Rose Swanson Mountain Collation of Wildlife, Vegetation, Species and Ecosystems at Risk Inventory Data

Prepared for:

Attn: Marge Sidney, RPBio.
Armstrong Spallumcheen Trails Society
astrailssociety@gmail.com

Prepared by:

Megan Olson, RBTech Trainee
Michele Hill, F.W., F.W.T., BSc., RPBio

Reviewed and submitted by:

Michele Hill, F.W., F.W.T., BSc., RPBio

Report submitted: July 31, 2024

2540 Pleasant Valley Boulevard, PO Box #68, Armstrong, B.C., V0E 1B0
PH: (250) 546-4069, micheleh@hillenvironmental.ca

TABLE OF CONTENTS

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

List of Figures

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

List of Tables

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

1.0 INTRODUCTION

Hill Environmental has been retained by the Armstrong Spallumcheen Trails Society (ASTS) to collate existing species and ecosystems inventory data on Rose Swanson Mountain (Rose Swanson). The ASTS sees value in the trail network and ecosystems on Rose Swanson and the ecosystem services Rose Swanson provides. BC Timber Sales (BCTS) has developed harvesting plans for Rose Swanson. The ASTS would like to collate the current and potential presence of wildlife, vegetation, and species and ecosystems at risk on Rose Swanson and have it incorporated into the proposed BCTS harvest plan. This inventory also details which species are listed under provincial and federal legislation, including the *Wildlife Act, Migratory Bird Convention Act* (MBCA), *Forest and Range Practices Act* (FRPA), and the *Species at Risk Act* (SARA). Additionally, desktop searches of current mapping and open data catalogues were conducted to determine what designations exist on Rose Swanson regarding ecosystem type and conservation of biodiversity. Recommendations on how to proceed with the management of Rose Swanson to ensure the future enjoyment and protection of biodiversity are also provided.

1.1 Site Location

Rose Swanson is in Spallumcheen, just west of the City of Armstrong (Figure 1). It is situated between the forested landscapes of Silver Star (Trinity Valley) to the east, Okanagan Lake to the southwest, and Falkland/Yankee Flats to the northwest. Waterbodies in the area include Okanagan Lake, Swan Lake, Round Lake, Otter Lake, Deep Creek, and the Salmon River. Rose Swanson's location and intact mature canopy create a refuge for a variety of wildlife and plant species and provide a corridor for wildlife movement between habitats. Rose Swanson also has a historical network of trails, making it a popular recreational area for the Armstrong/Spallumcheen community.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

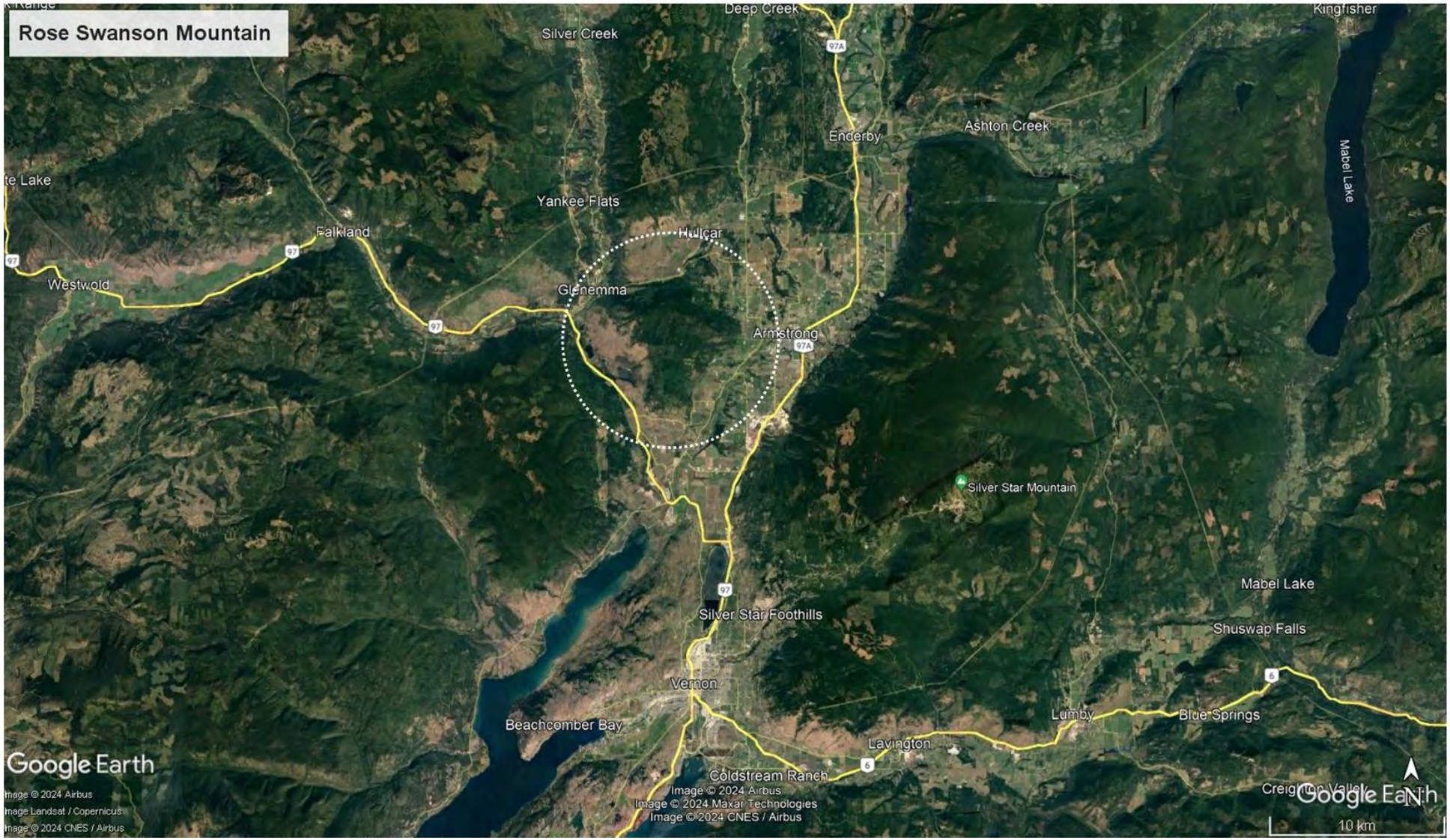

Figure 1- Orthophoto of the location of Rose Swanson (circled) and the surrounding areas.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

2.0 BACKGROUND

2.1 Sensitive Area Order & Crown Land Reserve

Approximately 1780ha of Rose Swanson is designated as a "Reserve" under the *Land Act*. Reserves are a type of tenure that grants an agency the ability to restrict the use of crown land and withdraws the area from disposition under the *Land Act* (Province of British Columbia, 2011). The Rose Swanson Reserve is specifically for the Use, Recreation and Enjoyment of the Public (UREP) (Province of British Columbia, 2024).

In 1996, a Sensitive Area and Objectives Order was established for Rose Swanson through FRPA (s 58(1)) and the *Land Act* (s 93.8) and remains in effect today (Figure 2). The creation of the 712ha[1] Sensitive Area was established with the following objectives:

1) maintain and enhance trail network for use by recreationalists,
2) protect visual quality of area,
3) maintain recreation values by limiting timber harvesting to low impact silvicultural systems, and
4) protect area against vandalism and timber theft

(B.C. Forest Practices Board, 2023).

[1] Current GIS work indicates that the Sensitive Area is 743.9ha, not 712ha as stated in the Objectives Order (BC Timber Sales, 2023, p. 54)

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

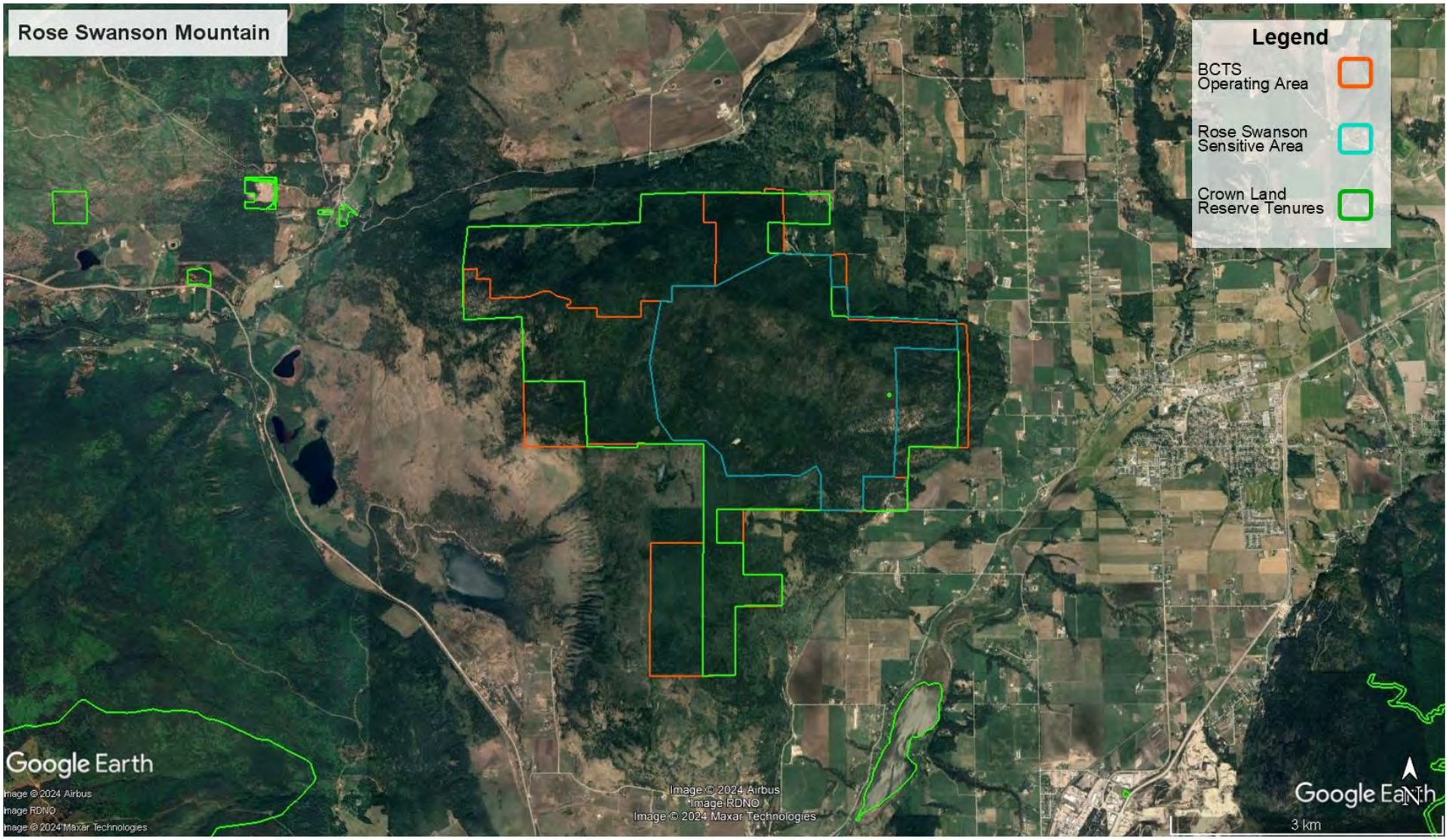

Figure 2 – Orthophoto of Rose Swanson with the mapped BCTS Operating Area, the Sensitive Area, and the Reserve Area.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

2.2 Planned Harvesting in and adjacent to the Sensitive Area

In 2021, the B.C. Forest Practices Board received a complaint regarding BCTS's plans to harvest Rose Swanson and its inconsistency with the "Sensitive Area" objectives. In 2023, BCTS subsequently amended their forest stewardship plan (FSP) to include these objectives which was approved by the Ministry of Forests. The amended FSP includes harvesting within the 712ha Sensitive Area in two separate zones. Zone 1 includes the main recreational trails and Zone 2 includes old roads and skid trails (Figure 3). Both zones are located within and extend outside of the designated "Sensitive Area". BCTS is proposing a 100m "Management Zone" on the outer limit of the trail system in Zone 1, which will be treated as a "Reserve Zone" (no harvesting) if there are no significant forest health factors, windthrow, fire salvage or a risk to public safety. There will be a 15m management zone on either side of each trail in Zone 2. If there are no significant forest health factors, windthrow, fire salvage or a risk to public safety Zone 2 will be harvested with single tree selection, group selection, or retention harvesting. Zone 2 will then have a minimum of 50% basal area retention which equates to 50% of merchantable trees within the management area, non merchantable trees will be retained.

A Management Zone as defined in the Riparian Management Guidebook, has constraints to harvesting as opposed to the "Reserve Zone" which does not permit harvesting. The objectives of a Riparian Management Zone are: (Forest Practices Code of British Columbia, 1995)

a) To minimize or prevent impacts of forest and range use on stream channel dynamics, aquatic ecosystems, and water supply of all streams, lakes and wetlands;

b) to minimize or prevent impacts of forest and range use on the diversity, productivity, and sustainability of wildlife habitat and vegetation adjacent to streams, lakes and wetlands with reserve zones or where high wildlife values are present;

c) to allow for forest and range use that is consistent with a and b above.

The label of "Management Zone" does not include the "Reserve Zone" restrictions of no harvesting. In addition, without the label of "Reserve Zone", the objective of the "Management Zone" excludes the retention of important wildlife habitat attributes including wildlife trees, large trees, hiding resting cover, nesting sites, structural diversity, coarse wood debris, and food sources characteristic of natural riparian ecosystems.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

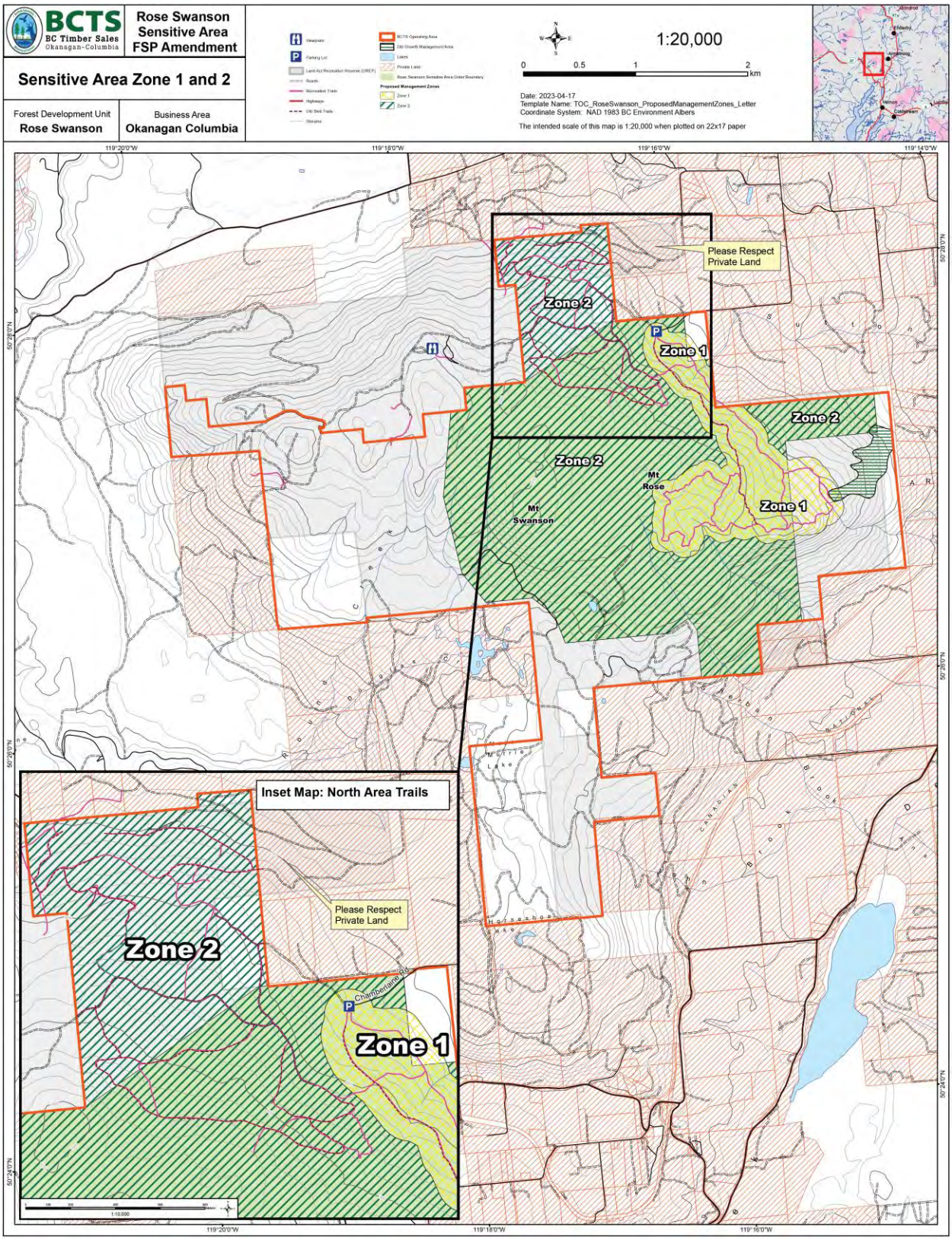

Figure 3 - BCTS (2023) FSP Amendment map of the 712ha Sensitive Area and Zone 1 and Zone 2.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

BCTS will be limited to harvesting a maximum of 5% of the Sensitive Area over a ten-year period (35.6ha of the 712ha), unless there are significant forest health factors, windthrow, fire salvage, or fuel mitigation projects. Areas outside of Zone 1 and Zone 2 will be harvested using low impact silviculture systems according to the *Silviculture Systems Handbook for British Columbia*, which include retention systems, group selection and single tree selection (BC Timber Sales, 2021).

In a Township of Spallumcheen Committee of the Whole meeting that took place on August 21, 2023, it was stated that "previous maps are no longer current and BCTS is creating the harvest plan from a clean slate" (Township of Spallumcheen, 2023, p. 836). This means that there currently are no maps for planned blocks for Rose Swanson. Once the harvesting plan is finalized it will potentially go to tender the fall of 2025.

2.3 Biogeoclimatic Ecosystem Classification (BEC zone)

According to the revised Provincial BEC database (Version 12), the current Biogeoclimatic (BGC) zone of Rose Swanson is Interior Cedar-Hemlock, very dry mild Shuswap (ICHxm1)[2] (Figure 4). The ICHxm1 zone was previously known as Interior Douglas-fir moist warm Shuswap (IDFmw1), which is no longer a BGC zone name as of 2021. The ICHxm1 is described in Land Management Handbook 75, which covers the area north from the Canada-America border to Shuswap Lake and east from Okanagan Lake to Castlegar (Figure 5). In addition to the renaming, the zone had minor mapping adjustments throughout its range (Province of British Columbia, 2021). The ICHxm1 covers an area of 147,561ha within the Eastern Okanagan-Shuswap-Boundary-South Arrow region (Figure 6) (Province of British Columbia, 2021). *The ICHxm1 zone does not occur anywhere else in the province.* The former IDFmw1 subzone still exists elsewhere in the province, but not with a Shuswap variant (1). The area surrounding Rose Swanson has remained Interior Douglas-fir very dry hot Okanagan (IDFxh1), which covers 224,874ha in the southern Thompson-Okanagan region (Province of British Columbia, 2022). The BCTS Operating Area on Rose Swanson, the Sensitive Area, and the Reserve Area are all mapped within the re-named ICHxm1 zone. A summary of the wildlife habitats and examples of the species they support in the ICHxm1 and IDFxh1 BGC zones are listed in Appendix A.

[2] Biogeoclimatic Ecosystem Classification Program maps – DVE_VernonSubunit_OkanaganShuswapResourceDistrict_ThompsonOkanaganRegion

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

The ICHxm1 occurs between the dry climates of the IDF and the moist climates of the ICH and has a broad mix of species that reflect this transition. “The mixture of dry, mesic, and wet forests interspersed with scattered grasslands, brushlands, rock outcrops, wetlands, and floodplains in the ICHxm1 provides a rich mosaic of habitats that support a range of wildlife species” (Province of British Columbia, 2021, p. 167). These habitats also support species at risk, winter range for ungulates, and old growth reliant species (Province of British Columbia, 2021).

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

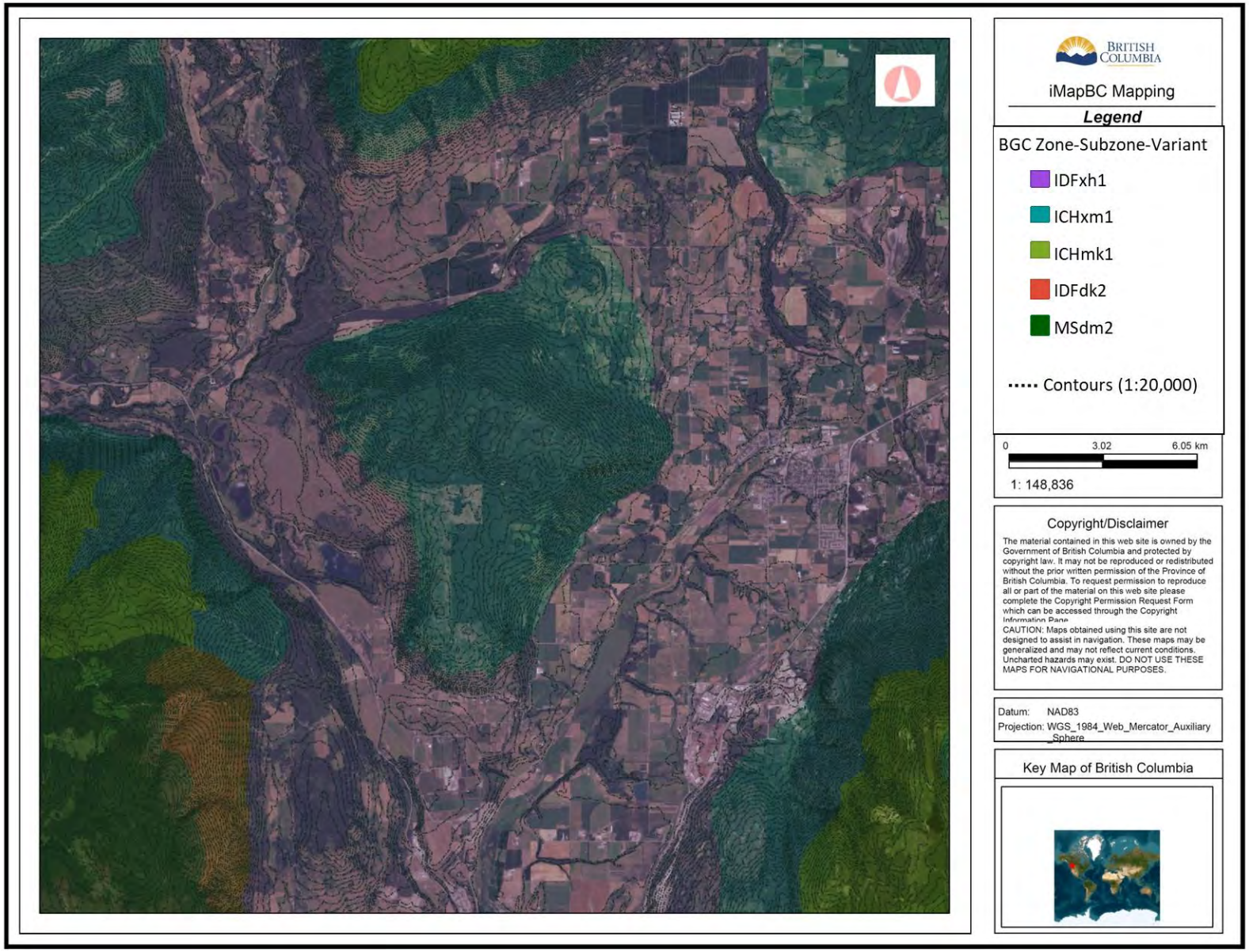

Figure 4 – Orthophoto of Rose Swanson with the current ICHxm1 BGC zone-subzone-variant layer in the center surrounded by IDFxh1...

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

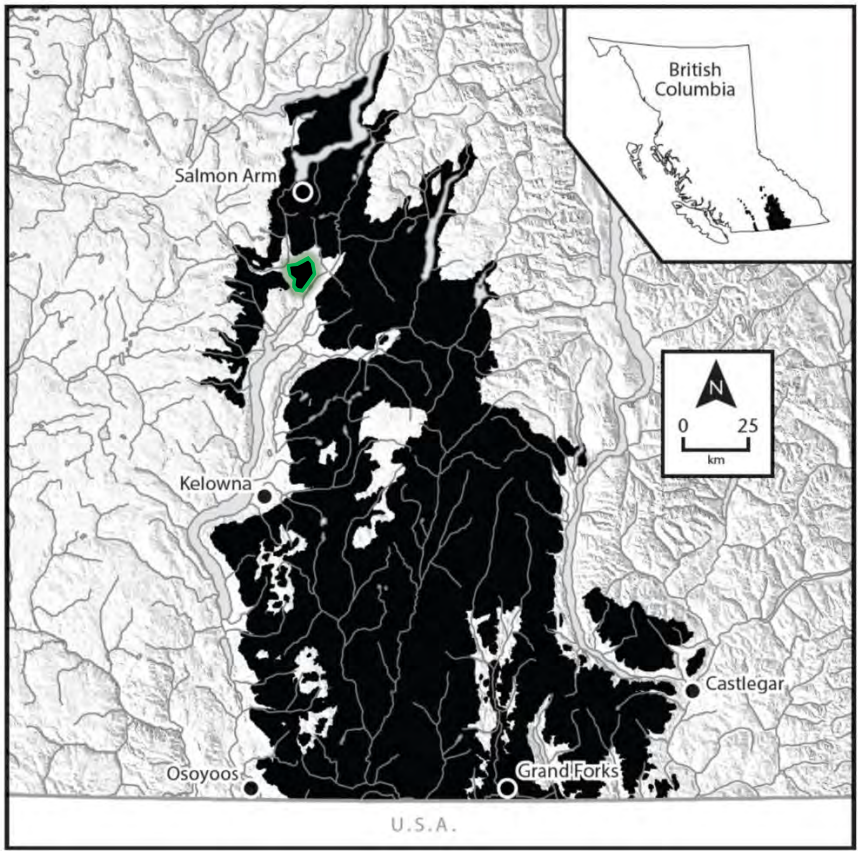

Figure 5- Geographic area covered in Land Management Handbook 75 which was released in 2021. Rose Swanson is outlined in green.

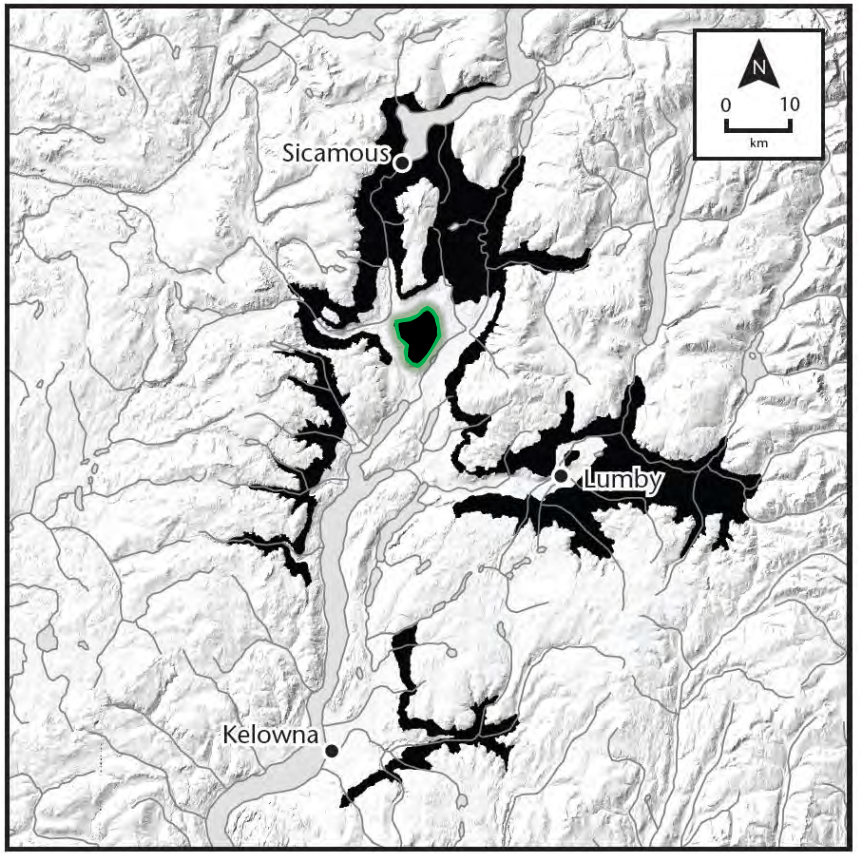

Figure 6 - The distribution of the ICHxm1 zone as described in Land Management Handbook 75 which is exclusive to this handbook. Rose Swanson is outlined in green.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

2.4 Seral Stages and Old Growth

The independent Old Growth Technical Advisory Panel (TAP) used the seral stage approach in the Biodiversity Guidebook and the climax tree species within each BGC zone according to updated Provincial BEC database (Version 12), to map old growth forests within each BGC zone (Old Growth Technical Advisory Panel, 2021). The Biodiversity Guidebook based seral stages on the natural disturbance type (NDT) and BGC zone. The Biodiversity Guidebook was released in 1995 and lists the old IDFmw1 BGC zone for Rose Swanson. However, the NDT for Rose Swanson has remained NDT4[3] and both ICH and IDF zones under NDT4 have the same definitions for the seral stages: Early (<40 years), Mid (undesignated but between early and mature), Mature (>100 years), and Old (>250 years) (Forest Practices Code of British Columbia, 1995). Based on the TAP mapping using the ICHxm1, Rose Swanson has early, mid, and mature seral stages as well as old growth deferral areas, priority big-treed older mature growth, and old growth recruitment forests (Figure 7). However, since TAP used the climax tree species of the re-named BGC zone (ICHxm1) in the study versus the IDFmw1, the climax species used to map old growth was not accurate. The climax species in a IDF stand is Douglas Fir and the climax species in an ICH stand is Western Red Cedar. Since the TAP mapping exercise utilized the ICHxm1 revised BGC zone as opposed to the previous IDFmw1, the outcome of the TAP mapping is inaccurate based on the climax species. There is a difference between how TAP characterized old growth (OG) between the two different climax species.

Old growth priority deferral areas are at-risk forests and should have harvesting deferred (Old Growth Technical Advisory Panel, 2021). At-risk forests are defined as those where “failure to act now could lead to the permanent loss of rare or unique ecosystem components” (Old Growth Technical Advisory Panel, 2021, p. 3). Deferral is not protection but aims to maintain at-risk forests in the short-term. On Rose Swanson, 8.98ha is mapped as a priority deferral area. The same mapped area is also identified as big-treed older mature growth. Where there are insufficient old forests, TAP identified younger stands (>80years) that should also have deferred harvesting to ensure recruitment and recovery of old growth forests (Old Growth Technical Advisory Panel, 2021). On Rose Swanson 56.4ha is mapped as old growth recruitment forest.

[3] Ecosystems with frequent stand-maintaining fires. Surface fire intervals range from 4-50 years and larger stand-initiating crown fires intervals range from 150-250 years or more (Forest Practices Code of British Columbia, 1995).

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

A 16.6ha old growth management area (OGMA) is mapped on the east slope of Rose Swanson (Figure 7). This OGMA is non-legal, meaning that "the direction given… is policy only and is not legally enforceable" (Government of Canada, 2023). In the Thompson-Okanagan, harvesting may occur in non-legal OGMAs for specific reasons, however the goal is to retain the original OGMA as much as possible (Integrated Land Management Bureau, 2007).

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

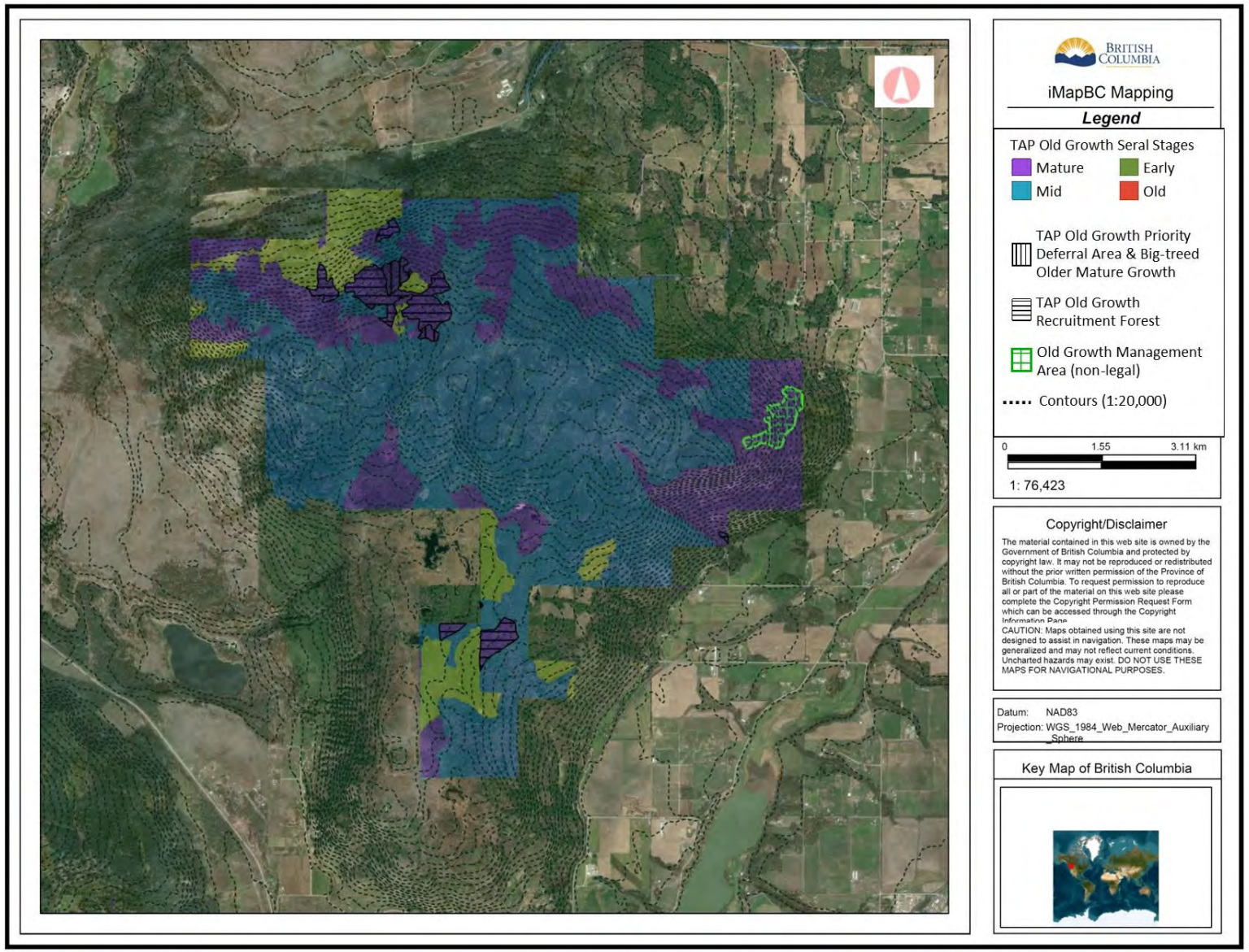

Figure 7 – iMapBC map of the TAP seral stages on Rose Swanson and the mapped big-treed old growth, old growth deferral area, old growth recruitment area, and the non-legal old growth management area.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

3.0 DESKTOP INVENTORY METHODS

Several methods were used to collate the species data presented in this inventory. The first method was to go through the iNaturalist Rose Swanson Reserve project observations. iNaturalist is a citizen science platform that allows the public to identify wildlife and plants and contribute their observations to projects. A total of 3,556 research grade observations[4] of 294 species were contributed to the project by 28 different observers and confirmed by 350 identifiers. For this report, only species level identifications uploaded up to December 21, 2023, were used and research grade identification confirmations were assumed to be accurate.

A search of eBird hotspots was also used to search documented bird species on Rose Swanson. Rose Swanson had a hotspot (Armstrong--Rose Swanson Hiking Trails) and 17 bird species were documented with the citizen science platform.

The third method was to review the wildlife occurrences documented on iMapBC, particularly the wildlife species inventories (WSI) for survey and incidental observations. Additionally, iMapBC was used to see what critical habitats and species at-risk have been documented on or near Rose Swanson[5].

Lastly, BC Species and Ecosystem Explorer (BC Explorer) was used to collect a list of potential wildlife and plant species and ecological communities that have the potential to be found on Rose Swanson based on habitat suitability. Some results that were clearly unlikely (i.e. coastal birds and prairie species) were removed from the list to ensure accurate outcomes. BC Explorer was also used to identify which species and ecosystems are at-risk provincially and federally. The search criteria included native or endemic species, the area of interest (Rose Swanson), and the Biogeoclimatic (BGC) zone. The BGC options on BC Explorer do not reflect the ICHxm1 name change in 2021. Therefore, searches used IDF or the pre-2021 name, IDFmw1 when available. The use of IDF also incorporated species that may cross over from the lower elevation IDFxh1 that surrounds Rose Swanson. ICH was used for wildlife species searches to broaden the list of possible species and accommodate species in the new ICH zone that may otherwise not be represented in the results.

[4] An observation that has been reviewed and a minimum of two members of the iNaturalist community agree on the identification.
[5] iMapBC and Conservation Data Center had the same mapped occurrences for species at-risk and critical habitats.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

4.0 INVENTORY RESULTS

Based on iNaturalist and eBird observations, BC Explorer criteria, and iMapBC occurrences, Rose Swanson has the potential to support 221 species of birds, mammals, amphibians, reptiles, and invertebrates. Search methods also resulted in 229 plant species and 28 ecological communities that may occur on Rose Swanson (Table 1). The following sections are broken down into taxonomic groups and discussed regarding their potential or documented presence on Rose Swanson.

Table 1 – List of the total number of species identified with the search methods and how many of which were documented on Rose Swanson.

Taxonomic Group	Search Results	Documented on Rose Swanson
Amphibian	6	3
Reptile	10	3
Invertebrate	73 (2) [a]	34 (0)
Mammal	36	13 (16) [b]
Bird	98	48
Plant	229	198
Ecological Community	28	0 [c]

a: Only invertebrates that are at-risk and on/near Rose Swanson are discussed.
b: White-tailed deer and Mule deer are expected on Rose Swanson, but the iNaturalist observation were not research grade. Grizzly bear is assumed on Rose Swanson but not documented with iNaturalist.
c: It is unknown whether the ecological communities exist on Rose Swanson due to the non-biological factors not being surveyed.

4.1 Amphibians and Reptiles

Of the six species of amphibian that resulted from the search methods, three were documented on Rose Swanson with iNaturalist (Figure 8). The three species included long-toed salamander (*Ambystoma macrodactylum*), western toad (*Anaxyrus boreas*), and northern pacific treefrog (*Pseudacris regilla*). These species, in addition to Great Basin spadefoot (*Spea intermontana*), have also been documented near Rose Swanson with iMapBC (Figure 9). The remaining two species have the potential to occur on Rose Swanson based on BC Explorer (Table 2).

Ten species of reptiles resulted from the search methods (Table 3). Three of the species were documented on Rose Swanson with iNaturalist or iMapBC (Figures 8 & 9). The species were common gartersnake (*Thamnophis sirtalis*), western skink (*Plestiodon skiltonianus*), and northern rubber boa (*Charina bottae*). Of the remaining seven species, two are unlikely to occur on Rose

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Swanson based on the existing habitats. Aquatic habitats are limited to small, isolated ponds for painted turtles (*Chrysemys picta pop. 2*), and desert nightsnake (*Hypsiglena chlorophaea*) has rarely been documented north of the arid regions in the southern Okanagan (Province of British Columbia, 2023). The remaining five species were documented near Rose Swanson on iMapBC and/or could potentially occur on Rose Swanson based on BC Explorer search criteria.

Of the 14 confirmed or likely amphibian and reptile species, six occur in both the ICH and IDF BGC zones and five are not specific to any BGC zone. Three species are specific to IDF only and none are specific to ICH.

Table 2 - List of documented and potential amphibian species on Rose Swanson. Bolded species have been documented on Rose Swanson with iMapBC or iNaturalist. The results are organized by BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	Source
Ambystoma mavortium	Western Tiger Salamander	X	X	Red	E	1-E (2018)	Y	BC Explorer
Lithobates pipiens	Northern Leopard Frog	X	X	Red	E	1-E (2003)	Y	BC Explorer
Spea intermontana	Great Basin Spadefoot	X		Blue	T	1-T (2003)	Y	iMap, BC Explorer
Ambystoma macrodactylum	**Long-toed Salamander**			Yellow	NAR			iMap, iNaturalist
Anaxyrus boreas	**Western Toad**	X	X	Yellow	SC	1-SC (2018)		iMap, iNaturalist, BC Explorer
Pseudacris regilla	**Northern Pacific Tree Frog**			Yellow				iMap, iNaturalist

a: Red- threatened, Blue- special concern, Yellow - secure.
b: E- Endangered, T- Threatened, SC- Special Concern, NAR- Not at Risk, DD- Data Deficient
c: Digit indicates the schedule under SARA, letter definitions the same as in b, and year is the date it was last reviewed.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 3 – List of documented and potential reptile species on Rose Swanson. Bolded species have been documented on Rose Swanson with iMapBC or iNaturalist. The results are organized by BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	Source
Hypsiglena chlorophaea	Desert Nightsnake	X		Red	E	1-E (2003)		BC Explorer
Chrysemys picta pop. 2	Painted Turtle – *Intermountain – Rocky Mountain Population*	X	X	Blue	SC	1-SC (2007)		BC Explorer
Coluber constrictor	North American Racer	X	X	Blue	T	1-T (2023)	Y	iMap, BC Explorer
Crotalus oreganus	Western Rattlesnake	X		Blue	T	1-T (2005)	Y	BC Explorer
Pituophis catenifer deserticola	Gophersnake, *deserticola*	X		Blue	T	1-T (2005)	Y	BC Explorer
Plestiodon skiltonianus	**Western Skink**	X	X	Blue	SC	1-SC (2005)		iMap, BC Explorer
Charina bottae	**Northern Rubber Boa**	X	X	Yellow	SC	1-SC (2005)		iMap, BC Explorer
Thamnophis elegans	Terrestrial Gartersnake			Yellow				iMap
Thamnophis sirtalis	**Common Gartersnake**			Yellow				iMap, iNaturalist
Elgaria coerulea	Northern Alligator Lizard			Yellow	NAR			iMap

a: Red- threatened, Blue- special concern, Yellow - secure.

b: E- Endangered, T- Threatened, SC- Special Concern, NAR- Not at Risk, DD- Data Deficient

c: Digit indicates the schedule under SARA, letter definitions the same as in b, and year is the date it was last reviewed.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

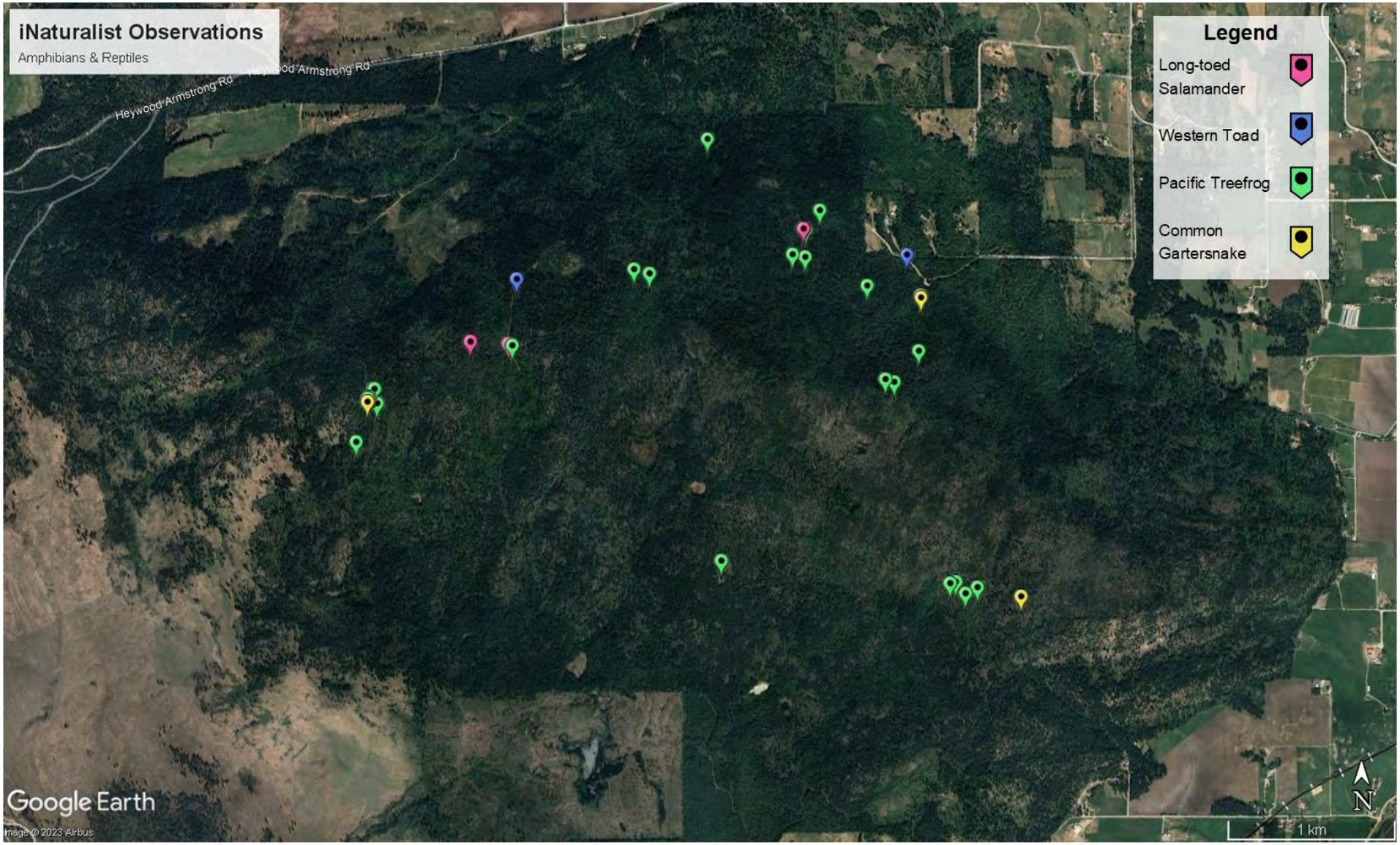

Figure 8 - iNaturalist research grade results for amphibian and reptile species on Rose Swanson.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

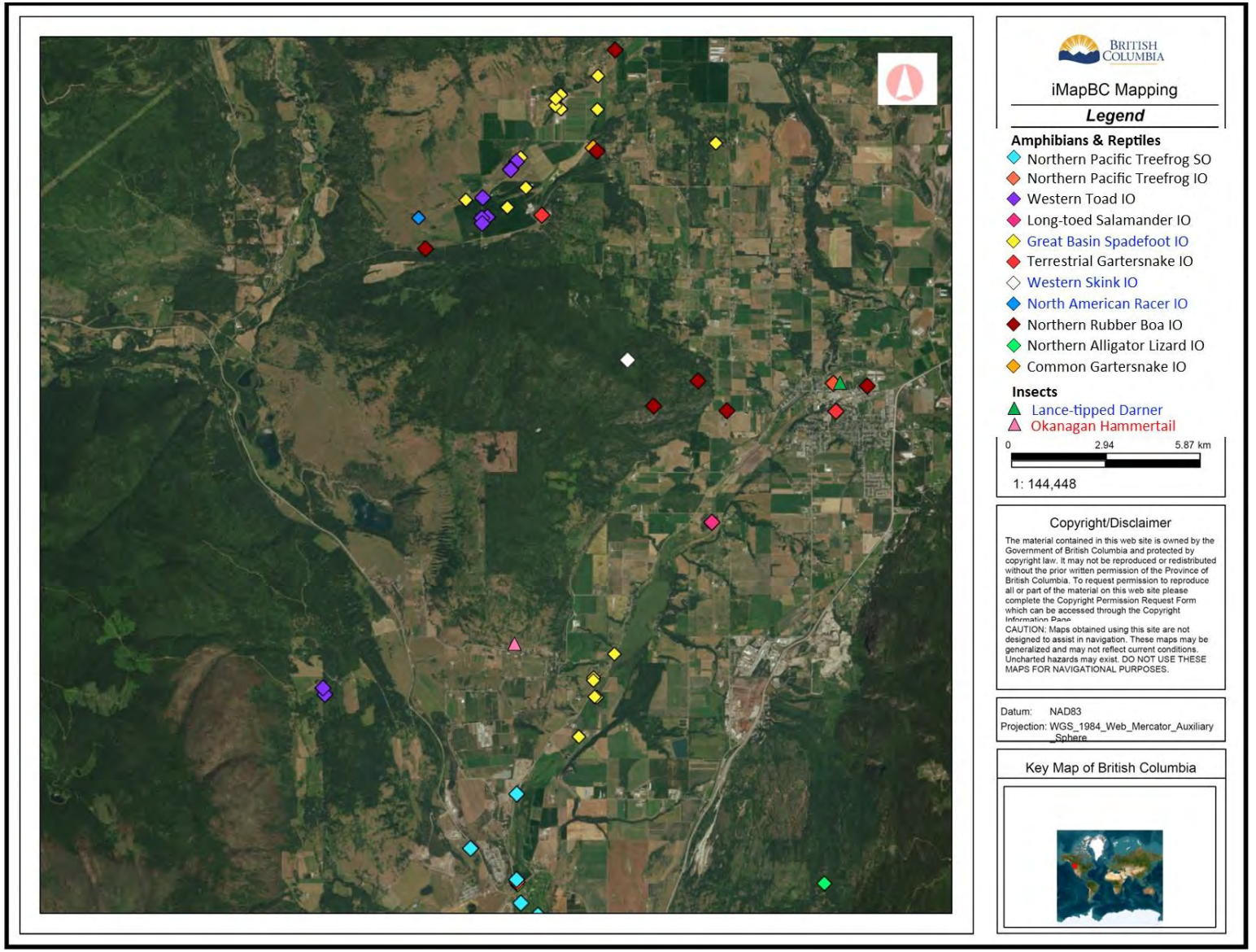

Figure 9 - iMapBC results for amphibian and reptile species and BC ranked invertebrates on Rose Swanson. Red legend entries are red-listed species in BC and blue entries are blue-listed in BC.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

4.2 Invertebrates

There were 73 invertebrate species that resulted from the search methods. The results were narrowed to species on that are ranked provincially as red (endangered) or blue (special concern) and are documented on or near Rose Swanson. Therefore, only two species are discussed (Figure 9; Table 4). Okanagan hammertail (*Efferia okanagana*) is red listed and is not specific to a particular BGC zone. Lance-tipped darner (*Aeshna constricta*) is blue listed and occurs in both IDF and ICH. Of the remaining species, the 34 identified by iNaturalist were yellow listed, had no rank, or were exotic and those identified with BC Explorer were red listed or blue listed and have the potential to occur in IDF and/or ICH BGC zones.

Table 4 - List of documented BC listed invertebrates that have been documented near Rose Swanson.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	Source
Efferia okanagana	Okanagan Hammertail			Red	E	1-E (2017)		iMap
Aeshna constricta	Lance-tipped Darner	X	X	Blue				iMap

a: Red- threatened, Blue- special concern, Yellow - secure.
b: E- Endangered, T- Threatened, SC- Special Concern, NAR- Not at Risk, DD- Data Deficient
c: Digit indicates the schedule under SARA, letter definitions the same as in b, and year is the date it was last reviewed.

4.3 Mammals

Six ungulates, six large carnivores, seven bats, and 17 rodents, mustelids, or mephitidae (skunk) resulted from the search methods (Table 5). Of the 36 mammal species, 13 were documented on Rose Swanson with iNaturalist and/or iMapBC (Figures 10 & 12).

Moose (*Alces alces*) and elk (*Cervus canadensis*) were documented on Rose Swanson with iNaturalist and/or iMapBC. Both white-tailed deer (*Odocoileus virginianus*) and mule deer (*Odocoileus hemionus*) are likely to occur on Rose Swanson, however, the iNaturalist observations were not research grade. Mule deer have been documented near Rose Swanson on iMapBC. It is unlikely the two remaining ungulate species, bighorn sheep (*Ovis canadensis*) and mountain goat (*Oreamnos americanus*), are present based on their habitat requirements. Both species frequent alpine, grasslands, and rocky slopes and only occasionally use dry or mesic forests (Province of British Columbia, 2023). Five of the six large carnivores have been documented on Rose Swanson with iNaturalist and/or iMapBC. Grizzly bear (*Ursus arctos*) is believed to occur on Rose Swanson but was not documented on iMapBC or iNaturalist. Of the seven bat species, none have been confirmed on Rose Swanson, but that is expected given their nocturnal behaviour. Five rodents

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

and one skunk have been documented on Rose Swanson with iNaturalist. The twelve remaining species were documented near Rose Swanson on iMapBC or were a result of the BC Explorer search. Of the 36 confirmed or likely mammal species, ten occur in both ICH and IDF BGC zones and 17 are not specific to any BGC zone. Six species are specific to IDF only and two are specific to only ICH.

Table 5 - List of documented and potential mammal species on Rose Swanson. Bolded species have been documented on Rose Swanson with iMapBC or iNaturalist. The results are organized by BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	Source
Lepus townsendii	White-tailed Jackrabbit	X	X	Red				BC Explorer
Pekania pennanti pop.5	Fisher – Columbian Population	X	X	Red			Y	BC Explorer
Sorex preblei	Preble's Shrew	X		Red				BC Explorer
Taxidea taxus	American Badger	X	X	Red	E	1-E (2018)	Y	iMap, BC Explorer
Corynorhinus townsendii	Townsend's Big-eared Bat	X	X	Blue				BC Explorer
Euderma maculatum	Spotted Bat	X		Blue	SC	1-SC (2005)	Y	BC Explorer
Gulo gulo luscus	Wolverine, *luscus*	X	X	Blue	SC	1-SC (2018)	Y	BC Explorer
Lasiurus cinereus	Hoary Bat	X	X	Blue	E			BC Explorer
Myotis ciliolabrum	Western Small-footed Myotis	X		Blue				BC Explorer
Myotis lucifugus	Little Brown Myotis	X	X	Blue	E	1-E (2014)		BC Explorer
Myotis thysanodes	Fringed Myotis	X	X	Blue	DD	3 (2005)	Y	BC Explorer
Myotis yumanensis	Yuma Myotis	X	X	Blue				BC Explorer
Neotamias ruficaudus simulans	Red-tailed Chipmunk, *simulans*		X	Blue				BC Explorer
Oreamnos americanus	Mountain Goat [d]	X	X	Blue				BC Explorer
Ovis canadensis	Bighorn Sheep [d]	X	X	Blue			Y	BC Explorer
Perognathus parvus	Great Basin Pocket Mouse	X		Blue				BC Explorer
Reithrodontomys megalotis	Western Harvest Mouse	X		Blue	E	1-SC (2009)		BC Explorer

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 5 continued - List of documented and potential mammal species on Rose Swanson. Bolded species have been documented on Rose Swanson with iMapBC or iNaturalist. The results are organized by BC rank then alphabetically by species name. Asterisks indicate non-research grade observations from iNaturalist for common species likely to occur on Rose Swanson.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	Source
Sylvilagus nuttallii	Nuttall's Cottontail	X		Blue	SC	1-SC (2007)		BC Explorer
Synaptomys borealis artemisiae	Northern Bog Lemming, *artemisiae*	X		Blue				BC Explorer
Ursus arctos	Grizzly Bear	X	X	Blue	SC	1-SC (2018)	Y	BC Explorer
Alces alces	**Moose [d]**			Yellow			Y	iMap, iNaturalist
Canis latrans	**Coyote**			Yellow				iMap, iNaturalist
Canis lupus	**Grey Wolf**			Yellow	NAR			iNaturalist
Cervus canadensis	**Elk [d]**			Yellow			Y	iMap, iNaturalist
Lepus americanus	**Snowshoe Hare**			Yellow				iNaturalist
Lynx rufus	**Bobcat**			Yellow				iNaturalist
Mephitis mephitis	**Striped Skunk**			Yellow				iNaturalist
Mustela frenata	Long-tailed weasel			Yellow				iMap
Neotamias amoenus	**Yellow-pine Chipmunk**			Yellow				iNaturalist
Odocoileus hemionus	**Mule Deer [d]**			Yellow				iMap, iNaturalist*
Odocoileus virginianus	**White-tailed Deer [d]**			Yellow				iNaturalist*
Peromyscus sonoriensis	**Western Deer Mouse**			Yellow				iNaturalist
Puma concolor	**Cougar**			Yellow				iNaturalist
Tamiasciurus hudsonicus	**American Red Squirrel**			Yellow				iNaturalist
Thomomys talpoides	**Northern Pocket Gopher**			Yellow				iNaturalist
Ursus americanus	**Black Bear**			Yellow	NAR			iNaturalist

a: Red- threatened, Blue- special concern, Yellow - secure.
b: E- Endangered, T- Threatened, SC- Special Concern, NAR- Not at Risk, DD- Data Deficient
c: Digit indicates the schedule under SARA, letter definitions the same as in b, and year is the date it was last reviewed.
d: ungulate species for which a winter range may be required for winter survival as identified by FRPA

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

4.4 Birds

A total of 98 bird species resulted from the search methods (Table 6). Forty-eight of the species were documented on Rose Swanson with iMapBC, iNaturalist and/or eBird (Figures 11 & 12). Of the remaining species, five were observed near Rose Swanson on iMapBC, and 44 resulted from the BC Explorer search. Several of the 44 species are unlikely to occur on Rose Swanson because of their habitat requirements (i.e. open water or grasslands). However, the species were kept on the list as they may be encountered during migrations or moving between foraging/hunting grounds and nesting sites.

Of the 98 bird species, 38 occur in both ICH and IDF BGC zones and 48 are not specific to any BGC zone. Ten species are specific to IDF only and two is specific to only ICH.

Table 6 - List of documented and potential bird species on Rose Swanson, including those listed under the Migratory Bird Convention Act (MBCA). Bolded species have been documented on Rose Swanson with iMapBC, iNaturalist, or eBird. The results are organized by BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	MBCA	Source
Aechmophorus occidentalis	Western Grebe	X	X	Red	SC	1-SC (2017)		Y	BC Explorer
Ammodramus savannarum	Grasshopper Sparrow	X		Red			Y	Y	BC Explorer
Athene cunicularia	Burrowing Owl	X		Red	E	1-E (2003)	Y		BC Explorer
Bartramia longicauda	Upland Sandpiper	X	X	Red				Y	BC Explorer
Buteo swainsoni	Swainson's Hawk	X	X	Red					BC Explorer
Coccyzus americanus	Yellow-billed Cuckoo		X	Red				Y	BC Explorer
Dolichonyx oryzivorus	Bobolink	X	X	Red	SC	1-T (2017)		Y	BC Explorer
Dryobates albolarvatus	White-headed Woodpecker	X	X	Red	E	1-E (2003)	Y	Y	BC Explorer
Eremophila alpestris merrilli	Horned Lark, merrilli	X	X	Red				Y	BC Explorer
Falco mexicanus	Prairie Falcon	X	X	Red	NAR		Y		BC Explorer
Falco peregrinus anatum	Peregrine Falcon, *anatum*	X		Red	NAR				BC Explorer
Icteria virens	Yellow-breasted Chat	X	X	Red	E	1-E (2003)	Y	Y	BC Explorer

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 6 continued - List of documented and potential bird species on Rose Swanson, including those listed under the Migratory Bird Convention Act (MBCA). Bolded species have been documented on Rose Swanson with iMapBC, iNaturalist, or eBird. The results are organized by BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	MBCA	Source
Limnodromus griseus	Short-billed Dowitcher	X	X	Red				Y	BC Explorer
Nycticorax nycticorax	Black-crowned Night-Heron	X	X	Red				Y	BC Explorer
Oreoscoptes montanus	Sage Thrasher	X	X	Red	E	1-E (2003)	Y	Y	BC Explorer
Strix occidentalis	Spotted Owl	X		Red	E	1-E (2003)	Y		BC Explorer
Accipiter atricapillus	**Northern Goshawk**	X	X	Blue	NAR				iNaturalist, BC Explorer
Aeronautes saxatalis	White-throated Swift	X	X	Blue				Y	BC Explorer
Ardea herodias herodias	Great Blue Heron, herodias	X	X	Blue			Y	Y	BC Explorer
Asio flammeus	Short-eared Owl	X	X	Blue	T	1-SC (2012)	Y		BC Explorer
Botaurus lentiginosus	American Bittern	X	X	Blue				Y	BC Explorer
Buteo lagopus	Rough-legged Hawk	X	X	Blue	NAR				BC Explorer
Calcarius pictus	Smith's Longspur	X		Blue				Y	BC Explorer
Catherpes mexicanus	Canyon Wren	X	X	Blue	NAR			Y	BC Explorer
Chondestes grammacus	Lark Sparrow	X	X	Blue				Y	BC Explorer
Chordeiles minor	**Common Nighthawk**	X	X	Blue	SC	1-SC (2023)		Y	iNaturalist, BC Explorer
Cygnus columbianus	Tundra Swan			Blue				Y	iMap
Cypseloides niger	Black Swift	X	X	Blue	E	1-E (2019)		Y	BC Explorer
Empidonax wrightii	Gray Flycatcher	X		Blue	NAR			Y	BC Explorer
Falco rusticolus	Gyrfalcon	X	X	Blue	NAR				BC Explorer
Megascops kennicottii macfarlanei	Western Screech-Owl, macfarlanei	X	X	Blue	T	1-T (2005)	Y		BC Explorer
Melanerpes lewis	Lewis's Woodpecker	X	X	Blue	T	1-T (2005)	Y	Y	BC Explorer
Nannopterum auritum	Double-crested Cormorant	X	X	Blue	NAR				BC Explorer
Patagioenas fasciata	Band-tailed Pigeon	X	X	Blue	SC	1-SC (2011)		Y	BC Explorer

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 6 continued - List of documented and potential bird species on Rose Swanson, including those listed under the Migratory Bird Convention Act (MBCA). Bolded species have been documented on Rose Swanson with iMapBC, iNaturalist, or eBird. The results are organized by BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	MBCA	Source
Phalaropus lobatus	Red-necked Phalarope	X	X	Blue	SC	1-SC (2019)		Y	BC Explorer
Pluvialis dominica	American Golden-Plover	X	X	Blue				Y	BC Explorer
Progne subis	Purple Martin		X	Blue				Y	BC Explorer
Psiloscops flammeolus	Flammulated Owl	X		Blue	SC	1-SC (2003)	Y		BC Explorer
Recurvirostra americana	American Avocet	X	X	Blue				Y	BC Explorer
Sphyrapicus thyroideus	Williamson's Sapsucker	X	X	Blue	E	1-E (2006)	Y	Y	BC Explorer
Spizella breweri breweri	Brewer's Sparrow, breweri	X		Blue			Y	Y	BC Explorer
Tympanuchus phasianellus columbianus	Sharp-tailed Grouse, columbianus	X		Blue			Y		BC Explorer
Tyto alba	Barn Owl	X	X	Blue	T	1-T (2018)			BC Explorer
Anas platyrhynchos	**Mallard**			Yellow				Y	iNaturalist
Antigone canadensis	**Sandhill Crane**	X	X	Yellow	NAR		Y	Y	iNaturalist
Aquila chrysaetos	Golden Eagle			Yellow	NAR				iMap
Bombycilla garrulus	**Bohemian Waxwing**			Yellow				Y	iNaturalist
Bonasa umbellus	**Ruffed Grouse**			Yellow					iNaturalist, eBird
Branta canadensis	**Canada Goose**			Yellow				Y	iNaturalist
Bubo Virginianus	Great Horned Owl			Yellow					iMap
Buteo jamaicensis	**Red-tailed Hawk**			Yellow	NAR				iNaturalist
Cathartes aura	**Turkey Vulture**			Yellow					iNaturalist
Catharus ustulatus	**Swainson's Thrush**			Yellow				Y	iNaturalist
Certhia americana	**Brown Creeper**			Yellow				Y	iNaturalist, eBird
Coccothraustes vespertinus	**Evening Grosbeak**	X	X	Yellow	SC	1-SC (2019)		Y	iNaturalist, BC Explorer
Colaptes auratus	**Northern Flicker**			Yellow				Y	iNaturalist

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 6 continued - List of documented and potential bird species on Rose Swanson, including those listed under the Migratory Bird Convention Act (MBCA). Bolded species have been documented on Rose Swanson with iMapBC, iNaturalist, or eBird. The results are organized by BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	MBCA	Source
Contopus cooperi	Olive-sided Flycatcher	X	X	Yellow	SC	1-SC (2023)		Y	BC Explorer
Contopus sordidulus	**Western Wood-Pewee**			Yellow				Y	iNaturalist
Corthylio calendula	**Ruby-crowned Kinglet**			Yellow				Y	iNaturalist
Corvus brachyrhynchos	**American Crow**			Yellow					eBird
Corvus corax	**Common Raven**			Yellow					iNaturalist, eBird
Dendragapus obscurus	**Dusky Grouse**			Yellow					iNaturalist
Dryobates pubescens	**Downy Woodpecker**			Yellow				Y	iNaturalist
Dryobates villosus	**Hairy Woodpecker**			Yellow				Y	iNaturalist, eBird
Dryocopus pileatus	**Pileated Woodpecker**			Yellow				Y	iMap, iNaturalist, eBird
Geothlypis tolmiei	**MacGillivray's Warbler**			Yellow				Y	iNaturalist
Glaucidium gnoma	**Northern Pygmy-Owl**			Yellow					iNaturalist
Haliaeetus leucocephalus	**Bald Eagle**			Yellow	NAR				iNaturalist
Hirundo rustica	Barn Swallow	X	X	Yellow	SC	1-T (2017)		Y	iMap, BC Explorer
Ixoreus naevius	**Varied Thrush**			Yellow				Y	iNaturalist
Junco hyemalis	**Dark-eyed Junco**			Yellow				Y	iNaturalist, eBird
Leiothlypis celata	**Orange-crowned Warbler**			Yellow				Y	iNaturalist
Leiothlypis ruficapilla	**Nashville Warbler**			Yellow				Y	iNaturalist
Loxia curvirostra	**Red Crossbill**			Yellow				Y	iNaturalist, eBird
Loxia leucoptera	**White-winged Crossbill**			Yellow				Y	iNaturalist, eBird
Numenius americanus	Long-billed Curlew	X	X	Yellow	SC	1-SC (2005)	Y	Y	BC Explorer
Perisoreus canadensis	**Canada Jay**			Yellow					iNaturalist

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 6 continued - List of documented and potential bird species on Rose Swanson, including those listed under the Migratory Bird Convention Act (MBCA). Bolded species have been documented on Rose Swanson with iMapBC, iNaturalist, or eBird. The results are organized by BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	MBCA	Source
Pica hudsonia	**Black-billed Magpie**			Yellow					iNaturalist, eBird
Pinicola enucleator	**Pine grosbeak**			Yellow				Y	eBird
Pipilo maculatus	**Spotted Towhee**			Yellow				Y	iNaturalist
Piranga ludoviciana	**Western Tanager**			Yellow				Y	iNaturalist
Poecile atricapillus	**Black-capped Chickadee**			Yellow				Y	iNaturalist, eBird
Poecile gambeli	**Mountain Chickadee**			Yellow				Y	eBird
Regulus satrapa	**Golden-crowned Kinglet**			Yellow				Y	iNaturalist, eBird
Setophaga coronata	**Yellow-rumped Warbler**			Yellow				Y	iNaturalist
Sitta canadensis	**Red-breasted Nuthatch**			Yellow				Y	iNaturalist, eBird
Sphyrapicus nuchalis	**Red-naped Sapsucker**			Yellow				Y	iNaturalist
Spinus pinus	**Pine Siskin**			Yellow				Y	iNaturalist, eBird
Strix varia	**Barred Owl**			Yellow					iMap, iNaturalist, eBird
Tachycineta thalassina	**Violet-green Swallow**			Yellow				Y	iMap
Troglodytes pacificus	**Pacific Wren**			Yellow				Y	iNaturalist
Turdus migratorius	**American Robin**			Yellow				Y	iNaturalist
Vireo cassinii	**Cassin's Vireo**			Yellow				Y	iNaturalist
Vireo gilvus	**Warbling Vireo**			Yellow				Y	iNaturalist
Buteo regalis	Ferruginous Hawk	X		Unknown	SC	1-T (2010)			BC Explorer
Falco peregrinus	Peregrine Falcon	X	X		SC	1-SC			BC Explorer

a: Red- threatened, Blue- special concern, Yellow - secure.
b: E- Endangered, T- Threatened, SC- Special Concern, NAR- Not at Risk, DD- Data Deficient
c: Digit indicates the schedule under SARA, letter definitions the same as in b, and year is the date it was last reviewed.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

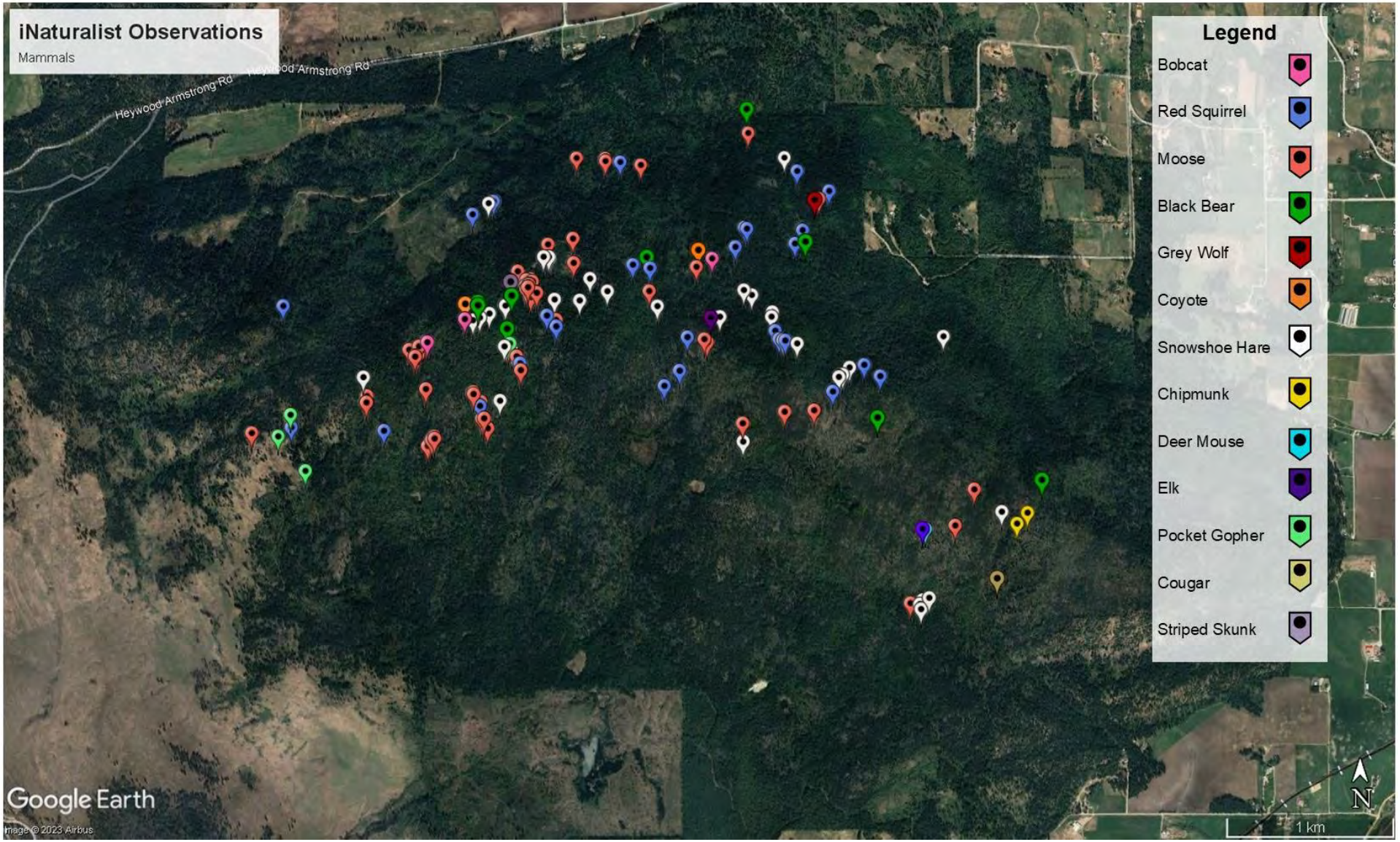

Figure 10 – iNaturalist research grade results for mammal species on Rose Swanson.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

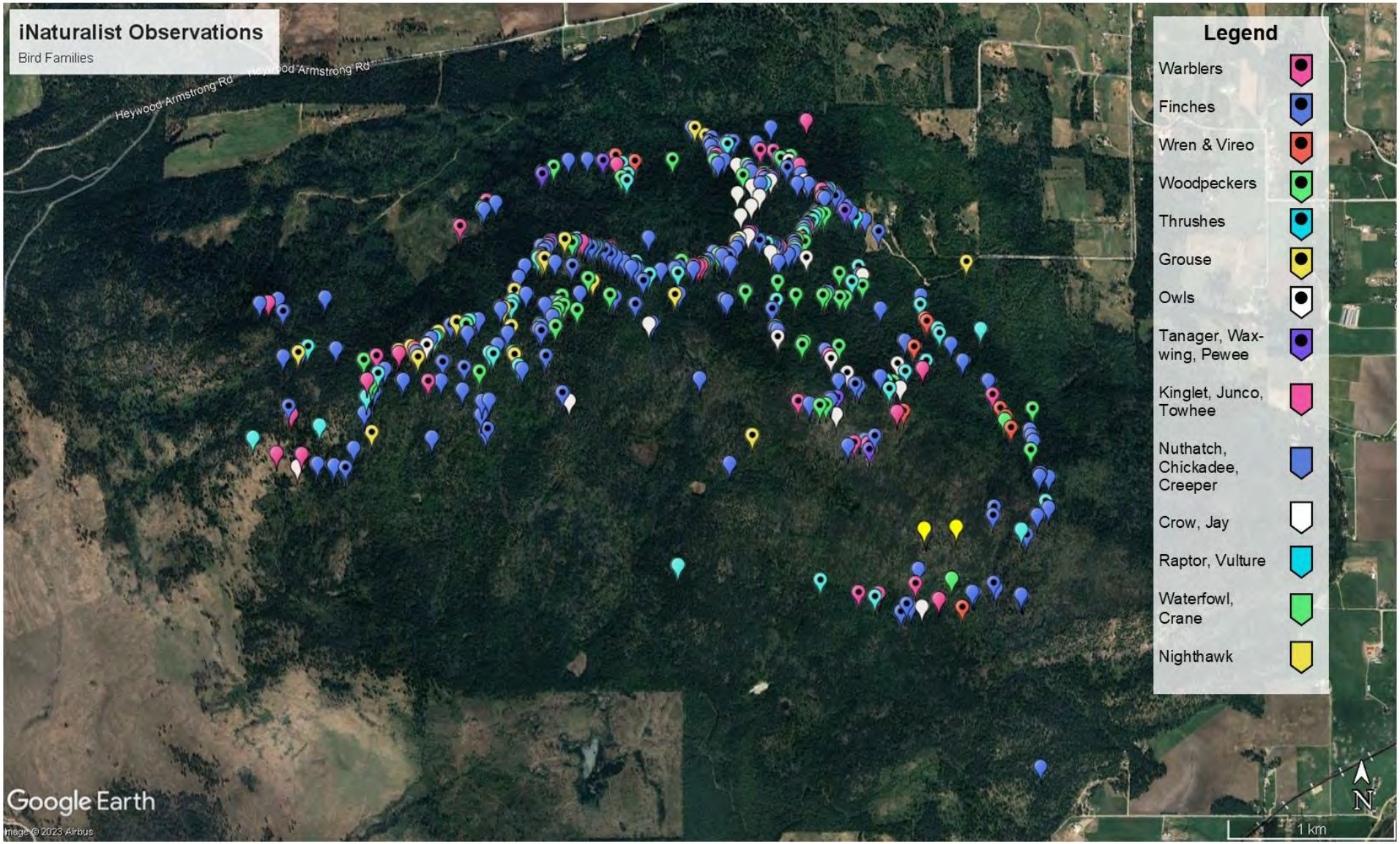

Figure 11 - iNaturalist research grade results for bird species which are symbolically grouped to accommodate the number of observations.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

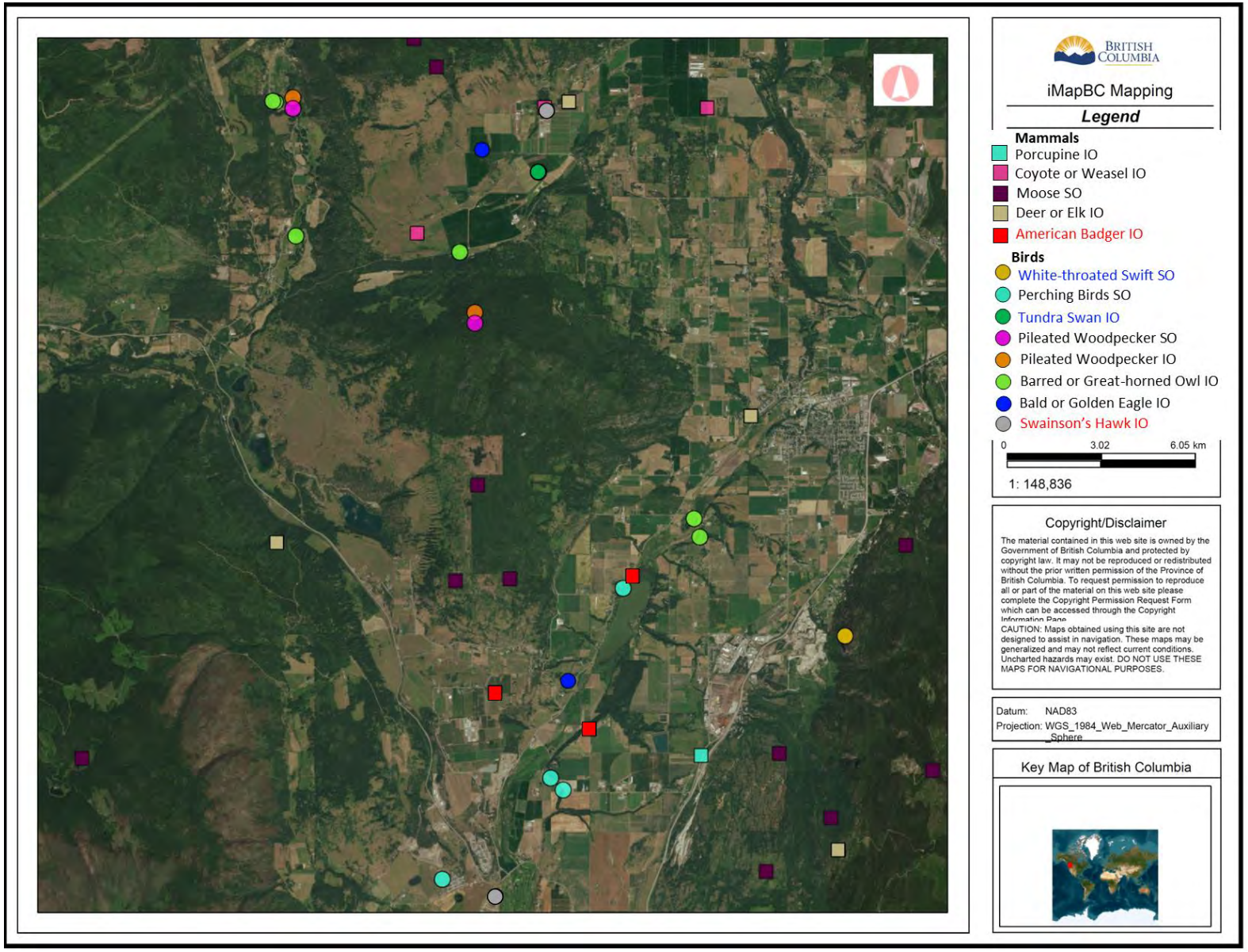

Figure 12 - iMapBC results for mammal and bird species on Rose Swanson. Red legend entries are red-listed species in BC and blue entries are blue-listed in BC.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

4.5 Vegetation Species

There were 198 vegetation species documented on Rose Swanson with iNaturalist. All the species were either yellow listed, exotic, or had no rank. BC Explorer produced another 31 species using the BGC zones IDFmw and/or IDFxh in the search criteria. The new ICHxm1 was not an available option on BC Explorer. Both subzones were used as species may cross over between the border of the two BGC zones. The 31 species include six red-listed and 25 blue-listed. There was no overlap between the species found by iNaturalist and BC Explorer. The 198 iNaturalist species were not specific to a BGC zone when searched on BC Explorer. Fifteen of the 31 BC Explorer results are specific to IDFxh, eight are specific to IDFmw, six are found in both, and two have the generic IDF zone listed. See Appendix A, Table 13 for list of all plant species.

The site series vegetation lists for ICHxm1 in Land Management Handbook (LMH) 75[6] and IDFmw1 in LMH 23[7] and were reviewed and compared to what was documented on Rose Swanson. The specific site series for Rose Swanson was not determined by Hill Environmental as it requires more than vegetation inventories. Thirty-nine site series species were listed under the pre-2021 IDFmw1, of which 33 were documented on Rose Swanson (including two that were not research grade). Fifty site series species were listed under the 2021 ICHxm1 zone, of which 38 were documented on Rose Swanson (including the two that were not research grade).

Table 7 – List of the site series vegetation listed under the pre- 2021 IDFmw1 and the post- 2021 ICHxm1 compared to vegetation documented on Rose Swanson.

Layer	Common Name	Scientific Name	IDFmw1	ICHxm1	Rose Swanson
Tree	Douglas-fir	*Pseudotsuga menziesii*	X	X	X
	Wester redcedar	*Thuja plicata*	X	X	X
	Lodgepole pine	*Pinus contorta*	X	X	X
	Western larch	*Larix occidentalis*	X	X	X
	Paper birch	*Betula papyrifera*	X	X	X
	Ponderosa pine	*Pinus ponderosa*	X	X	X
	Interior spruce - hybrid	*Picea engelmannii x glauca*	X	X	X
Shrub	Douglas maple	*Acer glabrum*	X	X	X
	Saskatoon	*Amelanchier alnifolia*	X	X	X
	Baldhip rose	*Rosa gymnocarpa*	X	X	X
	Birch-leaved spirea	*Spirea betulifolia*	X	X	X
	Falsebox	*Paxistima myrsinites*	X	X	X
	Oregon grape	*Mahonia spp.*	X	X	X

[6] Land Management Handbook 75 (Province of British Columbia, 2021)
[7] Land Management Handbook 23 (Province of British Columbia, 1990)

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 7 continued – List of the site series vegetation listed under the pre- 2021 IDFmw1 and the post- 2021 ICHxm1 compared to vegetation documented on Rose Swanson. Asterisks indicate non-research grade observations.

Layer	Common Name	Scientific Name	IDFmw1	ICHxm1	Rose Swanson
Shrub	Snowberry	*Symphoricarpos albus*	X	X	X
	Kinnikinnick	*Arctostaphylos uva-ursi*	X	X	X
	Red-osier dogwood	*Cornus sericea*	X	X	X
	Thimbleberry	*Rubus parviflorus*	X	X	X
	Black gooseberry	*Ribes lacustre*	X	X	X
	Oceanspray	*Holodiscus discolor*		X	X
	Utah honeysuckle	*Lonicera utahensis*		X	X
	Common juniper	*Juniperus communis*	X	X	X
	Soopolallie	*Shepherdia canadensis*	X		X
	Devil's club	*Oplopanax horridus*	X	X	
	Shrubby penstemon	*Penstemon fruticosus*	X	X	X
Herbs	Rattlesnake plantain	*Goodyera oblongifolia*		X	X
	Bluebunch wheatgrass	*Pseudoroegneria spicata*	X	X	X
	Showy aster	*Eurybia conspicua*	X	X	
	Yarrow	*Achillea millefolium*	X	X	X
	Wild sarsaparilla	*Aralia nudicaulis*	X	X	X
	Twinflower	*Linnaea borealis*	X	X	X
	One-leaved foamflower	*Tiarella trifoliata*	X	X	
	Sweet-scented bedstraw	*Actaea rubra*	X	X	X
	Canada violet	*Viola canadensis*	X		X
	Skunk cabbage	*Lysichiton americanus*		X	
	Baneberry	*Actaea rubra*	X	X	X
	Lady fern	*Athyrium filix-femina cyclosorum*		X	X
	Oak fern	*Gymnocarpium disjunctum*		X	X
	Bunchberry	*Cornus canadensis*		X	
	One-sided wintergreen	*Orthilia secunda*		X	X
	Sweet-cicely	*Myrrhis odarata*	X		*
	Hooker's fairybells	*Prosartes hookeri*	X		X
	Pinegrass	*Calamagrostis rubescens*	X	X	*
	Fairybells	*Prosartes spp.*		X	X
	Queen's cup	*Clintonia uniflora*	X	X	X
	Prince's pine	*Chimaphila umbellata*	X	X	
Mosses	Red-stemmed feathermoss	*Pleurozium schreberi*	X	X	X
	Clad lichens	*Cladonia spp.*		X	X
	Haircap moss	*Polytrichum spp.*		X	X
	Rock-mosses	*Racomitrium spp.*		X	
	Pelt lichens	*Peltigera spp.*		X	
	Heron's-bill mosses	*Dicranum spp.*		X	
	Ragged-mosses	*Brachythecium spp.*		X	
	Electrified cat's-tail moss	*Rhytidiadelphus triquetrus*	X	X	
	Leafy moss	*"leafy mosses"*	X	X	

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

4.6 Ecological Communities

A search of BC Explorer resulted in 28 ecological communities that occur within the IDFxh1 and/or IDFmw1 BGC zones (Table 8). Both subzones were used as the border between the two may be difficult to discern. Twelve of the ecological communities had all their component species documented on Rose Swanson with iNaturalist. Ecological communities include species that occur together in one location along with certain non-biological factors. It is unclear whether the ecological communities were documented, or solely the individual species. Since BC Explorer has not been updated to include the ICHxm1 BGC zone, the pre-2021 name IDFmw1 and IDFxh1 was used in the search. Five of the ecological communities are documented in IDFmw1 and IDFxh1, one is in IDFmw1 only, and the remaining 22 are only in IDFxh1.

Table 8 - List of ecological communities that have the potential to occur on Rose Swanson based on BC Explorer. Bolded communities have had all their component species documented on Rose Swanson with iNaturalist. The results are organized by BC rank then alphabetically by species name.

Species	Common Name	mw1	xh1	Rank [a]	FRPA
Artemisia tridentata / Pseudoroegneria spicata - Balsamorhiza sagittata	big sagebrush / bluebunch wheatgrass - arrowleaf balsamroot		X	Red	
Betula occidentalis / Rosa spp.	**Water birch / roses**		X	Red	Y
Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia spp.	Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens		X	Red	
Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha	Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass		X	Red	
Populus tremuloides / Symphoricarpos albus / Osmorhiza berteroi	trembling aspen / common snowberry / mountain sweet-cicely		X	Red	
Populus tremuloides / Symphoricarpos albus / Poa pratensis	trembling aspen / common snowberry / Kentucky bluegrass		X	Red	
Populus trichocarpa - Pseudotsuga menziesii / Acer glabrum - Symphoricarpos albus	**black cottonwood - Douglas fir / Douglas maple - common snowberry**	X	X	Red	
Populus trichocarpa - Pseudotsuga menziesii / Symphoricarpos albus - Cornus sericea	**black cottonwood - Douglas-fir / common snowberry - red-osier dogwood**		X	Red	
Populus trichocarpa / Symphoricarpos albus - Rosa spp.	**black cottonwood / common snowberry - roses**	X	X	Red	
Pseudotsuga menziesii / Acer glabrum - Cornus sericea	**Douglas-fir / Douglas maple - red-osier dogwood**		X	Red	
Puccinellia nuttalliana - Hordeum jubatum	Nuttall's alkaligrass - foxtail barley		X	Red	
Purshia tridentata / Hesperostipa comata	antelope-brush / needle-and-thread grass		X	Red	Y

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 8 (continued) - List of ecological communities that have the potential to occur on Rose Swanson based on BC Explorer. Bolded communities have had all their component species documented on Rose Swanson with iNaturalist. The results are organized by BC rank then alphabetically by species name.

Species	Common Names	mw1	xh1	Rank [a]	FRPA
Schoenoplectus pungens var. longispicatus Alkali Marsh	long-awned three-square bulrush Alkali Marsh		X	Red	
Thuja plicata - Pseudotsuga menziesii / Maianthemum racemosum	**western redcedar - Douglas-fir / false Solomon's seal**		X	Red	
Distichlis spicata - Hordeum jubatum	alkali saltgrass - foxtail barley		X	Blue	Y
Juncus balticus - Potentilla anserina	Baltic rush - common silverweed		X	Blue	
Symphoricarpos albus – Rosa woodsii	**common snowberry - prairie rose**	X	X	Blue	
Pseudoroegneria spicata - Balsamorhiza sagittata	**bluebunch wheatgrass - arrowleaf balsamroot**		X	Blue	
Pseudotsuga menziesii - Pinus ponderosa / Calamagrostis rubescens	Douglas-fir - ponderosa pine / pinegrass		X	Blue	
Pseudotsuga menziesii - Pinus ponderosa / Ceanothus velutinus	**Douglas-fir - ponderosa pine / snowbrush**		X	Blue	
Pseudotsuga menziesii - Pinus ponderosa / Festuca idahoensis	Douglas-fir - ponderosa pine / Idaho fescue		X	Blue	
Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata	**Douglas-fir - ponderosa pine / bluebunch wheatgrass**		X	Blue	
Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens	Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass		X	Blue	
Pseudotsuga menziesii / Penstemon fruticosus - Calamagrostis rubescens	Douglas-fir / shrubby penstemon - pinegrass	X		Blue	
Pseudotsuga menziesii / Symphoricarpos albus - Spiraea betulifolia	**Douglas-fir / common snowberry - birch-leaved spirea**		X	Blue	
Schoenoplectus actus Deep Marsh	Hard-stemmed bulrush Deep Marsh	X	X	Blue	
Thuja plicata - Pseudotsuga menziesii / Cornus stolonifera	**western redcedar - Douglas-fir / red-osier dogwood**		X	Blue	
Typha latifolia Marsh	common cattail Marsh	X	X	Blue	

a: Red- threatened, Blue- special concern, Yellow - secure.

5.0 Protection of Species and Ecosystems

The following sections outline which provincial and federal at-risk species and ecosystems are identified on Rose Swanson and how they are protected by legislation.

5.1 BC Wildlife Act

The BC *Wildlife Act* protects most vertebrate wildlife in BC from harm, except where regulated hunting and trapping is permitted. It also has offenses specific to the harassment or destruction of a bird, its egg, or nest (s 34). "Wildlife" is defined in the Act as "raptors, threatened species,

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

endangered species, game and other species of vertebrate prescribed by regulation"[8]. The Designation and Exemption Regulation under the *Wildlife Act* specifies the species that are "wildlife" (Schedule A), species that are designated as threatened (Schedule D- sea otter), and species that are designated as endangered (Schedule E- Vancouver Island marmot, burrowing owl, and American white pelican).

5.2 BC Forest and Range Practices Act (FRPA)

Under the FRPA Government Actions Regulations (GAR), categories may be established for at-risk species, regionally important wildlife, or ungulate species. The establishment of these categories enables provisions to manage the species under FRPA. Species at risk listed under FRPA are those that have habitats that may be impacted by forest or range practices. The management of habitats for FRPA identified species is guided by the Identified Wildlife Management Strategy (IWMS) (Province of British Columbia, 2023). Identified wildlife are managed through establishing wildlife habitat areas, general wildlife measures, and ungulate winter ranges. Currently, Rose Swanson is not covered by a wildlife habitat area for any of the FRPA listed species. Rose Swanson has 1,372ha mapped as ungulate winter range (UWR) for mule deer (U-8-001) (Figure 13). UWR are areas that have habitat that are necessary for an ungulate species in winter. These areas are conditional harvest zones, meaning activities, such as forestry, are limited for the purpose of conservation and preserving biodiversity but are still allowed to occur (Province of British Columbia, 2017). For Rose Swanson, this means that forest practices must follow the general wildlife measures outlined in the Order that established the U-8-001, which includes retaining certain levels of snow interception cover and that the wildlife tree patches are comprised of certain species and age classes (Appendix B).

There are three amphibians, three reptiles, nine mammals, and 17 bird species that are listed under FRPA that occur or have the potential to occur on Rose Swanson. The FRPA species that are documented on Rose Swanson are moose (*Alces alces),* elk (*Cervus elaphus*), and sandhill crane (*Antigone canadensis*). Three ecological communities for Rose Swanson are listed under FRPA, but only water birch / roses (*Betula occidentalis / Rosa spp.)* have all its species documented on Rose Swanson.

[8] BC *Wildlife Act,* RSBC 1996, c 488, s 1.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

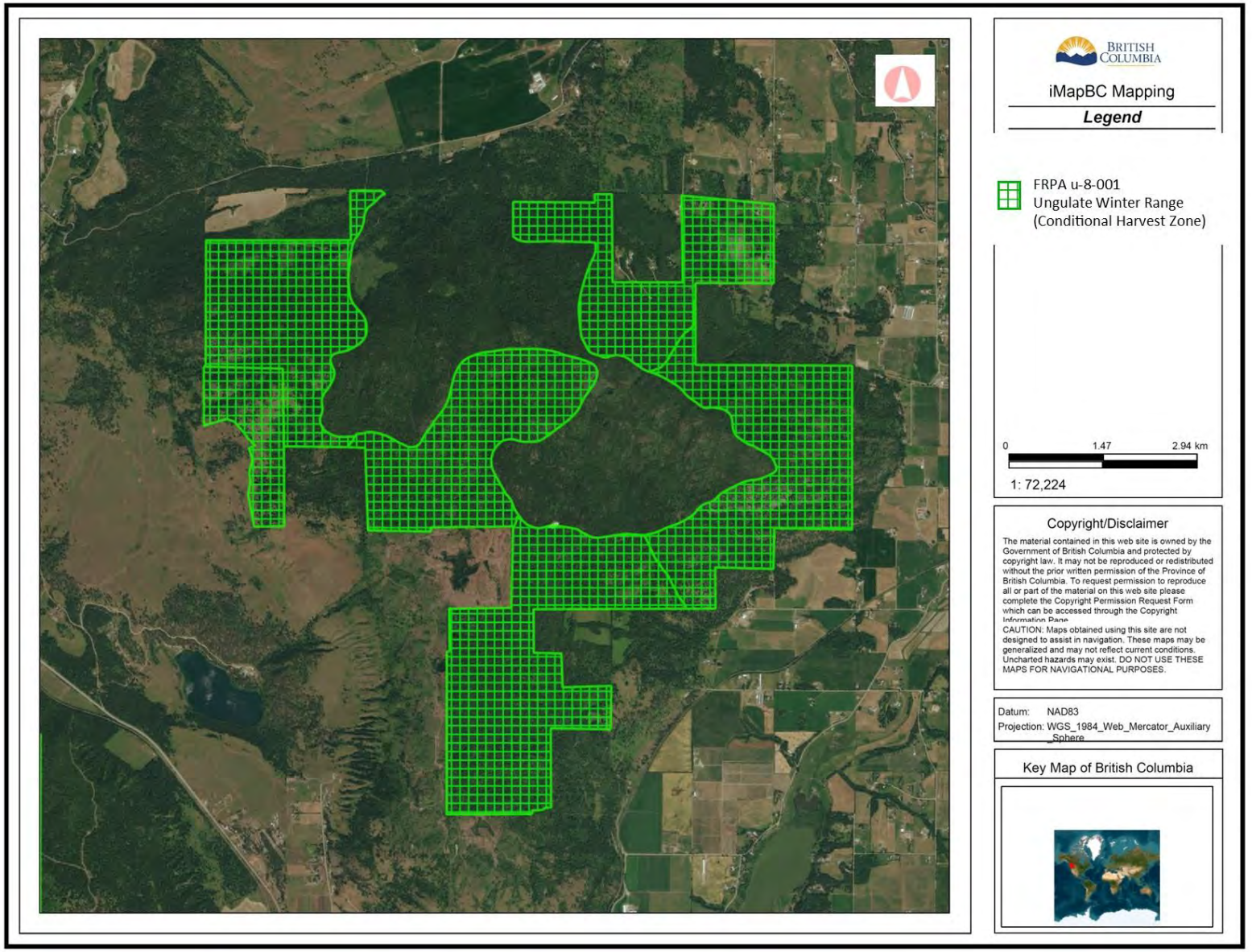

Figure 13 - iMapBC results for FRPA ungulate winter range on Rose Swanson for mule deer (U-8-001). The total area is approximately 1,372ha.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

5.3 Migratory Birds Convention Act (MBCA)

The MBCA gives the federal government the authority to establish regulations that protect certain species of birds, including their nests and eggs. Even if an activity *inadvertently* causes harm to a MBCA listed bird, its nest, or eggs, it is still in contravention. Such activities include forest harvesting, stand thinning, and brush removal (Healthy Forest Coalition, n.d.). Of the 98 bird species from the inventory results, 68 are listed under MBCA and are therefore protected in Canada (Refer to Table 6). The remaining species are protected by other legislation, such as the BC *Wildlife Act* (s 34). Of the 68 MBCA listed birds, 37 have been documented on Rose Swanson with iMapBC or iNaturalist. Of those documented on Rose Swanson, two are also listed as at risk. The common nighthawk (*Chordeiles minor*) is blue listed in BC and a special concern under *Species at Risk Act* (SARA). Evening grosbeak (*Coccothraustes vespertinus*) is yellow listed in BC and a special concern under SARA.

5.4 Species and Ecosystems at Risk (SEAR)

The following addresses species at risk that have a status in BC and/or are listed federally under COSEWIC[9] or SARA (Table 9).

Table 9- List of the total number of species identified with the search methods and how many were documented on Rose Swanson compared to how many are at-risk provincially or federally and documented on Rose Swanson. Invertebrate results were reduced to those near Rose Swanson and at-risk as discussed in Section 4.2.

Taxonomic Group	Search Results	Rose Swanson	At Risk	Rose Swanson
Amphibian	6	3	4	1
Reptile	10	3	7	2
Invertebrate [a]	73 (2)	34 (0)	37 (2)	0
Mammal [b]	36	13 (16)	19	0
Bird	98	48	49	3
Plant	229	198	31	0
Ecological Community [c]	28	0	28	0

a: Only invertebrates that are at-risk and on/near Rose Swanson are discussed ( ).
b: White-tailed deer and Mule deer are expected on Rose Swanson, but the iNaturalist observation were not research grade. Grizzly bear is assumed on Rose Swanson but not documented with search methods.
c: It is unknown whether the ecological communities exist on Rose Swanson

[9] Committee on the Status of Endangered Wildlife in Canada (COSEWIC)

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

5.4.1 Provincial Status

The BC status of a species (red, blue, and yellow) depends on their Provincial Conservation Status, which is assigned by the Conservation Data Centre (CDC) and reflects how at risk the species is. This helps identify species and ecosystems that can be considered for designation as endangered or threatened. Red listed species are candidates for threatened, extirpated, or endangered status in BC. Blue listed species are of special concern in BC. Yellow species are secure in BC and are therefore not discussed in this section unless they are ranked under COSEWIC or SARA. Species that are given an endangered or threatened BC status are protected by legislation including the BC *Wildlife Act,* and potentially by the *Forests and Range Practices Act* (FRPA). The status of a species in BC does not always match the federal listing under SARA or COESWIC. For example, Western Toad is yellow listed (secure) in BC but is listed as a special concern under SARA and COSEWIC. Or a species may be red listed (endangered) in BC but have no federal status.

5.4.2 Federal Status

COSEWIC was established by SARA as an independent advisory panel that identifies and classifies endangered wildlife. Once a species is designated by COSEWIC it may be placed under legal protection by SARA. Schedule 1 of SARA is the official list of species at risk and categorizes them as extirpated, endangered, threatened, or special concern. Species that fall under Schedules 2 or 3 are not yet on the official list under SARA. Once listed on Schedule 1, the legal protection of a species is implemented. Typically, the rank of a species is the same for COSEWIC and SARA, but not always. Since SARA is the legislation that protects the species at risk, this section will refer to the SARA rank.

Under SARA, it is an offense to "kill, harm, harass, capture or take" and to "posses, collect, buy, sell or trade" a species listed under Schedule 1 and to "damage or destroy the residence" of a species listed under Schedule 1 if a recovery strategy has recommended the reintroduction of the species into the wild[10]. These prohibitions do not apply to species listed as "special concern" on Schedule 1. SARA only applies to federal lands, not to provincial crown land or private land (s 34(1)). On land that is not federal, the offenses above only apply to aquatic species listed in Schedule 1 and migratory birds listed under both MBCA and Schedule 1. Since Rose Swanson is not federal land, SARA only protects 13 bird species that may occur on Rose Swanson and two

[10] *Species at Risk Act,* Sc 2002, c 29, s 32-33

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

documented on Rose Swanson: common nighthawk (*C. minor*) and evening grosbeak (*C. vespertinus*). However, the following section refers to all the inventory results that are listed in Schedule 1 to demonstrate the number of species that are officially at risk on Rose Swanson.

5.4.3 Status of Inventory Results

Of the Rose Swanson wildlife species that resulted from the search methods, 24 are red listed and 50 are blue listed (Table 10). Of the red listed species, none were documented on Rose Swanson but two were documented nearby on iMapBC. American badger (*Taxidae taxus*) has been documented at several locations around Rose Swanson and Okanagan hammertail (*Okanagan efferia*) was documented at one location south of Rose Swanson. Of the blue listed wildlife species, three have been documented on Rose Swanson with iNaturalist or iMapBC; western skink (*Plestiodon skiltonianus*), northern goshawk (*Accipiter atricapillus*), and common nighthawk (*Chordeilies minor*). Of the wildlife search results 13 species are endangered, 10 are threatened, and 19 are special concern under Schedule 1 of SARA. Five species that are special concern have been documented on Rose Swanson. They include western toad (*Anaxyrus boreas)*, western skink (*P. skiltonianus)*, northern rubber boa (*Pseudacris regilla)*, evening grosbeak (*C. vespertinus*), and common nighthawk (*C. minor)*. The remaining Schedule 1 species were potential species for Rose Swanson based on the BC Explorer search criteria. Even though they were not documented on Rose Swanson, the species could utilize Rose Swanson for part of their life cycle, as hunting or foraging grounds, or as a navigation corridor to other habitats.

There are six red, 25 blue, and four Schedule 1 listed plant species that have the potential to occur on Rose Swanson based on BC Explorer, but none were identified on Rose Swanson (Table 11). Ecological communities are ranked in BC but are not listed under COSEWIC or SARA. Of the 14 red listed ecological communities, six have all their component species documented on Rose Swanson with iNaturalist. Of the 14 blue listed ecological communities, six have all their component species documented on Rose Swanson with iNaturalist. However, ecological communities involve species that occur together in one location with specific non-biological factors. Therefore, it is unknown whether the ecological communities occur on Rose Swanson.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 10 – List of documented and potential amphibian, reptile, mammal, and bird species that are red or blue listed in BC and those listed in Schedule 1 of SARA. Bolded species have been documented on Rose Swanson with iMapBC or iNaturalist. The results are organized by taxon then BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	Source
Ambystoma mavortium	Western Tiger Salamander	X	X	Red	E	1-E (2018)	Y	BC Explorer
Lithobates pipiens	Northern Leopard Frog	X	X	Red	E	1-E (2003)	Y	BC Explorer
Spea intermontana	Great Basin Spadefoot	X		Blue	T	1-T (2003)	Y	iMap, BC Explorer
Ambystoma macrodactylum	**Long-toed Salamander**			Yellow	NAR			iMap, iNaturalist
Anaxyrus boreas	**Western Toad**	X	X	Yellow	SC	1-SC (2018)		iMap, iNaturalist, BC Explorer
Hypsiglena chlorophaea	Desert Nightsnake	X		Red	E	1-E (2003)		BC Explorer
Chrysemys picta pop. 2	Painted Turtle – *Intermountain – Rocky Mountain Population*	X	X	Blue	SC	1-SC (2007)		BC Explorer
Coluber constrictor	North American Racer	X	X	Blue	T	1-T (2023)	Y	iMap, BC Explorer
Crotalus oreganus	Western Rattlesnake	X		Blue	T	1-T (2005)	Y	BC Explorer
Pituophis catenifer deserticola	Gophersnake, *deserticola* subspecies	X		Blue	T	1-T (2005)	Y	BC Explorer
Plestiodon skiltonianus	**Western Skink**	X	X	Blue	SC	1-SC (2005)		iMap, BC Explorer
Charina bottae	**Northern Rubber Boa**	X	X	Yellow	SC	1-SC (2005)		iMap, BC Explorer
Efferia okanagana	Okanagan Hammertail			Red	E	1-E (2017)		iMap
Aeshna constricta	Lance-tipped Darner	X	X	Blue				iMap
Lepus townsendii	White-tailed Jackrabbit	X	X	Red				BC Explorer
Pekania pennanti pop.5	Fisher – Columbian Population	X	X	Red			Y	BC Explorer
Sorex preblei	Preble's Shrew	X		Red				BC Explorer
Taxidea taxus jeffersonii	American Badger *jeffersonii* subspecies	X	X	Red	E	1-E (2018)	Y	iMap, BC Explorer

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 10 continued – List of documented and potential amphibian, reptile, mammal, and bird species that are red or blue listed in BC and those listed in Schedule 1 of SARA. Bolded species have been documented on Rose Swanson with iMapBC or iNaturalist. The results are organized by taxon then BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	Source
Corynorhinus townsendii	Townsend's Big-eared Bat	X	X	Blue				BC Explorer
Euderma maculatum	Spotted Bat	X		Blue	SC	1-SC (2005)	Y	BC Explorer
Gulo gulo luscus	Wolverine, *luscus* subspecies	X	X	Blue	SC	1-SC (2018)	Y	BC Explorer
Lasiurus cinereus	Hoary Bat	X	X	Blue	E			BC Explorer
Myotis ciliolabrum	Western Small-footed Myotis	X		Blue				BC Explorer
Myotis lucifugus	Little Brown Myotis	X	X	Blue	E	1-E (2014)		BC Explorer
Myotis yumanensis	Yuma Myotis	X	X	Blue				BC Explorer
Neotamias ruficaudus simulans	Red-tailed Chipmunk, *simulans* subspecies		X	Blue				BC Explorer
Oreamnos americanus	Mountain Goat	X	X	Blue				BC Explorer
Ovis canadensis	Bighorn Sheep	X	X	Blue			Y	BC Explorer
Perognathus parvus	Columbia Plateau Pocket Mouse	X		Blue				BC Explorer
Reithrodontomys megalotis	Western Harvest Mouse	X		Blue	E	1-SC (2009)		BC Explorer
Sylvilagus nuttallii	Nuttall's Cottontail	X		Blue	SC	1-SC (2007)		BC Explorer
Synaptomys borealis artemisiae	Northern Bog Lemming, *artemisiae* subspecies	X		Blue				BC Explorer
Ursus arctos	Grizzly Bear	X	X	Blue	SC	1-SC (2018)	Y	BC Explorer
Aechmophorus occidentalis	Western Grebe	X	X	Red	SC	1-SC (2017)		BC Explorer
Ammodramus savannarum	Grasshopper Sparrow	X		Red			Y	BC Explorer
Athene cunicularia	Burrowing Owl	X		Red	E	1-E (2003)	Y	BC Explorer
Bartramia longicauda	Upland Sandpiper	X	X	Red				BC Explorer
Buteo swainsoni	Swainson's Hawk	X	X	Red				BC Explorer
Coccyzus americanus	Yellow-billed Cuckoo		X	Red				BC Explorer
Dolichonyx oryzivorus	Bobolink	X	X	Red	SC	1-T (2017)		BC Explorer
Dryobates albolarvatus	White-headed Woodpecker	X	X	Red	E	1-E (2003)	Y	BC Explorer

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 10 continued – List of documented and potential amphibian, reptile, mammal, and bird species that are red or blue listed in BC and those listed in Schedule 1 of SARA. Bolded species have been documented on Rose Swanson with iMapBC or iNaturalist. The results are organized by taxon then BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	Source
Eremophila alpestris merrilli	Horned Lark, merrilli subspecies	X	X	Red				BC Explorer
Falco mexicanus	Prairie Falcon	X	X	Red	NAR		Y	BC Explorer
Falco peregrinus anatum	Peregrine Falcon, *anatum* subspecies	X		Red	NAR			BC Explorer
Icteria virens	Yellow-breasted Chat	X	X	Red	E	1-E (2003)	Y	BC Explorer
Limnodromus griseus	Short-billed Dowitcher	X	X	Red				BC Explorer
Nycticorax nycticorax	Black-crowned Night-Heron	X	X	Red				BC Explorer
Oreoscoptes montanus	Sage Thrasher	X	X	Red	E	1-E (2003)	Y	BC Explorer
Strix occidentalis	Spotted Owl	X		Red	E	1-E (2003)	Y	BC Explorer
Accipiter atricapillus	**Northern Goshawk**	X	X	Blue	NAR			iNaturalist, BC Explorer
Aeronautes saxatalis	White-throated Swift	X	X	Blue				BC Explorer
Ardea herodias herodias	Great Blue Heron, herodias subspecies	X	X	Blue			Y	BC Explorer
Asio flammeus	Short-eared Owl	X	X	Blue	T	1-SC (2012)	Y	BC Explorer
Botaurus lentiginosus	American Bittern	X	X	Blue				BC Explorer
Buteo lagopus	Rough-legged Hawk	X	X	Blue	NAR			BC Explorer
Calcarius pictus	Smith's Longspur	X		Blue				BC Explorer
Catherpes mexicanus	Canyon Wren	X	X	Blue	NAR			BC Explorer
Chondestes grammacus	Lark Sparrow	X	X	Blue				BC Explorer
Chordeiles minor	**Common Nighthawk**	X	X	Blue	SC	1-SC (2023)		iNaturalist, BC Explorer
Cygnus columbianus	Tundra Swan			Blue				iMap
Cypseloides niger	Black Swift	X	X	Blue	E	1-E (2019)		BC Explorer
Empidonax wrightii	Gray Flycatcher	X		Blue	NAR			BC Explorer
Falco rusticolus	Gyrfalcon	X	X	Blue	NAR			BC Explorer

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 10 continued – List of documented and potential amphibian, reptile, mammal, and bird species that are red or blue listed in BC and those listed in Schedule 1 of SARA. Bolded species have been documented on Rose Swanson with iMapBC or iNaturalist. The results are organized by taxon then BC rank then alphabetically by species name.

Species Name	Common Name	IDF	ICH	Rank [a]	COSEWIC [b]	SARA [c]	FRPA	Source
Megascops kennicottii macfarlanei	Western Screech-Owl, macfarlanei	X	X	Blue	T	1-T (2005)	Y	BC Explorer
Melanerpes lewis	Lewis's Woodpecker	X	X	Blue	T	1-T (2005)	Y	BC Explorer
Nannopterum auritum	Double-crested Cormorant	X	X	Blue	NAR			BC Explorer
Patagioenas fasciata	Band-tailed Pigeon	X	X	Blue	SC	1-SC (2011)		BC Explorer
Phalaropus lobatus	Red-necked Phalarope	X	X	Blue	SC	1-SC (2019)		BC Explorer
Pluvialis dominica	American Golden-Plover	X	X	Blue				BC Explorer
Progne subis	Purple Martin		X	Blue				BC Explorer
Psiloscops flammeolus	Flammulated Owl	X		Blue	SC	1-SC (2003)	Y	BC Explorer
Recurvirostra americana	American Avocet	X	X	Blue				BC Explorer
Sphyrapicus thyroideus	Williamson's Sapsucker	X	X	Blue	E	1-E (2006)	Y	BC Explorer
Spizella breweri breweri	Brewer's Sparrow, breweri subspecies	X		Blue				BC Explorer
Tympanuchus phasianellus columbianus	Sharp-tailed Grouse, columbianus subspecies	X		Blue			Y	BC Explorer
Tyto alba	Barn Owl	X	X	Blue	T	1-T (2018)		BC Explorer
Coccothraustes vespertinus	**Evening Grosbeak**	X	X	Yellow	SC	1-SC (2019)		iNaturalist, BC Explorer
Contopus cooperi	Olive-sided Flycatcher	X	X	Yellow	SC	1-SC (2023)		BC Explorer
Hirundo rustica	Barn Swallow	X	X	Yellow	SC	1-T (2017)		iMap, BC Explorer
Numenius americanus	Long-billed Curlew	X	X	Yellow	SC	1-SC (2005)	Y	BC Explorer
Buteo regalis	Ferruginous Hawk	X		Unknown	SC	1-T (2010)		BC Explorer
Falco peregrinus	Peregrine Falcon	X	X		SC	1-SC		BC Explorer

a: Red- threatened, Blue- special concern, Yellow - secure.
b: E- Endangered, T- Threatened, SC- Special Concern, NAR- Not at Risk, DD- Data Deficient
c: Digit indicates the schedule under SARA, letter definitions the same as in b, and year is the date it was last reviewed.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 11 – List of the species of vegetation that have the potential to occur on Rose Swanson that are red or blue listed in BC and those listed in Schedule 1 of SARA. The results are organized by taxon then BC rank then alphabetically by species name.

Species Name	Common Name	xh	mw	Rank [a]	COSEWIC [b]	SARA [c]	Source
Crepis modocensis ssp. modocensis	Low Hawksbeard	X		Red			BC Explorer
Phlox speciosa ssp. occidentalis	Showy Phlox	X		Red			BC Explorer
Polemonium californicum	California Jacob's Ladder		X	Red			BC Explorer
Schoenoplectiella saximontana	Rocky Mountain Clubrush		X	Red			BC Explorer
Senecio integerrimus var. ochroleucus	White Western Groundsel	X		Red			BC Explorer
Sisyrinchium idahoense var. occidentale	Idaho Blue-Eyed Grass	X		Red			BC Explorer
Acorus americanus	American Sweet-Flag		X	Blue			BC Explorer
Arctoparmelia subcentrifuga	Abrading Ring		X	Blue			BC Explorer
Azolla mexicana	Mexican Mosquito Fern		X	Blue	T	1-T (2003)	BC Explorer
Berula incisa	Cut-Leaved Water-Parsnip	X	X	Blue			BC Explorer
Bryoerythrophyllum columbianum	Columbian Carpet Moss	X	X	Blue	SC	1-SC (2005)	BC Explorer
Carex pedunculata	Peduncled Sedge		X	Blue			BC Explorer
Castilleja cusickii	Cusick's Paintbrush	X		Blue			BC Explorer
Cladonia cyanipes	Blue-Footed Pixie	X		Blue			BC Explorer
Claytonia cordifolia	Heart-Leaved Springbeauty	X	X	Blue			BC Explorer
Crataegus atrovirens	Dark-Green Hawthorn	X		Blue			BC Explorer
Crataegus okanaganensis var. okanaganensis	Okanagan Hawthorn	X		Blue			BC Explorer
Dermatocarpon intestiniforme	Quilted Stippleback	X		Blue			BC Explorer
Erythranthe suksdorfii	Suksdorf's Monkey-Flower	X		Blue			BC Explorer
Evernia divaricata	Mountain Oakmoss		X	Blue			BC Explorer
Gayophytum ramosissimum	Hairstem Groundsmoke	X		Blue			BC Explorer
Liparis loeselii	Yellow Widelip Orchid		X	Blue			BC Explorer
Lupinus sulphureus	Sulphur Lupine	X	X	Blue			BC Explorer

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 11 continued– List of the species of vegetation that have the potential to occur on Rose Swanson that are red or blue listed in BC and those listed in Schedule 1 of SARA. The results are organized by taxon then BC rank then alphabetically by species name.

Species Name	Common Name	xh	mw	Rank [a]	COSEWIC [b]	SARA [c]	Source
Marsilea vestita	Hairy Water-Clover	X	X	Blue			BC Explorer
Navarretia propinqua	Near Navarretia	X		Blue			BC Explorer
Olsynium douglasii var. inflatum	Satinflower	X	X	Blue			BC Explorer
Phaeophyscia ciliata	Greater Eye Shadow	X		Blue			BC Explorer
Pinus albicaulis	Whitebark Pine	X		Blue	E	1-E (2012)	BC Explorer
Pterygoneurum kozlovii	Alkaline Wing-Nerved Moss	X	X	Blue	T	1-T (2006)	BC Explorer
Salix amygdaloides	Peach-Leaf Willow	X		Blue			BC Explorer
Viola sororia	Woolly Blue Violet	X	X	Blue			BC Explorer

a: Red- threatened, Blue- special concern, Yellow - secure.

b: E- Endangered, T- Threatened, SC- Special Concern, NAR- Not at Risk, DD- Data Deficient

c: Digit indicates the schedule under SARA, letter definitions the same as in b, and year is the date it was last reviewed.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

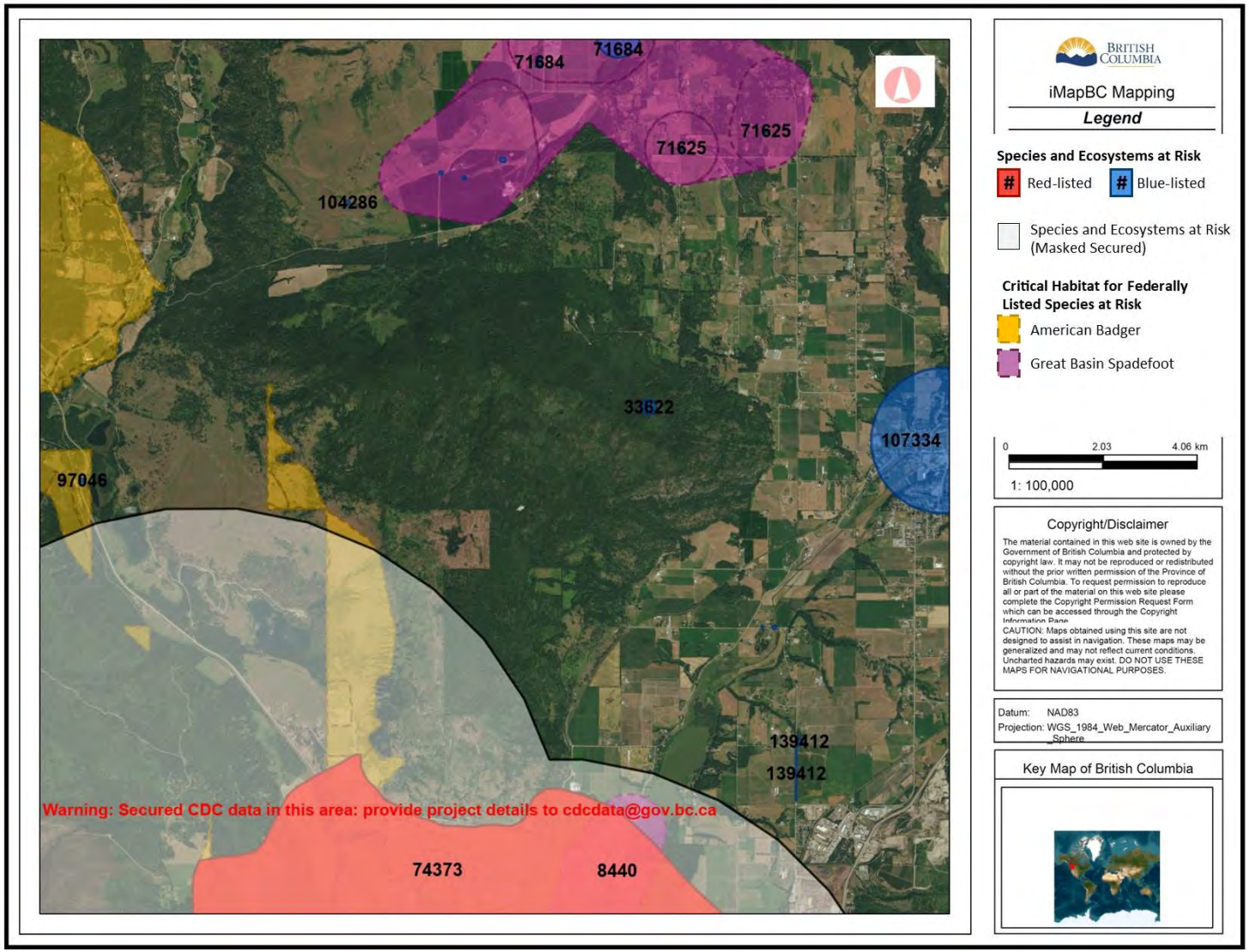

Figure 14 - iMapBC results for critical habitat for federally listed species, masked occurrences, and mapped species at risk. Species at risk shape IDs are #97046 and #107334 for western painted turtle (*C. picta*), #33622 for western skink (*P. skiltonianus*), #74373 for American badger (*T. taxus*), #104286 for North American racer (*C. constrictor*), #71684, #71733, #71625, and #8440 for Great Basin spadefoot (*S. intermontana*), and #139412 for dark green hawthorn (*Crataegus atrovirens).*

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

5.5 Critical Habitats

SARA defines critical habitat as necessary for the survival or recovery of a species at risk and is identified in the recovery strategy or action plan for that species. A search of iMapBC revealed two critical habitats for federally listed species near Rose Swanson (Figure 14). There is critical habitat for Great Basin spadefoot (*S. intermontana*) to the north and south of Rose Swanson and for American badger (*T. taxus*) to the west and south of Rose Swanson. As SARA only applies to federal lands, it is up to the province to protect SARA identified critical habitat. Currently, BC does not have legislation that is specific to the protection of critical habitats, however some existing legislation may be able to prohibit the destruction of critical habitats, but they are limited (Environment and Climate Change Canada, 2019).

Additionally, there is a masked occurrence (#576916; Object ID #64073) south of Rose Swanson. The Conservation Data Center (CDC) should be contacted to gather relevant information on the masked occurrence. The collation of this data does not warrant the disclosure of the masked occurrence. Harvesting in the area may have an impact on the masked occurrence and should be investigated prior to harvesting.

5.6 Inconsistent Species Protection

Given the extensive inventory list, Rose Swanson provides valuable habitat to wildlife, vegetation, and species at risk. Many of the species that were inventoried through the search methods are listed under legislation either provincially or federally. An issue that arose was the inconsistent categorization of the species at risk under the legislation. Species that are listed under SARA are not necessarily listed under the BC *Wildlife Act* or FRPA. This is because SARA, being federal would exceed the protection offered by the *Wildlife Act* and FRPA. However, SARA only applies to federal land so species that are at risk are not protected everywhere in BC. A way to rectify this would be to also have the SARA species listed under the provincial legislation. Currently, only four species are considered at risk under the BC *Wildlife Act* and at-risk species under FRPA are those designated by GAR that could be impacted by forestry.

5.7 Timing Sensitivity

Sensitive times are periods in a species' life cycle when they are the most susceptible to disturbances. Species that are at-risk provincially or federally generally do not have windows of least risk as all the phases of their life cycles are of high concern (Province of BC, 2024).

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Winter can be a sensitive time for many species, especially hibernating amphibians, reptiles, and mammals. If these species are disturbed during their hibernation, their chances of survival decrease as waking up increases their heart rate and utilizes the vital calories stored to last the winter. Another consideration is that some species, especially amphibians and reptiles, hibernate underground and disturbing soils and coarse woody debris can result in mortality. Winter is also a sensitive time on Rose Swanson because a large, forested area is documented to support the winter survival of mule deer in terms of snow interception, bedding and food sources.

Spring is a sensitive time as hibernating species will be waking and requiring immediate food sources therefore the natural movement of species, foraging and hunting should not be disrupted. It is also sensitive timing because of the birthing and raising of young. The destruction of eggs and young for any species will affect the population size and reduce sources of prey for species higher up the food chain.

5.8 Fuel Mitigation

Fire Risk mapping was completed for Rose Swanson. Areas with a "high" fire risk within the BCTS operating area are located at the end of Chamberlain Road, along the southern end of the trail network in Zone 1, and on the western edge of the operating area near Swanson Mountain Road (Figure 16). Due to the mapping results, the Township of Spallumcheen has requested that fuel mitigation measures are completed to reduce the fuel load and the fire risk. This could involve incorporating those areas into the BCTS harvest plan (Township of Spallumcheen, 2023). **However, there are differing schools of thought on fuel mitigation and reducing fire risks that should be taken into consideration when planning for harvesting on Rose Swanson. The two schools of thought 1. are mechanical fuel mitigation and 2. the combination of prescribed burning and mechanical fuel mitigation outside of old growth areas.**

One critique of mechanical fuel mitigation (i.e., logging or thinning) is there is a low probability that a treated area will actually burn within the treatment's lifespan, meaning the benefits of the treatment are not encountered before it is ineffective (Barnett, Parks, Miller, & Naighton, 2016; McIver, et al., 2012). Additionally, while fuel mitigation aims to remove the fuel for future fires, it also removes the vegetation that provides shade and allows the soil and woody debris to retain moisture. One study found that flame length and intensity were reduced by 40-47% when the moisture of the fuel was increased from 9% to 13% (Kreye, Kobziar, & Zipperer, 2013). Specific

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

to Rose Swanson, a study completed at the University of British Columbia concluded that there is a possibility of increased fire likelihood, intensity and spread on Rose Swanson if it was harvested. However, the techniques BCTS would be using is unlikely to increase the risk to the extent of the model outcomes (Klonsky, 2022). Another study found that the probability of crown fire increased in recently logged areas, indicating the ineffectiveness of logging as a fuel treatment (Price & Bradstock, 2012). The same study concluded that weather is the dominate factor in determining fire risk and that the capacity to mitigate the risk with pre-emptive treatment diminishes as weather conditions deteriorate. When the rates of spread and wind speed are very high to extreme, fuel treatments are expected to be ineffective (Beverly, Leverkus, Cameron, & Schroeder, 2020). Additionally, where thinning is the only treatment used, there is less of an effect or no effect on fire severity, tree mortality, and crown scorch compared to untreated sites (Kalies & Yocom Kent, 2016). Thinning and prescribed burning occurring together is the most effective fuel treatment to lower the fire risk (Kalies & Yocom Kent, 2016; McIver, et al., 2012). Lastly, forests with older trees have a greater resistance to fire (Old Growth Technical Advisory Panel, 2021), which are mapped on Rose Swanson at similar locations as the "high" fire risk ratings (Refer to Figure 15).

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

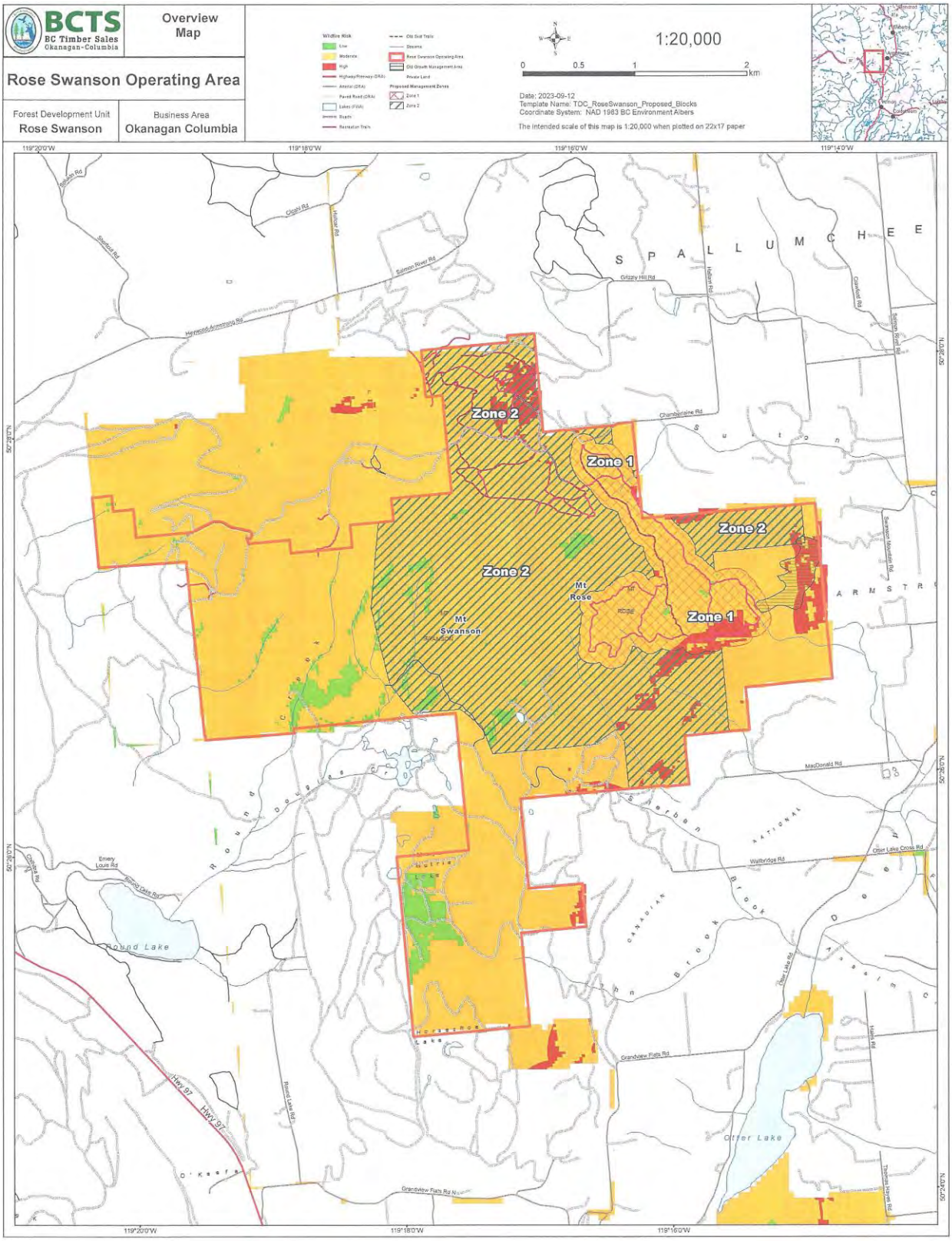

Figure 15 – BCTS Fire Risk mapping results for Rose Swanson.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

5.9 Wildlife Corridors

Habitat fragmentation is a major threat to biodiversity conservation and may increase predation, result in changes to the local microclimate, and increase the spatial isolation of species (MacDonald, 2003). These negative impacts can be mitigated by creating and improving habitat connectivity.

Given its location, Rose Swanson is expected to be a corridor for wildlife movement between the forested habitats on the west side of Okanagan Lake, east of Kalamalka Lake and north towards Shuswap Lake. The connectivity between these habitats, in addition to elevation changes, are important to migrating wildlife, transient species, as well as species with large territories. Rose Swanson supports a variety of species, many of which inhabit both the higher elevation ICHxm1 and the lower elevation IDFxh1. Maintaining the connectivity between these BGC zones in addition to the forested areas surrounding them will safeguard the continued use of Rose Swanson by wildlife species, including those that are at-risk. Additionally, maintaining the corridor will be beneficial to existing conservation projects, such as the Okanagan Collaborative Conservation Program (OCCP) Ecosystem Connectivity in the Okanagan project. The OCCP aims to protect the major ecological wildlife corridor that spans 65km from Okanagan Mountain Provincial Park north to Kalamalka Lake Provincial Park. Keeping Rose Swanson as a viable stepping stone for wildlife will preserve the ability of wildlife to move between habitats throughout the entire valley.

6.0 CONCLUSION

6.1 Rose Swanson is rich in species Biodiversity.

Given the extensive inventory list, Rose Swanson provides valuable habitat to wildlife, vegetation, and species at risk. **The inventory results support that Rose Swanson provides habitat for numerous species of wildlife and plants.** Many of the species inventoried are at risk provincially and/or federally, are listed under legislation (though not necessarily protected by it) and have valuable habitat on Rose Swanson (i.e. ungulate winter range and Critical Habitat).

6.2 Gaps in Species Protection

Many of the species that were inventoried through the search methods are listed under legislation either provincially or federally. The issue arises with the inconsistent categorization of species at risk under the legislation. SARA only applies to federal land therefore species that are at risk are

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

not protected everywhere in BC. A way to rectify this on Rose Swanson, would be to include the SARA listed species under those listed under the BC *Wildlife Act* or FRPA. **The inconsistency leads to gaps in the protection of species at risk and the ability to make informed decisions regarding the management and development of forests.** These gaps could lead to:

- Habitat loss for wildlife and species at risk
- Habitat fragmentation for wildlife and species at risk
- Impacts to sensitive species, ecosystems, and sensitive times in species life cycles
- Loss of mature forests and old growth-reliant species
- Loss of valuable microhabitats (i.e., dens, wildlife trees, coarse woody debris, and hibernacula)

6.3 Climate Change Resiliency

In the Okanagan Valley we have experienced a heat dome, an atmospheric river, drought, flooding and wildfires in addition to the reduced snowpack in the mountains and lowered water table levels. Forested areas provide climate regulation, clean air due to respiration, carbon sequestration, soil moisture retention, ecosystem services, cooler ambient temperatures, snow interception, protection from wind erosion and accelerated snowmelt and refuge for wildlife.

Snow accumulation and retention, filtering of groundwater to replenish wells in the valley bottom, cooler ambient temperatures and moisture retention are ecosystem functions of forested areas. Groundwater is retained in the forests and stored during rainfall events which reduces overland flow and increases infiltration into the soil. Soil moisture is increased in a treed canopy which also reduces fire risk. During high rainfall events, interception of rainfall and snow accumulation retains soil moisture, replenishes groundwater sources (aquifers) in addition to creating a lag in stream flows while the goundwater slowly travels into streams. If the canopy is not present, soil moisture is lost and there is an increased potential for overland flow and surges of water into streams at lower elevations.

Surface and groundwater are connected and must be assessed together and not independently. High elevation wetlands and streams, as documented in Rose Swanson, are critical storage areas when rainfall and snowpack is low.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

6.4 Mental Wellness

The trails provide outdoor recreation for many users in the community. The trail counters that have been in place since August 1, 2021, have an average of 1500 users per month for an annual average use of 18,000 users per year during all months of the year. During the Covid 19 pandemic, there were 20,000 users of the trails. Since the trail counters were installed 30 months ago, there have been 45,000 trail users. The proximity of Rose Swanson to the City of Armstrong and Spallumcheen provides unique recreation opportunities as demonstrated in the trail counts. The mental wellness benefits of physical activity and being out in nature are essential for our community.

7.0 RECOMMENDATIONS

7.1 Field Studies to document gaps in desktop inventory

Hill Environmental recognizes that the desktop inventory results are not exhaustive. **At the recommendation of ASTS, Hill Environmental proposes to conduct field work to expand on the desktop inventory results presented in this report.** Habitats will be documented including those that are needed for the sensitive life cycle periods (i.e., calving sites, hibernacula, and active nests) as well as microhabitats that enhance the suitability of Rose Swanson for wildlife. These include seepages and drainages, rock outcrops, wallows, dens/burrows, large woody debris, and wildlife trees. Recommendations will also be prescribed to protect these important habitat features.

7.2 Retention of Big Treed Older Mature Forests

Rose Swanson contains mapped priority big-treed older mature forests that are recommended for deferral (i.e., no harvesting) (Figure 15). **Retaining these areas will ensure that the values that older forests offer are preserved on Rose Swanson.** Impacts to nesting periods, sensitive timing of activities and retention of mature forest canopies will have negative effects on the values listed below.

Values such as:

- Unique conditions and processes that are important to conservation of biodiversity;
- Banks of genetic material for future use or adaptation strategies;
- Resistance to fire
- Interception and storage of water;
- High carbon sequestration capacity;
- Botanical forest products, including medicinal, edible, decorative, and ceremonial plants;

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

• Fish and wildlife habitats, including essential attributes for nesting or denning, thermal protection and refuge from predators;
• Spiritual and cultural uses, including carvings, canoes, and ceremonial poles;
• Aesthetics such as resident viewing and tourism;
• Non-commercial recreation, hiking, snowshoeing, natural area adventures (Old Growth Technical Advisory Panel, 2021)

7.3 Sensitive Timing (Least Risk Timing Windows)

It is recommended that timing of works be taken into consideration for species that exist on Rose Swanson. It is recommended that the nesting period for birds is avoided. The regional nesting period for the Rose Swanson area is late March/early April to mid-August for nesting birds. For raptors and herons, the nesting period is late January to mid-August (Province of BC, 2024). Active nests are to be given a buffer zone that is species dependant and set out by an expert (Government of Canada, 2023).

7.4 Retention Areas incorporated into Harvesting Plans

It is recommended that proposed blocks on Rose Swanson have varying retention levels and patterns to benefit a variety of wildlife species. It is also recommended that the tree species left in retention areas mimic the species composition and age classes of the harvested area (i.e., not just one species of the same age).

To summarize, the concerns regarding the impact of tree removal on Rose Swanson include:

- Loss of canopy cover and mature trees (coniferous and deciduous)
- Loss of understory vegetation
- Increased sun exposure due to loss of shade cover leading to:
    - Reduced soil and fuel moisture linked to the potential increase in wildfire risk
    - Drying of wetted areas and wetlands
- Increased runoff and sedimentation to streams.

7.5 Riparian Buffers

There are mapped wetlands and streams on Rose Swanson with some occurring within the BCTS Operating Area (Figure 15). **Such features are provided buffer zones according to the Riparian Management Guidebook (1995); however, it is recommended that the mapped streams and wetlands (plus additional drainages documented in the field) be given a Reserve Zone (no harvesting buffer), based on their drought resiliency and stream classification.** Establishing a generous buffer zone around these waterbodies will maintain cool water temperatures, increase

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

drought resiliency, reduce erosion, sedimentation downstream, and maintain a healthy headwater source for the lakes and rivers long the valley-bottom.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

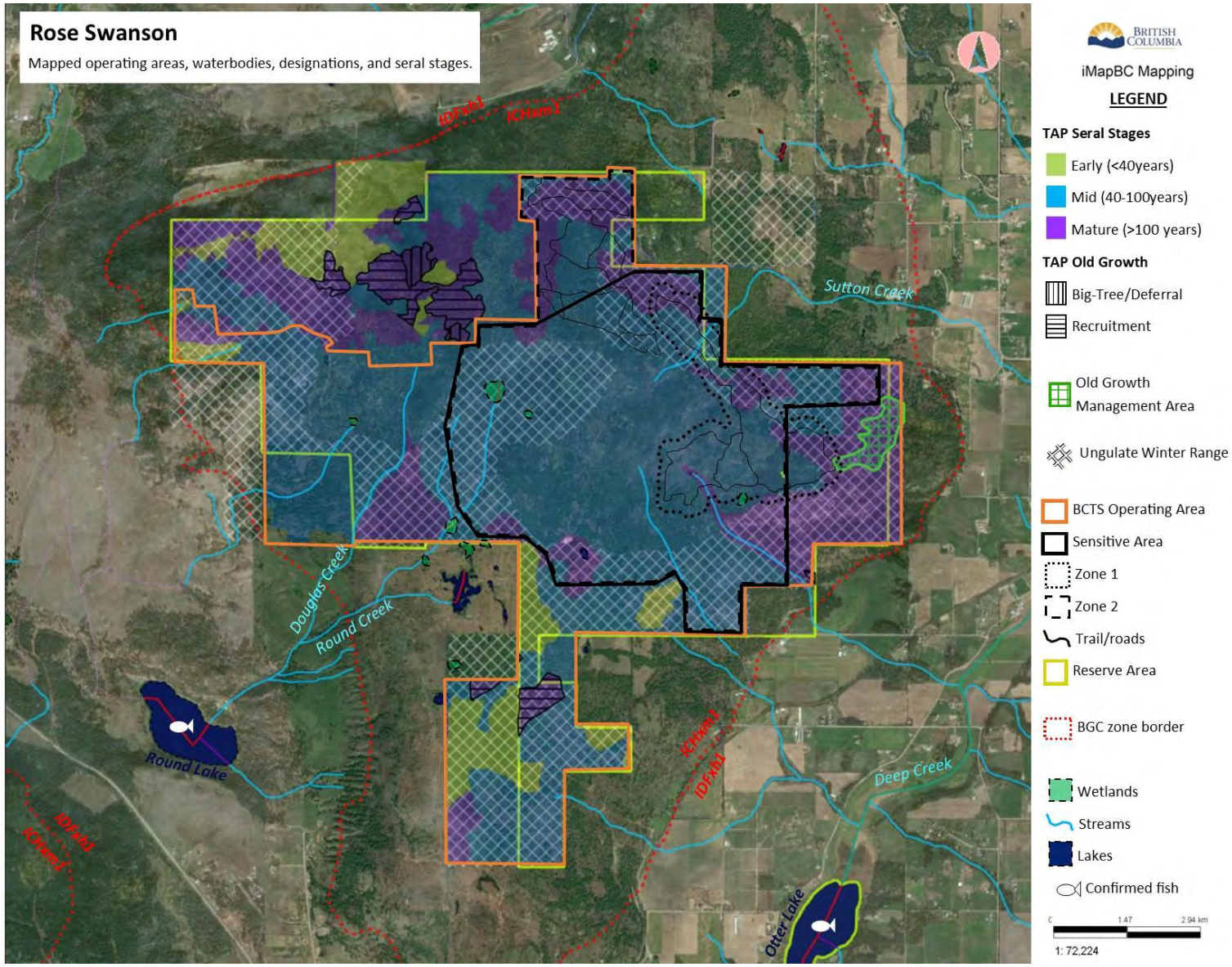

Figure 16 – Orthophoto (curtesy of iMapBC) of Rose Swanson with the TAP Old Growth mapping and seral stage results, old growth management area (non-legal), the ungulate winter range (U-8-001), Reserve Area, Sensitive Area (including Zone 1 and Zone 2), and the BCTS Operating Area all occurring within the ICHxm1 BGC zone.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

7.6 Proposed Fuel Mitigation

Fire Risk mapping was completed for Rose Swanson. Areas with a "high" fire risk within the BCTS operating area are located at the end of Chamberlain Road, along the southern end of the trail network in Zone 1, and on the western edge of the operating area near Swanson Mountain Road (Figure 16). D**iffering schools of thought on fuel mitigation and reducing fire risks should be taken into consideration on Rose Swanson. A Fire Risk Assessment is recommended to determine the best option to reduce fire risk while protecting the integrity of the ecosystem function.**

<u>Considerations include:</u>

1. l**ow probability that a treated area will actually burn within the treatment's lifespan**.
2. **fuel mitigation removes the vegetation that provides shade and allows the soil and woody debris to retain moisture**, flame length and intensity were reduced by 40-47% when the moisture of the fuel was increased from 9% to 13% (Kreye, Kobziar, & Zipperer, 2013).
3. Specific to Rose Swanson, there is a **possibility of increased fire likelihood, intensity and spread on Rose Swanson if it was harvested** (Klonsky, 2022).
4. **probability of crown fire increased in recently logged areas** (Price & Bradstock, 2012).
5. **weather is the dominate factor in determining fire risk** and that the capacity to mitigate the risk with pre-emptive treatment diminishes as weather conditions deteriorate (Beverly, Leverkus, Cameron, & Schroeder, 2020).
6. where t**hinning is the only treatment used, there is less of an effect or no effect on fire severity, tree mortality, and crown scorch** compared to untreated sites (Kalies & Yocom Kent, 2016).
7. **Thinning and prescribed burning occurring together is the most effective fuel treatment** to lower the fire risk (Kalies & Yocom Kent, 2016; McIver, et al., 2012).
8. **Forests with older trees have a greater resistance to fire** (Old Growth Technical Advisory Panel, 2021), which are mapped on Rose Swanson at similar locations as the "high" fire risk ratings (Refer to Figure 15).

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

7.7 Maintain Wildlife Corridors

Given its location, Rose Swanson is expected to be a corridor for wildlife to move between the forested habitats on the west side of Okanagan Lake, the east of Kalamalka Lake and north towards Shuswap Lake. **Maintaining the connectivity between the variety of habitats these BGC zones provide, in addition to the forested areas surrounding them, will safeguard the continued use of Rose Swanson by wildlife species, including those that are at-risk and support existing conservation projects, such as the Okanagan Collaborative Conservation Program (OCCP) Ecosystem Connectivity in the Okanagan project.**

7.8 Forest Hydrology Assessment

Forested areas provide climate regulation, clean air due to respiration, carbon sequestration, soil moisture retention, ecosystem services, cooler ambient temperature, snow interception, protection from wind erosion and accelerated snowmelt and refuge for wildlife. It is important to work collaboratively with colleagues in hydrology to make well rounded, informed decisions and not keep to our particular areas of expertise. **It is recommended that a Forest hydrologist be consulted to assess the existing conditions on Rose Swanson and determine how the existing tree canopy and understory function in terms of water storage, its relationship to aquifers in the area and downslope wells, determine the potential impacts (positive and negative) on groundwater flows, surface flows and soil moisture.**

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

WORKS CITED

B.C. Forest Practices Board. (2023, August 15). Request to appeal the district manager's decision approving amendments to BC Timber Sales' forest stewardship plan.

Barnett, K., Parks, S. A., Miller, C., & Naighton, H. T. (2016). Beyond Fuel Treatment Effectiveness: Characterizing Interactions between Fire and Treatments in the US. *Forests, Volume 7*, pp. 1-12.

BC Timber Sales. (2021). *Forest Stewardship Plan (FSP) Amendment Rose Swanson Sensitive Area Results and Strategies.*

BC Timber Sales. (2023). *Okanagan-Columbia Forest Stewardship Plan.*

BCTS. (2018). *Migratory Bird Convention Act Operational Considerations - Standard Operating Procedures.*

Beese, W. J., Deal, J., Dunsworth, B. G., Mitchell, S. J., & Philpott, T. J. (2019). Two decades of variable retention in British Columbia: a review of its implementation and effectiveness for biodiversity conservation. *Ecological Processes*, 1-22.

Beverly, J. L., Leverkus, S. E., Cameron, H., & Schroeder, D. (2020). Stand-Level Fuel Reduction Treatments and Fire Behaviour in Canadian Boreal Conifer Forests. *Fire, Volume 3, Special Issue*, pp. 1-23.

Environment and Climate Change Canada. (2019). *Report on Critical Habitat Protection for Species at Risk in Canada. Species at Risk Act Critical Habitat Report Series.* Ottawa: Environment and Climate Change Canada.

Forest Practices Code of British Columbia. (1995). *Biodiversity Guidebook.* September.

Forest Practices Code of British Columbia. (1995). *Riparian Management Area Guidebook.* Province of British Columbia.

Franklin, C. M. (2018). *Effectiveness of Retention Harvesting for Biodiversity Conservation: Evidence for Understory Vegetation and Wildlife.* University of Alberta.

Government of Canada. (2023, January). *Environment and Climate Change Canada*. Retrieved from Birds protected under the Migratory Birds Convention Act: https://www.canada.ca/en/environment-climate-change/services/migratory-birds-legal-protection/convention-act.html

Government of Canada. (2023, July 26). *Guidelines to avoid harm to migratory birds*. Retrieved from Environment and Climate Change Canada: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html#toc5

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Government of Canada. (2023, January). *Non Legal Planning Features - Current - Polygon*. Retrieved from https://open.canada.ca/data/en/dataset/5d859a89-f173-4006-82f9-16254de2c1fc

Healthy Forest Coalition. (n.d.). *Migratory Birds Convention Act*. Retrieved from Healthy Forest Coalition: https://www.healthyforestcoalition.ca/migratory-birds-convention-act---explained.html

Integrated Land Management Bureau. (2007). *Old Growth Management Area Guidance - Thompson Okanagan.* Retrieved from https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/land-use-plans-and-objectives/thompsonokanagan-region/merritt-biodiveristy-planning/ilmbogma_guidancetoaug2007.pdf#:~:text=old%20growth

Kalies, E. L., & Yocom Kent, L. L. (2016). Are fuel treatments effective at achieving ecological and social objectives? A systematic review. *Forest Ecology and Management, Volume 375*, pp. 84-95.

Klonsky, J. (2022). *Burn-P2 modelling of fire behavious on Rose Swanson Mountain, British Columbia before an dafter harvesting.* University of British Columbia.

Kreye, J. K., Kobziar, L. N., & Zipperer, W. C. (2013). Effects of fuel load and moisture content on fire behaviour and heating in masticated litter-dominated fuels. *International Journal of Wildland Fire, Volume 22*, pp. 440-445.

MacDonald, M. A. (2003). The role of corridors in biodiversity. *Tasforests, Volume 14*, pp. 41-52.

McIver, J. D., Stephens, S. L., Agee, J. K., Barbour, J., Boerner, R. E., Edminster, C. B., . . . Zack, S. (2012). Ecological effects of alternative fuel-reduction treatments: highlights of the National Fire and Fire Surrogate study (FFS). *International Jounral of Wildland Fire, Volume 22*, pp. 63-82.

Old Growth Techincal Advisory Panel. (2021). *OG TAP Old Growth Deferral: Background and Technical Appendices.*

Old Growth Technical Advisory Panel. (2021). *Priority Deferrals: An ecological approach.*

Price, O. F., & Bradstock, R. A. (2012). The efficacy of fuel treatment in mitigating property loss during wildfires: Insights from analysis of the severity of the catastrophic fires in 2009 in Victoria, Australia. *Journal of Environmental Management, Volume 113*, pp. 146-157.

Province of BC. (2024). *Regional Terms & Conditions & Timing Windows*. Retrieved from https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/working-around-water/regional-terms-conditions-timing-windows/okanagan-timing-windows

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Province of British Columbia. (1990). IDFmw1 Shuswap moist warm Interior Douglas-fir variant. In *A Guide to Site Identification and Interpretation for the Kamloops Forest Region - Land Management Handbook 23.*

Province of British Columbia. (2011, March 8). TANTALIS - Crown Land Reserves and Notations. British Columbia, Canada.

Province of British Columbia. (2017, November). *Land Designations that Contribute to Conservation in B.C.* Retrieved from Environmental Reporting BC: https://www.env.gov.bc.ca/soe/indicators/land/land-designations.html

Province of British Columbia. (2021). *A Field Guide to Ecosystem Classification and Identification, Land Management Handbook 75.* Crown Publications Inc.

Province of British Columbia. (2021). ICHxm1 Shuswap Very Dry Mild Interior Cedar-Hemlock. In *A Field Guide to Ecosystem Classification adn Identification, Land Management Handbook 75.* Crown Publications Inc.

Province of British Columbia. (2022). *A Field Guide to Ecosystem Classification and Identification for the Southern Thompson-Okanagan, Land Management Handbook 76.* Crown Publications Inc.

Province of British Columbia. (2023, December). *BC Species & Ecosystems Explorer*. Retrieved from https://a100.gov.bc.ca/pub/eswp/

Province of British Columbia. (2023, January). *Biogeoclimatic Maps*. Retrieved from Biogeoclimatic Ecosystem Classification Program: https://www.for.gov.bc.ca/hre/becweb/resources/maps/PastVersions.html

Province of British Columbia. (2023, January). *Old growth definitions and values*. Retrieved from Old Growth Forests: https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/old-growth-forests/old-growth-values

Province of British Columbia. (2023, January). *Species at risk related legislation*. Retrieved from Environment protection and sustainability: https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk/legislation

Province of British Columbia. (2024, January). *Reserve and Notation Tenures - Tantalis*. Retrieved from iMap BC: https://maps.gov.bc.ca/ess/hm/imap4m/

Township of Spallumcheen. (2023). Minutes of a Township of Spallumcheen Rose Swanson Mountain Planned Harvest Select Committee Meeting. *Committee of the Whole*, (pp. 834-837). Spallumcheen.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Welch, I. D., Rodgers, A. R., & McKinley, R. S. (2000). TIMBER HARVEST AND CALVING SITE FIDELITY OF MOOSE IN NORTHWESTERN ONTARIO. *Alces: A Journal Devoted to the Biology and Management of Moose, Volume 36*, pp. 93-103.

WWF. (n.d.). *Habitat*. Retrieved from Wildlife Habitat Conservation In Canada: https://wwf.ca/habitat/

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

APPENDIX A – SUMMARY OF WILDLIFE AND HABITATS BY BGC ZONE

Table 12 – List of wildlife habitats and species they support according to LMH 75 and LMH 76. Within each habitat type, species listed under IDFxh1 (LMH 76) are highlighted with orange, species listed under ICHxm1 (LMH 75) are highlighted in green and non-highlighted species were listed under both. Asterisks indicate non-research grade iNaturalist observations.

Habitat Type	Species Name	Common Name	Documented on RS
Grasslands and dry open forest	*Taxidea taxus*	American badger	Near
	Buteo swainsoni	Swainson's hawk	
	Numenius americanus	Long-billed curlew	
	Eremophila alpestris	Merrill's horned lark	
	Grasshopper Sparrow	Grasshopper sparrow	
	Asio flammeus	Short-eared owl	
	Perognathus parvus	Great Basin pocket mouse	
	Chondestes grammacus	Lark sparrow	
	Dolichonyx oryzivorus	Bobolink	
	Chordeiles minor	Common nighthawk	Yes
	Hirundo rustica	Barn swallow	Near
	Dolichonyx oryzivorus	Prairie falcon	
	Buteo lagopus	Rough-legged hawk	
Wetland and ponds	*Spea intermontane*	Great Basin spadefoot	Near
	Anaxyrus boreas	Western toad	Yes
	Chrysemys picta	Painted turtle	
	Hirundo rustica	Barn swallow	
	Icteria virens	Yellow-breasted chat	
	Ambystoma mavortium	Tiger salamander	
	Riparia riparia	Bank swallow	
	Aechmophorus occidentalis	Western grebe	
	Euphagus carolinus	Rusty blackbird	
	Phalaropus lobatus	Red-necked phalarope	
Rock-dominated	*Corynorhinus townsendii*	Townsend's big-eared bat	
	Crotalus oreganus	Western rattlesnake	
	Coluber constrictor	North American racer	Near
	Plestiodon skiltonianus	Western skink	Yes
	Pituophis catenifer	Gopher snake	
	Marmota flaviventris	Yellow-bellied marmot	
	Euderma maculatum	Spotted bat	
	Myotis ciliolabrum	Western small-footed myotis	
	Hirundo rustica	Barn swallow	Near
	Falco peregrinus	Peregrine falcon	
	Falco mexicanus	Prairie falcon	
	Catherpes mexicanus	Canyon wren	
	Aeronautes saxatalis	White-throated swift	
	Cypseloides niger	Black swift	
	Northern Rubber Boa	Northern rubber boa	Yes

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 12 continued – List of wildlife habitats and species they support according to LMH 75 and LMH 76. Within each habitat type, species listed under IDFxh1 (LMH 76) are highlighted with orange, species listed under ICHxm1 (LMH 75) are highlighted in green and non-highlighted species were listed under both. Asterisks indicate non-research grade iNaturalist observations.

Habitat Type	Species Name	Common Name	Documented on RS
Old forest and veteran trees	*Melanerpes lewis*	Lewis's woodpecker	
	Sphyrapicus thyroideus	Williamson's sapsucker	
	Megascops kennicottii	Western screech-owl	
	Psiloscops flammeolus	Flammulated owl	
	Ursus americanus	Black bear	Yes
	Buteo swainsoni	Swainson's hawk	
	Ardea herodias	Great blue heron	
	Myotis lucifugus	Little brown myotis	
Coniferous and mixed forests and winter range	*Odocoileus hemionus*	Mule Deer	Near / *
	Odocoileus virginianus	White-tailed deer	*
	Cervus canadensis	Elk	Yes
	Ovis canadensis	Bighorn sheep	
	Puma concolor	Cougar	Yes
	Alces alces	Moose	Yes
	Lynx rufus	Bobcat	Yes
	Oreamnos americanus	Mountain goat	
	Coccothraustes vespertinus	Evening grosbeak	Yes
Large tracts of forest	*Accipiter atricapillus*	Northern goshawk	Yes

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

APPENDIX B – LIST OF DOCUMENTED AND POTENTIAL PLANT SPECIES ON ROSE SWANSON

The Rank refers to the species status in BC (Red-threatened, Blue-special concern, Yellow-secure, and Exotic). The COSEWIC status is E- Endangered, T- Threatened, SC- Special Concern, NAR- Not at Risk, and DD- Data Deficient. For the SARA status, the digit indicates the schedule under SARA, letter definitions the same as for COSEWIC, and year is the date it was last reviewed.

Table 13 – List of the documented and potential species of vegetation for Rose Swanson. Only the iNaturalist species have been documented on Rose Swanson. The species are organised by Rank then alphabetically by species name.

Species Name	Common Name	BGC	Rank	COSEWIC	SARA	Source
Crepis modocensis ssp. modocensis	Low Hawksbeard	IDFxh	Red			BC Explorer
Phlox speciosa ssp. occidentalis	Showy Phlox	IDFxh	Red			BC Explorer
Polemonium californicum	California Jacob's Ladder	IDFmw	Red			BC Explorer
Schoenoplectiella saximontana	Rocky Mountain Clubrush	IDFmw	Red			BC Explorer
Senecio integerrimus var. ochroleucus	White Western Groundsel	IDFxh	Red			BC Explorer
Sisyrinchium idahoense var. occidentale	Idaho Blue-Eyed Grass	IDFxh	Red			BC Explorer
Acorus americanus	American Sweet-Flag	IDFmw	Blue			BC Explorer
Arctoparmelia subcentrifuga	Abrading Ring	IDF mw	Blue			BC Explorer
Azolla mexicana	Mexican Mosquito Fern	IDFmw	Blue	T	1-T (2003)	BC Explorer
Berula incisa	Cut-Leaved Water-Parsnip	IDFmw, IDFxh	Blue			BC Explorer
Bryoerythrophyllum columbianum	Columbian Carpet Moss	IDF	Blue	SC	1-SC (2005)	BC Explorer
Carex pedunculata	Peduncled Sedge	IDFmw	Blue			BC Explorer
Castilleja cusickii	Cusick's Paintbrush	IDFxh	Blue			BC Explorer
Cladonia cyanipes	Blue-Footed Pixie	IDFxh	Blue			BC Explorer
Claytonia cordifolia	Heart-Leaved Springbeauty	IDFmw, IDFxh	Blue			BC Explorer
Crataegus atrovirens	Dark-Green Hawthorn	IDFxh	Blue			BC Explorer
Crataegus okanaganensis var. okanaganensis	Okanagan Hawthorn	IDFxh	Blue			BC Explorer
Dermatocarpon intestiniforme	Quilted Stippleback	IDFxh	Blue			BC Explorer
Erythranthe suksdorfii	Suksdorf's Monkey-Flower	IDFxh	Blue			BC Explorer
Evernia divaricata	Mountain Oakmoss	IDFmw	Blue			BC Explorer

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 13 continued – List of the documented and potential species of vegetation for Rose Swanson. Only the iNaturalist species have been documented on Rose Swanson. The species are organised by Rank then alphabetically by species name.

Species Name	Common Name	BGC	Rank	COSEWIC	SARA	Source
Gayophytum ramosissimum	Hairstem Groundsmoke	IDFxh	Blue			BC Explorer
Liparis loeselii	Yellow Widelip Orchid	IDFmw	Blue			BC Explorer
Lupinus sulphureus	Sulphur Lupine	IDFmw, IDFxh	Blue			BC Explorer
Marsilea vestita	Hairy Water-Clover	IDFmw, IDFxh	Blue			BC Explorer
Navarretia propinqua	Near Navarretia	IDFxh	Blue			BC Explorer
Olsynium douglasii var. inflatum	Satinflower	IDFmw, IDFxh	Blue			BC Explorer
Phaeophyscia ciliata	Greater Eye Shadow	IDFxh	Blue			BC Explorer
Pinus albicaulis	Whitebark Pine	IDFxh	Blue	E	1-E (2012)	BC Explorer
Pterygoneurum kozlovii	Alkaline Wing-Nerved Moss	IDF	Blue	T	1-T (2006)	BC Explorer
Salix amygdaloides	Peach-Leaf Willow	IDFxh	Blue			BC Explorer
Viola sororia	Woolly Blue Violet	IDFmw, IDFxh	Blue			BC Explorer
Abies lasiocarpa	Subalpine Fir		Yellow			iNaturalist
Acer glabrum	Rocky Mountain Maple		Yellow			iNaturalist
Acer glabrum douglasii	Douglas Maple		Yellow			iNaturalist
Actaea rubra	Red Baneberry		Yellow			iNaturalist
Adenocaulon bicolor	American Trailplant		Yellow			iNaturalist
Amelanchier alnifolia	Saskatoon		Yellow			iNaturalist
Anaphalis margaritacea	Pearly Everlasting		Yellow			iNaturalist
Antennaria anaphaloides	Handsome Pussytoes		Yellow			iNaturalist
Antennaria racemosa	Hooker's Pussytoes		Yellow			iNaturalist
Antennaria rosea	Rosy Pussytoes		Yellow			iNaturalist
Aphyllon purpureum	Oneflower Broomrape		Yellow			iNaturalist
Apocynum androsaemifolium	Spreading Dogbane		Yellow			iNaturalist
Aralia nudicaulis	Wild Sarsaparilla		Yellow			iNaturalist
Arctostaphylos uva-ursi	Kinnikinnick		Yellow			iNaturalist
Arnica cordifolia	Heartleaf Arnica		Yellow			iNaturalist
Artemisia frigida	Fringed Sagebrush		Yellow			iNaturalist
Athyrium filix-femina	Lady Fern		Yellow			iNaturalist
Athyrium filix-femina cyclosorum	Western Lady Fern		Yellow			iNaturalist
Balsamorhiza sagittata	Arrowleaf Balsamroot		Yellow			iNaturalist
Mahonia aquifolium	Oregon Grape		Yellow			iNaturalist
Betula occidentalis	Water Birch		Yellow			iNaturalist

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 13 continued – List of the documented and potential species of vegetation for Rose Swanson. Only the iNaturalist species have been documented on Rose Swanson. The species are organised by Rank then alphabetically by species name.

Species Name	Common Name	BGC	Rank	COSEWIC	SARA	Source
Betula papyrifera	Paper Birch		Yellow			iNaturalist
Boechera retrofracta	Reflexed Rockcress		Yellow			iNaturalist
Calochortus macrocarpus	Sagebrush Mariposa Lily		Yellow			iNaturalist
Calypso bulbosa	Fairy-Slipper		Yellow			iNaturalist
Calypso bulbosa americana	Eastern Fairy-Slipper		Yellow			iNaturalist
Calypso bulbosa occidentalis	Western Fairy-Slipper		Yellow			iNaturalist
Castilleja hispida	Harsh Indian Paintbrush		Yellow			iNaturalist
Castilleja miniata	Giant Red Indian Paintbrush		Yellow			iNaturalist
Ceanothus sanguineus	Redstem Ceanothus		Yellow			iNaturalist
Ceanothus velutinus	Snowbrush Ceanothus		Yellow			iNaturalist
Chamaenerion angustifolium	Fireweed		Yellow			iNaturalist
Chimaphila umbellata	Pipsissewa		Yellow			iNaturalist
Claytonia lanceolata	Lanceleaf Springbeauty		Yellow			iNaturalist
Claytonia rubra	Redstem Springbeauty		Yellow			iNaturalist
Clematis occidentalis	Purple Clematis		Yellow			iNaturalist
Clintonia uniflora	Queen's Cup		Yellow			iNaturalist
Collinsia parviflora	Small-Flowered Blue-Eyed Mary		Yellow			iNaturalist
Collomia linearis	Narrow-Leaf Mountain Trumpet		Yellow			iNaturalist
Corallorhiza maculata	Spotted Coralroot		Yellow			iNaturalist
Corallorhiza maculata maculata	Eastern Spotted Coralroot		Yellow			iNaturalist
Corallorhiza maculata occidentalis	Western Spotted Coralroot		Yellow			iNaturalist
Corallorhiza striata	Striped Coralroot		Yellow			iNaturalist
Cornus sericea	Red Osier Dogwood		Yellow			iNaturalist
Corylus cornuta	Beaked Hazelnut		Yellow			iNaturalist
Crepis atribarba	Slender Hawksbeard		Yellow			iNaturalist
Cryptogramma acrostichoides	American Parsley Fern		Yellow			iNaturalist
Cystopteris fragilis	Fragile Fern		Yellow			iNaturalist
Delphinium nuttallianum	Upland Larkspur		Yellow			iNaturalist
Diphasiastrum complanatum	Northern Ground-Cedar		Yellow			iNaturalist
Drymocallis convallaria	Cream Cinquefoil		Yellow			iNaturalist
Equisetum arvense	Field Horsetail		Yellow			iNaturalist

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 13 continued – List of the documented and potential species of vegetation for Rose Swanson. Only the iNaturalist species have been documented on Rose Swanson. The species are organised by Rank then alphabetically by species name.

Species Name	Common Name	BGC	Rank	COSEWIC	SARA	Source
Equisetum scirpoides	Dwarf Horsetail		Yellow			iNaturalist
Erigeron philadelphicus	Philadelphia Fleabane		Yellow			iNaturalist
Eriogonum heracleoides	Parsnipflower Buckwheat		Yellow			iNaturalist
Fragaria vesca	Woodland Strawberry		Yellow			iNaturalist
Fragaria virginiana	Virginia Strawberry		Yellow			iNaturalist
Fritillaria affinis	Chocolate Lily		Yellow			iNaturalist
Fritillaria pudica	Yellow Fritillary		Yellow			iNaturalist
Galium triflorum	Fragrant Bedstraw		Yellow			iNaturalist
Gentianella amarella	Autumn Gentian		Yellow			iNaturalist
Geum triflorum	Prairie Smoke		Yellow			iNaturalist
Goodyera oblongifolia	Western Rattlesnake Plantain		Yellow			iNaturalist
Gymnocarpium disjunctum	Pacific Oak Fern		Yellow			iNaturalist
Heuchera cylindrica	Roundleaf Alumroot		Yellow			iNaturalist
Hippuris vulgaris	Common Mare's Tail		Yellow			iNaturalist
Holodiscus discolor	Ocean Spray		Yellow			iNaturalist
Hylocomiadelphus triquetrus	Rough Goose Neck Moss		Yellow			iNaturalist
Hylocomium splendens	Stairstep Moss		Yellow			iNaturalist
Hypericum scouleri	Scouler's St. John's Wort		Yellow			iNaturalist
Juniperus communis	Common Juniper		Yellow			iNaturalist
Juniperus scopulorum	Rocky Mountain Juniper		Yellow			iNaturalist
Larix occidentalis	Western Larch		Yellow			iNaturalist
Lilium columbianum	Columbia Lily		Yellow			iNaturalist
Linnaea borealis	Twinflower		Yellow			iNaturalist
Lithophragma parviflorum	Smallflower Woodland Star		Yellow			iNaturalist
Lithospermum ruderale	Western Stoneseed		Yellow			iNaturalist
Lomatium ambiguum	Wyeth Biscuitroot		Yellow			iNaturalist
Lomatium geyeri	Geyer's Desert-Parsley		Yellow			iNaturalist
Lomatium macrocarpum	Bigseed Biscuitroot		Yellow			iNaturalist
Lomatium multifidum	Carrotleaf Biscuitroot		Yellow			iNaturalist
Lonicera ciliosa	Orange Honeysuckle		Yellow			iNaturalist
Lonicera involucrata	Twinberry Honeysuckle		Yellow			iNaturalist
Lonicera involucrata involucrata	Bearberry Honeysuckle		Yellow			iNaturalist
Lonicera utahensis	Utah Honeysuckle		Yellow			iNaturalist
Maianthemum racemosum	False Solomon's Seal		Yellow			iNaturalist

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 13 continued – List of the documented and potential species of vegetation for Rose Swanson. Only the iNaturalist species have been documented on Rose Swanson. The species are organised by Rank then alphabetically by species name.

Species Name	Common Name	BGC	Rank	COSEWIC	SARA	Source
Maianthemum racemosum amplexicaule	Western Solomon's Plume		Yellow			iNaturalist
Maianthemum stellatum	Starry False Solomon's-Seal		Yellow			iNaturalist
Mentha canadensis	Canada Mint		Yellow			iNaturalist
Micranthes occidentalis	Western Saxifrage		Yellow			iNaturalist
Microsteris gracilis	Slender Phlox		Yellow			iNaturalist
Monotropa uniflora	Ghost Pipe		Yellow			iNaturalist
Orthilia secunda	One-Sided Wintergreen		Yellow			iNaturalist
Paxistima myrsinites	Faslebox		Yellow			iNaturalist
Pedicularis bracteosa	Bracted Lousewort		Yellow			iNaturalist
Penstemon fruticosus	Shrubby Penstemon		Yellow			iNaturalist
Penstemon fruticosus fruticosus	Shrubby Beardtongue		Yellow			iNaturalist
Penstemon fruticosus scouleri	Littleleaf Bush Penstemon		Yellow			iNaturalist
Phacelia linearis	Linearleaf Phacelia		Yellow			iNaturalist
Philadelphus lewisii	Lewis' Mock Orange		Yellow			iNaturalist
Picea glauca	White Spruce		Yellow			iNaturalist
Pinus contorta	Lodgepole Pine		Yellow			iNaturalist
Pinus contorta latifolia	Interior Lodgepole Pine		Yellow			iNaturalist
Pinus monticola	Western White Pine		Yellow			iNaturalist
Pinus ponderosa	Ponderosa Pine		Yellow			iNaturalist
Plagiomnium insigne	Badge Moss		Yellow			iNaturalist
Platanthera aquilonis	North Wind Bog Orchid		Yellow			iNaturalist
Platanthera elegans	Elegant Rein Orchid		Yellow			iNaturalist
Platanthera elongata	Denseflower Rein Orchid		Yellow			iNaturalist
Platanthera orbiculata	Round-Leaved Bog Orchid		Yellow			iNaturalist
Platanthera unalascensis	Alaska Rein Orchid		Yellow			iNaturalist
Pleurozium schreberi	Red-Stemmed Feather Moss		Yellow			iNaturalist
Polystichum munitum	Western Sword Fern		Yellow			iNaturalist
Polytrichum juniperinum	Juniper Haircap Moss		Yellow			iNaturalist
Polytrichum piliferum	Bristly Haircap Moss		Yellow			iNaturalist
Populus tremuloides	Trembling Aspen		Yellow			iNaturalist
Populus trichocarpa	Black Cottonwood		Yellow			iNaturalist
Primula pauciflora	Dark-Throated Shooting Star		Yellow			iNaturalist
Prosartes hookeri	Hooker's Fairybells		Yellow			iNaturalist

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 13 continued – List of the documented and potential species of vegetation for Rose Swanson. Only the iNaturalist species have been documented on Rose Swanson. The species are organised by Rank then alphabetically by species name.

Species Name	Common Name	BGC	Rank	COSEWIC	SARA	Source
Prosartes trachycarpa	Rough-Fruited Fairybells		Yellow			iNaturalist
Pseudoroegneria spicata	Bluebunch Wheatgrass		Yellow			iNaturalist
Pseudotsuga menziesii	Common Douglas-Fir		Yellow			iNaturalist
Pseudotsuga menziesii glauca	Rocky Mountains Douglas-Fir		Yellow			iNaturalist
Pteridium aquilinum	Common Bracken		Yellow			iNaturalist
Pteridium aquilinum pubescens	Hairy Brackenfern		Yellow			iNaturalist
Pterospora andromedea	Woodland Pinedrops		Yellow			iNaturalist
Ptilium crista-castrensis	Ostrich-Plume Moss		Yellow			iNaturalist
Pyrola asarifolia	Bog Wintergreen		Yellow			iNaturalist
Pyrola chlorantha	Green-Flowered Wintergreen		Yellow			iNaturalist
Pyrola picta	White-Veined Wintergreen		Yellow			iNaturalist
Ranunculus glaberrimus	Sagebrush Buttercup		Yellow			iNaturalist
Rhytidiopsis robusta	Pipecleaner Moss		Yellow			iNaturalist
Ribes lacustre	Black Gooseberry		Yellow			iNaturalist
Ribes viscosissimum	Sticky Currant		Yellow			iNaturalist
Rosa gymnocarpa	Baldhip Rose		Yellow			iNaturalist
Rosa woodsii	Woods' Rose		Yellow			iNaturalist
Rubus idaeus	Red Raspberry		Yellow			iNaturalist
Rubus leucodermis	Whitebark Raspberry		Yellow			iNaturalist
Rubus parviflorus	Thimbleberry		Yellow			iNaturalist
Salix discolor	American Pussy Willow		Yellow			iNaturalist
Salix prolixa	Mackenzie's Willow		Yellow			iNaturalist
Salix scouleriana	Scouler's Willow		Yellow			iNaturalist
Salix sitchensis	Sitka Willow		Yellow			iNaturalist
Sedum stenopetalum	Wormleaf Stonecrop		Yellow			iNaturalist
Selaginella densa	Dense Spikemoss		Yellow			iNaturalist
Shepherdia canadensis	Soopolallie		Yellow			iNaturalist
Sium suave	Water Parsnip		Yellow			iNaturalist
Spiraea betulifolia	Birch-leaved Spirea		Yellow			iNaturalist
Symphoricarpos albus	Common Snowberry		Yellow			iNaturalist
Symphyotrichum ericoides	White Heath Aster		Yellow			iNaturalist
Taxus brevifolia	Pacific Yew		Yellow			iNaturalist
Thalictrum occidentale	Western Meadow-Rue		Yellow			iNaturalist
Thuja plicata	Western Redcedar		Yellow			iNaturalist

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 13 continued – List of the documented and potential species of vegetation for Rose Swanson. Only the iNaturalist species have been documented on Rose Swanson. The species are organised by Rank then alphabetically by species name.

Species Name	Common Name	BGC	Rank	COSEWIC	SARA	Source
Toxicodendron rydbergii	Western Poison Ivy		Yellow			iNaturalist
Toxicoscordion venenosum	Meadow Deathcamas		Yellow			iNaturalist
Tsuga heterophylla	Western Hemlock		Yellow			iNaturalist
Vaccinium membranaceum	Black Huckleberry		Yellow			iNaturalist
Veronica americana	American Brooklime		Yellow			iNaturalist
Vicia americana	American Vetch		Yellow			iNaturalist
Viola adunca	Hookedspur Violet		Yellow			iNaturalist
Viola canadensis	Canada Violet		Yellow			iNaturalist
Viola orbiculata	Western Roughleaf Violet		Yellow			iNaturalist
Woodsia oregana	Oregon Woodsia		Yellow			iNaturalist
Woodsia scopulina	Rocky Mountain Woodsia		Yellow			iNaturalist
Acer platanoides	Norway Maple		Exotic			iNaturalist
Alchemilla mollis	Garden Lady's-Mantle		Exotic			iNaturalist
Arctium lappa	Greater Burdock		Exotic			iNaturalist
Arenaria serpyllifolia	Thyme-Leaved Sandwort		Exotic			iNaturalist
Berteroa incana	Hoary Alyssum		Exotic			iNaturalist
Buglossoides arvensis	Corn Gromwell		Exotic			iNaturalist
Campanula rapunculoides	Creeping Bellflower		Exotic			iNaturalist
Chelidonium majus	Greater Celandine		Exotic			iNaturalist
Chondrilla juncea	Rush Skeletonweed		Exotic			iNaturalist
Cirsium vulgare	Bull Thistle		Exotic			iNaturalist
Clinopodium acinos	Basil-Thyme		Exotic			iNaturalist
Daucus carota	Wild Carrot		Exotic			iNaturalist
Erodium cicutarium	Redstem Stork's-Bill		Exotic			iNaturalist
Euphrasia nemorosa	Common Eyebright		Exotic			iNaturalist
Filago arvensis	Field Fluffweed		Exotic			iNaturalist
Hypericum perforatum	Common St. John's Wort		Exotic			iNaturalist
Leucanthemum vulgare	Oxeye Daisy		Exotic			iNaturalist
Mycelis muralis	Wall Lettuce		Exotic			iNaturalist
Pilosella aurantiaca	Orange Hawkweed		Exotic			iNaturalist
Potentilla argentea	Silvery Cinquefoil		Exotic			iNaturalist
Potentilla recta	Sulphur Cinquefoil		Exotic			iNaturalist
Ranunculus repens	Creeping Buttercup		Exotic			iNaturalist
Trifolium aureum	Large Hop Clover		Exotic			iNaturalist
Trifolium pratense	Red Clover		Exotic			iNaturalist

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 13 continued – List of the documented and potential species of vegetation for Rose Swanson. Only the iNaturalist species have been documented on Rose Swanson. The species are organised by Rank then alphabetically by species name.

Species Name	Common Name	BGC	Rank	COSEWIC	SARA	Source
Verbascum thapsus	Common Mullein		Exotic			iNaturalist
Veronica officinalis	Heath Speedwell		Exotic			iNaturalist
Achillea millefolium	Common Yarrow					iNaturalist
Calypso bulbosa — kostiukiae	Kostiuk's Hybrid Calypso					iNaturalist
Comandra umbellata	Bastard Toadflax					iNaturalist
Marchantia polymorpha	Common Liverwort					iNaturalist
Persicaria amphibia stipulacea	Flanged Smartweed					iNaturalist
Picea glauca — engelmannii	Interior Hybrid Spruce					iNaturalist
Prunella vulgaris	Common Selfheal					iNaturalist
Spinulum annotinum	Interrupted Clubmoss					iNaturalist

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

APPENDIX C – ORDER - UNGULATE WINTER RANGE #U-8-001 (2006)

BRITISH COLUMBIA

ORDER – Ungulate Winter Range # U-8-001 – Okanagan TSA

This order is given under the authority of sections 12(1) and 9(2) of the *Government Actions Regulation* (B.C. Reg. 582/2004).

The Deputy Minister of Environment orders that:

1. the ungulate winter range shown in the map set out in the attached Schedule A (#U-8-001) is established;
2. the ungulate winter range is established for mule deer (*Odocoileus hemionus hemionus*);
3. the general wildlife measures outlined in Schedule 1 are established for the ungulate winter range as shown on the attached Schedule A;
4. where there is any discrepancy between the ungulate winter range boundaries shown in the attached Schedule A and the GIS file *tuwra_bc*, the boundaries as detailed in the GIS file will take precedent. The centre point of the line on the map denoting the ungulate winter range is what establishes the boundary;
5. for the purposes of section 2(3)(a) of the *Government Actions Regulation*, the general wildlife measures outlined in Schedule 1 apply to minor tenures;
6. woodlot licence agreements are exempt from this Order;
7. pursuant to section 7(3) of the *Forest Planning and Practices Regulation* the person(s) required to prepare a forest stewardship plan are hereby exempted from the obligation to prepare results or strategies in relation to the objective set out in section 7(1) of the *Forest Planning and Practices Regulation* for the winter survival of mule deer in the Okanagan TSA;
8. the general wildlife measures outlined in Schedule 1 do not apply for the purposes of exploration, development and production activities when these activities have been authorized for the purpose of subsurface resource exploration, development or production by the *Mineral Tenure Act, the Coal Act, the Mines Act, the Petroleum and Natural Gas Act, the Pipeline Act or the Geothermal Resources Act*; and
9. the general wildlife measures listed below do not apply to the extent they would prevent the following:
    i. operations required for safety reasons, and
    ii. recovery of timber damaged by fire, insects or other similar events.

Definition
Non-timber harvesting landbase refers to the non-timber harvesting landbase defined in TSR 2.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Schedule 1 – General Wildlife Measures

Harvesting and silviculture

1. Forest practices will result in the retention of the amount of snow interception cover (SIC) set out in the feature notes of the GIS file *tuwra_bc* for each planning cell delineated in Schedule A.
2. The SIC amount that is retained for each planning cell, consistent with the feature notes of the GIS file *tuwra_bc*, will exhibit the attributes set out in Table 1 for each BEC unit.
3. Where SIC is not distributed in numerous patches throughout the planning cell, even-aged silviculture system cutblocks must not exceed 200 meters in one dimension.
4. Wildlife tree patches (WTPs) are to be Douglas-fir of at least 140 years of age, where available. Where Douglas-fir of at least 140 years is not available within the cutblock, the next oldest Douglas-fir stems/stands are to be identified as WTPs. This GWM does not apply where large diameter deciduous, ponderosa pine and/or larch are to be used for WTPs for Red and/or Blue-listed species; or where nest trees, or other high value wildlife trees, have no-work zones established to meet safety requirements.
5. Subject to FPPR 92 (1) and where available, retain snow interception cover in a variety of sizes throughout the planning cell.
6. In the Moderate snow pack zone (except the IDFmw), up to 50% of the snow interception cover in each planning cell can be met in the non-timber harvesting landbase (NTHLB), provided the stands are at least 50% Douglas-fir, at least 120 years of age, and have a crown closure of at least 36%.
7. In the IDFmw, there is no restriction on the amount of snow interception cover that can be located in the NTHLB, provided the above stated (see GWM 6) age and species composition are met, along with a canopy closure of at least 50%.
8. In the Moderate Snowpack Zone, 33% of the snow interception cover area is reserved from timber harvest, and uneven aged silviculture systems may occur in the remaining 67% of the area identified as snow interception cover provided no more than 20% of the stems are removed every 40 years. Stems that are removed are to be less than 40 cm dbh, except where trails are developed.
9. In the Moderate Snowpack Zone, snow interception cover must not be located on slopes above 80%
10. Silviculture activities (planting and stand tending) are to result in at least 70% of the well spaced stems at free growing being Douglas-fir in the Moderate and Deep snowpack zones, and at least 50% of the well spaced stems at free growing being Douglas-fir in the Shallow snowpack zone, in each cutblock.
11. GWM 10 is rescinded where the MoE regional manager has approved a landscape level plan to address Douglas-fir composition in areas of 'root rot'.
12. Subject to FPPR 92 (1), in the Moderate snowpack zone, no more than 30% of the planning cell is to be in stands of less than 20 years of age.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Table 1: Snow Interception Cover attributes by snowpack zones

Snowpack Zone	Biogeoclimatic Units	Dominant Tree Species	Minimum Stand Age (years)	Canopy Closure
Shallow	BG PP IDFxh	Douglas-fir	Not less than 140	None specified Small patches, clumps or 'vets' acceptable
Moderate	IDFdk IDFdm IDFmw MS ICHdw	Douglas-fir	IDFmw – not less than 140 All other units – not less than 175; or not less than 40 cm dbh	At least 36%
Deep	ICH (except ICHdw)	Douglas-fir	Not less than 100, or not less than 40 cm dbh	At least 46%

Signed this 1st day of October, 2006
Chris Trumpy, Deputy Minister
Ministry of Environment

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca

Appendix 1

The contents of this Appendix are not part of the legal Order U-8-001, and are intended to provide clarification or further information regarding the intent of the Order.

1. Private lands are excluded from the application of these general wildlife measures as they are not subject to the Forest and Range Practices Act.
2. The most appropriate stands for snow interception cover are those that are comprised of older aged Douglas-fir, with a high canopy closure. In all snow pack zones, the initial allocation of snow interception cover is to Douglas-fir stands with the highest age/height. In planning cells where snow interception cover attributes are not present, forest practices are not to result in the removal of stands, up to the levels defined in the feature notes of the GIS file *tuwra_bc*, that have the likelihood of developing those attributes in the shortest period of time. Stands that have an inappropriate species composition can be removed, and converted to an appropriate species composition.
3. The intent is to have SIC well distributed throughout the planning cell. This allows for reduced distance to cover, and opportunity for greater use of the entire planning cell.
4. It is acknowledged that the Okanagan Shuswap Land and Resource Management Plan (OSLRMP) formed the basis for the general wildlife measures included in this Order. The OSLRMP has recommended that research be conducted related to the forage and cover requirements contained within the document. This Order will be assessed based on improved knowledge, resulting form that research, about local conditions and forestry/wildlife interactions, and amendments will be considered.

2540 Pleasant Valley Blvd, PO Box #68, Armstrong BC, V0E 1B0 • Tel 250-546-4069
micheleh@hillenvironmental.ca • hillenvironmental.ca