallow (*Hirundo rustica*) - Threatened: Barn Swallows are migratory, nesting in infrastructure from April to mid-summer. This species will not be impacted by project activities because project timing does not overlap with nesting period and there will be no interaction with infrastructure. **A SARA permit is not required for this species.**

Common nighthawk (*Chordeiles minor*) - Threatened: Common Nighthawks nest on the ground in the coastal sands ecosystem. However, their nesting period generally occurs between May and August and does not overlap with project activities. Critical habitat has not been identified for the species, and no residual adverse impacts to the species habitat are anticipated in general. **A SARA permit is not required for this species.**

2. Does the activity qualify for an exception under s 83 of SARA?

Yes. A SARA permit is NOT required, as the activity is permitted in a published recovery strategy or action plan and authorized under an Act of Parliament.

OR

Yes. A SARA permit is NOT required, as the activity is required for public safety, health or national security AND is authorized by or under another Act of Parliament.

STOP - If ALL activities that would contravene a SARA prohibition qualify for an exception under SARA s 83, check the first box in Part C and submit for approval (Part F).

No. A SARA permit is required. Continue to Part B.

Part B – Can a SARA permit be issued for this activity?

******Complete ONLY if you have answered NO to Question 2, above******

3. What is the purpose of the activity?

Select the appropriate box:

The activity is scientific research related to the conservation of the species and conducted by qualified persons (continue to Question 4); OR

The activity benefits the species or is required to enhance its chance of survival in the wild (i.e., an activity that supports the implementation of recovery actions as described in recovery documents (recovery strategies/action plans) for the species, where these are available. Where recovery documents are not available, the activity must support the recovery of the species based on an assessment of best information available (including status reports, species experts, peer-reviewed information) (continue to Question 4); OR

Affecting the species is incidental to the activity (i.e., the purpose of the activity is not to engage in an activity that is prohibited under SARA (e.g., kill, harm, harass an individual; destroy a residence or critical habitat). For example, fishing for a listed species would not be incidental, but accidental by-catch would be. A construction activity that causes destruction of critical habitat, such as building a parking lot, would be considered to incidentally affect the species.) (continue to Question 4; If the activity will incidentally affect a species listed under the [Migratory Bird Convention Act](#), consult with the [Species Conservation](#) team); OR

The proposed activity DOES NOT fit in any of the above three categories, and the activity CANNOT be permitted; check the second box in Part C and submit for approval (Part F).

4. Have alternatives that would reduce the impact(s) on the species been considered and the best solution adopted?

Excerpts from [SARA Permits and Agreements Policy](#): The purpose of this section is impact avoidance. The alternatives provided must clearly articulate how the impacts of the activity on the listed wildlife species have

been avoided by considering reasonable alternatives. Moreover, it must be demonstrated that there are no other reasonable alternatives to the one selected that would further avoid the impact. Biological, ecological, conservation and recovery objectives, and technical and economic factors may be considered when deciding whether a given alternative is reasonable. The amount of analysis undertaken for the alternatives must be proportional to the magnitude and severity of the impact on the listed wildlife species. An explanation of why not undertaking the activity is not considered reasonable must be provided.

Below is a list of alternatives to the proposed eradication operations that were considered. The preferred (proposed) option is highlighted in **yellow**.

Approach	Contribution to ecological restoration	Technical feasibility	Economic feasibility	Operational feasibility	Impact on Species at Risk
No Action	Continued decline in ecological integrity.	Yes; no intervention needed.	Feasible; no investment.	Feasible in that no action is required.	Continued degradation of overall habitat quality.
European Fallow Deer population control	Some recovery possible; improving trend in ecological integrity expected with adaptive management of deer and forest restoration, albeit at a slower rate. Sustained recovery uncertain.	Unknown; uncertain if population control could effectively maintain the European Fallow Deer population below an appropriate threshold. Deer populations can quickly rebound.	Likely not feasible; long term investment is high and indefinite.	Not feasible; effective control would require a level of effort annually that is likely not operationally feasible.	Lessened degradation of overall habitat quality but control techniques could result in increased disturbance and harm.
Aerial and ground-based eradication with complete avoidance of all areas with Species at Risk	Ecological recovery possible if eradication is successful, continued loss of ecological integrity if it is not.	Feasible; all areas would be marked on maps for complete avoidance or fences erected to bar entry.	Feasible but would add significant cost to the project due to inefficiencies and potential fencing.	Not feasible; Would create pockets for deer to hide, undermining probability of eradication success.	None if eradication is successful, continued loss of ecological integrity if it is not.
Aerial and ground-based eradication with avoidance when possible of areas with Species at Risk	Ecological recovery possible if eradication is successful, continued loss of ecological integrity if it is not.	Feasible; there are no refugia for deer to hide from operations. Genetic evidence suggests that European Fallow Deer do not swim between islands so risk of reinvasion is low.	Feasible; upfront costs are high but do not outweigh the conservation gains.	Feasible; Sidney Island is small and has mild terrain. If all areas can be accessed, deer can be targeted.	Potentially minor impact during eradication operations but long-term improvement of habitat if eradication is successful. Continued loss if it is not successful.

Continue to Question 5.

5. Have all feasible measures been taken to minimize the impact of the activity?

Excerpts from [SARA Permits and Agreements Policy](#): After having determined that impacts on the listed wildlife species have been avoided to the extent reasonably possible, the applicant must apply all feasible

mitigation measures to minimize the impacts that could not otherwise be avoided despite having selected the best alternative. Demonstrate that the needs of the species were fully considered during the design of the activity and for identifying all feasible measures to minimize the impact of the activity. Consideration must be given to identifying and adopting best practices for the species. Biological, ecological, technical and economic factors may be considered when considering what measures are feasible.

Foothill Sedge (*Carex tumulicola*): To mitigate negative impact to this SAR, Foothill Sedge in the operational area will be flagged, and ground personnel will be provided with maps of sensitive areas to be avoided. Following deer eradication, browse pressure on this species will be eliminated, but there is potential for increased competition from invasive plant species. Competition from introduced alien species is the top threat to Foothill Sedge, as described in the COSEWIC Assessment and Status Report (2008). To pre-empt this potential impact, priority invasive species such as common hawthorn are being removed (SARA permit decision tool completed 2021). A Scotch Broom management plan has also been developed to assist with ongoing control of Scotch Broom on the project island.

Western Screech Owl (*Megascops kennicottii*): This species formerly bred on Sidney Island up to early 2000s, but it is unknown if it's still present. There is potential for project activities to overlap with this species' breeding season, beginning in March. If project activities extend into March due to unforeseen circumstances, a specialist with the appropriate knowledge will conduct a bird survey to confirm the presence of sensitive species and provide direction with regards to areas to avoid. Eradication related activities will avoid sensitive locations identified during this survey.

Red Knot (*Calidris canutus roseaari*) – Threatened; Marbled Murrelet (*Brachyramphus marmoratus*): Disturbance from helicopter operation or ground activities could flush these species if they are present. Eradication related activities will avoid sensitive locations (e.g., Sidney spit; Sidney lagoon; shoreline areas) as much as possible. Personnel will be briefed on how to identify these species and, should the species be observed during the proposed activities, activities in those areas will be halted until further mitigation measures are implemented.

6. Will the activity jeopardize the survival or recovery of the species?

Excerpts from [SARA Permits and Agreements Policy](#): An activity will jeopardize the survival or recovery of the species if it increases threats to the extent that the species is not able to, or may not be able to, survive or recover. As the degree of uncertainty increases about whether an activity would affect a species to such an extent that it may not be able to survive or recover, the likelihood decreases that a permit can be issued. Where data is sufficient to support the completion of quantitative analyses, such as population viability, this should be done. However, in some cases, such analyses will not be possible and a precautionary approach will guide the assessment of jeopardy based on the best available information and the weight of available evidence.

Foothill Sedge (*Carex tumulicola*): The two population and distribution objectives for the species are to maintain known populations and preventing a decline in the distribution of the species. All eradication activities will avoid known foothill Sedge locations when possible. Foot traffic will be directed away from those locations and any ground operations will avoid those sites where operationally feasible. However, according to the SAR Species Recovery Strategy for Foothill Sedge (2012), Foothill Sedge is a “relatively hardy” plant and while there is potential for damage to individual plants, the effects of pedestrian traffic “are of low concern”. Additionally, Foothill Sedge is used elsewhere within its native range as a substitute for grass lawn because it is durable and resistant to foot traffic. Pro-active invasive plant control is expected to increase

critical habitat quality for foothill sedge as competition from invasive alien species is the leading threat to the species. The integrity of the population on Sidney Island will be maintained and the species' distribution within Canada will not decline.

Western Screech Owl (*Megascops kennicottii*): The presence of this species on Sidney Island is unknown, and the proposed activities will have no long-term negative impact on the quality of potential habitat on the island (no clearcutting, or removal of potential nest or perch sites). Any disturbance to this species from these activities will be temporary in nature, and there is only a small temporal overlap between the proposed activities and the Western Screech Owl's breeding season.

Red Knot (*Calidris canutus roselaari*) and Marbled Murrelet (*Brachyramphus marmoratus*): While occasionally observed overwintering in the area, they do not breed in the area. The birds could potentially use tidal flats or waters around Sidney Island but eradication operations are primarily land based. Any disruptions to areas used by the birds will be temporary, lasting minutes to hours at the most.

The proposed eradication activities do not jeopardize any of the aforementioned species' survival or recovery.

Yes. The activity will jeopardize the survival or recovery of the species and cannot be permitted.

Check the second box in Part C and submit for approval (Part F).

No. The activity will not jeopardize survival or recovery of the species and can be permitted.

Yes. The activity will jeopardize survival or recovery of the species, but an offset will be implemented to ensure survival or recovery of the species is not jeopardized.

Check the third box in Part C and submit for approval (Part F).

Part C – SARA Permit Decision

Select the appropriate answer from the options below. Note: if this section addresses multiple species and the answer varies among species, specify to which species each answer pertains.

This activity does not require a SARA permit, as was documented in the answers to Questions 1 and 2. **Continue to approval of the decision tool (Part F).**

This activity requires a SARA permit but one cannot be issued because it does not fit into one of the three required categories (see response to Question 3), OR it does not meet one of the SARA pre-conditions (see responses to Questions 4-6). **Continue to approval of the decision tool (Part F).**

This activity requires a SARA permit and one can be issued (see response to Questions 3-6). **Continue to issuing the permit (Part D).**

Part D – Issuing the Permit

Select the appropriate section of SARA being used, issue the permit, and continue to Part E.

SARA s 74: This activity is already being permitted under another Act of Parliament (e.g., a research, collection or restricted activity permit is already being issued for this activity) and therefore that permit can be made SARA-compliant. Issue the permit for the activity and, below, specify the relevant section(s) of the other Act of Parliament being used to issue the permit (examples provided).

Either include language in the permit already being issued under another Act of Parliament to indicate that the permit is also being issued pursuant to s 74 of the *Species at Risk Act*, or use the [SARA Permit Template](#) to attach a SARA s 74 permit to the other permit being issued.

The terms and conditions of the permit being issued under the other Act or Parliament should refer to or include any measures required to ensure compliancy with meeting SARA s 73 pre-conditions (e.g., mitigations outlined in question 5 of this tool). The permit issued under the other Act of Parliament is the enforceable permit.

Under Section 12 of National Park Regulations: The superintendent may issue a permit authorizing a person to remove, deface, damage or destroy any flora or natural objects in a park for the purposes of park management.

- SARA s 73:** This activity is NOT being permitted under another Act of Parliament. Issue the permit using the [SARA Permit Template](#).

The terms and conditions of the permit should refer to or include any measures required to ensure compliancy with meeting SARA s 73 pre-conditions (e.g., mitigations outlined in question 5 of this tool).

Part E - Preparing the Explanation of the Permit

7. Provide an explanation of the permit for posting on the SAR Public Registry and continue to Part F.

SARA requires an explanation of any SARA permit issued to be posted on the SARA Public Registry in both official languages (the Species Conservation team recommends that this be completed within 30 days of the permit being issued). Prepare the explanation, using the information you entered in the previous sections of this tool. The Species Conservation team will review the explanation, have it translated and publish it on the SAR Public Registry.

Regional or Local Number:

This SARA permit will accompany a Detailed Impact Assessment associated with the proposed eradication operations. The DIA will be submitted for approvals in May 2023 with a decision expected by October 1st, 2023.

Start Date of Permit: October 1, 2023 **End Date of Permit:** March 31, 2026

Issuing Authority: Parks Canada Agency

Authority Used: SARA s 74

Location of Activity (province, territory or ocean): Sidney Island, British Columbia

Affected Species:

Foothill Sedge (*Carex tumulicola*), Western Screech Owl (*Megascops kennicottii*), Red Knot (*Calidris canutus roselaari*), and Marbled Murrelet (*Brachyramphus marmoratus*).

Purpose:

- Affecting the species is incidental to the activity

Description of the Activity:

Sidney Island in Gulf Islands National Park Reserve has a population of invasive, non-native European Fallow Deer (*Dama dama*) that is negatively impacting the ecological integrity of the forest ecosystem. Decades of over-browsing by European Fallow Deer has degraded the forest understory and resulted in decreased biodiversity of flora and fauna, including the near or total loss of many native and culturally-significant understory plant species, a significant reduction of songbird abundance and diversity, and a reduction of the native Black-tailed Deer population (*Odocoileus hemionus*). Parks Canada and project partners have collaboratively developed shared goals and objectives for the conservation and restoration of the Sidney Island's forest ecosystem. A key component restoration is the proposed eradication of European Fallow Deer on Sidney Island; activities will include aerial herding/shooting from a helicopter and ground-based herding/shooting by specialized hunters using trained dogs. The island will be partitioned into zones (via temporary fencing) which will restrict activity to one area at a time. Sensitive areas such as the sand spit and known locations of Foothill Sedge will be avoided when at all possible. There is a chance that activities in general will cause disturbance to listed species within the project area. However, any disturbance will be temporary and, as assessed above, does not jeopardize the survival of the species. If eradication is successful, the habitat quality of all species will be improved as native vegetation recovers. Eradication related activities and mitigations are reviewed at length in the Federal Detailed Impact Assessment.

Alternatives to the proposed methods were considered and included no European Fallow Deer eradication and long-term control of the European Fallow Deer population on Sidney Island. While technically, economically, and perhaps operationally feasible, not eradicating the population would result in the continued decline of Sidney Island's ecological integrity and the degradation of habitat quality on the island. Long-term European Fallow Deer management on the island is unlikely to be feasible given the long-term operational and financial commitment required. Even maintaining a low but persistent population on the island would continue to degrade habitat quality and have cascading ecological effects as decades of browse pressure have significantly altered vegetation and forest composition and dynamics. To mitigate risk to Foothill Sedge, individual plants located in the operational area will be flagged and ground personnel will be provided with maps of sensitive areas to be avoided. To pre-empt the potential impact of increased competition from invasive plant species following European Fallow Deer eradication, Common Hawthorn are

being removed and a Scotch Broom management plan has also been developed to assist with ongoing control of this species on Sidney Island. To mitigate potential disturbance to Western Screech Owl, a bird survey will be conducted prior to project activities to determine species' presence and to identify areas to avoid. Deer and ground activities will be pushed away from sensitive locations identified during this survey. Red Knot and Marbeled Murrelet may use tidal flats and waters surrounding Sidney Island so ground personnel will be briefed on how to identify these species and, should the species be observed during the proposed activities, these activities will be halted in that area until further mitigation measures are implemented.

Eliminating browse pressure on Sidney Island while simultaneously reducing the abundance of invasive hawthorn sets the stage for sustained ecological recovery on Sidney Island. The project has secured funding to plant native shrubs and trees after the eradication to assist natural recovery of the island. The subsequent increase in the abundance and diversity of native plant species is expected to have positive, cascading ecological effects. Vegetation is a resource for invertebrates such as pollinators and acts as habitat for a broad range of species. Improvements in invertebrate populations can greatly impact higher trophic levels such as screech owls or other species of concerns. By removing hawthorn located within and adjacent to known critical habitat, we will be improving habitat for Foothill Sedge (which requires open areas to grow). Additionally, scientific studies show that reducing woody encroachment into meadow spaces increases water availability. Foothill Sedge is most closely associated with the shrubby margins of moist meadows so increased water availability would improve conditions for the sedge.

PART F - TRANSMITTAL FORM			
Delete, modify or add rows as required			
Tool Completed By	Name & Title	Date Completed	Specific Comments
Resource Conservation	Becky Miller; Resource Management Officer II	15 December 2022	The SAR permit will be included in the Detailed Impact Assessment application.
Functional Teams Consulted:	Name & Title	Date of Review	Specific Comments
National Office Teams			
PAEC (Species Conservation)	Diane Casimir; Ecosystem Scientist	2021	Consultation has been ongoing since 2021.
Field Unit Teams			
Cultural Resource Management	Alex Lausanne; Cultural Heritage Officer	2021	Consultation has been ongoing since 2021.
Resource Conservation	Molly Clarkson; Resource Conservation Manager	2021	Consultation has been ongoing since 2021.
Visitor Experience	Darcy Gray (and acting personnel); Visitor Experience Manager	2021	Consultation has been ongoing since 2021.
Other			

<input type="checkbox"/> Legal Services		Click here to enter a date.	
<input checked="" type="checkbox"/> Other (<i>specify</i>):	First Nations project partners associated with the eradication project.	2019	Consultation has been ongoing since 2019.
Approved By (FUS, Director of Waterway)	Name & Title	Date Approved	Signature

Appendix 3 Ecological Valued Component Screening for Impact Analysis

Ecological Valued Components Considered	S Rank ¹	COSEWIC Status ²	SARA Status ³	Potential Interaction with Project?	Considered in Analysis?
Vascular Plants					
<i>Species at Risk</i>					
Contorted-pod Evening-primrose (<i>Camissonia contorta</i>)	S1S2	Endangered	Endangered, Schedule 1	Critical habitat for this species, as identified in the species' recovery strategy, exists at the northernmost tip of the sand spit on Sidney Island (Parks Canada Agency, 2018b). This relatively exposed area of the island is frequently cut off by tides and is rarely visited by deer. The use of helicopters could result in rotor downwash that displaces sand in this critical habitat, the helicopter will avoid herding deer towards the Sidney Spit, Hook Spit, and lagoon whenever possible to avoid project activities in these sensitive areas to minimize impacts to marine and shorebirds. There will be no other project activities within or adjacent to the critical habitat for this species.	No
Foothill Sedge (<i>Carex tumulicola</i>)	S3S4	Special Concern	Endangered, Schedule 1	Foothill Sedge has critical habitat in the field areas in the vicinity of the Sidney Island campground (Parks Canada Agency, 2018b). The primary threat to Foothill Sedge is encroachment by non-native/invasive plants. The invasive English Hawthorn is establishing and degrading the habitat on Sidney Island. There is potential for the harming individual plants due to trampling (human, canine, or deer) during ground activities, as well as due to potential increases in invasive species following the project.	Yes
Silky Beach Pea (<i>Lathyrus littoralis</i>)	S2	Threatened	Threatened, Schedule 1	Habitat for this species is located on the northern tip of Sidney Spit (Parks Canada Agency, 2018b). This relatively exposed area of the island is frequently cut off by tides and is rarely visited by deer. The use of helicopters could result in rotor downwash that displaces sand in this critical habitat, the helicopter will avoid herding deer towards the Sidney Spit, Hook Spit, and lagoon whenever possible to avoid project activities in these sensitive areas to minimize impacts to marine and shorebirds. There will be no other project activities within or adjacent to the critical habitat for this species.	No
<i>Vegetation Communities</i>					
Eelgrass Beds	n/a	n/a	n/a	Eelgrass beds are located in the marine environment adjacent to Sidney Island. They are sensitive to physical disturbance from marine vessel traffic and mooring. During the project, all boats will be moored on existing buoys and docks, avoiding known Eelgrass beds and, where landing is necessary, landing areas will be selected to avoid known Eelgrass beds. The fueling of boats will largely take place off-island, at the operations centre in Sidney.	No
Forest Understory Vegetation	n/a	n/a	n/a	Forest understory vegetation may be impacted from ground activities during the project, and from the removal of deer-browsing pressure on vegetation, including the potential for increased invasive plant species.	Yes
Birds					
<i>Species at Risk</i>					
Bank Swallow (<i>Riparia riparia</i>)	S4	Threatened	Threatened, Schedule 1	Bank Swallows nest a variety of natural and artificial sites with vertical banks, including riverbanks, lake and ocean bluffs, road cuts, and stock piles such as at aggregate pits (COSEWIC, 2013). These sites are typically adjacent to suitable open foraging habitat such as grasslands, meadows, pastures, and agricultural cropland. Large wetlands are	No

Ecological Valued Components Considered	S Rank ¹	COSEWIC Status ²	SARA Status ³	Potential Interaction with Project?	Considered in Analysis?
				used as communal nocturnal roost sites following the breeding, migration, and wintering periods (COSEWIC, 2013). Bank Swallows migrate to overwintering habitats in South America, following the breeding season, which is from May to August (COSEWIC, 2013). There are no known Bank Swallow nesting areas on Sidney Island. There may be suitable foraging habitat in the open fields of Sidney Island, however, foraging Bank Swallows are thought to use open areas within 200-500m of their breeding colony (COSEWIC, 2013). Therefore, it is unlikely that any Bank Swallows would be foraging on Sidney Island and this species is not anticipated to be impacted by the project.	
Barn Swallow (<i>Hirundo rustica</i>)	S4B	Special Concern	Threatened, Schedule 1	Barn Swallows are migratory, nesting in infrastructure (e.g., buildings, barns, pavilions, etc.) from April to mid-summer. There are Barn Swallow nesting sites in infrastructure on Sidney Island. The island also provides suitable foraging habitat. Phase 2 project preparation, contingency, or demobilization periods (April to October) may overlap with Barn Swallow migration and/or nesting period (generally between May and August). Although there will be no changes to infrastructure that may provide nesting habitat for Barn Swallow, there is the potential for Barn Swallow to be disturbed by ground operations during the project.	Yes
Black Swift (<i>Cypseloides niger</i>)	S3	Endangered	Endangered, Schedule 1	Black Swifts forage at high altitudes and also over forests and in open areas and nest behind or next to waterfalls or wet cliffs, on sea cliffs and in sea caves (NatureServe, 2023c). Black Swifts migrate to overwintering habitats, likely in South America, anywhere from late August to early October (COSEWIC, 2015). Black Swifts arrive back in British Columbia (BC) in late April, with peak migrations in mid- to late May and into June (COSEWIC, 2015). There are no known Black Swift nesting areas on Sidney Island and there are only two reported recent observations from September 2021 (eBird, 2023b). Prior to that the next most recent observation reported for Sidney Island was from 1995 (eBird, 2023b). Given that the island likely only provides foraging habitat, that there are so few reported observations from Sidney Island, and that the species is likely to only be found on/around Sidney Island during the migration period, when potential disturbances to birds will be through ground operations (not above the canopy), it is not anticipated that this species will be impacted by the project.	No
Buff Breasted Sandpiper (<i>Calidris subruficollis</i>)	SUM	Special Concern	Special Concern, Schedule 1	This species has no critical habitat on Sidney Island as it breeds in the arctic and uses grassland habitats, largely in central Canada, for foraging on its migration route (COSEWIC, 2012a). A very small number of juveniles or transient individuals may migrate along the Pacific coast (COSEWIC, 2012a). Several observations have been reported from the Sidney Spit in August and September (eBird, 2023b). Given the small number of individuals that may be present and the lack of suitable grassland habitat on Sidney Island, the project is not anticipated to impact this species.	No
Common Nighthawk (<i>Chordeiles minor</i>)	S3S5B	Special Concern	Special Concern, Schedule 1	Common Nighthawks are a migratory species that may nest on the ground in the coastal sands ecosystem on Sidney Island (Parks Canada Agency, 2018b) and there are recent observations reported (2020, 2022) (eBird, 2023b). Their migration and nesting period (generally between May and August) may overlap with Phase 2 project preparation, contingency, or demobilization periods (April to October). Given that these project activities will not be occurring in the coastal sands ecosystem of Sidney Island, no adverse impacts to Common Nighthawk or their habitat are anticipated.	No
Great Blue Heron (<i>Ardea Herodias fannini</i>)	S3	Non-active	Special Concern, Schedule 1	This subspecies forages in fresh and saltwater marshes, along rivers and in grasslands along the coast and nest in woodlands near foraging habitat (COSEWIC, 2008b). Large numbers of Great Blue Herons nested within the park	Yes

Ecological Valued Components Considered	S Rank ¹	COSEWIC Status ²	SARA Status ³	Potential Interaction with Project?	Considered in Analysis?
		(determined ineligible for assessment in 2022)		reserve on Sidney Island from 1974 to 1990, however there are no current nesting colonies on Sidney Island (COSEWIC, 2008b). Approximately 50 Great Blue Herons are known to overwinter on Sidney Island and forage along the coastline and in the inter-tidal zone (Bird Studies Canada, 2017). Helicopter operation, boat traffic, or ground activities (e.g., gunshots) could disturb this species during the overwintering period.	
Horned Grebe (<i>Podiceps auritus</i>)	S4B, SNRN	Special Concern	Special Concern, Schedule 1	The Horned Grebe is considered a rare summer visitor in coastal BC as it mainly breeds east of the coastal mountains (COSEWIC, 2009). The Horned Grebe winters on the Pacific coast (COSEWIC, 2009). Horned Grebes are occasionally observed during the winter months from the Sidney Spit and in the Sidney lagoon (eBird, 2023b). Helicopter operation, boat traffic, or ground activities (e.g., gunshots) could disturb this species.	Yes
Marbled Murrelet (<i>Brachyramphus marmoratus</i>)	S3	Threatened	Threatened, Schedule 1	No nesting locations for this species has been found on Sidney Island as there are no suitable old growth nesting trees. Approximately 50 Marbled Murrelets are regularly reported in the waters surrounding Sidney Island in the Sidney Channel Important Bird Area (IBA) during their overwintering season (Bird Studies Canada, 2017). Disturbance from helicopter operation or ground activities could flush individuals of this species if they are present.	Yes
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	S4B	Special Concern	Special Concern, Schedule 1	Olive-sided Flycatchers breed in most coniferous or mixed forests with tall trees or snags for perching and nearby open areas in BC (except Haida Gwaii) (COSEWIC, 2018). Olive-sided Flycatcher is confirmed or highly suspected of being a breeding resident in the Gulf Islands National Park Reserve (GINPR) (COSEWIC, 2018) and there are recent observations reported (2023) (eBird, 2023b). The majority of the project (Phases 1 and 2) will occur outside the breeding period for Olive-sided Flycatcher; however Phase 2 project preparation, contingency, or demobilization periods (April to October) may overlap with Olive-sided Flycatcher migration and/or nesting period (generally between May and August). There is the potential for Olive-sided Flycatcher to be disturbed by ground operations during the project.	Yes
Red Knot (<i>Calidris canutus roselaari</i>)	S3	Threatened	Threatened	The Red Knot breeds in northwestern Alaska and in the Russian Eastern Arctic. It migrates through Canada to overwinter on the Pacific coast of the Americas, and occurs in small numbers in coastal BC during migration and during the winter (COSEWIC, 2020). This species has occasionally been observed at the Sidney Spit and Sidney lagoon during the overwintering season (eBird, 2023b). Project activities, including aerial and ground hunting, have the potential to disturb this species if any individuals are in the waters surrounding Sidney Island during the project.	Yes
Short-eared Owl (<i>Asio flammeus</i>)	S3B, S1N	Threatened	Special Concern, Schedule 1	Short-eared Owls inhabit large, open habitats such as grasslands, tundra, and wetlands throughout the year. They breed in this large open habitats in the subarctic tundra and prairies (COSEWIC, 2021). Winter habitat includes a variety of large open areas and in some cases those with adjacent conifer forests (COSEWIC, 2021). Although there may be suitable habitat for this species on Sidney Island, the last reported observation of a Short-eared Owl on Sidney Island is from 1991 (eBird, 2023b). Therefore, the likelihood of Short-eared Owls being present on Sidney Island and being impacted by the project is anticipated to be very low.	No
Western Screech Owl (<i>Megascops kennicottii kennicottii</i>)	S4	Threatened	Threatened, Schedule 1	Western Screech Owls along the BC coast inhabit low elevation forests and woodlands, preferring deciduous-coniferous forests near watercourses (COSEWIC, 2012b). Nesting, which typically begins in April, occurs in cavities in large, mature trees such as natural cavities or those made by Northern Flickers (<i>Colaptes auratus</i>) or Pileated Woodpeckers (<i>Dryocopus pileatus</i>) (COSEWIC, 2012b). Fledging occurs between mid-July and the end of August	Yes

Ecological Valued Components Considered	S Rank ¹	COSEWIC Status ²	SARA Status ³	Potential Interaction with Project?	Considered in Analysis?
				(COSEWIC, 2012b). Western Screech Owls are non-migratory. There are observations of this species on Sidney Island up to 1997, but there have been no observations since, and it is unknown if it is still present (Ledger, 2022). There is potential for project activities to overlap with this species during the winter, with noise from human activity, gunshots, or dogs potentially negatively impacting individuals.	
<i>Other Bird Groups</i>					
Marine Birds	n/a	n/a	n/a	The waters west and north of Sidney Island are internationally-recognized as Sidney Channel IBA (IBA Canada, n.d.), while the waters to the east are designated as the Mandarte Island IBA (IBA# BC046). These areas provide habitat for ducks, geese, grebes, loons, mergansers, seabirds, gulls, and terns (Bird Studies Canada, 2017; eBird, 2023b). Many of the species observed in these areas are present during the proposed project (i.e. November to March) (Bird Studies Canada, 2017; eBird, 2023b), including American Wigeon (<i>Mareca americana</i>), Northern Pintail (<i>Anas acuta</i>), Green-winged Teal (<i>Anas crecca</i>), Greater Scaup (<i>Aythya marila</i>), Surf Scoter (<i>Melanitta perspicillata</i>), Bufflehead (<i>Bucephala albeola</i>), Common Goldeneye (<i>Bucephala clangula</i>), Pacific Loon (<i>Gavia pacifica</i>), Red-breasted Merganser (<i>Mergus serrator</i>), Common Murre (<i>Uria aalge</i>), and Pigeon Guillemot (<i>Cepphus columba</i>), among others (Bird Studies Canada, 2017; eBird, 2023b). Observations of Brandt's Cormorant (<i>Urile penicillatus</i>), which has a conservation ranking of S1 in BC but is not listed under SARA (NatureServe, 2023f), and Brant, which has a conservation ranking of S3 (NatureServe, 2023a), are reported from the Sidney Spit and Sidney lagoon during the winter months when the project activities will be occurring (eBird, 2023b, 2023a). The project has the potential to impact marine bird species during the winter months through helicopter operation, boat traffic, or ground activities (e.g. gunshots).	Yes
Shorebirds	n/a	n/a	n/a	The Sidney Spit, Hook Spit, and the shoreline around the lagoon and along the west side of Sidney Island are included in the Sidney Channel IBA (IBA Canada, n.d.). The inter-tidal zone, tidal mudflats, shorelines in these areas are important habitats for shorebirds. While most shorebird species observed on Sidney Island are present from April to September when the project will not be occurring, there are also observations of shorebird species in the late fall or winter. Species observed during the winter months when the project activities will be occurring include Black-bellied Plover (<i>Pluvialis squatarola</i>), Black Oystercatcher (<i>Haematopus bachmani</i>), Black Turnstone (<i>Arenaria melanocephala</i>), Dunlin (<i>Calidris alpina</i>), Killdeer (<i>Charadrius vociferus</i>), Least Sandpiper (<i>Calidris minutilla</i>), Spotted Sandpiper (<i>Actitis macularius</i>), and Sanderling (<i>Calidris alba</i>) (eBird, 2023b, 2023a). Helicopter operation, boat traffic, or ground activities (e.g. gunshots) could therefore disturb these species.	Yes
Passerines and Other Terrestrial Bird Species, Including Raptors	n/a	n/a	n/a	Other birds that are known to occur on Sidney Island include swifts, flycatchers, swallows, sparrow and allies, finches and allies, vireos, warblers, thrushes, blackbirds, pigeons, jays, crows, ravens, eagles, osprey, vultures, hawks, falcons, and owls (Bird Studies Canada, 2017; eBird, 2023b). The majority of the other bird species that occur on Sidney Island are migratory and are not likely to be present on the island when the project is proposed to occur (November to March; although depending on the seasonal weather, up to 10% of migratory species may start nesting in late March (Environment and Climate Change Canada, 2018)). The foraging and activity patterns of non-migratory species have the potential to be impacted during the winter months by both Phase 1 and Phase 2 of the proposed project. In addition, species that begin nesting in the late	Yes

Ecological Valued Components Considered	S Rank ¹	COSEWIC Status ²	SARA Status ³	Potential Interaction with Project?	Considered in Analysis?
				winter have the potential to be impacted by the proposed project. Early breeders, including Barred Owl (<i>Strix varia</i>), Great Horned Owls (<i>Bubo virginianus</i>), and Northern Saw-whet Owl (<i>Aegolius acadicus</i>), may start nesting in January, while Bald Eagles (<i>Haliaeetus leucocephalus</i>) are known to commence nesting in January or February. Year-round resident passerines (e.g. Hutton's Vireo (<i>Vireo huttoni</i>), Purple Finch (<i>Haemorhous purpureus</i>), Chestnut-backed Chickadee (<i>Poecile rufescens</i>), Red-breasted Nuthatch (<i>Sitta canadensis</i>), Anna's Hummingbird (<i>Calypte anna</i>) (Cruickshank, 2017)) regularly start nesting in March (Environment and Climate Change Canada, 2018).	
Mammals					
<i>Species at Risk</i>					
Little Brown Myotis (<i>Myotis lucifugus</i>)	S3S4	Endangered	Endangered, Schedule 1	Little Brown Myotis use a wide range of habitats for resting and maternity sites such as hollow trees, caves, and often human-made structures (NatureServe, 2021). They foraging in open areas with plentiful insects such as over water, along the margins of lakes and streams, or in woodlands, especially near water (NatureServe, 2021) Winter hibernation sites include caves, tunnels, abandoned mines, etc. (NatureServe, 2021). Other than white-nose syndrome, the greatest threat to Little Brown Myotis is habitat loss. This project does not impact critical habitat or residences of Little Brown Myotis, and the long-term results of these activities are likely to be beneficial to the species. The large mesh size and thick ropes of the temporary fencing used during project activities will be highly visible to echolocating bats and the rigidity of the materials used will prevent entanglement. Previous field trials of the fencing resulted in no entanglements, so no impacts to individual Little Brown Myotis are expected.	No
Sea Otter (<i>Enhydra lutris</i>)	S3	Special Concern	Special Concern, Schedule 1	Although Sea Otters are occasionally observed in the waters around Sidney Island, the most suitable habitat is found on the outer west coast of Vancouver Island, on the mainland coast north of Vancouver Island, and around the Queen Charlotte Islands. Resting and/or nearshore use by Otters may be periodically and temporarily disturbed by helicopter operation, boat traffic, or ground activities (e.g. gunshots), however, given that the project is terrestrial and will not be occurring during their breeding season, the impacts are expected to be negligible. During Phase 1, the helicopter will largely be flying over the island. Marine vessel traffic associated with the project will be minimal and no more than is typical for the area. The fueling of boats will take place away from the island, at the operations centre in Sidney.	No
Southern Resident Killer Whales (<i>Orcinus orca</i>)	S3	Endangered	Threatened, Schedule 1	Southern Resident Killer Whales spend the majority of late fall through spring, when the project is proposed, away from the waters around Sidney Island. The project is terrestrial and, during Phase 1, the helicopter will largely be flying over the island. The marine vessel traffic associated with the project will be minimal and no more than typical boat traffic in the area. In addition, boat traffic will not occur within the Interim Sanctuary Zones as identified by the Interim Order of the Canada Shipping Act. No project vessel will come within 400m of any orca, as per the mitigation measures identified in the Interim Order. The fueling of boats will take place away from the island, at the operations centre in Sidney.	No
Stellar's Sea Lion (<i>Eumetopias jubatus</i>)	S3S4B, S4N	Special Concern	Special Concern, Schedule 1	This species may occur in the vicinity of Sidney Island but is not common on Sidney Island as the shoreline is largely too steep. The project is terrestrial and is not expected to interact with Stellar's Sea Lion.	No

Ecological Valued Components Considered	S Rank ¹	COSEWIC Status ²	SARA Status ³	Potential Interaction with Project?	Considered in Analysis?
<i>Other Mammals and Mammal Groups</i>					
Black-tailed Deer (<i>Odocoileus hemionus</i>)	S5	Not Listed	Not Listed	Black-tailed Deer population density varies within the Southern Gulf Islands region, however on Sidney Island they persist in low numbers, likely the result of resource competition and negative behavioural interactions with European Fallow Deer. The project will result in the eradication of this population of Black-tailed Deer from Sidney Island, until such time that they recolonize/are introduced back to the island.	Yes
Other Marine Mammals	n/a	n/a	n/a	Other marine mammals that occur in the vicinity of Sidney Island include Harbour Seal (<i>Phoca vitulina</i>). Resting and/or nearshore use by marine mammals may be periodically and temporarily disturbed by small marine vessels landing in select sites with hunting teams, and/or by shoreline cruising, however the impacts to marine mammals are expected to be negligible, given that the project is terrestrial will not be occurring during their breeding season. During Phase 1, the helicopter will largely be flying over the island. Marine vessel traffic associated with the project will be minimal and no more than is typical for the area. The fueling of boats will take place away from the island, at the operations centre in Sidney.	No
Other Terrestrial Mammals	n/a	n/a	n/a	Other native mammals occurring on Sidney Island include American Mink (<i>Neogale vison</i>), North American River Otter (<i>Lontra canadensis</i>), Common Raccoon (<i>Procyon lotor</i>), American Red Squirrel (<i>Tamiasciurus hudsonicus</i>), and Deer Mouse (<i>Peromyscus maniculatus</i>) (iNaturalist, 2023; Stephanie Coulson, personal communication, March 7, 2023). The project may affect normal foraging, activity, and movement patterns of some terrestrial mammal species due to noise, light, physical disturbance from aerial and ground hunting, including the presence of hunting dogs, the presence of temporary fences, and the presence of bait stations and deer carcasses.	Yes
Invertebrate Species at Risk					
Edward's Beach Moth (<i>Anarta edwardsii</i>)	S1	Endangered	Endangered, Schedule 1	Critical habitat for this species, as identified in the species' recovery strategy, exists in the coastal sands ecosystem habitat found on the Hook Spit and Sidney Spit areas of Sidney Island. The COSEWIC Assessment and Status Report states that the species appears to produce a single annual brood with the flight period extending from mid-May through July. The project will occur outside of the species' flight period, outside the species' critical habitat, and there will be no disturbances to the habitat as the helicopter will avoid flying over these areas.	No

¹The S-Rank is the sub-national or provincial ranking for species rarity or conservation status. S5 = Secure, S4 = Apparently Secure, S3 = Vulnerable, S2 = Imperiled, S1 = Critically Imperiled, SU = Un-rankable.

Qualifiers may be included in the rank including "B" for breeding, "N" for non-breeding, and "M" for migrant (NatureServe, Arlington, Virginia, 2023)

²Committee on the Status of Endangered Wildlife in Canada (Government of Canada, 2021b)

³*Species at Risk Act* Status (Government of Canada, 2021b)

Appendix 4 Select Indigenous Culturally Important Plants Typical to the Coastal Douglas Fir Forest and Garry Oak Ecosystems and their Current Status on Sidney Island

Plant Name			Notes on Indigenous Use and Knowledge
SENĆOŦEN	English	Scientific	
Currently Present on Sidney Island			
ᐱᐱᐱ, ELC	Bigleaf Maple	<i>Acer macrophyllum</i>	<ul style="list-style-type: none"> Fresh cambium is edible The wood is good for carving, Large leaves are useful to line berry baskets or to wrap fish
SEᐱÁN	Bracken Fern	<i>Pteridium aquilinum</i>	<ul style="list-style-type: none"> Used as a fish cutting board for the fish does not slide around Causes stomach upset if rhizomes are eaten in the summer
ᐱᐱᐱᐱᐱ	Oceanspray	<i>Holodiscus discolor</i>	<ul style="list-style-type: none"> Hard wood is used to make salmon stakes, arrows, etc. Indicator of sockeye harvest and time to hunt deer
SENI, ILC	Oregon Grape	<i>Mahonia aquafolium</i>	<ul style="list-style-type: none"> Roots are used to make yellow dye Berries are used as a remedy for shellfish poisoning
SᐱOLNEᐱᐱ	Red Alder	<i>Alnus rubra</i>	<ul style="list-style-type: none"> Bark is used to make red dye Dyeing fish nets red makes them invisible to fish
DAᐱE ILC	Salal	<i>Gaultheria Shallon</i>	<ul style="list-style-type: none"> Berries are dried and made into cakes Branches and leaves are used in pit cooks
Currently Present but Rare on Sidney Island			
ᐱᐱᐱᐱᐱ	Arbutus	<i>Arbutus menziesii</i>	<ul style="list-style-type: none"> Bark is used to make tea for mood enhancing or sleep inducing In the flood story, this species saved the W̱SÁNEĆ People, as such it is not burned
ᐱᐱᐱᐱᐱ	Garry Oak	<i>Quercus garryana</i>	<ul style="list-style-type: none"> Acorns are eaten, after cooking out the tannins Periodic prescribed burns were used to maintain Garry Oak meadows (otherwise conifers take over)
ᐱᐱᐱᐱᐱ, ILC	Nootka Rose	<i>Rosa nutkana</i>	<ul style="list-style-type: none"> Edible petals/hips
ᐱᐱ, EWILC	Pacific Crabapple	<i>Malus fusca</i>	<ul style="list-style-type: none"> Wood is used to make tools, adze, hooks Planting will bring back salmon
PEPKIYOS	Snowberry	<i>Symphoricarpos albus</i>	<ul style="list-style-type: none"> Bath for muscles PEPKIYOS means "little revenge berry" as it is not edible
SᐱÍ, SENILC	Saskatoon Berry	<i>Amechancier alnifolia</i>	<ul style="list-style-type: none"> Berries are eaten fresh The wood is used to make arrow shafts
DEᐱEN, ILC	Thimbleberry	<i>Rubus parviflorus</i>	<ul style="list-style-type: none"> Young shoots and berries are edible, made into cakes Leaves are made into bowls
Currently Absent from Sidney Island			
ᐱᐱMI, ILC	Baldhip rose	<i>Rosa gymnocarpa</i>	<ul style="list-style-type: none"> Used for spiritual purposes

Plant Name			Notes on Indigenous Use and Knowledge
SENĆOŦEN	English	Scientific	
KEBOX IŁĆ	Beaked Hazelnut	<i>Corylus cornuta</i>	<ul style="list-style-type: none"> Nuts are eaten
	Black Twinberry	<i>Lonicera involucrata</i>	
ŦKOME, IŁĆ	Blackcap Raspberry	<i>Rubus leucodermis</i>	<ul style="list-style-type: none"> Berries are dried into cakes
YIYXEM IŁĆ	Evergreen Huckleberry	<i>Vaccinium ovatum</i>	<ul style="list-style-type: none"> Berries are eaten fresh Last berry to harvest in the year (can harvest until December)
KÁMQ IŁĆ	Gummy Gooseberry	<i>Ribes lobbii</i>	
TÁ, TEŦLP	Hardhack Spirea	<i>Spiraea douglassi</i>	
	Kinnikinnick	<i>Arctostaphylos uva-ursi</i>	
	Mock Orange	<i>Philadelphus lewisii</i>	<ul style="list-style-type: none"> Used to make arrowheads, knitting needles
ŦEXEN, IŁĆ	Osoberry	<i>Oemleria cerasiformis</i>	<ul style="list-style-type: none"> Bark is used as a purgative The fruit are edible
ŁEW, KIMIŁĆ	Oval-leaved Blueberry	<i>Vaccinium ovalifolium</i>	<ul style="list-style-type: none"> Berries are eaten fresh or dried into cakes
	Pacific Ninebark	<i>Physocarpus capitatus</i>	<ul style="list-style-type: none"> Root tea is used as a laxative
ŦIWEKIŁĆ	Red Elderberry	<i>Sambucus racemosa</i>	
WIWQ, IŁĆ	Red Flowering Currant	<i>Ribes sanguineum</i>	<ul style="list-style-type: none"> Mixed with other berries and dried into cakes Indicator that spring has arrived
S, KEKĆES IŁĆ	Red Huckleberry	<i>Vaccinium parvifolium</i>	<ul style="list-style-type: none"> Berries are eaten fresh or in cakes Swainson's Thrush ripens the berries with its song
ELILE IŁĆ	Salmonberry	<i>Rubus spectabilis</i>	
SXÁSEM	Soapberry	<i>Shepherdia canadensis</i>	<ul style="list-style-type: none"> Used to make "Indian iced cream" (a sweet, frothy food)
SPEŦIŁĆ	Stink Currant	<i>Ribes bracteosum</i>	
KÁMQ IŁĆ	Wild Black Gooseberry	<i>Ribes divaricatum</i>	<ul style="list-style-type: none"> Berries are boiled, dried into cakes with Salal Thorns used for tattooing

Appendix 5 Accidental Finds Protocol

Indigenous Cultural Artifacts and Culturally significant Sites

Accidental Finds Protocol

This protocol will be used if items are found when archaeologists or Parks Canada Agency (Parks Canada) Cultural Resource staff are not present on-site during construction activities. There may be cultural artifacts present in the project area that have not yet been discovered (even after an archaeological assessment has been carried out or no assessment was deemed necessary for the project).

Procedure in the Event of an Accidental Find

If staff or contractors observe any suspected cultural artifacts while working, they should stop work in the immediate area, and contact the Project Manager and Cultural Resource Management (CRM) Advisor (see contact information in Table 1), to discuss any protective measures that might be needed. Artifacts must be left in place until Parks Canada staff are consulted. Artifacts should be left in place until a Parks Archaeologist has been consulted.

Significant resources that could be considered grounds for work stoppage include, but are not limited to, human remains, unique or diagnostic artifacts, and/or artifacts directly associated with known sites and/or unidentified sites in the area. In all cases, Cultural Resource Management Advisors must be made aware of finds and communicate to the Parks Canada Archaeologists.

Documentation

To assess the situation, the following information should be documented/recorded:

- A description of what was seen,
- The location of where the material was encountered (including GPS point),
- What the surrounding soil looked like,
- How deep the material was from the ground surface, or if it was at ground surface.
- Photographs of the observed material

This information should be sent to the CRM Advisor who will pass the information on to a Parks Canada Archaeologist. If the CRM Advisor (or other listed GINPR managers) cannot be reached, contact the Parks Canada Archaeologist directly (Table 1).

Table 1. Cultural Resource Contacts

Name and Title	Contact Information
Michael Janssen, Project Manager, GINPR	michael.janssen@pc.gc.ca 250-418-5746
Alex Lausanne, Cultural Heritage Officer, GINPR	alex.lausanne@pc.gc.ca 250-415-7357
Molly Clarkson, Resource Conservation Manager, GINPR	molly.clarkson@pc.gc.ca 236-464-2015
Kate Humble,	meghankate.humble@pc.gc.ca

Name and Title	Contact Information
Site Superintendent, GINPR	250-654-4021
Jacob Salmen-Hartley, Archaeologist, Archaeology, Collections and Curatorial Branch, Indigenous Affairs and Cultural Heritage Directorate, Parks Canada, Victoria	jacob.salmen-hartley@pc.gc.ca 236-334-5877
Aaron Osicki, Archaeologist, Archaeology, Collections and Curatorial Branch, Indigenous Affairs and Cultural Heritage Directorate, Parks Canada, Calgary	aaron.osicki@canada.ca 236-464-2448
Chris Springer, Archaeologist, Archaeology, Collections and Curatorial Branch, Indigenous Affairs and Cultural Heritage Directorate, Parks Canada, Vancouver	chris.springer@pc.gc.ca

Appendix 6 Passerines and Other Terrestrial Birds Including Raptors Reported from Sidney Island Between November and April

Table 1. Passerines and Other Terrestrial Birds Including Raptors Reported from Sidney Island Between October and April (1900-2023)

Passerines or Other Terrestrial Species Including Raptors		Species Reported ¹						
Common Name	Scientific Name	Jan	Feb	Mar	Apr	Oct	Nov	Dec
American Crow	<i>Corvus brachyrhynchos</i>	X	X	X	X	X	X	X
American Goldfinch	<i>Spinus tristis</i>				X			
American Kestrel	<i>Falco sparverius</i>							X
American Pipit	<i>Anthus rubescens</i>				X	X	X	
American Robin	<i>Turdus migratorius</i>	X	X	X	X	X	X	X
Anna's Hummingbird	<i>Calypte anna</i>	X	X		X	X		X
Bald Eagle	<i>Haliaeetus leucocephalus</i>	X	X	X	X	X	X	X
Band-tailed Pigeon	<i>Patagioenas fasciata</i>			X	X			
Barn Swallow	<i>Hirundo rustica</i>	X			X			
Belted Kingfisher	<i>Megaceryle alcyon</i>	X	X	X	X	X	X	X
Bewick's Wren	<i>Thryomanes bewickii</i>			X	X	X		X
Black-throated Gray Warbler	<i>Setophaga nigrescens</i>				X			
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>						X	
Brown Creeper	<i>Certhia americana</i>		X	X	X	X		
Brown-headed Cowbird	<i>Molothrus ater</i>				X			
Cedar Waxwing	<i>Bombycilla cedrorum</i>					X		
Chestnut-backed Chickadee	<i>Poecile rufescens</i>	X	X	X	X	X	X	
Common Raven	<i>Corvus corax</i>	X	X	X	X	X	X	X
Common Yellowthroat	<i>Geothlypis trichas</i>				X			
Cooper's Hawk	<i>Accipiter cooperii</i>	X		X	X	X	X	X
Dark-eyed Junco	<i>Junco hyemalis</i>	X	X	X	X	X	X	X
Downy Woodpecker	<i>Dryobates pubescens</i>	X		X	X	X		

Passerines or Other Terrestrial Species Including Raptors		Species Reported ¹						
Common Name	Scientific Name	Jan	Feb	Mar	Apr	Oct	Nov	Dec
European Starling	<i>Sturnus vulgaris</i>	X	X	X	X	X	X	X
Evening Grosbeak	<i>Coccothraustes vespertinus</i>				X			
Fox Sparrow	<i>Passerella iliaca</i>			X		X		X
Golden-crowned Kinglet	<i>Regulus satrapa</i>	X		X	X	X	X	X
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>			X	X	X	X	X
Hairy Woodpecker	<i>Dryobates villosus</i>			X		X		X
Hermit Thrush	<i>Catharus guttatus</i>				X			X
Horned Lark	<i>Eremophila alpestris</i>					X	X	
House Finch	<i>Haemorhous mexicanus</i>					X	X	X
House Wren	<i>Troglodytes aedon</i>				X			
Hutton's Vireo	<i>Vireo huttoni</i>		X	X	X	X		
Lapland Longspur	<i>Calcarius lapponicus</i>					X		
Lincoln's Sparrow	<i>Melospiza lincolnii</i>				X			
Marsh Wren	<i>Cistothorus palustris</i>	X				X		X
Merlin	<i>Falco columbarius</i>			X	X	X	X	
Northern Flicker	<i>Colaptes auratus</i>		X	X	X	X		X
Northern Harrier	<i>Circus hudsonius</i>	X	X	X		X	X	X
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>				X			
Northern Shrike	<i>Lanius borealis</i>						X	
Orange-crowned Warbler	<i>Leiothlypis celata</i>			X	X			
Osprey	<i>Pandion haliaetus</i>				X			
Pacific Wren	<i>Troglodytes pacificus</i>	X	X	X	X	X	X	X
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>				X			
Peregrine Falcon	<i>Falco peregrinus</i>	X	X	X	X	X	X	X
Pileated Woodpecker	<i>Dryocopus pileatus</i>		X	X	X	X	X	
Pine Siskin	<i>Spinus pinus</i>		X	X	X	X	X	X
Purple Finch	<i>Haemorhous purpureus</i>		X	X	X	X		
Purple Martin	<i>Progne subis</i>				X			

Passerines or Other Terrestrial Species Including Raptors		Species Reported ¹						
Common Name	Scientific Name	Jan	Feb	Mar	Apr	Oct	Nov	Dec
Red Crossbill	<i>Loxia curvirostra</i>			X	X			
Red-breasted Nuthatch	<i>Sitta canadensis</i>		X	X	X	X	X	
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>			X	X			X
Red-tailed Hawk	<i>Buteo jamaicensis</i>		X		X			
Red-winged Blackbird	<i>Agelaius phoeniceus</i>		X	X	X	X		
Ring-necked Pheasant	<i>Phasianus colchicus</i>			X				
Rock Pigeon	<i>Columba livia</i>			X				
Ruby-crowned Kinglet	<i>Corthylio calendula</i>			X	X	X	X	X
Rufous Hummingbird	<i>Selasphorus rufus</i>			X	X			
Savannah Sparrow	<i>Passerculus sandwichensis</i>				X	X		
Sharp-shinned Hawk	<i>Accipiter striatus</i>				X			
Short-eared Owl	<i>Asio flammeus</i>						X	X
Snow Bunting	<i>Plectrophenax nivalis</i>			X			X	
Song Sparrow	<i>Melospiza melodia</i>	X	X	X	X	X	X	X
Spotted Towhee	<i>Pipilo maculatus</i>		X		X	X	X	X
Townsend's Warbler	<i>Setophaga townsendi</i>				X	X		
Tree Swallow	<i>Tachycineta bicolor</i>			X	X			
Turkey Vulture	<i>Cathartes aura</i>		X	X	X	X		
Varied Thrush	<i>Ixoreus naevius</i>		X	X	X	X	X	
Violet-green Swallow	<i>Tachycineta thalassina</i>			X	X			
Warbling Vireo	<i>Vireo gilvus</i>				X			
Western Meadowlark	<i>Sturnella neglecta</i>						X	
Western Screech-Owl	<i>Megascops kennicottii</i>			X	X			
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>			X	X	X		
Yellow-rumped Warbler	<i>Setophaga coronata</i>			X	X	X		X

¹ X = Species reported at least once between October and April (1900-2023) (eBird, 2023b, 2023a)