

---

# Environmental Feasibility Study

*Kettle Valley Railway, South Spur Trail*

---

**Prepared for:**

**British Columbia Ministry of Forests, Lands,  
Natural Resource Operations and Rural Development  
Recreation Sites and Trails BC  
Sea to Sky Natural Resource District  
101-42000 Loggers Lane  
Squamish BC V8B 0H3**



Prepared by:

**EBB** Environmental  
Consulting Inc.

PAGE INTENTIONALLY LEFT BLANK

# Environmental Feasibility Study

## Kettle Valley Railway, South Spur Trail

### PREPARED FOR

#### **Tennessee Trent**

BC Ministry of Forests, Lands, Natural Resource  
Operations and Rural Development  
Recreation Sites and Trails BC  
Sea to Sky Natural Resource District  
101-42000 Loggers Lane  
Squamish BC V8B 0H3

### SUBMITTED

March 2018

### PREPARED BY

#### **EBB Environmental Consulting Inc.**

PO Box 18180 1215C 56<sup>th</sup> Street  
Delta, British Columbia, V4L 2M4

Phone: 604-943-3209

Fax: 604-948-3273

Toll-Free: 1-877-943-3209

[www.ebbconsulting.ca](http://www.ebbconsulting.ca)

### PRINCIPAL CONTACT

**Oliver Busby, MBA, RPBio, PAg**

Mobile: 604-219-2412

Email: [busby@ebbconsulting.ca](mailto:busby@ebbconsulting.ca)

## Document Limitations

This document was prepared exclusively for the Recreation Sites and Trails BC branch of the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development. Findings, conclusions, and recommendations in this document are based on expertise and experience of EBB personnel using 1) information available at the time of preparation; 2) data supplied by outside sources; and, 3) assumptions, conditions, and qualifications set forth in this document. Professional judgement and standard practices were used in interpreting external third-party data; however, EBB did not verify accuracy and quality of externally provided data.

Respectfully submitted;

*Prepared by*

*Reviewed by*

**ORIGINAL SIGNED AND SEALED**

**ORIGINAL SIGNED AND SEALED**

**Geoff Smart**, BSc, PBIOL, RPBio  
Biologist

**Oliver Busby**, MBA, RPBio, PAg  
Principal

*I certify that the work described herein fulfills standards acceptable of a Professional Biologist.*

*I certify that the work described herein fulfills standards acceptable of a Professional Biologist.*

## Executive Summary

The B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Recreation Sites and Trails BC (RSTBC) contracted EBB Environmental Consulting Inc. (EBB) to conduct a high-level desktop review and analysis of environmental values of the former Kettle Valley Railway (KVR) Line, South Spur for assessing the feasibility of a public recreation route connecting much of the South Okanagan.

Key objectives of the feasibility study include:

- To identify environmental values, with focus on sensitive ecosystems, ecological communities at risk (ECAR) and species at risk (SAR), including provincial (red and blue) and federal (Species at Risk Act [SARA]) listed species.
- To assess potential impacts of a public recreation trail for identified environmental values on both the primary and alternative routes.
- To determine cumulative effects of proposed trail development in light of regional pressures.
- Provide recommendations for a trail development route, mitigation strategies (avoidance, mitigation, compensation), monitoring, evaluation and adaptive management.

Assessments were conducted on four identified routes as identified by the Province and include the KVR South Spur (primary route) and three alternative routes; Okanagan River Dike, North of Vaseux Lake, East Side of Vaseux Lake and Okanagan River and Okanagan River Dike, South of McAlpine Bridge (International Hike and Bike Trail). Primary analysis was conducted within a 500 m Local Study Area (LSA) and a 5-kilometer Regional Study Area (RSA).

### Baseline Environmental Values

Three broad environmental values were identified for the LSA with several associated environmental components and include:

- Vegetation
  - Plant Species at Risk
  - Ecological Communities at Risk
  - Sensitive Ecosystems
  - Critical Habitat
- Wildlife
  - Wildlife Species at Risk
  - Breeding Birds
  - Critical Habitat
- Fish
  - Regionally Important Fish Species
  - Fish Species at Risk

Analysis of the available datasets for the environmental components resulted in the following occurrences within the LSA.

For the Vegetation Environmental Value:

- 72 potential plant species at risk with potential to occur
- 24 documented plant species at risk
- 5 SARA listed plant species at risk
- 1 plant species at risk with documented Critical Habitat
- 432 element occurrences representing 26 sensitive ecosystems
- 18 ecological communities at risk'
- 37 invasive plant species including 15 noxious weeds

Regionally for the Wildlife Environmental Value:

- 323 species of birds, with 263 observed during the breeding period
- 34 species of mammals
- 10 species of amphibian
- 10 species of reptiles
- 2 species of turtles
- 50 species of invertebrates

Within the LSA:

- 102 potential wildlife species at risk
- 42 documented wildlife species at risk
- 31 SARA listed wildlife species at risk
- 4 wildlife species at risk with documented Critical Habitat

Regionally for the Fish Environmental Value:

- 30 species of fish

Within the LSA:

- 9 regionally important species of fish
- 1 fish species at risk

## **Environmental Effects Assessment**

Each of the identified routes were assessed to determine the overall environmental effect. Broad potential environmental effects associated with trail development were identified as:

- Habitat loss
- Loss of Critical Habitat
- Changes in habitat
- Introduction and spread of invasive plants
- Wildlife Mortality, injury and reduction in fitness

- Changes in wildlife behaviour
- Proximity disturbances to wildlife
- Changes in stream base flows
- Changes to fish habitat quality
- Risk of fish mortality

## **Risk Assessment and Effects Ranking**

A risk assessment consistent with the recommended analysis methodologies within B.C. Ministry of Environment's *Environmental Mitigation Procedures* was conducted to evaluate the potential effect of the identified routes on the environmental components and conservation lands. Risk evaluation was based on each of the identified environmental components and effects ranking included both the resulting risk ranking and ranking of overall environmental effects. Environmental effects were qualified using a relative ranking score, where impacts on environmental values and components were assigned a higher score than those with less impact. Relative ranking scores were assigned using the following ranks: 1.00, highest impact; 0.75, moderate impact; 0.50; moderate-low impact; and 0.25, lowest impact. Ranked variables included:

- Risk Score
- Number of Conservation Lands
- Number of BC CDC Occurrences
- Number of SARA Listed Occurrences
- Absolute Habitat Loss
- Relative Habitat Loss
- Absolute Change in Habitat
- Relative Change in Habitat
- Absolute Critical Habitat Loss
- Number of Sensitive Habitat
- Number of Ecological Communities at Risk
- Number of Invasive Plant Species
- Mortality, Injury and Reduction in Overall Fitness
- Change in Behaviour
- Proximity Disturbances
- Change in Fish Habitat Quality
- Change in Risk to Fish Mortality

## **Recommended Route**

Based on both the risk assessment and effects ranking analysis the recommended route was considered a combination of route segments and including portions of the KVR South Spur, the alternative route along the eastern bank of Vaseaux Lake and the existing International Hike and Bike Trail. This considers existence of developed and impacted trail routes with the lowest relative effect on the environment.

## **Recommendations**

Key recommendations for any potential trail development included:

- Additional studies and assessments to fully identify all species and ecosystems at risk impacted by the trail route.
- Development of a trail management plan consistent with Provincial standards, including the *Trails Strategy for British Columbia* and the *Operational Policy for Authorizing Recreational Mountain Bike Trails on Provincial Crown Land*. Measures at to maintain the trail include:
  - identification of operational policy, procedures, guidelines and standards;
  - identification of formal parking locations and associated infrastructure;
  - development and implementation of educational tools, including signage, outlining trail rules, safety and etiquette; and,
  - identification of habitat enhancement opportunities.
- Monitoring and evaluation of the effects of trail use on the environment including:
  - Invasive plant occurrence;
  - Habitat degradation and off-trail impacts;
  - Habitat enhancement;
  - Unauthorized use;
  - Dog-on leash compliance, and;
  - Pedestrian and cycling use.
- Implementation of adaptive management to adjust management actions where and when necessary.

# Table of Contents

<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
1.1	LIMITATIONS	1
1.2	HISTORICAL CONTEXT	1
1.3	CURRENT CONTEXT	1
1.4	STUDY OBJECTIVES	1
1.5	POTENTIAL EFFECTS OF TRAIL DEVELOPMENT	3
1.6	ACKNOWLEDGEMENTS	3
<b>2</b>	<b>LAND DESCRIPTION</b>	<b>3</b>
2.1	LOCATION	3
2.2	PRIMARY AND ALTERNATIVE ROUTES	5
2.2.1	<i>KVR SOUTH SPUR TRAIL</i>	5
2.2.2	<i>ALTERNATIVE ROUTES</i>	5
2.3	ECOSYSTEMS AND CLIMATE	12
2.4	LAND OWNERSHIP	12
<b>3</b>	<b>ASSESSMENT METHODOLOGY</b>	<b>19</b>
3.1	STAKEHOLDER ENGAGEMENT	19
3.2	SPECIES AND ECOSYSTEMS AT RISK CLASSIFICATION	19
3.3	CONSERVATION PRIORITIES	19
3.4	REPORTS AND LITERATURE	20
3.5	DIGITAL DATABASES	20
3.6	SPATIAL DATA	20
3.7	MAPPING	22
3.8	LIMITATIONS OF ANALYSIS	22
3.9	ENVIRONMENTAL EFFECTS AND RISK ASSESSMENT	22
<b>4</b>	<b>LEGISLATION, AGREEMENTS AND POLICIES</b>	<b>23</b>
4.1	PROVINCIAL LEGISLATION	24
4.1.1	<i>FOREST AND RANGE PRACTICES ACT</i>	24
4.1.2	<i>WATER SUSTAINABILITY ACT</i>	26
4.1.3	<i>WILDLIFE ACT</i>	26
4.1.4	<i>WEED CONTROL ACT</i>	28
4.2	FEDERAL LEGISLATION	28
4.2.1	<i>CANADIAN WILDLIFE ACT</i>	28
4.2.2	<i>FISHERIES ACT</i>	29
4.2.3	<i>MIGRATORY BIRDS CONVENTION ACT</i>	29
4.2.4	<i>SPECIES AT RISK ACT</i>	30
4.3	ENVIRONMENTAL AUTHORIZATIONS	32
<b>5</b>	<b>CONSERVATION LANDS MANAGEMENT</b>	<b>32</b>
5.1	CONSERVATION LANDS	32
5.2	MANAGEMENT STRATEGIES	34
5.2.1	<i>FEDERAL CONSERVATION LANDS</i>	34
5.2.2	<i>NON-GOVERNMENTAL ORGANIZATION CONSERVATION LANDS</i>	35
5.2.3	<i>PROVINCIAL CONSERVATION LANDS</i>	37

<b>6</b>	<b>IDENTIFICATION OF ENVIRONMENTAL VALUES</b>	<b>44</b>
<b>7</b>	<b>ENVIRONMENTAL EFFECTS ASSESSMENT</b>	<b>44</b>
7.1	VEGETATION	44
7.1.1	COMPONENTS	44
7.1.2	BASELINE CONDITIONS	46
7.1.3	POTENTIAL EFFECTS	75
7.1.4	GENERAL MITIGATION MEASURES	77
7.2	WILDLIFE	79
7.2.1	COMPONENTS	79
7.2.2	BASELINE CONDITIONS	79
7.2.3	POTENTIAL EFFECTS	118
7.2.4	GENERAL MITIGATION MEASURES	121
7.3	FISH AND FISH HABITAT	123
7.3.1	COMPONENTS	123
7.3.2	BASELINE CONDITIONS	123
7.3.3	POTENTIAL EFFECTS	129
7.3.4	GENERAL MITIGATION MEASURES	130
7.4	CUMULATIVE EFFECTS	132
7.5	RISK ASSESSMENT	132
7.6	SUMMARY OF ENVIRONMENTAL EFFECTS	143
<b>8</b>	<b>EVALUATION OF TRAIL ROUTES</b>	<b>147</b>
8.1	RECOMMENDED ROUTE	147
<b>9</b>	<b>IMPACT MITIGATION STRATEGIES</b>	<b>154</b>
9.1	DISPOSITION OF LANDS FOR CONSERVATION	155
9.2	RELATIVE COSTS FOR IMPLEMENTATION	156
<b>10</b>	<b>DISCUSSION AND RECOMMENDATIONS</b>	<b>157</b>
10.1	ANALYSIS LIMITATIONS	157
10.2	EXISTING DISTURBANCE	157
10.3	STUDY NEEDS	158
10.4	TRAIL MANAGEMENT PLAN	158
10.5	MONITORING, EVALUATION AND ADAPTIVE MANAGEMENT	158
10.5.1	MONITORING	158
10.5.2	EVALUATION	159
10.5.3	ADAPTIVE MANAGEMENT	159
<b>11</b>	<b>CONCLUSION</b>	<b>159</b>
<b>12</b>	<b>LEGISLATION CITED</b>	<b>160</b>
<b>13</b>	<b>LITERATURE CITED</b>	<b>160</b>

## Appendices

- APPENDIX A DOCUMENTED OCCURRENCES OF WILDLIFE
- APPENDIX B DOCUMENTED OCCURRENCES OF SPECIES AT RISK
- APPENDIX C POTENTIALLY OCCURRING SPECIES AT RISK

## List of Tables

TABLE 2-1.	ROUTE OPTIONS AND ASSOCIATED IDENTIFIERS.....	5
TABLE 2-2.	SUMMARY OF LAND OWNERSHIP WITHIN THE LSA BASED ON LTSA TITLED PARCELS AND UN-SURVEYED PROVINCIAL CROWN LAND PARCELS. ....	12
TABLE 4-1.	SUMMARY OF APPLICABLE FEDERAL AND PROVINCIAL LEGISLATION. ....	23
TABLE 4-2.	SUMMARY OF APPLICABLE ENVIRONMENTAL PERMITS AND APPROVALS. ....	32
TABLE 5-1.	SUMMARY OF CONSERVATION LANDS WITHIN THE REGIONAL STUDY AREA. ....	33
TABLE 5-2.	SUMMARY OF CONSERVATION LANDS WITHIN THE LOCAL STUDY AREA. ....	33
TABLE 5-3.	SUMMARY OF CONSERVATION FOCUS AND IDENTIFIED CONCERNS FOR CONSERVATION LANDS MANAGED BY DUCKS UNLIMITED CANADA.....	36
TABLE 5-4.	SUMMARY OF CONSERVATION FOCUS AND IDENTIFIED CONCERNS FOR CONSERVATION LANDS MANAGED BY THE NATURE TRUST OF BC. ....	36
TABLE 5-5.	SUMMARY OF PROVINCIALLY MANAGED CONSERVATION LANDS WITHIN THE LSA.....	37
TABLE 5-6.	SUMMARY OF CONSERVATION LANDS INTERSECTED BY IDENTIFIED ROUTES. ....	38
TABLE 6-1.	ENVIRONMENTAL VALUES, COMPONENTS AND RATIONALE FOR STUDY INCLUSION.....	44
TABLE 7-1.	SUMMARY OF ECOLOGICAL AND SOCIO-ECONOMIC VALUES, ADAPTED FROM IVERSON <i>ET AL.</i> (2008). ....	45
TABLE 7-2.	SUMMARY OF BC CDC LISTED PLANT SPECIES AT RISK. ....	47
TABLE 7-3.	SARA LISTED SPECIES AT RISK IDENTIFIED TO OCCUR WITHIN THE LSA.....	53
TABLE 7-4.	SUMMARY OF INVASIVE PLANTS AND NOXIOUS WEEDS IDENTIFIED TO OCCUR WITHIN 50 M OF THE IDENTIFIED ROUTES. ....	65
TABLE 7-5.	SUMMARY OF SENSITIVE ECOSYSTEMS OCCURRING WITHIN THE LSA. ....	66
TABLE 7-6.	SUMMARY OF AT RISK ECOLOGICAL COMMUNITIES INTERSECTED BY IDENTIFIED ROUTES. ....	68
TABLE 7-7.	SUMMARY OF TOTAL HABITAT LOSS FOR VEGETATION BY IDENTIFIED ROUTES.....	75
TABLE 7-8.	SUMMARY OF CRITICAL HABITAT LOSS FOR SARA LISTED VEGETATION AT RISK. ....	76
TABLE 7-9.	SUMMARY OF TOTAL CHANGE IN HABITAT FOR VEGETATION BY IDENTIFIED ROUTES. ....	77
TABLE 7-10.	SUMMARY OF OBSERVED SPECIES BY CLASS. ....	79
TABLE 7-11.	SUMMARY OF BC CDC LISTED WILDLIFE SPECIES AT RISK. ....	80
TABLE 7-12.	SARA LISTED WILDLIFE SPECIES AT RISK IDENTIFIED TO OCCUR WITHIN THE LSA. ....	81
TABLE 7-13.	FEDERALLY LISTED WILDLIFE SPECIES AT RISK WITH IDENTIFIED CRITICAL HABITAT WITHIN THE LSA.....	93
TABLE 7-14.	BIOPHYSICAL ATTRIBUTES OF BOTH CORE AND CONNECTIVITY CRITICAL HABITAT, ADAPTED FROM ENVIRONMENT AND CLIMATE CHANGE CANADA (2017A).....	99
TABLE 7-15.	TOTAL CRITICAL HABITAT LOSS BY SARA LISTED SPECIES. ....	118
TABLE 7-16.	SUMMARY OF PROXIMITY DISTURBANCES FOR SELECT WILDLIFE SPECIES. ....	121
TABLE 7-17.	MINIMUM BUFFERS FOR NESTING RAPTORS.....	122
TABLE 7-18.	DESCRIPTION CONSEQUENCE OF EFFECTS RANKING CRITERIA. ....	133
TABLE 7-19.	DESCRIPTION PROBABILITY OF OCCURRANCE RANKING CRITERIA. ....	133
TABLE 7-20.	DESCRIPTION MAGNITUDE OF EFFECTS RANKING CRITERIA.....	133
TABLE 7-21.	DESCRIPTION OF RISK RANKING CRITERIA. ....	133
TABLE 7-22.	DESCRIPTION OF DURATION OF EVENT CRITERIA.....	134
TABLE 7-23.	DESCRIPTION OF THE FREQUENCY OF EVENT CRITERIA.....	134
TABLE 7-24.	SUMMARY OF RISK ASSESSMENT ANALYSIS FOR ROUTE A. ....	135
TABLE 7-25.	SUMMARY OF RISK ASSESSMENT ANALYSIS FOR ROUTE B. ....	137
TABLE 7-26.	SUMMARY OF RISK ASSESSMENT ANALYSIS FOR ROUTE C. ....	139
TABLE 7-27.	SUMMARY OF RISK ASSESSMENT ANALYSIS FOR ROUTE D. ....	141
TABLE 7-28.	SUMMARY OF ENVIRONMENTAL VALUES AND ANTICIPATED IMPACTS.....	144
TABLE 7-29.	RANKING OF ENVIRONMENTAL EFFECTS BY IDENTIFIED ROUTE.....	146
TABLE 9-1.	SUMMARY OF RELATIVE COSTS FOR THE IMPLEMENTATION OF MANAGEMENT STRATEGIES.....	156
TABLE 10-1.	SUMMARY OF MONITORING AND EVALUATION OF ENVIRONMENTAL VALUES.....	158

## List of Figures

FIGURE 2-1.	REGIONAL STUDY AREA BOUNDARIES.....	4
FIGURE 2-2.	IDENTIFIED TRAIL ROUTES WITHIN SECTION 1 OF THE LSA.....	7
FIGURE 2-3.	IDENTIFIED TRAIL ROUTES WITHIN SECTION 2 OF THE LSA.....	8
FIGURE 2-4.	IDENTIFIED TRAIL ROUTES WITHIN SECTION 3 OF THE LSA.....	9
FIGURE 2-5.	IDENTIFIED TRAIL ROUTES WITHIN SECTION 4 OF THE LSA.....	10
FIGURE 2-6.	IDENTIFIED TRAIL ROUTES WITHIN SECTION 5 OF THE LSA.....	11
FIGURE 2-7.	LAND OWNERSHIP WITHIN SECTION 1 OF THE LSA, EXCLUDING UN-SURVEYED CROWN LAND.....	14
FIGURE 2-8.	LAND OWNERSHIP WITHIN SECTION 2 OF THE LSA, EXCLUDING UN-SURVEYED CROWN LAND.....	15
FIGURE 2-9.	LAND OWNERSHIP WITHIN SECTION 3 OF THE LSA, EXCLUDING UN-SURVEYED CROWN LAND.....	16
FIGURE 2-10.	LAND OWNERSHIP WITHIN SECTION 4 OF THE LSA, EXCLUDING UN-SURVEYED CROWN LAND.....	17
FIGURE 2-11.	LAND OWNERSHIP WITHIN SECTION 5 OF THE LSA, EXCLUDING UN-SURVEYED CROWN LAND.....	18
FIGURE 5-1.	CONSERVATION LANDS OCCURRING WITHIN SECTION 1 OF THE LSA.....	39
FIGURE 5-2.	CONSERVATION LANDS OCCURRING WITHIN SECTION 2 OF THE LSA.....	40
FIGURE 5-3.	CONSERVATION LANDS OCCURRING WITHIN SECTION 3 OF THE LSA.....	41
FIGURE 5-4.	CONSERVATION LANDS OCCURRING WITHIN SECTION 4 OF THE LSA.....	42
FIGURE 5-5.	CONSERVATION LANDS OCCURRING WITHIN SECTION 5 OF THE LSA.....	43
FIGURE 7-1.	NO PROVINCIALY LISTED PLANT SPECIES AT RISK OCCUR WITHIN SECTION 1 OF THE LSA.....	48
FIGURE 7-2.	PROVINCIALY LISTED PLANT SPECIES AT RISK WITHIN SECTION 2 OF THE LSA.....	49
FIGURE 7-3.	PROVINCIALY LISTED PLANT SPECIES AT RISK WITHIN SECTION 3 OF THE LSA.....	50
FIGURE 7-4.	PROVINCIALY LISTED PLANT SPECIES AT RISK WITHIN SECTION 4 OF THE LSA.....	51
FIGURE 7-5.	PROVINCIALY LISTED PLANT SPECIES AT RISK WITHIN SECTION 5 OF THE LSA.....	52
FIGURE 7-6.	NO SARA LISTED PLANT SPECIES AT RISK WITHIN SECTION 1 OF THE LSA.....	54
FIGURE 7-7.	SARA LISTED PLANT SPECIES AT RISK WITHIN THE SECTION 2 OF THE LSA.....	55
FIGURE 7-8.	SARA LISTED PLANT SPECIES AT RISK WITHIN SECTION 3 OF THE LSA.....	56
FIGURE 7-9.	SARA LISTED PLANT SPECIES AT RISK WITHIN SECTION 4 OF THE LSA.....	57
FIGURE 7-10.	SARA LISTED PLANT SPECIES AT RISK WITHIN SECTION 5 OF THE LSA.....	58
FIGURE 7-11.	NO CRITICAL HABITAT FOR SHORT-RAYED ALKALI ASTER WITHIN SECTION 1 OF THE LSA.....	60
FIGURE 7-12.	CRITICAL HABITAT FOR SHORT-RAYED ALKALI ASTER WITH SECTION 2 OF THE LSA.....	61
FIGURE 7-13.	CRITICAL HABITAT FOR SHORT-RAYED ALKALI ASTER WITH SECTION 3 OF THE LSA.....	62
FIGURE 7-14.	NO CRITICAL HABITAT FOR SHORT-RAYED ALKALI ASTER WITH SECTION 4 OF THE LSA.....	63
FIGURE 7-15.	CRITICAL HABITAT FOR SHORT-RAYED ALKALI ASTER WITH SECTION 5 OF THE LSA.....	64
FIGURE 7-16.	ECOLOGICAL COMMUNITIES AT RISK WITHIN THE SECTION 1 OF THE LSA.....	70
FIGURE 7-17.	ECOLOGICAL COMMUNITIES AT RISK WITHIN SECTION 2 OF THE LSA.....	71
FIGURE 7-18.	ECOLOGICAL COMMUNITIES AT RISK WITHIN SECTION 3 OF THE LSA.....	72
FIGURE 7-19.	ECOLOGICAL COMMUNITIES AT RISK WITHIN SECTION 4 OF THE LSA.....	73
FIGURE 7-20.	ECOLOGICAL COMMUNITIES AT RISK WITHIN SECTION 5 OF THE LSA.....	74
FIGURE 7-21.	BC CDC LISTED WILDLIFE SPECIES, EXCLUDING AMERICAN BADGER, WITHIN SECTION 1 OF THE LSA.....	83
FIGURE 7-22.	BC CDC LISTED WILDLIFE SPECIES, EXCLUDING AMERICAN BADGER, WITHIN SECTION 2 OF THE LSA.....	84
FIGURE 7-23.	BC CDC LISTED WILDLIFE SPECIES, EXCLUDING AMERICAN BADGER, WITHIN SECTION 3 OF THE LSA.....	85
FIGURE 7-24.	BC CDC LISTED WILDLIFE SPECIES, EXCLUDING AMERICAN BADGER, WITHIN SECTION 4 OF THE LSA.....	86
FIGURE 7-25.	BC CDC LISTED WILDLIFE SPECIES, EXCLUDING AMERICAN BADGER, WITHIN SECTION 5 OF THE LSA.....	87
FIGURE 7-26.	SARA LISTED WILDLIFE SPECIES, EXCLUDING AMERICAN BADGER, WITHIN SECTION 1 OF THE LSA.....	88
FIGURE 7-27.	SARA LISTED WILDLIFE SPECIES, EXCLUDING AMERICAN BADGER, WITHIN SECTION 2 OF THE LSA.....	89
FIGURE 7-28.	SARA LISTED WILDLIFE SPECIES, EXCLUDING AMERICAN BADGER, WITHIN SECTION 3 OF THE LSA.....	90
FIGURE 7-29.	SARA LISTED WILDLIFE SPECIES, EXCLUDING AMERICAN BADGER, WITHIN SECTION 4 OF THE LSA.....	91
FIGURE 7-30.	SARA LISTED WILDLIFE SPECIES, EXCLUDING AMERICAN BADGER, WITHIN SECTION 5 OF THE LSA.....	92
FIGURE 7-31.	CRITICAL HABITAT FOR BEHR’S HAIRSTREAK WITHIN SECTION 1 OF THE LSA.....	94
FIGURE 7-32.	CRITICAL HABITAT FOR BEHR’S HAIRSTREAK WITHIN SECTION 2 OF THE LSA.....	95
FIGURE 7-33.	CRITICAL HABITAT FOR BEHR’S HAIRSTREAK WITHIN SECTION 3 OF THE LSA.....	96
FIGURE 7-34.	CRITICAL HABITAT FOR BEHR’S HAIRSTREAK WITHIN SECTION 4 OF THE LSA.....	97

FIGURE 7-35.	CRITICAL HABITAT FOR BEHR'S HAIRSTREAK WITHIN SECTION 5 OF THE LSA. ....	98
FIGURE 7-36.	NO CRITICAL HABITAT FOR GREAT BASIN SPADEFOOT WITHIN SECTION 1 OF THE LSA. ....	101
FIGURE 7-37.	CRITICAL HABITAT FOR GREAT BASIN SPADEFOOT WITHIN SECTION 2 OF THE LSA. ....	102
FIGURE 7-38.	CRITICAL HABITAT FOR GREAT BASIN SPADEFOOT WITHIN SECTION 3 OF THE LSA. ....	103
FIGURE 7-39.	CRITICAL HABITAT FOR GREAT BASIN SPADEFOOT WITHIN SECTION 4 OF THE LSA. ....	104
FIGURE 7-40.	CRITICAL HABITAT FOR GREAT BASIN SPADEFOOT WITHIN SECTION 5 OF THE LSA. ....	105
FIGURE 7-41.	CRITICAL HABITAT FOR LEWIS'S WOODPECKER WITHIN SECTION 1 OF THE LSA. ....	107
FIGURE 7-42.	CRITICAL HABITAT FOR LEWIS'S WOODPECKER WITHIN SECTION 2 OF THE LSA. ....	108
FIGURE 7-43.	CRITICAL HABITAT FOR LEWIS'S WOODPECKER WITHIN SECTION 3 OF THE LSA. ....	109
FIGURE 7-44.	CRITICAL HABITAT FOR LEWIS'S WOODPECKER WITHIN SECTION 4 OF THE LSA. ....	110
FIGURE 7-45.	CRITICAL HABITAT FOR LEWIS'S WOODPECKER WITHIN SECTION 5 OF THE LSA. ....	111
FIGURE 7-46.	CRITICAL HABITAT FOR YELLOW-BREASTED CHAT WITHIN SECTION 1 OF THE LSA.....	113
FIGURE 7-47.	CRITICAL HABITAT FOR YELLOW-BREASTED CHAT WITHIN SECTION 2 OF THE LSA.....	114
FIGURE 7-48.	CRITICAL HABITAT FOR YELLOW-BREASTED CHAT WITHIN SECTION 3 OF THE LSA.....	115
FIGURE 7-49.	CRITICAL HABITAT FOR YELLOW-BREASTED CHAT WITHIN SECTION 4 OF THE LSA.....	116
FIGURE 7-50.	CRITICAL HABITAT FOR YELLOW-BREASTED CHAT WITHIN SECTION 5 OF THE LSA.....	117
FIGURE 7-51.	NESTING CALENDAR FOR THE OKANAGAN VALLEY SHOWING PERIODS OF HIGHEST PROBABILITY OF NESTING (ROUSSEU AND DROLET 2015). ....	122
FIGURE 7-52.	BC CDC LISTED FISH SPECIES WITHIN SECTION 1 OF THE LSA.....	124
FIGURE 7-53.	BC CDC LISTED FISH SPECIES WITHIN SECTION 2 OF THE LSA.....	125
FIGURE 7-54.	BC CDC LISTED FISH SPECIES WITHIN SECTION 3 OF THE LSA.....	126
FIGURE 7-55.	NO BC CDC LISTED FISH SPECIES WITHIN SECTION 4 OF THE LSA. ....	127
FIGURE 7-56.	BC CDC LISTED FISH SPECIES WITHIN SECTION 5 OF THE LSA.....	128
FIGURE 8-1.	RECOMMENDED ROUTE WITHIN SECTION 1 OF THE LSA. ....	149
FIGURE 8-2.	RECOMMENDED ROUTE WITHIN SECTION 2 OF THE LSA. ....	150
FIGURE 8-3.	RECOMMENDED ROUTE WITHIN SECTION 3 OF THE LSA. ....	151
FIGURE 8-4.	RECOMMENDED ROUTE WITHIN SECTION 4 OF THE LSA. ....	152
FIGURE 8-5.	RECOMMENDED ROUTE WITHIN SECTION 5 OF THE LSA. ....	153
FIGURE 9-1.	MITIGATION HIERARCHY. ....	154

## List of Acronyms and Abbreviations

BC CDC .....	B.C. Conservation Data Center
BEC.....	Biogeoclimatic Ecosystems Classification System
CF .....	Conservation Framework
CRA.....	Commercial, Recreational and Aboriginal Fisheries
CWS.....	Canadian Wildlife Service
DFO.....	Fisheries and Ocean Canada
E.....	Endangered (SARA)
EC .....	Environmental Component
ECCC .....	Environment and Climate Change Canada
ESC.....	Erosion and Sediment Control
EV .....	Environmental Value
FID .....	Flight Initiation Distance
FIDQ.....	Fish Information Data Query System
FLNRO .....	B.C. Ministry of Forests, Lands and Natural Resource Operations (former)
FLNRORD .....	B.C. Ministry of Forests, Lands, Natural Resources Operations and Rural Development
IBA .....	Important Bird Area
IPP .....	Invasive Plant Program
LSA .....	Local Study Area
LTSA .....	Land Title and Survey Authority of B.C.
MBS .....	Migratory Birds Sanctuary
NWA.....	National Wildlife Area
QEP.....	Qualified Environmental Professional
RDOS.....	Regional District of the Okanagan-Similkameen
RSA.....	Regional Study Area
RSTBC .....	Recreation Sites and Trails BC
SARA .....	Species at Risk Act
SC .....	Special Concern (SARA)
SEI .....	Sensitive Ecosystem Inventory
T .....	Threatened (SARA)
TEM.....	Terrestrial Ecosystem Mapping
VRI.....	Vegetation Resource Inventory
KVR.....	Kettle Valley Railway
WLAP .....	B.C. Ministry of Water, Land and Air Protection (former)
COSEWIC .....	Committee on the Status of Endangered Wildlife in Canada
WSA.....	Water Sustainability Act
WSI .....	Wildlife Species Inventory

## **1 Introduction**

The B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Recreation Sites and Trails BC (RSTBC) contracted EBB Environmental Consulting Inc. (EBB) to conduct a high-level desktop review and analysis of environmental values of the former Kettle Valley Railway (KVR) Line, South Spur for assessing the feasibility of a public recreation route connecting much of the South Okanagan.

### **1.1 Limitations**

This feasibility assessment is limited to publicly available information and spatial data. No field assessments were conducted to verify occurrences of wildlife species or condition of sensitive and at risk ecological communities. Any final route selection must be supported by ground-truthing field assessments to verify the presence any species or ecological communities at risk, including legally defined Critical Habitat. The full extent of trail upgrades along the KVR South Spur are not known and therefore have not been included in the assessment. Environmental effects assessments assume that habitat impacted by the trail corridor has not been previously disturbed and represents intact and functional habitat. In reality, considerable portions of identified trail corridors have been previously impacted by the historic railway, roads and other public infrastructure, residential, commercial and industrial development and trail development activities. Both developed and undeveloped sections of the identified trail routes are routinely utilized for recreation activities.

### **1.2 Historical Context**

The Kettle Valley Railway, South Spur has a long history, starting with its construction from Penticton to Oliver shortly after the First World War. To increase fruit shipments to Great Britain during the Second World War, the Osoyoos Subdivision was extended to connect Oliver with Osoyoos. In 1931 Canadian Pacific Railway assumed operations of the KVR. The Osoyoos Subdivision was abandoned in 1977 due to the loss in fruit traffic as these shipments were being taken by truck (Cross 2014). Formal abandonment did not occur until the early 1990's (Sanford 2002).

### **1.3 Current Context**

Many sections of trail corridor are actively used as hiking and bicycling routes, with varied degrees of trail improvements implemented by local municipalities and the Regional District of the Okanagan-Similkameen (RDOS). Trail development and improvement activities include surfacing upgrades (gravel to asphalt) and grading to trail level. Known surfacing upgrades along the KVR South Spur Trail include Osoyoos Lake (91st Street) to Road 21, Skaha Lake from Sutherland Road to Vancouver Place, Kaleden to Okanagan Falls Trail Resurfacing, and Road 22 KVR Trail Boardwalk.

Any proposal to develop the KVR South Spur corridor including alternative routes for formal trail use requires a formal decision at all levels of government.

### **1.4 Study Objectives**

The objective of this feasibility study is to provide an assessment of potential impacts associated with developing a non-motorized, cycling optimized public recreation trail on the historic Kettle Valley Railway South Spur rail bed. Trail characteristics are assumed consistent with a Type I foot trail and a Type II bicycle trail (BC Ministry

of Forests 2000). Physical characteristics of these trail types are similar, with general widths of 2.0 m, gentle grades, and surfaced treads (e.g., compacted gravel or asphalt). The BC Ministry of Forests (2000) define these trail types as:

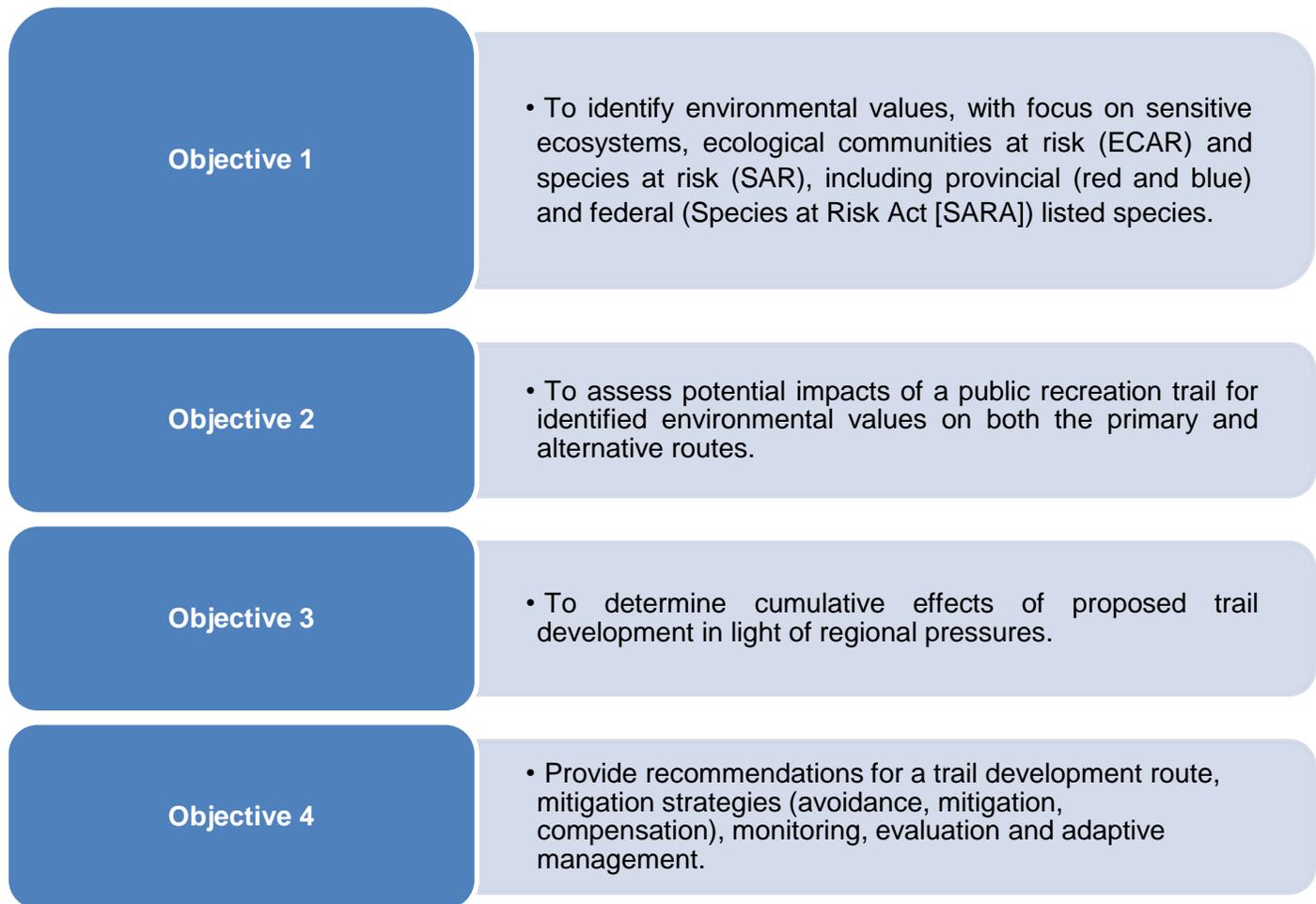
**Type I Foot Trails**

typically used in day-use areas, to access vistas and viewpoints located a short distance from vehicle access, and near campgrounds. The high-use nature of these locations usually requires structures, such as toilets. They may also be used as ski trails in winter if criteria for those trails are met.

**Type II Bicycle Trails**

surfaced two-way bicycle paths, but with narrower widths, steeper grades, and compacted gravel surfaces rather than pavement. Existing old road or railway beds may also be used. Type II trails are suitable for road or mountain bikes, and suitable for most users.

This assessment is intended to assist decision-makers in assessing trail development proposals. Specific objectives of this assessment include the following:



## 1.5 Potential Effects of Trail Development

The effects of trail development are well documented and broadly include soil disturbances, the introduction and spread of invasive plants, impacts to native plants, impacts to native wildlife, and impacts to sensitive environments and landscape features (BC Ministry of Water, Land and Air Protection 2005).

Components of trail development include, but are not limited to:

- Vegetation clearing and trail widening
- Ground disturbance
- Trail surfacing (gravel or asphalt)
- Construction of boardwalks, bridges, and other crossings
- Installation of information kiosks, signage and fencing
- Placement of garbage bins and bathroom facilities (temporary or permanent)

Potential effects of trail development based on the phase of development, construction and operational, are discussed in depth within the environmental effects assessment, Section 7.

## 1.6 Acknowledgements

EBB wishes to thank the following people for their input and insights provided during development of this feasibility study:

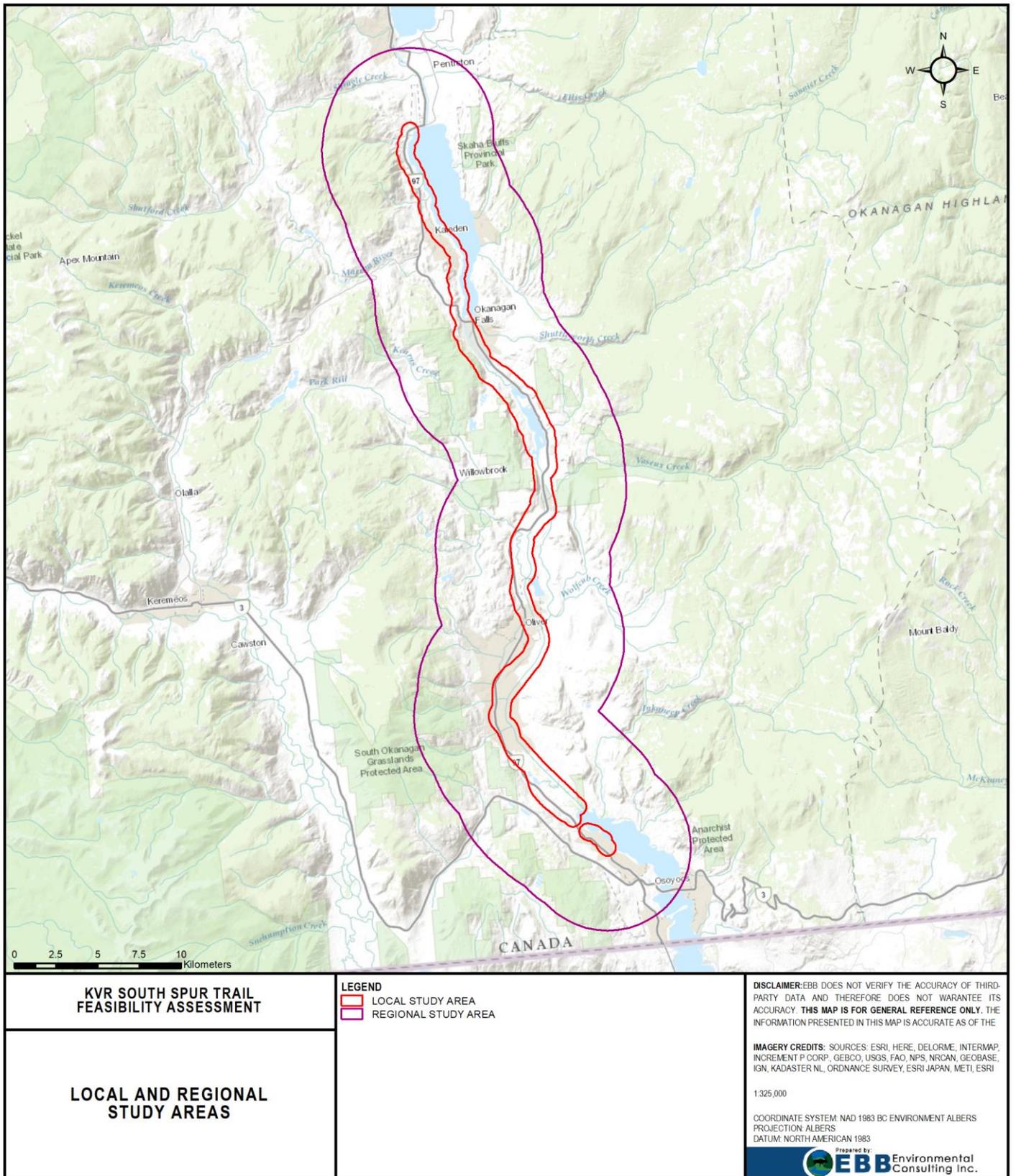
- Bruce Harrison, Ducks Unlimited Canada
- Josie Symonds, B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development
- Nick Burdock, The Nature Trust of B.C.
- Ian Parnell, Canadian Wildlife Service, Environment and Climate Change Canada

## 2 Land Description

### 2.1 Location

The Kettle Valley Railway South Spur stretches roughly 48 kilometers from Penticton south to Osoyoos within the Okanagan Valley. For the feasibility study, the study area was segmented into two unique study areas (Figure 2-1):

- 1) Primary analysis was conducted in the Local Study Area (LSA), defined as a 500 m radial buffer from identified routes. The LSA was selected based on flight response data for wildlife that indicated flight initiation distances between 100 and 300 m (Miller *et al.* 2003; McLeod *et al.* 2013) and includes an additional 200 m buffer to account for variability in response distances.
- 2) a Regional Study Area (RSA) with a 5-kilometer radial buffer from KVR South Spur and alternative route corridors was established to assess cumulative effects of trail development and recreational activity.



**Figure 2-1. Regional Study Area boundaries.**

## 2.2 Primary and Alternative Routes

The historic KVR South Spur route was identified by the Province as the primary route for analysis and assessment. Three additional routes, based on existing trail networks were identified as potential alternative routes, and include:

1. Okanagan River Dike, North of Vaseux Lake
2. East Side of Vaseux Lake and Okanagan River
3. Okanagan River Dike, South of McAlpine Bridge (International Hike and Bike Trail)

**Table 2-1. Route options and associated identifiers.**

Identified Trail Routes			
<i>Route Name</i>	<i>Route Distance (kilometres)</i>	<i>Type</i>	<i>Route Identifier</i>
KVR South Spur	47.4	Primary	A
Okanagan River Dike, North of Vaseux Lake	4.8	Alternative	B
East Side of Vaseux Lake and Okanagan River	14.9	Alternative	C
Okanagan River Dike, South of McAlpine Bridge	20.6	Alternative	D

### 2.2.1 KVR South Spur Trail

The KVR South Spur (Route A) corridor begins at the north end of Skaha Lake in Penticton and travels south approximately 47 kilometers where it terminates at the north end of Osoyoos Lake. The corridor follows abandoned railbed of the KVR which travels through disturbed habitats, road surfaces, parks and protected areas, riparian habitats, and is adjacent to commercial, industrial, residential and agricultural properties. Recreational activities occur within many sections of the KVR South Spur Trail, particularly along the west side of Skaha Lake, where trail improvements have been undertaken by RDOS.

### 2.2.2 Alternative Routes

#### 2.2.2.1 Okanagan River Dike North of Vaseux Lake

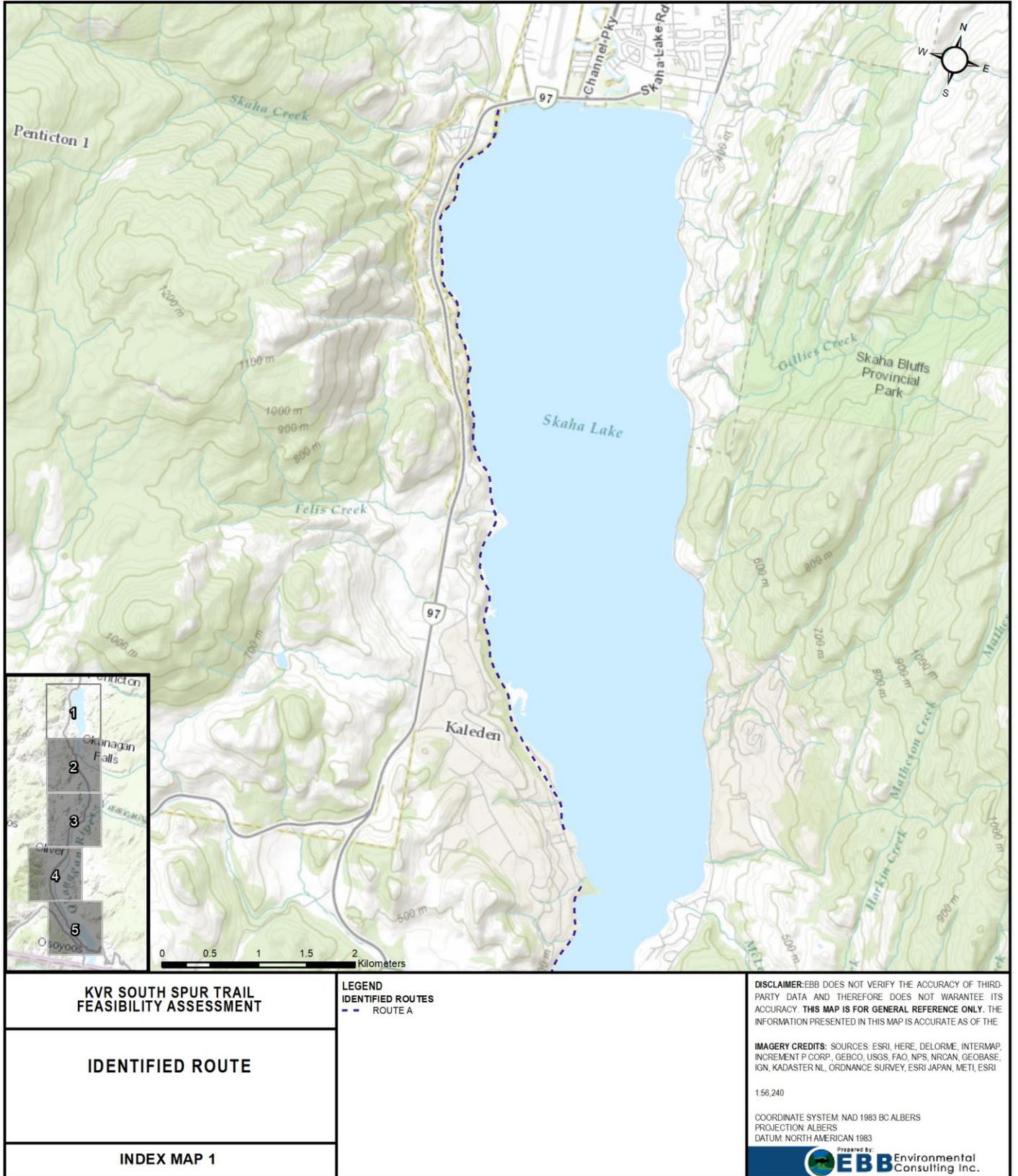
The first alternative route segment (Route B) occurs along an existing trail on the west side of the Okanagan River Dike. This segment originates within s̓x̓wəḥ̓wnitk̓w (Okanagan Falls) Provincial Park and continues south for approximately 5 km where it connects with the KVR South Spur Trail at the north end of Vaseux Lake.

#### 2.2.2.2 East Side of Vaseux Lake and Okanagan River

The second alternative route segment (Route C) originates within Okanagan Falls and follows the eastern bank of the Okanagan River Dike until the north end of Vaseux Lake where it connects with Highway 97 and continues along the highway until McAlpine Bridge, an approximate distance of 15 kilometers.

### *2.2.2.3 Okanagan River Dike, South of McAlpine Bridge*

The third alternative route segment (Route D) occurs along the Okanagan River Dike, south of McAlpine Bridge, and continues for approximately 21 kilometres until it terminates at the north end of Osoyoos Lake. The trail is locally known as the International Hike and Bike Trail. Trail improvements have been undertaken by RDOS.



**Figure 2-2. Identified trail routes within Section 1 of the LSA.**

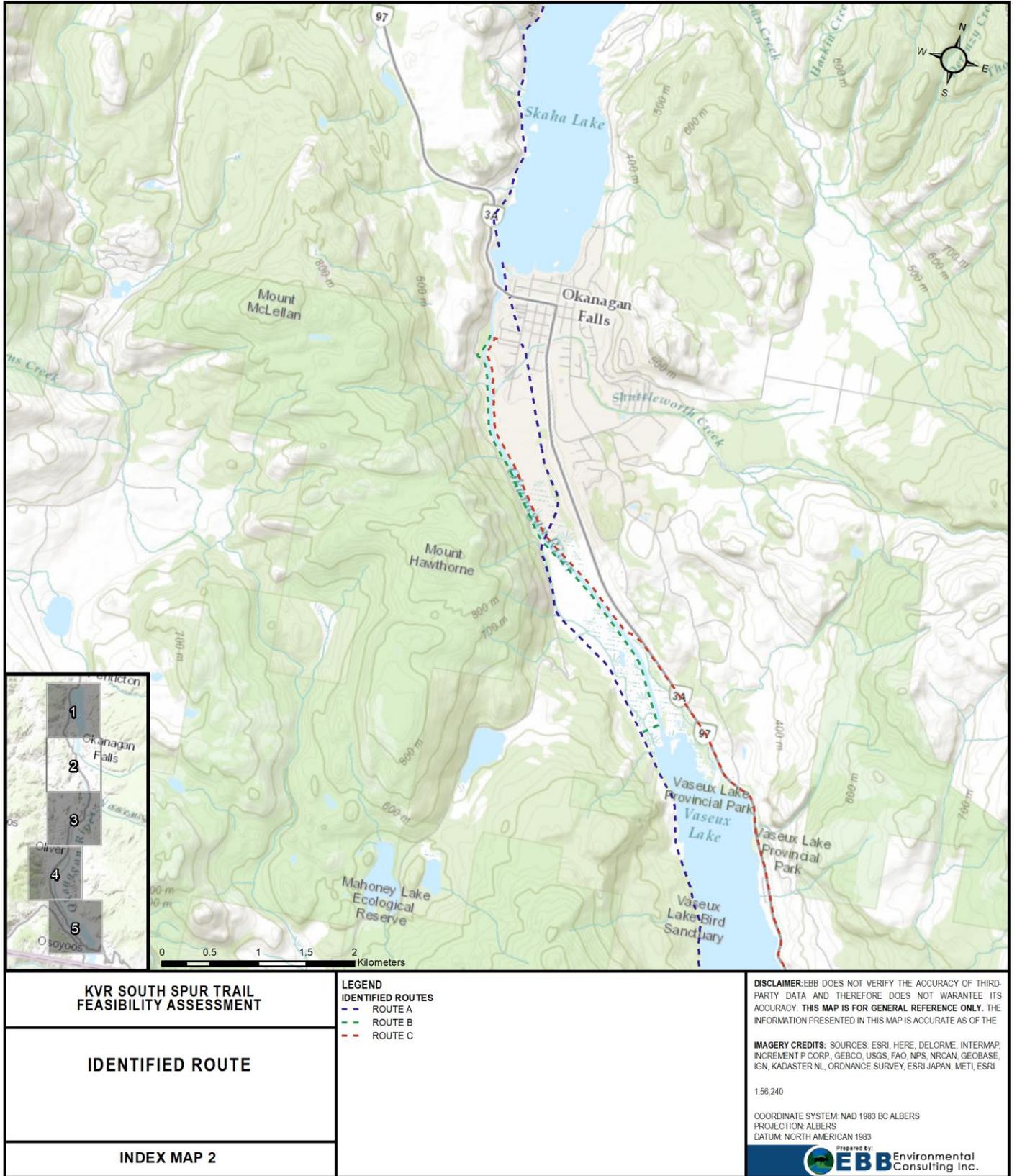


Figure 2-3. Identified trail routes within Section 2 of the LSA.

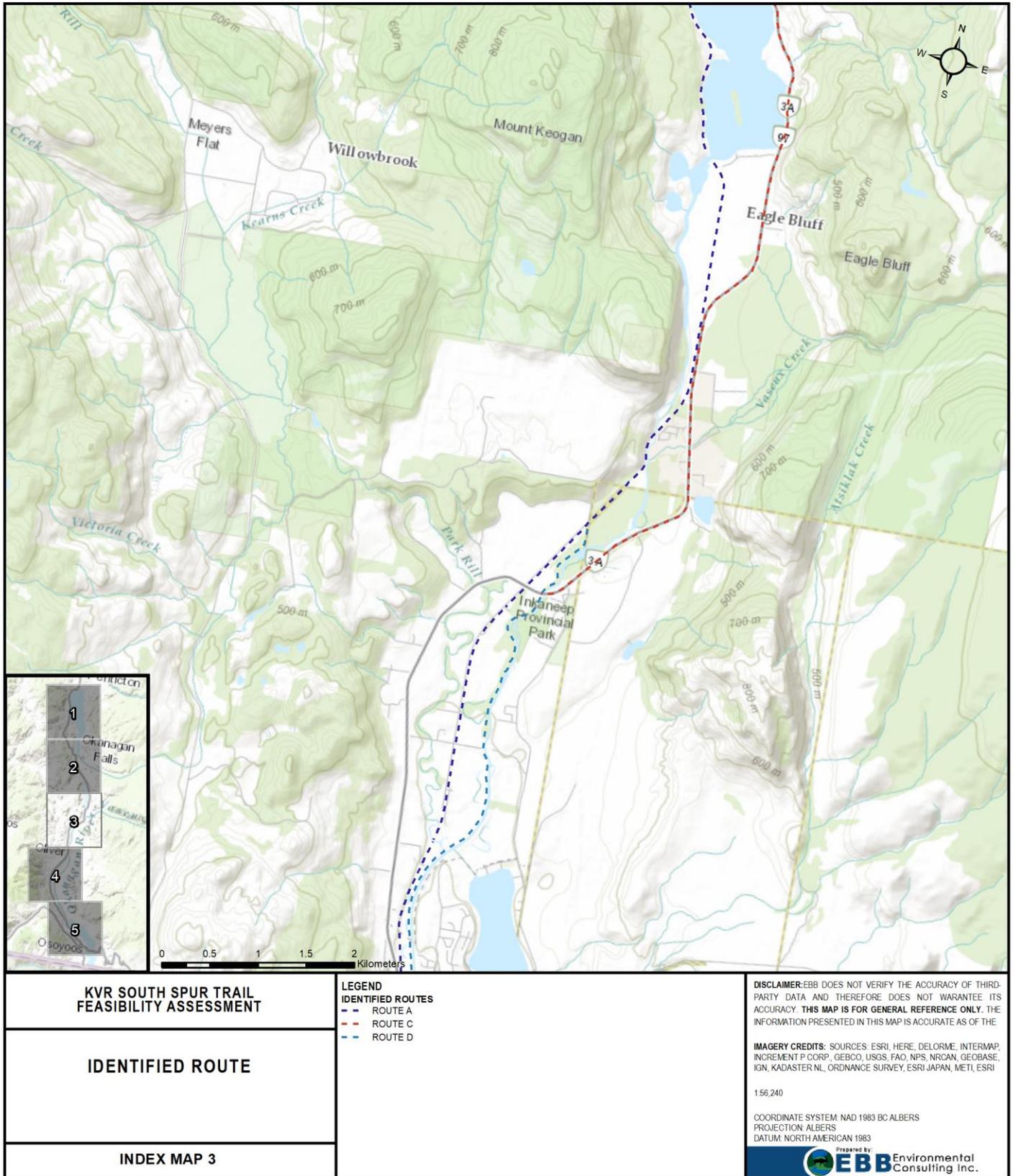


Figure 2-4. Identified trail routes within Section 3 of the LSA.

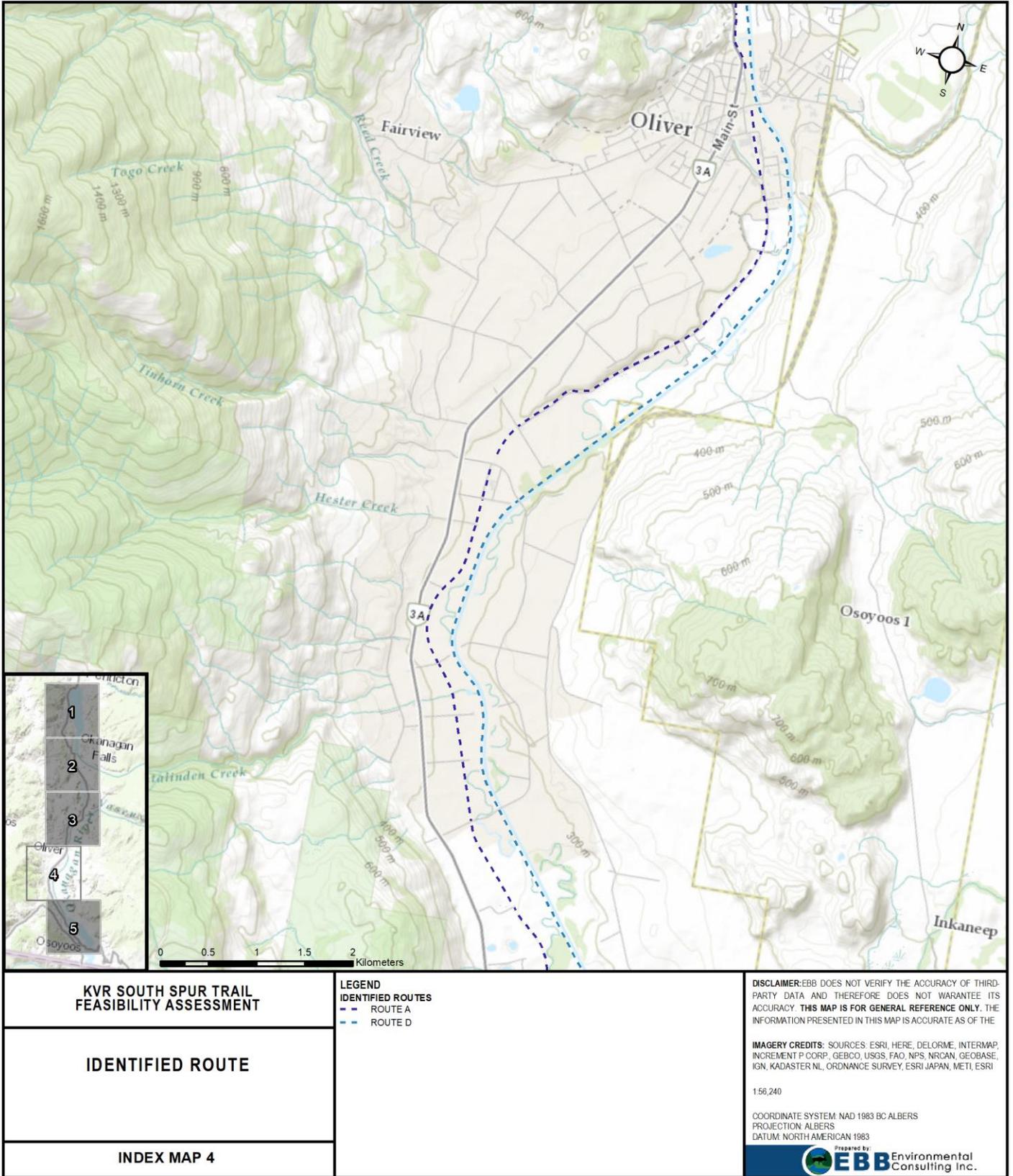


Figure 2-5. Identified trail routes within Section 4 of the LSA.

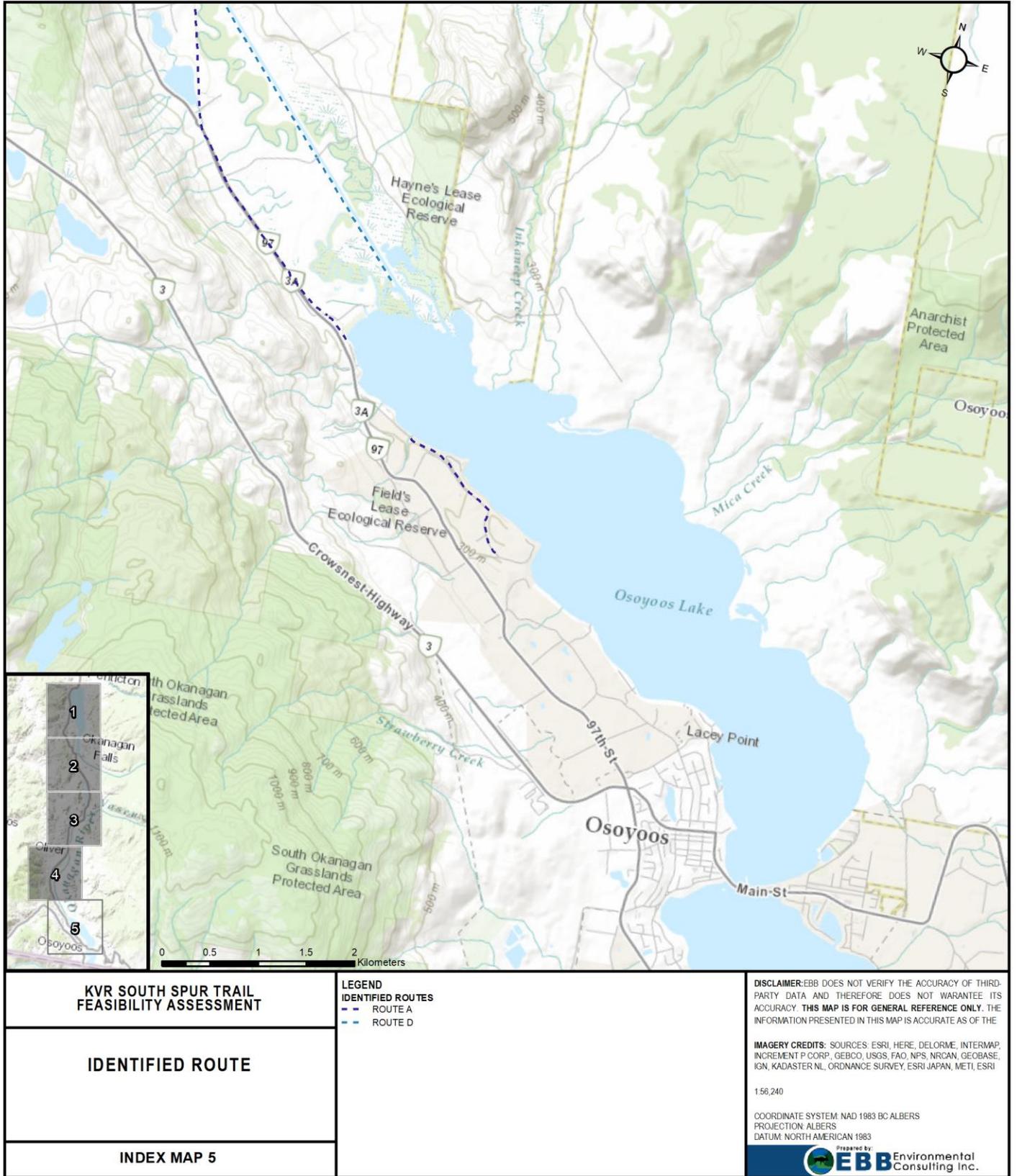


Figure 2-6. Identified trail routes within Section 5 of the LSA.

## 2.3 Ecosystems and Climate

Provincially, two biophysical classification systems are used to describe B.C. landscapes: the B.C. Ecoregion Classification System and the Biogeoclimatic Zone (BEC) Classification System. Using the B.C. Ecoregion Classification System (Demarchi 2011) the RSA is classified as:

- Dry Ecodomain,
  - Semi-arid Steppe Highlands Ecodivision
    - Southern Interior Ecoprovince,
      - Okanogan Highland Ecoregion,
        - South Okanogan Basin Ecosection,
      - Thompson-Okanogan Plateau Ecoregion,
        - Northern Okanogan Basin Ecosection,
        - Northern Okanogan Highland Ecosection,
      - Northern Cascade Ranges Ecoregion,
        - Northern Okanogan Basin Ecosection.

Using the BEC classification system, the proposed trail alignment is located within two zones including the bunchgrass very dry, hot, Okanogan variant (BGxh1), and the ponderosa pine very dry, hot, Okanogan variant (PPxh1). The BGxh1 zone is characterized by warm to hot, dry summers, and moderately cold winters with little snowfall. Annually, the zone receives 242 to 336 mm of precipitation and 56 to 78 mm of snowfall (Lloyd *et al.* 1990). The PPxh1 is the driest, and in the summer, the warmest forested zone in B.C. Annual precipitation ranges from 258 to 390 mm, with 81 to 106 mm falling as snow (Lloyd *et al.* 1990).

## 2.4 Land Ownership

Land Ownership within the LSA is a complex mixture of provincial and federal Crown lands, private lands, municipal lands, and First Nations. The Land Title and Survey Authority of British Columbia's (LTSA) identifies 6,524 hectares of titled parcels and un-surveyed provincial Crown land parcels within the LSA.

**Table 2-2. Summary of land ownership within the LSA based on LTSA titled parcels and un-surveyed provincial Crown land parcels.**

Summary of Land Ownership			
Ownership	Status	Hectares	Percent of Study Area
Federal	Surveyed	330.84	5.07
Crown Provincial	Surveyed	325.81	4.99
Crown Agency	Surveyed	11.72	0.18
First Nation	Surveyed	4.38	0.07
Indian Reserve	Surveyed	417.72	6.40
Mixed Ownership	Surveyed	38.14	0.58
Municipal Land	Surveyed	78.25	1.20

<b>Summary of Land Ownership</b>			
<i>Ownership</i>	<i>Status</i>	<i>Hectares</i>	<i>Percent of Study Area</i>
None	Surveyed	224.21	3.44
Private Land	Surveyed	3198.07	49.02
Unknown	Surveyed	65.58	1.01
Un-surveyed Crown	Un-surveyed	1751.67	26.85

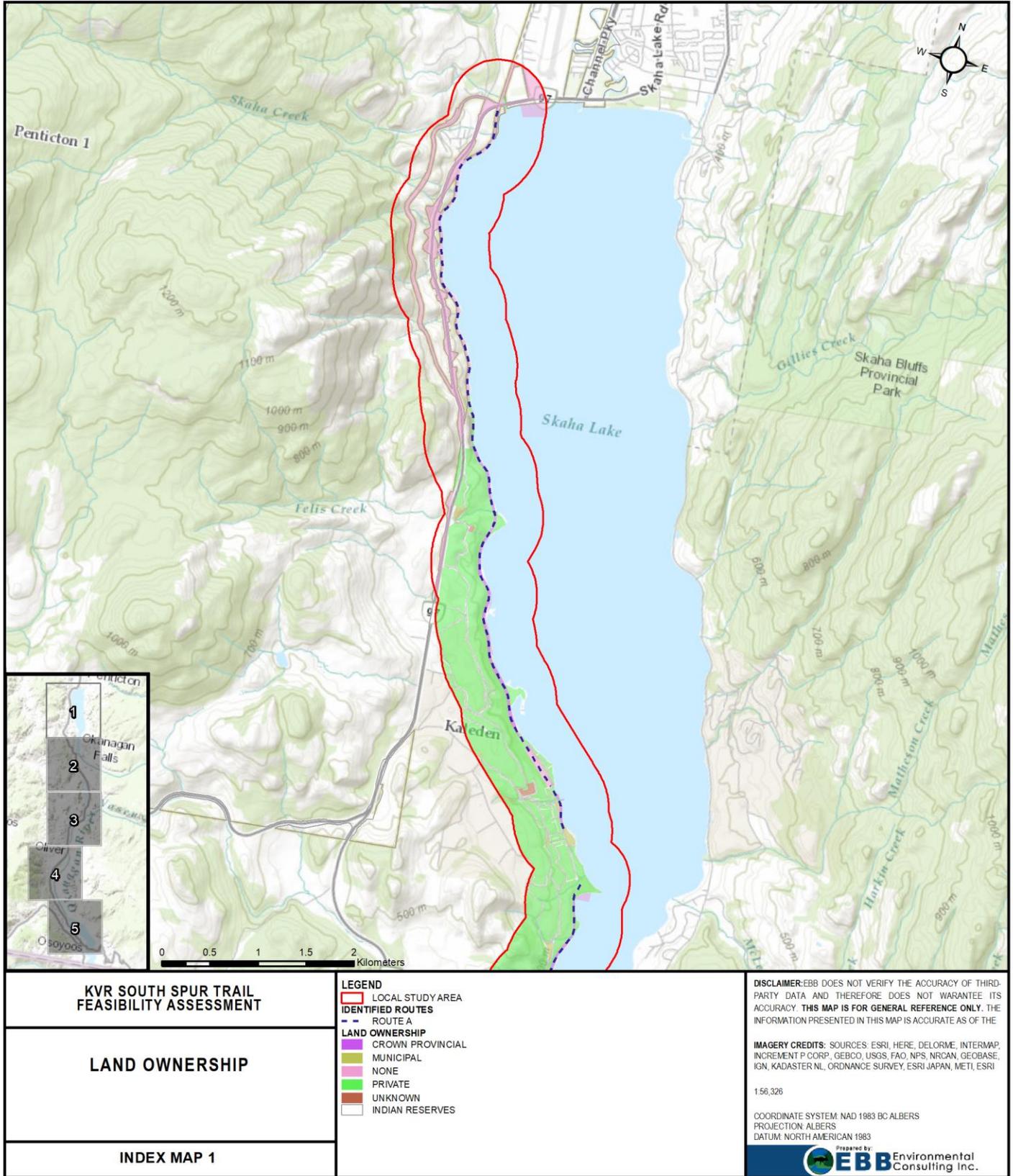


Figure 2-7. Land ownership within Section 1 of the LSA, excluding un-surveyed Crown land.

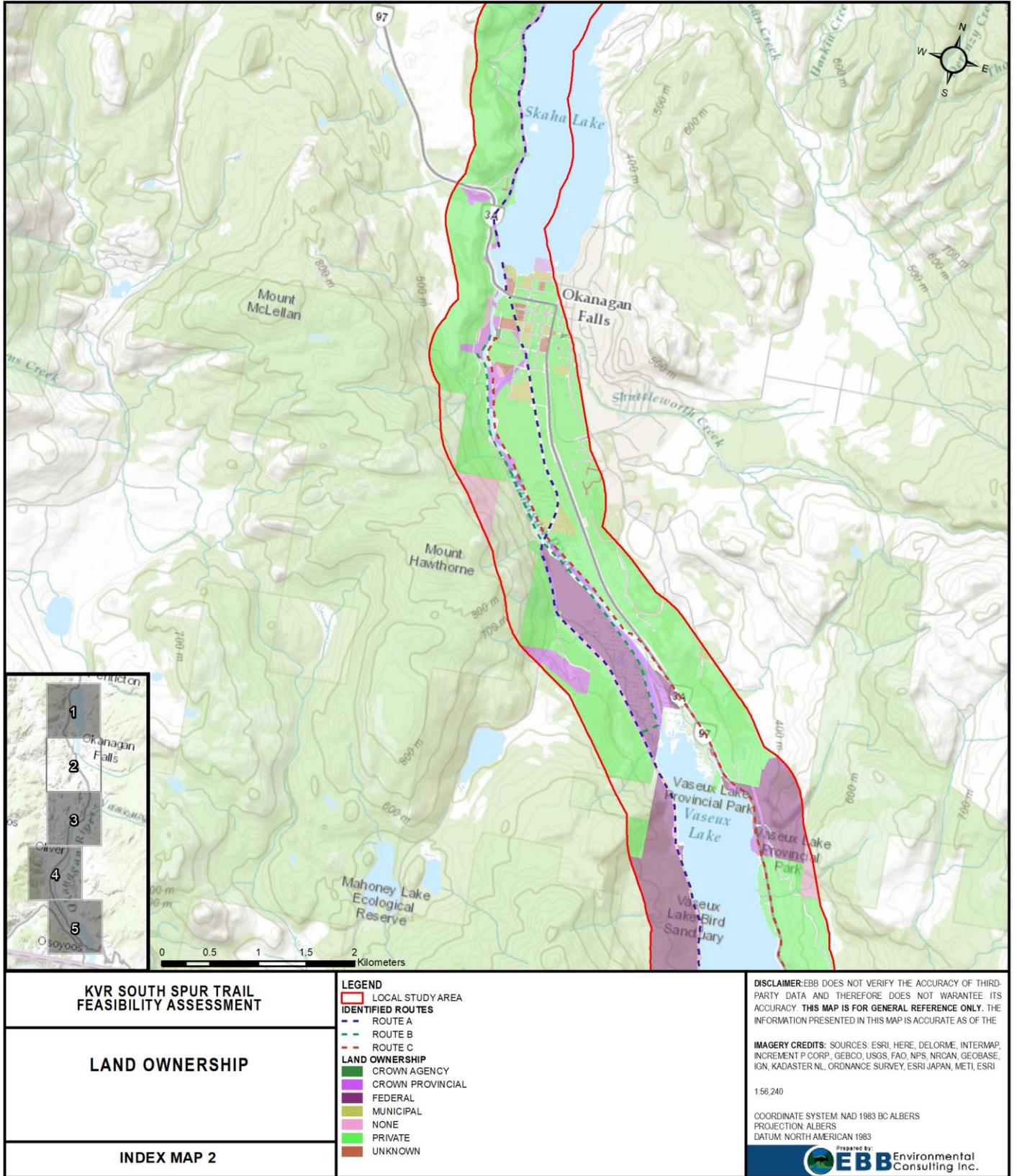


Figure 2-8. Land ownership within Section 2 of the LSA, excluding un-surveyed Crown land.

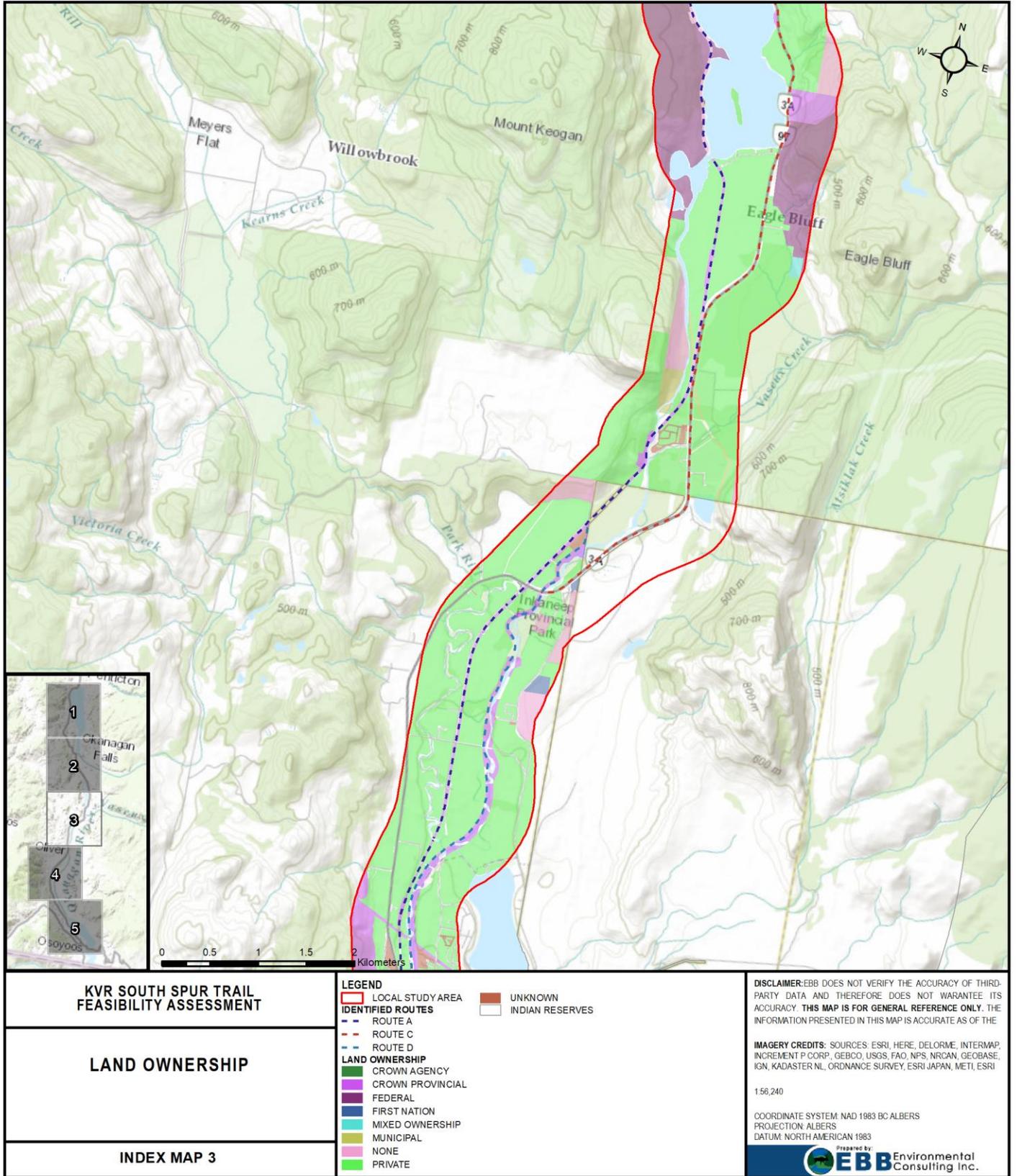


Figure 2-9. Land ownership within Section 3 of the LSA, excluding un-surveyed Crown land.

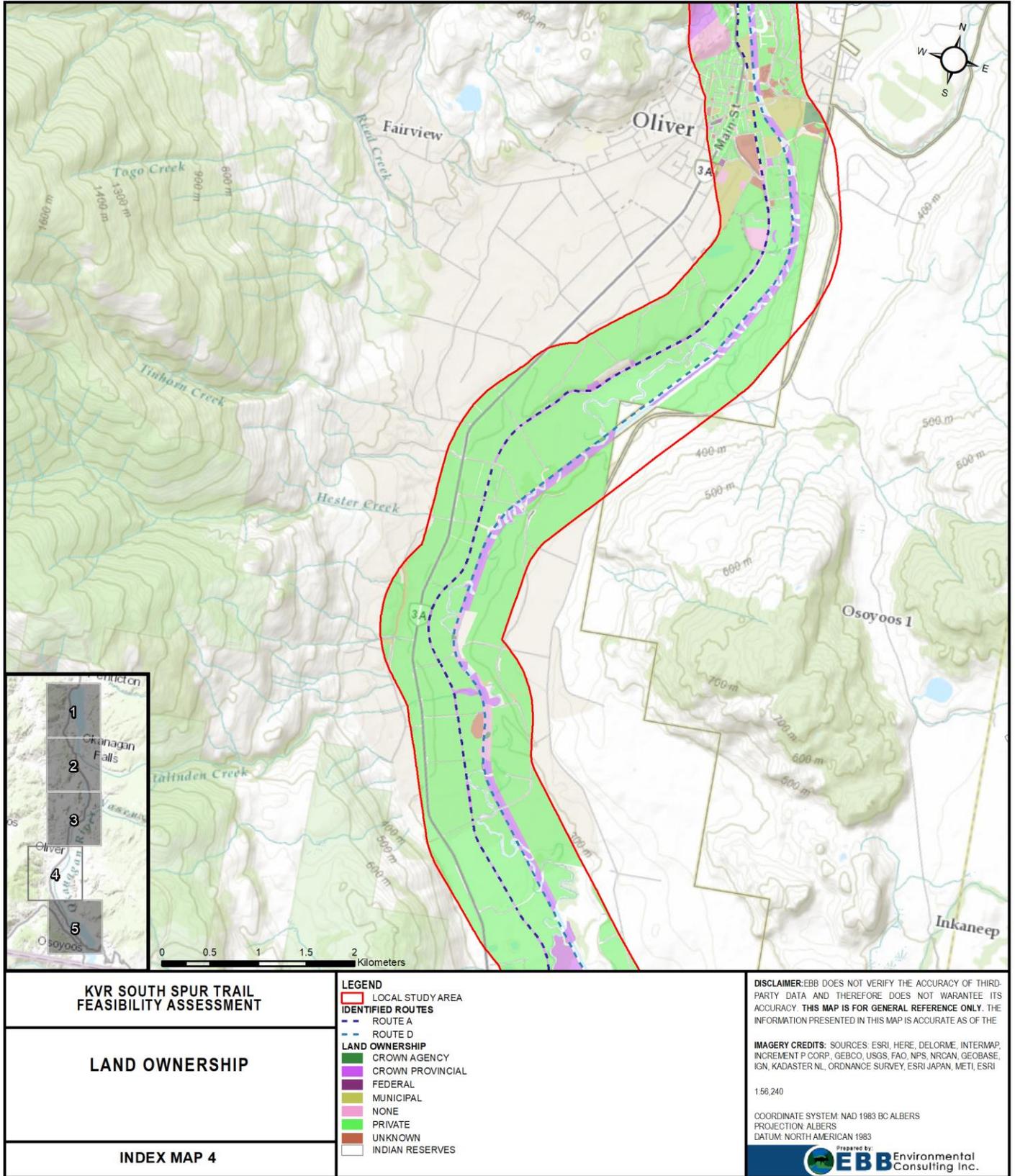


Figure 2-10. Land ownership within Section 4 of the LSA, excluding un-surveyed Crown land.

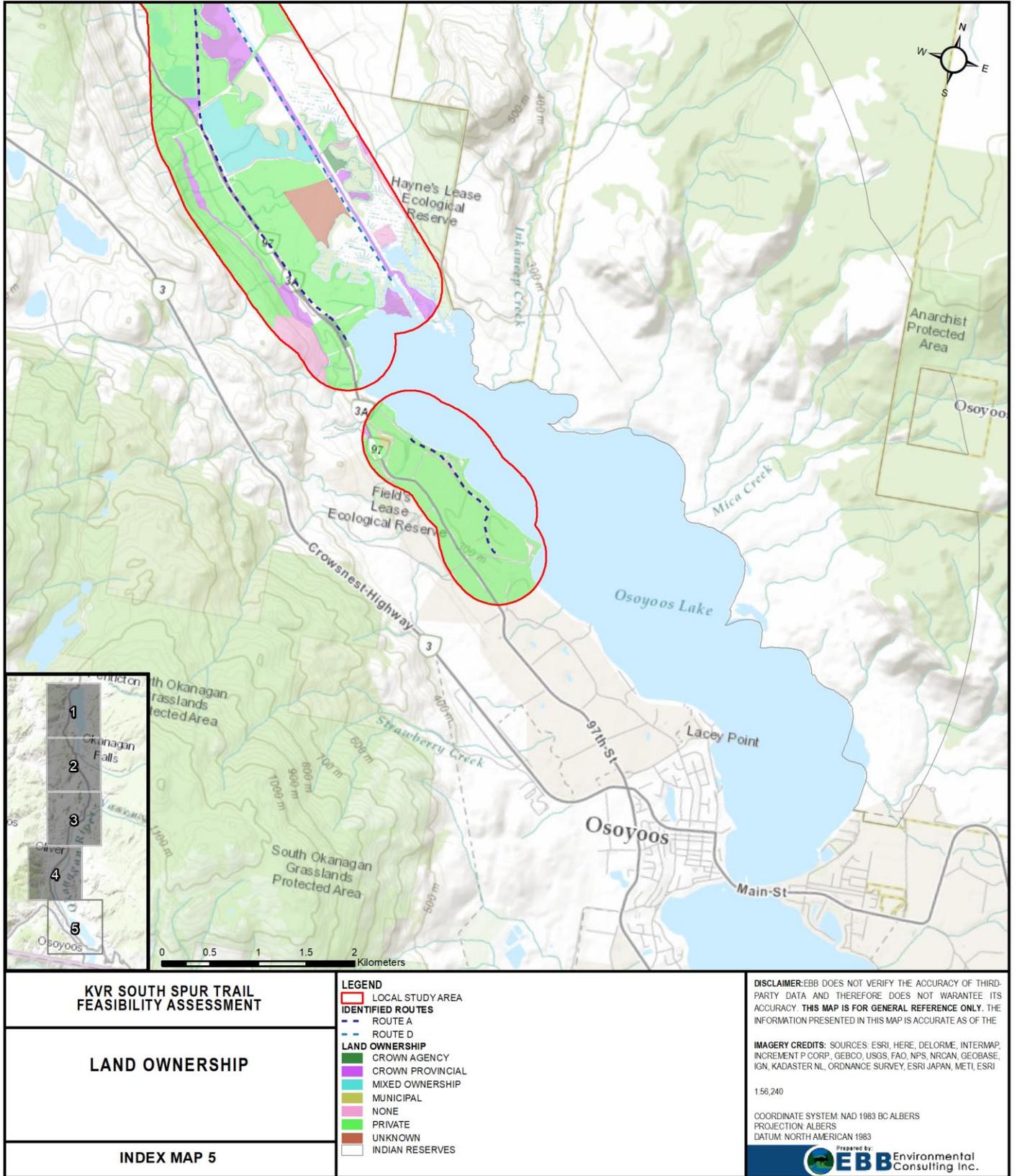


Figure 2-11. Land ownership within Section 5 of the LSA, excluding un-surveyed Crown land.

### **3 Assessment Methodology**

#### **3.1 Stakeholder Engagement**

Where stakeholders were identified, by the Province and during literature and data reviews, efforts were made to contact and engage representative of the stakeholder groups. Comments, opinions, and information received during stakeholder engagement was integrated into the overall feasibility assessment.

#### **3.2 Species and Ecosystems at Risk Classification**

This feasibility study places an emphasis on the potential effects to sensitive and at-risk species. Two classification systems are used, the Conservation Data Centre (BC CDC) rankings and the legal classifications under the *Species at Risk Act*.

Provincially, species are assessed and ranked by the B.C. Conservation Data Centre (BC CDC) and are assigned to yellow, blue or red listings, based on their conservation status ranking. Blue and red listed species include species ranging from critically imperilled to vulnerable (BC CDC 2002). Species with a subnational (S) ranks of 1 (critically imperilled), 2 (imperilled), 1-2, 1-3 (ranged range from critically imperilled to vulnerable), H (historical) or X (presumed extirpated or extinct) are assigned to the Red List and are species that have been legally designated endangered or threatened under the *Wildlife Act*, or candidates for such designation; species with a S rank of 2-3, 3, or 3-4 (animals only) are assigned to the Blue List and include species that are not immediately threatened but are particularly sensitive to human activities or natural events (BC CDC 2002).

Federally, species at risk are assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which recommends listing of species under the *Species at Risk Act* to the responsible Ministers. Species under the Act at listed as Extirpated (wildlife species no longer exists in Canada but occurs elsewhere in the wild), Endangered (wildlife species facing imminent extirpation or extinction), Threatened (wildlife species that is likely to become an endangered species), and Special Concern (wildlife species that may become a threatened or endangered species).

#### **3.3 Conservation Priorities**

The Province has developed a Conservation Framework (CF), which is a Provincial initiative that provides resource managers with a set of decision and support tools to (1) prioritize species and ecosystems for conservation and (2) determine the most appropriate and effective management actions.

Three overarching goals have been identified for the Conservation Framework and are:

1. To contribute to global efforts for species and ecosystems conservation;
2. To prevent species and ecosystems from becoming at risk; and
3. To maintain the full diversity of native species and ecosystems.

Tools have been developed to assist in achieving the identified goals and include Prioritization and Action Sorting. The Conservation Framework tools are intended to provide guidance on how species and ecosystems are prioritized, and the conservation actions needed. The prioritizing rank system is based on five criteria:

- Global and provincial status

- Trends
- Threats
- Stewardship responsibility
- Feasibility of recovery

Each species or ecosystem is ranked according to three specific goals in the framework. The ranking scale used is: 1 (highest) through 6 (lowest) (BC Ministry of Environment, 2009).

### 3.4 Reports and Literature

Scientific literature, technical reports and assessments, and available management plans were reviewed in the context of effects on soils, vegetation, sensitive ecosystems, species at risk and wildlife to identify areas of concern and to guide mitigation recommendations.

### 3.5 Digital Databases

Digital databases were queried for species with potential to occur within and the Study Areas. Databases included British Columbia Conversation Data Centre (BC CDC), British Columbia Breeding Bird Atlas (BCBBA), eBird, British Columbia Ecological Reports Catalogue (EcoCat), and BC Environmental Information Resources System for Biodiversity (EIRS BD). Queries searched for information related to the Subject Property and surrounding landscape. BC CDC results specifically provided listings of at-risk species listed under the provincial *Wildlife Act* and the federal *Species at Risk Act* (SARA).

### 3.6 Spatial Data

Publicly available datasets from RDOS, provincial, and federal sources were reviewed for presence of known environmental values within the RSA. Data queries included, but were not limited to:

- Wildlife species inventory (WSI) incidental, study and telemetry observations;
- Sensitive Ecosystem Inventory (SEI) polygons;
- Terrestrial Ecosystem Mapping (TEM) polygons;
- Vegetation Resource Inventory (VRI) polygons;
- Important bird areas (IBA);
- Masked and unmasked sensitive species;
- Parks, protected areas, and ecological reserves;
- Non-governmental organizations conservation lands;
- Wildlife habitat and wildlife management areas;
- Critical Habitat for species at risk;
- Administrative boundaries;
- Existing trails, and;
- Fish observations and distribution.

Analysis of species at risk looked at documented occurrences, ecosystem-based occurrences and available Critical Habitat polygons. Documented occurrences were determined through queries of available datasets, with results spatially limited to the Study Areas, and included:

- Wildlife Species Inventory, Incidental Observations;
- Wildlife Species Inventory, Survey Observations;
- Wildlife Species Inventory, Telemetry Observations;
- eBird Observational Data; and,
- B.C. Conservation Data Centre Unmasked Spatial Data

Potential for species at risk occurrences within the Study Areas was determined by querying the B.C. Conservation Data Center's Species and Ecosystem Explorer. Results were limited by the following variables:

- restricted to red, blue, and legally designated species;
- occurring within the RDOS;
- limited to Bunchgrass and Ponderosa Pine Biogeoclimatic Zones; and,
- occurring within:
  - Agricultural
    - Cultivated Field
    - Orchard/Vineyard
    - Hedgerow
    - Pasture/Old Field
  - Anthropogenic
    - Industrial
    - Roadside Ditch
    - Urban/Suburban
  - Forest
    - Conifer Forest (Dry, Mesic, Moist/Wet)
    - Deciduous/Broadleaf Forest
    - Mixed Forest
  - Grassland/Shrub
    - Antelope-brush Steppe
    - Grassland
    - Sagebrush Steppe
    - Shrub (Logged, Natural)
  - Lakes
    - Lake
    - Pond/Open Water
  - Riparian
    - Gravel Bar
    - Riparian Forest
    - Riparian Herbaceous
    - Riparian Shrub
  - Rock/Sparsely Vegetated Rock
    - Cliff
    - Rock/Sparsely Vegetated Rock
    - Talus
  - Stream/River
  - Wetland

- Bog
- Fen
- Marsh
- Swamp

The resulting list was cross referenced with known occurrences within the wildlife species inventory and BC CDC unmasked occurrence spatial datasets.

### 3.7 Mapping

All relevant data were reviewed and compiled utilizing Environmental Systems Research Institute (ESRI) ArcGIS Desktop Version 10.6. All Provincial and Federal data was combined into a single file geodatabase limited to the LSA. In document maps were designed to generalize the data and provide a contextual overview of the displayed data rather than the identification and labelling of individual element occurrences. Mapsets were set at a scale that provided suitable context and a balanced number of maps.

### 3.8 Limitations of Analysis

The design of this feasibility study was limited to high-level data analysis, no field assessments to ground-truth and verify the occurrence of the environmental components (EC) were carried out. It is expected that variations between the data and ground conditions will exist, particularly where Critical Habitat for species at risk are based on models. Due to the absence of data on trail condition for the length of the identified routes, analysis of impacts to habitat were based on the assumption of undisturbed habitats. In reality most, if not all, of the trail corridor has been impacted, both by historical industrial activities and current recreational use and development.

### 3.9 Environmental Effects and Risk Assessment

Assessment of environmental effects and risk were guided by the B.C. Ministry of Environment's *Environmental Mitigation Procedures* (B.C. Ministry of Environment 2014). The assessments of environmental effects are applied to environmental values and their associated components to determine overall effect and impact of a proposed project. Per *Environmental Mitigation Procedures* these are defined as:

**Environmental Value** An element of the natural environment that the people and Government of British Columbia care about and see as important for assuring the integrity and well-being of the province's ecological systems over time.

**Environmental Component** An attribute of the natural resource system that is measured, managed, and maintained to ensure the integrity and well-being of the environmental value with which the component is associated.

Evaluation indices of the impacts to both the Environmental Values (EV) and Environmental Components (EC) include indicators, benchmarks and management targets and are defined as:

**Indicators** A metric used to measure and report the condition and trend of an environmental component.

**Benchmarks** Reference points reflecting the risk associated with the performance of an indicator that may trigger different levels of management response.

**Management Targets** Required levels of performance for an indicator established as a matter of policy or associated with a legal requirement.

Application of established procedures and specific impact mitigation planning including selection and application of indicators, benchmarks, and management targets will occur following final route selection and ground-truthing.

Environmental effects were qualified using a relative ranking score, where impacts on environmental values and components were assigned a higher score than those with less impact. Relative ranking scores were assigned using the following ranks: 1.00, highest impact; 0.75, moderate impact; 0.50; moderate-low impact; and 0.25, lowest impact.

Risk assessment of each EC was conducted for the proposed development of each identified route. Effects on each environmental component was assessed for level of environmental impact, including: extent, probability, frequency, duration and reversibility. The combination of these variables resulted in an overall risk ranking.

- Extent – the area where an environmental effect occurs, defined for each EC based on definitions of the LSA, and RSA;
- Frequency – the number of that an environmental effect might occur (e.g., one time or multiple times) in a specified time period;
- Duration – the period of time required until the EC returns to its baseline condition or the environmental effect can no longer be measured or otherwise perceived; and,
- Reversibility – the likelihood that a measurable parameter will recover from an environmental effect, including through active management techniques (e.g., habitat restoration).

Full definitions of assessment variables are outlined in Section 7.5.

## 4 Legislation

Provincial and federal laws, agreements, and policies are applicable to administration of Crown lands and environmental resources occurring within the Study Areas. The following table outlines common agreements, policies, and legislation applicable to construction, maintenance, and operation of the identified routes.

**Table 4-1. Summary of applicable federal and provincial legislation.**

Summary of Applicable Legislation		
Name	Jurisdiction	Brief Description
<i>Forest and Range Practice Act</i>	Provincial	The <i>Forest and Range Practices Act</i> outlines how all forest and range practices and resource-based activities are conducted on Crown land in B.C. The Act provisions for the establishment of recreation sites and trails, and their management through the Forest Recreation Regulation.
<i>Water Sustainability Act</i>	Provincial	The <i>Water Sustainability Act</i> is intended to protect surface and groundwater resources through regulation of water use, management of rights, and protection of the resource. In instances where changes in and about a stream may occur, the Act regulates changes through the Water Sustainability Regulation.

Summary of Applicable Legislation		
Name	Jurisdiction	Brief Description
<i>Wildlife Act</i>	Provincial	The <i>Wildlife Act</i> protects all vertebrate animals from direct harm and is key legislation in the management of B.C.'s wildlife resources. The Act allows for protection of birds and their nests that are not protected under the federal <i>Migratory Birds Convention Act</i> . Additionally, the Act provisions for establishment of wildlife management areas and regulates their use and access through the Wildlife Management Areas Use and Access Regulation.
<i>Weed Control Act</i>	Provincial	The purpose of the Act is to protect the province's economy, natural resources, and society from negative impacts of foreign weeds. The Act provides a list of invasive plants designated as 'noxious weeds' at regional and provincial levels. Private property owners and government agencies are mandated by law to control these species that occur on their property or jurisdiction through the Weed Control Regulation.
<i>Canadian Wildlife Act</i>	Federal	The <i>Canadian Wildlife Act</i> allows for establishment, management and protection of wildlife areas for research, or for conservation or interpretation of wildlife. National wildlife areas are intended for preservation of habitat that are critical to migratory birds and other wildlife species, particularly species at risk. Wildlife Areas are regulated through the Wildlife Area Regulations.
<i>Fisheries Act</i>	Federal	The <i>Fisheries Act</i> is intended to provide for sustainable development of Canada's seacoast and inland fisheries, through conservation and protection of fish and fish habitat and proper management and control of fisheries.
<i>Migratory Birds Convention Act</i>	Federal	The purpose of the <i>Migratory Birds Convention Act</i> is to implement the Convention by protecting and conserving migratory birds, as populations and individual birds, and their nests. Protection and conservation is established in the Migratory Birds Regulations and the Migratory Birds Sanctuaries Regulations. The Migratory Birds Sanctuaries Regulations established restrictions on activities permitted within a bird sanctuary.
<i>Species at Risk Act</i>	Federal	The <i>Species at Risk Act</i> prevents wildlife species in Canada from disappearing and provides for recovery of wildlife species that are extirpated, endangered, or threatened because of human activity and manages species identified as special concern to prevent them from becoming threatened or endangered.

## 4.1 Provincial Legislation

### 4.1.1 Forest and Range Practices Act

The *Forest and Range Practice Act* (2002) has provisions for establishment, variance and disestablishment of interpretive forest sites, recreation sites or trails, to manage public recreation use on Crown land, and to protect recreation or range resources. The Act specifically reads that:

56 (1) *The minister may order*

- (a) *the establishment of Crown land as an interpretive forest site, a recreation site or a recreation trail, except Crown land that is subject to another enactment and is being administered by another minister, branch or agency of government,*
- (b) *the variance of the boundaries of an interpretive forest site, a recreation site or a recreation trail, and*
- (c) *the disestablishment of an interpretive forest site, a recreation site or a recreation trail.*

- (3) *The minister may establish an objective for an interpretive forest site, recreation site or recreation trail established under subsection (1).*
- 57** (1) *Unless authorized in writing by the minister or under another enactment, a person must not*
- (a) construct,*
  - (b) rehabilitate, or*
  - (c) maintain.*
- a trail or other recreation facility on Crown land*
- 58** (1) *If the minister determines that it is necessary to protect a recreation or range resource or to manage public recreation use on Crown land, he or she by order may restrict or prohibit*
- (a) a non-recreational use of*
    - (i) any of the following established under the Forest Practices Code of British Columbia Act for recreation:*
      - (A) a resource management zone;*
      - (B) a landscape unit'*
      - (C) a sensitive area, or*
    - (ii) any of the following that is on Crown land:*
      - (A) an interpretive forest site;*
      - (B) a recreation site or recreation trail,*
- except any non-recreational use permitted under the Coal Act, the Mineral Tenure Act or the Oil and Gas Activities Act, or*
- (b) a recreational use anywhere on Crown land, except a use that is specifically permitted under another enactment.*

Use of recreation sites and trails are regulated under the Forest Recreation Regulation, and addresses protection of the environment, responsible care of pets, and appropriate use of bicycles. These are specifically addressed in Sections 6, 7, 12 and 17 of the regulations:

- 6** (1) *A person must not operate a motor vehicle or a bicycle on a recreation site, recreation trail or interpretive forest site in a manner that is likely to do any of the following:*
- (a) cause damage to a structure or natural resource;*
  - (b) endanger, injure or damage people or property;*
  - (c) harass, injure or kill wildlife or any other kind of animal.*
- 7** (1) *A person must properly wear*
- (a) a bicycle safety helmet, or*
  - (b) a motorcycle safety helmet.*

*while operating, or riding as a passenger on, a bicycle or motorcycle in a recreation site or interpretive forest site or on a recreation trail.*

**12** (1) *A person who owns, or is responsible for, a pet must ensure that the pet does not, while on a recreation site, recreation trail or interpretive forest site*

*(a) present a threat to a person's property or to the life or safety of any person or animal, or  
(b) cause an unnecessary disturbance to other persons or animals.*

(2) *An official, a recreation officer or a peace officer who determines that a person has contravened subsection (1) may require the person*

*(a) to keep the pet under physical restraint, or  
(b) to remove the pet from the recreation site, recreation trail or interpretive forest site.*

**17** (1) *A person must not,*

*(a) in a careless or negligent manner, damage, or cause any alterations to, a structure or natural resource on a recreation site, recreation trail or interpretive forest site, or  
(b) unless authorized by a recreation officer, move a structure that is on a recreation site, recreation trail or interpretive forest site.*

#### **4.1.2 Water Sustainability Act**

Under Section 11 of the *Water Sustainability Act* (2015) any proposed changes in or about a stream requires an authorization. Changes in and about a stream is legally defined under the Act as:

*(a) any modification to the nature of a stream, including any modification to the land, vegetation and natural environment of a stream or the flow of water in a stream, or  
(b) any activity or construction within a stream channel that has or may have an impact on a stream or a stream channel.*

Under the *Water Sustainability Act*, the Water Sustainability Regulation details conditions where changes in and about a stream may be conducted without a Change Approval or Authorization, and specific conditions associated with each authorized change (Section 39(1)).

For works that are authorized under the Act, a habitat officer must be notified per Section 38(1) of the Act a minimum of 45 days prior to beginning the authorized change. For works that are not authorized under the Act, an application for a Change Approval must be submitted for review by the Province, and an authorization issued prior to any instream works.

#### **4.1.3 Wildlife Act**

The *Wildlife Act* (1996) was written to help protect and manage wildlife in British Columbia. Except for species listed under Schedule C of the Act, birds not listed as explicitly protected under the federal *Migratory Birds Convention Act* are included under Section 34 of the *Wildlife Act* which states:

- 35** (1) *A person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests or destroys*
- (a) bird or its egg*
  - (b) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or*
  - (c) the nest of a bird not referred to in paragraph (b) when the nest is occupied by a bird or its egg.*

In addition, Section 75 of the Act states:

- 75** (1) *A person who kills or wounds wildlife, other than prescribed wildlife, either by accident or for the protection of life or property, must promptly report to an officer*
- (a) The killing or wounding, and*
  - (b) The location of the wildlife.*
- (2) *A person who kills or wounds wildlife, other than prescribed wildlife, either by accident or for the protection of life or property, must promptly report to an officer*

Wildlife Management Areas (WMA) are legal designations under the *Wildlife Act* setting aside lands for the benefit of significant fish and wildlife species or their habitats. Under Section 7 of the *Wildlife Act*, WMAs are protected from alteration, destruction or damage to wildlife habitat and enables the regional manager to restrict activities within an WMA.

- 7** (1) *A person commits an offence if the person*
- (a) alters, destroys or damages wildlife habitat, or*
  - (b) deposits on land or water a substance or manufactured product or by product*
- in a manner that is harmful to*
- (c) wildlife, or*
  - (d) wildlife habitat*
- in a wildlife management area, except as permitted under section 4 (4) or by the regulations or a permit.*
- (4) *A regional manager may make orders prohibiting a person from*
- (a) entering,*
  - (b) cutting, picking, removing, altering, destroying or damaging vegetation in,*
  - (c) disturbing or harassing wildlife in,*
  - (d) releasing or abandoning an animal in, and*
  - (e) allowing an animal to enter*
- a wildlife management area, a critical wildlife area or a wildlife sanctuary.*

#### **4.1.4 Weed Control Act**

The *Weed Control Act* (1996) was written to help protect the province's economy, natural resources, and society from negative impacts of foreign weeds. The Act provides a list of invasive plants designated as 'noxious weeds' at regional and provincial levels. Section 2 of the Act describes the duty to control noxious weeds:

- 2** *In accordance with the regulations, an occupier must control noxious weeds growing or located on land and premises, and on any other property located on land and premises, occupied by that person.*

## **4.2 Federal Legislation**

### **4.2.1 Canadian Wildlife Act**

The *Canadian Wildlife Act* (1985) provides provisions for the acquisition and management of lands in agreement with the Province for wildlife research, conservation or interpretation, Specifically:

- 9** (1) *The Governor in Council may authorize the Minister to lease any lands, or purchase or acquire any lands or any interests or rights in any lands, for the purpose of research, conservation and interpretation in respect of*
- (a) migratory birds; or*
  - (b) with the agreement of the government of the province having an interest therein, other wildlife.*

The KVR South Spur Trail intersects portions of the Vaseux-Bighorn National Wildlife Area; therefore, provisions in the Wildlife Area Regulations under the *Canadian Wildlife Act* are in effect:

- 3** (1) *Subject to subsection (2), no person shall, in any wildlife area,*
- (a) hunt or fish,*
  - (b) be in possession of any firearm, slingshot, bow and arrow, shot other than non-toxic shot or any instrument that could be used for the purpose of hunting,*
  - (b.1) be in possession of, while fishing, any lead sinkers or lead jigs that weigh less than 50 grams,*
  - (c) have in his possession any animal, carcass, nest, egg or a part of any of those things,*
  - (d) damage, destroy or remove a plant,*
  - (e) carry on any agricultural activity, graze livestock or harvest any natural or cultivated crop,*
  - (f) allow any domestic animal to run at large,*
  - (g) swim, picnic, camp or carry on any other recreational activity or light or maintain a fire,*
  - (h) operate a conveyance,*
  - (i) destroy or molest animals or carcasses, nests or eggs thereof,*
  - (j) remove, deface, damage or destroy any artifact, natural object, building, fence, poster, sign or other structure,*
  - (k) carry on any commercial or industrial activity,*
  - (l) disturb or remove any soil, sand, gravel or other material, or*

(m) *dump or deposit any rubbish, waste material or substance that would degrade or alter the quality of the environment,*

*unless he does so under and in accordance with a permit issued by the Minister pursuant to section 4.*

The regulation further empowers the Minister to prohibit entry into a national wildlife area:

**8** *Where the Minister has published a notice in a local newspaper or posted a notice at the entrance of any wildlife area or on the boundary of any part thereof prohibiting entry to any wildlife area or part thereof, no person shall enter the area or part thereof set out in the notice.*

#### **4.2.2 Fisheries Act**

The *Fisheries Act* (1985) is intended to provide for sustainable development of Canada's seacoast and inland fisheries, through conservation and protection of fish and fish habitat and proper management and control of fisheries and to protect commercial, recreational, and Aboriginal fisheries. The Act is applicable to any trail development works that has potential to result in serious harm to fish and fish habitat, specifically Section 35 which states:

- 35** (1) *No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery.*
- (2) *A person may carry on a work, undertaking or activity without contravening subsection (1) if*
- (a) the work, undertaking or activity is a prescribed work, undertaking or activity, or is carried on in or around prescribed Canadian fisheries waters, and the work, undertaking or activity is carried on in accordance with the prescribed conditions;*
  - (b) the carrying on of the work, undertaking or activity is authorized by the Minister and the work, undertaking or activity is carried on in accordance with the conditions established by the Minister;*
  - (c) the carrying on of the work, undertaking or activity is authorized by a prescribed person or entity and the work, undertaking or activity is carried on in accordance with the prescribed conditions;*
  - (d) the serious harm is produced as a result of doing anything that is authorized, otherwise permitted or required under this Act; or*
  - (e) the work, undertaking or activity is carried on in accordance with the regulations.*

Serious harm to fish is legally defined under the Act as:

- 2** (2) *For the purposes of this Act, serious harm to fish is the death of fish or any permanent alteration to, or destruction of, fish habitat.*

#### **4.2.3 Migratory Birds Convention Act**

The *Migratory Birds Convention Act* (1994) provides protection to migratory birds. The Act was designed to protect birds that are migratory in nature and include migratory game and insectivorous birds, and other migratory

non-game birds as listed in Article 1 of the Act. Several resident birds do not fall under the protection of this Act (e.g. corvids and accipiters); however, many of these species are protected under the BC *Wildlife Act*.

The Act protects migratory birds through the Migratory Birds Regulations, which state that:

- 5** (9) *No person shall hunt in a migratory bird sanctuary except*
- (a) under authority of a special permit therefor; or*
  - (b) as provided in the Migratory Bird Sanctuary Regulation*
- 6** (1) *Subject to subsection 5(9), no person shall*
- (a) disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird, or*
  - (b) have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird*
- except under authority of a permit thereof.*

The KVR South Spur Trail intersects portions of the Vaseux Lake Migratory Bird Sanctuary Area. Provisions in the Migratory Bird Sanctuary Regulations under the *Migratory Birds Convention Act* that are in effect include:

- 3** (2) *No person shall, in a migratory bird sanctuary*
- (a) hunt migratory birds,*
  - (b) disturb, destroy or take the nests of migratory birds, or*
  - (c) have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird,*
- except under authority of a permit therefor.*
- 5** (1) *No person who owns a dog or cat shall permit the dog or cat to run at large in a migratory bird sanctuary.*
- 10** (1) *No person shall, in a migratory bird sanctuary, carry on any activity that is harmful to migratory birds or the eggs, nests or habitat of migratory birds, except under authority of a permit.*

#### **4.2.4 Species at Risk Act**

The *Species at Risk Act* (2002) provides protection to species designated as at risk under the Act. Specifically;

- 6** *The purposes of this Act are to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened.*

The assessment of species at risk (SAR) within Canada is conducted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), an independent body of experts who recommends status listings to the Minister of the Environment and Climate Change and to the Canadian Endangered Species Conservation Council.

When species are listed under SARA, the species are afforded legal protection, specifically through Sections 32 and 33 of the Act, which state:

- 32** (1) *No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species.*
- (2) *No person shall possess, collect, buy, sell or trade an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species, or any part or derivative of such an individual.*
- (3) *For the purposes of subsection (2), any animal, plant or thing that is represented to be an individual, or a part or derivative of an individual, of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species is deemed, in the absence of evidence to the contrary, to be such an individual or a part or derivative of such an individual.*
- 33** *No person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada*

In addition to the protection of the individual wildlife species and their residences, the Act further protects habitat determined to be critical to the survival or recovery of the species:

- 58** (1) *Subject to this section, no person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species — or of any listed extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada — if*
- (a) *the critical habitat is on federal land, in the exclusive economic zone of Canada or on the continental shelf of Canada;*
- (b) *the listed species is an aquatic species; or*
- (c) *the listed species is a species of migratory birds protected by the Migratory Birds Convention Act, 1994.*

Critical Habitat is legally defined under the Act as:

- 1 Critical Habitat** *means the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species.*

## 4.3 Environmental Authorizations

Environmental permits and authorizations will apply to any trail development along the KVR South Spur and alternative route segments. The following table provides a summary of permits and approvals expected to be required for trail development. Required permits and approvals must be confirmed prior to initiation of any trail development.

**Table 4-2. Summary of applicable environmental permits and approvals.**

Environmental Permits and Approvals		
<i>Issuing Agency</i>	<i>Required Permit or Approval</i>	<i>Description</i>
Environment and Climate Change Canada	Section 73 SARA Permit	Permit required for all activities within federally owned lands that may impact critical habitat or incidentally impact terrestrial species at risk.
	National Wildlife Area Permit	Permit is required to conduct any activity within a NWA that falls under Section 3(1).
	Migratory Bird Sanctuary Permit	Permit is required to conduct any activity which may disturb a migratory bird.
Fisheries and Oceans Canada	Request for Project Review	Precursor to a formal Section 35(2) authorization, permits DFO to review the proposed instream activities and determine whether a Section 35(2) authorization would be required.
	Fisheries Act Section 35(2) Authorization	A Section 35(2) Authorization may be required for any watercourse crossing structure that is constructed to cross the Okanagan River.
	Section 73 SARA Permit	Permit required for all activities that may impact critical habitat or incidentally impact aquatic species at risk.
	Scientific License	Fish Salvage – Salmonids
BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development	General Wildlife Permit	Wildlife Salvage – Required for the capture, handling and movement of wildlife.
	Scientific Fish Collection Permit	Fish Salvage – Freshwater, Non-salmonids
	Water Sustainability Act, Section 11 Change Approval	Required for any instream works that do not conform to the description of approved changes.

## 5 Conservation Lands Management

### 5.1 Conservation Lands

Conservation lands refer to a broad spectrum of private and Crown lands that are managed for wildlife or conservation and include parks, protected areas, ecological reserves, wildlife management areas, wildlife habitat areas, non-governmental organization conservation lands, national wildlife areas, migratory bird sanctuaries, and important bird areas. Of the roughly 57,700 hectares of land within the Regional Study Area, 21,000 hectares or 36%, of the land base falls within areas with a conservation mandate. Total hectares by managing agency is summarized in Table 5-1.

**Table 5-1. Summary of conservation lands within the Regional Study Area.**

<b>Summary of Conservation Lands within the Regional Study Area</b>				
<i>Jurisdiction</i>	<i>Managing Agency</i>	<i>Type</i>	<i>Number</i>	<i>Hectares</i>
Federal	Environment and Climate Change Canada Canadian Wildlife Service	National Wildlife Area	1	558.95
		Migratory Bird Sanctuary	1	752.64
Provincial	B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development	Wildlife Management Area	2	3011.16
		Wildlife Habitat Area	74	2374.06
	B.C. Ministry of Environment & Climate Change Strategy Parks and Protected Areas Division	Provincial Park	4	819.73
		Protected Area	5	11474.14
		Ecological Reserve	3	136.56
Non-Governmental Organization	Burrowing Owl Conservation Society of BC	Conservation Area	1	2.39
	Ducks Unlimited Canada	Conservation Area	4	56.26
	Nature Conservancy of Canada	Conservation Area	4	283.11
	The Nature Trust of British Columbia	Conservation Area	41	1547.04

Conservation lands within the LSA are comprised of lands by the same Federal, Provincial and Non-governmental organizations. Table 5-2 summarizes the number of conservation lands occurring within the LSA.

**Table 5-2. Summary of conservation lands within the Local Study Area.**

<b>Summary of Conservation Lands within the Local Study Area</b>				
<i>Jurisdiction</i>	<i>Managing Agency</i>	<i>Type</i>	<i>Number</i>	<i>Hectares</i>
Federal	Environment and Climate Change Canada Canadian Wildlife Service	National Wildlife Area	1	344.88
		Migratory Bird Sanctuary	1	558.95
Provincial	B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development	Wildlife Management Area	1	367.82
		Wildlife Habitat Area	20	123.03
	B.C. Ministry of Environment & Climate Change Strategy Parks and Protected Areas Division	Provincial Park	3	345.36
		Protected Area	3	219.54
		Ecological Reserve	1	214.73
Non-Governmental Organization	Burrowing Owl Conservation Society of BC	Conservation Area	1	2.39
	Ducks Unlimited Canada	Conservation Area	4	56.26
	Nature Conservancy of Canada	Conservation Area	1	23.67
	The Nature Trust of British Columbia	Conservation Area	20	250.03

## 5.2 Management Strategies

Management plans, conservation goals, and objectives exist for several conservation lands within the LSA.

### 5.2.1 Federal Conservation Lands

Two federal conservation areas intersect identified routes and include Vaseux-Bighorn National Wildlife Area (Vaseux-Bighorn NWA) and Vaseux Lake Migratory Bird Sanctuary (Vaseux Lake MBS). Management goals have been developed for the Vaseux-Bighorn NWA.

#### 5.2.1.1 Vaseux-Bighorn National Wildlife Area

A formal management plan (Environment Canada 2011) for Vaseux-Bighorn NWA has been developed with several goals. For any trail development within the Vaseux-Bighorn NWA these goals must be integrated into the trail development plan. Goals include:

**Goal 1:** Restoration and management of important habitats and ecosystems, particularly for species at risk, migratory birds and other priority species.

- Forest habitats will be maintained to mimic an ecosystem driven by periodic low-intensity fires so that populations of species at risk, migratory birds and other priority species are sustained and/or residences and habitats are created, restored or maintained through active management.
- Riparian habitats will be maintained so that populations of species at risk, migratory birds and other priority species are sustained and/or residences and habitats are created, restored or maintained through active management.
- Wetland and meadow habitats will be maintained so that populations of species at risk, migratory birds and other priority species are sustained and/or residences and habitats are created, restored or maintained through active management.
- Rocky cliffs and talus slope habitats will be maintained so that populations of species at risk, migratory birds and other priority species are sustained and/or residences and habitats are created, restored or maintained through active management.
- Grassland and antelope brush habitats will be maintained so that populations of species at risk, migratory birds and other priority species are sustained and/or residences and habitats are created, restored or maintained through active management.

**Goal 2:** Control of invasive plants.

- Habitat and vegetation will be actively managed to eliminate (where possible) or reduce the extent and density of alien and exotic species of plants.

**Goal 3:** Control of unauthorized activities in the NWA.

- Eliminate off-trail recreational activities in the NWA.

**Goal 4:** Reduce risk of catastrophic fire in the NWA

- Achieve sub-goal 1.1 so that fuel load is reduced through the removal of young trees and downed woody material.

**Goal 5:** Limit anthropogenic impacts on water quality in the NWA

- The quality of surface water in Vaseux–Bighorn NWA will be sustained or improved to a level necessary to meet native aquatic species’ life history requirements.

The federal lands in the Vaseux-Bighorn NWA are closed to public access except for the parking lot, boardwalk and viewing tower west of Highway 97 at the north end of the Vaseux Lake.

#### *5.2.1.2 Vaseux Lake Migratory Bird Sanctuary*

Vaseux Lake Migratory Bird Sanctuary (Vaseux Lake MBS) was originally created in 1923 to provide protection to Trumpeter Swans (*Cygnus buccinator*). Several species of waterfowl and waterbirds overwinter when open water is available. Great Blue Herons (*Ardea herodias herodias*) and Common Loons (*Gavia immer*) are residents of the sanctuary. Public access to Vaseux Lake MBS is not restricted. However, use of motorized boats is prohibited as outlined in the Migratory Bird Sanctuary Regulations.

#### *5.2.1.3 Identified Concerns and Comments*

Conversations with the Canadian Wildlife Service (CWS) (I. Parnell, pers. comm. 29 January 2018) outlined a broad concern regarding any potential trail development, within the context of Vaseux-Bighorn NWA and Vaseux Lake MBS protected areas and the South Okanagan region. Concern focused on potential impacts to the ecological integrity of habitat and sensitive ecosystems, including habitat fragmentation and connectivity. This concern applies to federally managed protected areas and species at risk, migratory birds, and Critical Habitat occurring within and outside of the protected areas.

CWS has previously tracked usage of existing trail along the western side of Vaseux Lake; data indicate that the trail is frequently used. For any development proposal, projections of anticipated increase of use and monitoring of trail use should be included to evaluate the influence of recreational activities on the landscape. Measures to mitigate impacts associated with any increase would be necessary for any development proposal.

Measures to minimize or avoid impacts to wildlife (direct and indirect), including migration, breeding, and living should be included in any trail development proposal for consideration, particularly within Vaseux-Bighorn NWA and Vaseux Lake MBS. Suggested examples include raised terrestrial boardwalks and physical barriers that restrict people from venturing off-trail while maintaining unrestricted movement for wildlife. Motorized recreation is not to be permitted within Vaseux-Bighorn NWA per the prohibitions outlined in Section 3 of the Wildlife Area Regulations and no form of boat propulsion (including electric propellers) may be used within Vaseux Lake MBS per Section 8 of the Migratory Bird Sanctuary Regulations.

### **5.2.2 Non-Governmental Organization Conservation Lands**

Three non-governmental organization have conservation properties within the LSA. These include Ducks Unlimited Canada, the Nature Conservancy of Canada, and the Land Trust of British Columbia.

Conversations were held with Ducks Unlimited Canada (B. Harrison, pers. comm., 25 January 2018) regarding management focus, value, and opinions and concerns regarding potential trail development. Table 5-3 summarizes results of the communications.

**Table 5-3. Summary of conservation focus and identified concerns for conservation lands managed by Ducks Unlimited Canada.**

<b>Conservation Lands Managed by Ducks Unlimited Canada</b>		
<i>Name</i>	<i>Description of Management Focus</i>	<i>Identified Opinions/Concerns</i>
Quintal Floodplain	<ul style="list-style-type: none"> <li>Managed primarily as wildlife habitat for waterfowl/birds.</li> <li>Conservation projects have included enhancements for Great Basin Spadefoot and Tiger Salamander.</li> </ul>	<ul style="list-style-type: none"> <li>Increased access into the property not desirable.</li> <li>Happy with the currently level of trail users on the developed portion of the KVR trail along the western boundary of the property.</li> </ul>
Winter's Property	<ul style="list-style-type: none"> <li>Managed primarily as wildlife habitat for waterfowl/birds.</li> </ul>	<ul style="list-style-type: none"> <li>Geographic location of property minimizes public access. Not specifically concerned with impacts arising from proposed trail development.</li> </ul>

Conversations were held with The Nature Trust of B.C. (N. Burdock, pers. comm., 25 January 2018) regarding the management focus, value, and opinions and concerns regarding potential trail development. Table 5-4 summarizes the results of the communications and documentation provided.

**Table 5-4. Summary of conservation focus and identified concerns for conservation lands managed by The Nature Trust of BC.**

<b>Conservation Lands Managed by the Nature Trust of British Columbia</b>		
<i>Name</i>	<i>Description of Management Focus</i>	<i>Identified Concerns</i>
Vaseux Lake	<ul style="list-style-type: none"> <li>Vaseux Lake is comprised of an assemblage of properties managed to protect and enhance conservation values, including species at risk, management of invasive plant species, and to minimize habitat fragmentation and degradation.</li> </ul>	<ul style="list-style-type: none"> <li>General concerns applicable to all the Conservation Lands managed by the Nature Trust include:               <ul style="list-style-type: none"> <li>Potential impacts to the ecosystem integrity and function, and any associated impacts to habitat connectivity and fragmentation.</li> <li>Concerns regarding the introduction and spread of invasive plant species.</li> <li>Concerns regarding the increase in human presence which could lead to behavioural changes (security) in wildlife resulting in underutilization of the conservation lands.</li> </ul> </li> </ul>
Antelope-brush (Phases I – IV)	<ul style="list-style-type: none"> <li>The antelope-brush property complex is intended to conserve several ecological communities at risk, including antelope-brush/needle-and-thread grass.</li> <li>Upwards of 26 species at risk occur within the properties and provides valued habitat for connectivity across the landscape.</li> </ul>	
Osoyoos Lake	<ul style="list-style-type: none"> <li>No specific information regarding the Osoyoos Lake property is available, however, given the proximity to the South Okanagan Wildlife Management Area and the Okanagan River, there is likely a strong overlap in the habitat types and overall management objectives.</li> </ul>	
Okanagan River Oxbows	<ul style="list-style-type: none"> <li>The Okanagan River Oxbows contain critical wetland complexes that are rare in the Okanagan and provides habitat for various</li> </ul>	

Conservation Lands Managed by the Nature Trust of British Columbia		
Name	Description of Management Focus	Identified Concerns
	species at risk and ecological communities. These properties are managed for the protection of high value, sensitive habitats and which benefits numerous species at risk.	

### 5.2.3 Provincial Conservation Lands

Several conservation lands under Provincial management occur within the LSA, including wildlife management areas, wildlife habitat areas, ecological reserves, protected areas, and provincial parks.

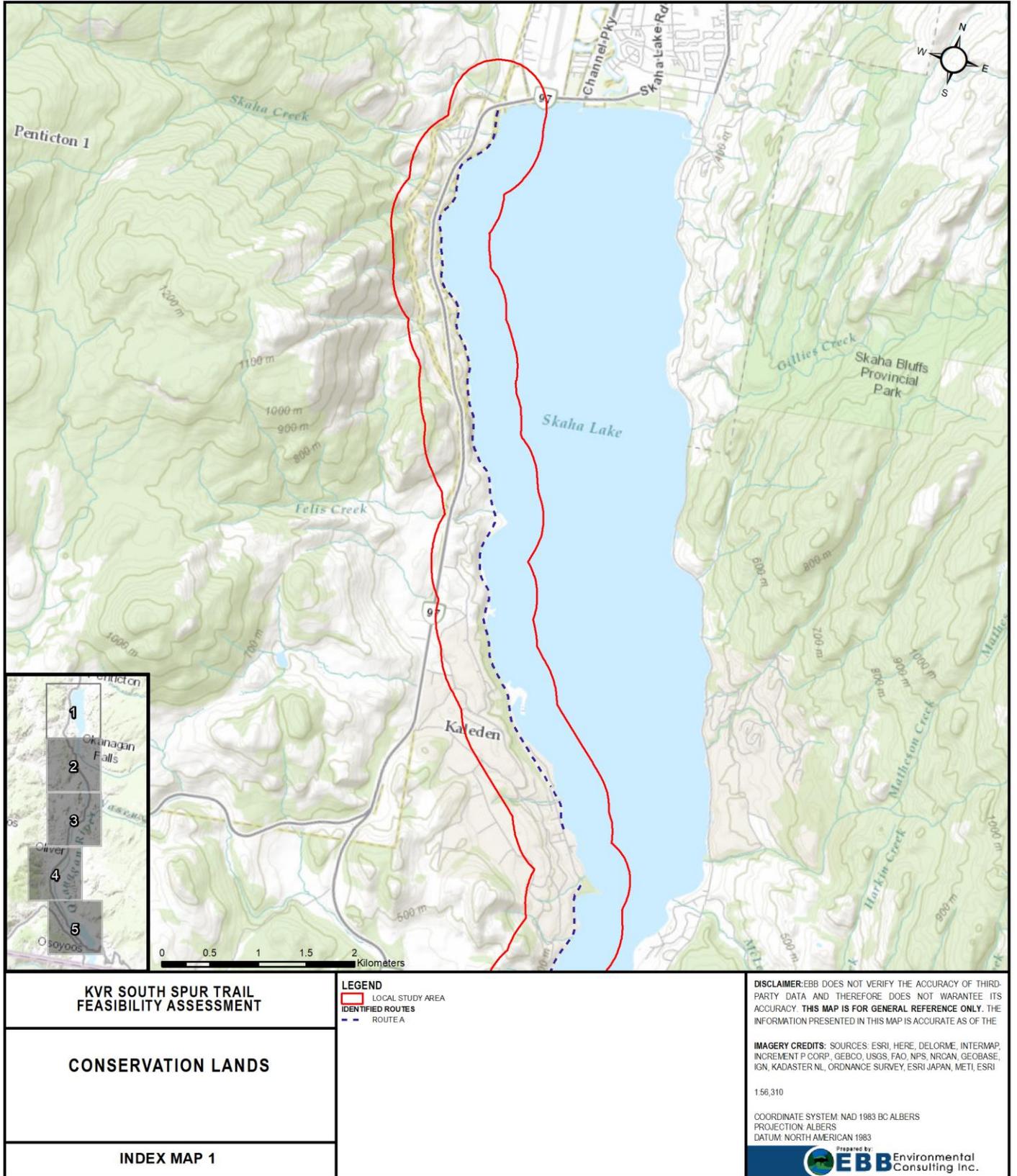
**Table 5-5. Summary of Provincially managed conservation lands within the LSA.**

Intersected Protected Areas	
Name	Description of Management Priority
South Okanagan Wildlife Management Area	Draft objective of the South Okanagan Wildlife Management Area has been identified as (1) Protection of the ecological integrity of the WMA's species and habitats while recognizing the value and importance of the existing land and water use, (2) protection of the cultural heritage values within the WMA, and (3) protection of the WMA's biodiversity and habitat values while allowing for recreation activities (B.C. Ministry of Environment 2011).
Hayne's Lease Ecological Reserve	The primary purpose of Haynes' Lease Ecological Reserve is to protect a portion of antelope-brush habitat and wetland habitat within the southern portion of the reserve (B.C. Ministry of Water, Land and Air Protection 2005).
Inkameep Provincial Park	The primary purpose of the park is to protect small areas of antelope-brush and cottonwood riparian habitat along the Okanagan River. The second purpose of the park is to provide river-oriented day use opportunities and vehicle camping (B.C. Ministry of Water, Land and Air Protection 2003a).
Vaseux Provincial Park	Primary purpose of the park is to provide camping, lake-oriented and nature appreciation-oriented recreation opportunities. The secondary purpose of the park is to protect the lake and upland values typical of the lower elevation land in the Southern Okanagan Valley (B.C. Ministry of Water, Land and Air Protection 2003c).
Vaseux Lake Protected Area	The primary roles of the Vaseux Protected Area are to protect low- to mid-elevation grasslands that provide important winter range for California bighorn sheep and to protect its rare species and habitat (B.C. Ministry of Water, Land and Air Protection 2003b).
White Lake Grasslands Protected Area	The primary role of the White Lake Grasslands Protected Area is to protect red- and blue-listed wildlife species and the habitat that they rely on. Secondary roles are to protect regionally significant archeological sites and areas of value for traditional First Nations uses, and to provide continued wildlife viewing, natural history interpretation, and other limited-access recreation opportunities (B.C. Ministry of Water, Land and Air Protection 2003d)
s̓wəx̓w̓nitkw̓ (Okanagan Falls) Provincial Park	The primary purpose of this park is to provide camping opportunities. Secondary purpose of the park is to protect riparian features which provide bat feeding habitat.

Of the conservation lands within the LSA, six are intersected by identified routes, Table 5-6 summarizes intersected conservation lands.

**Table 5-6. Summary of conservation lands intersected by identified routes.**

<b>Intersected Conservation Lands</b>		
<i>Jurisdiction</i>	<i>Type</i>	<i>Intersecting Route(s)</i>
Federal	Migratory Bird Sanctuary <i>Vaseux Lake Migratory Bird Sanctuary</i>	A, B, C
	National Wildlife Area <i>Vaseux-Bighorn National Wildlife Area</i>	A, B
Provincial	Wildlife Management Area <i>South Okanagan Wildlife Management Area</i>	A, C, D
	Provincial Park <i>Vaseux Provincial Park</i>	C
Non-Governmental Organization	The Nature Trust of British Columbia <i>Vaseux Lake – Green Lake Road</i>	A
	The Nature Trust of British Columbia <i>Vaseux Lake – Franmar</i>	C



**Figure 5-1. Conservation lands occurring within Section 1 of the LSA.**

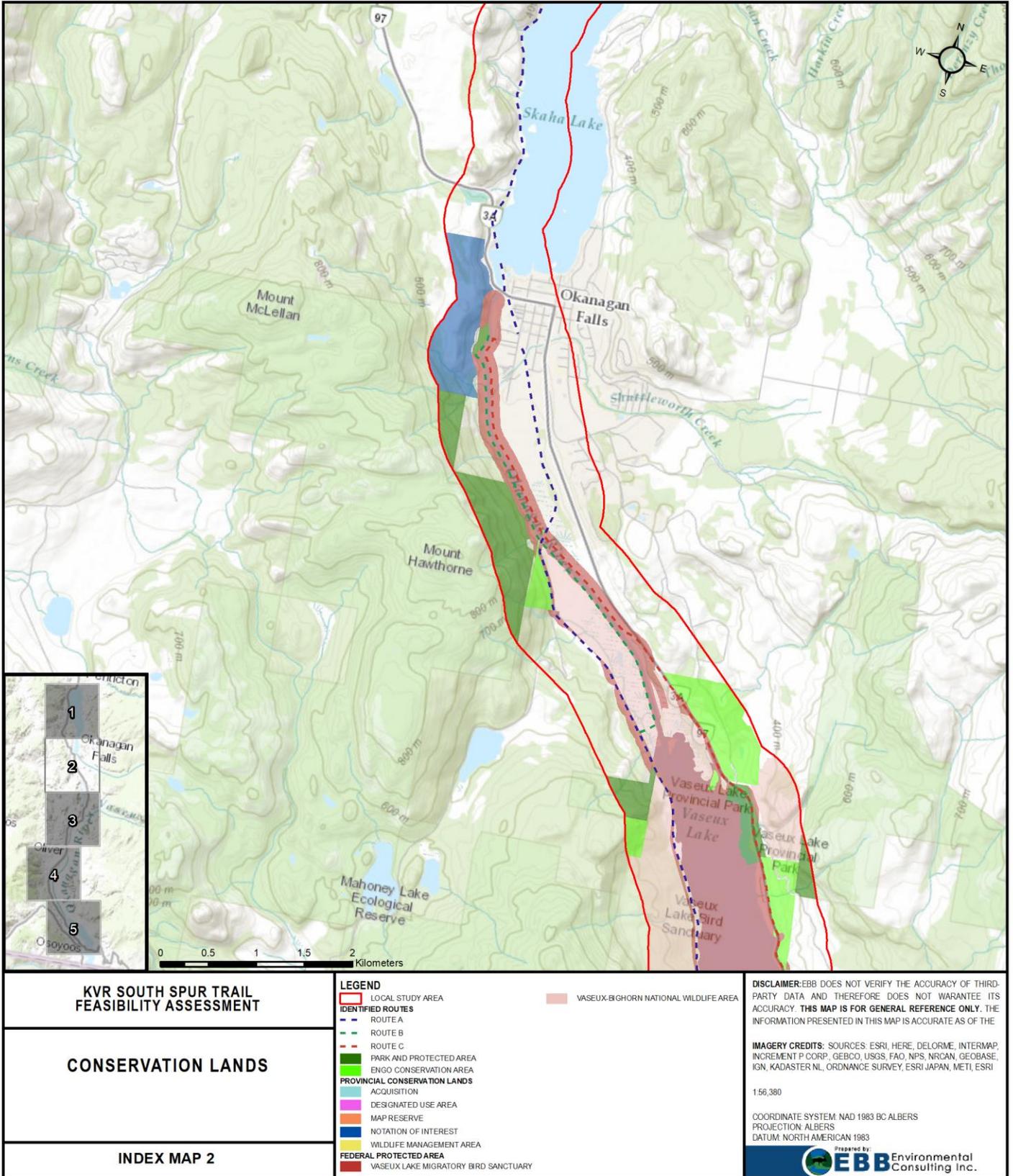
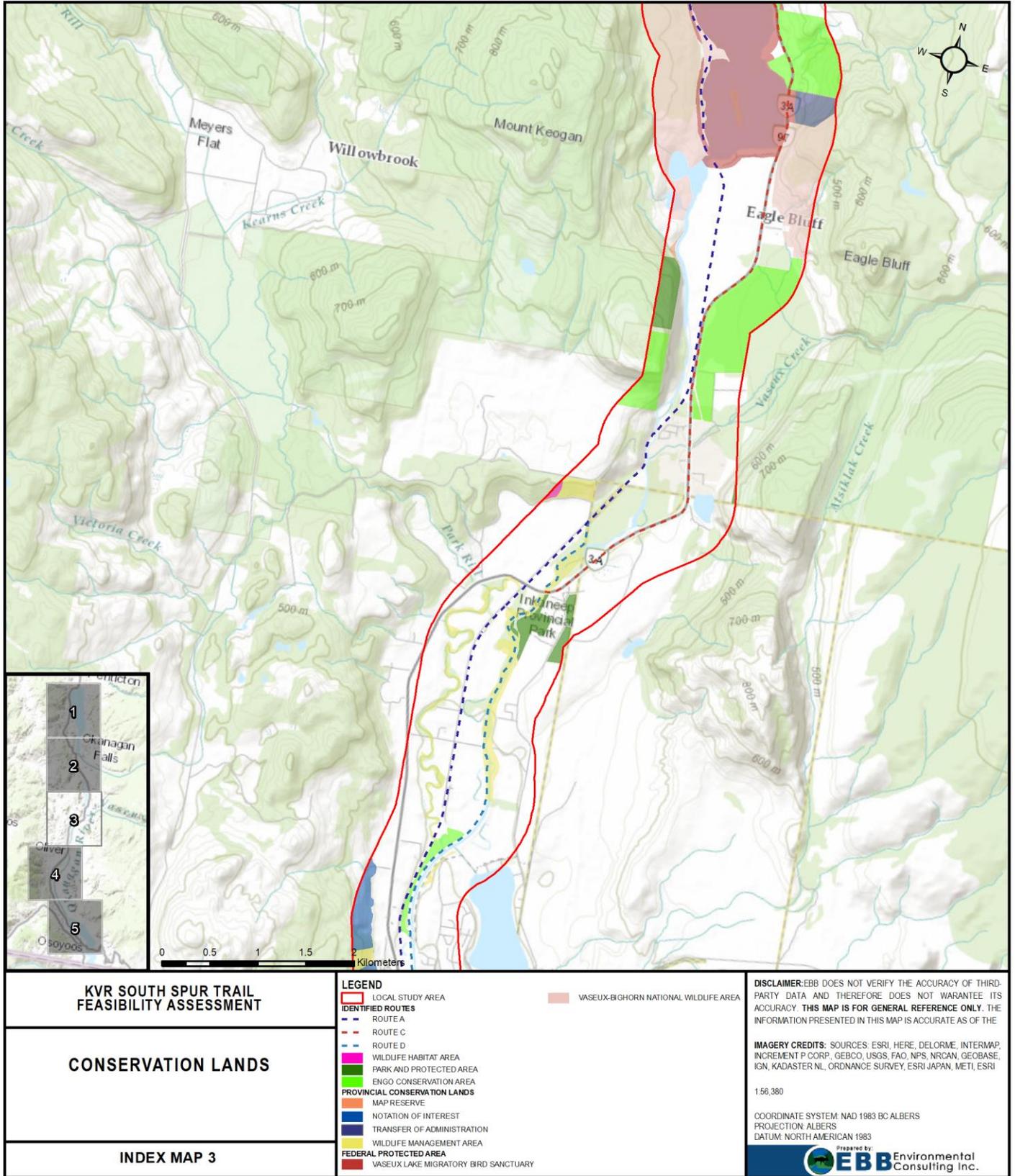


Figure 5-2. Conservation lands occurring within Section 2 of the LSA.



**Figure 5-3. Conservation lands occurring within Section 3 of the LSA.**

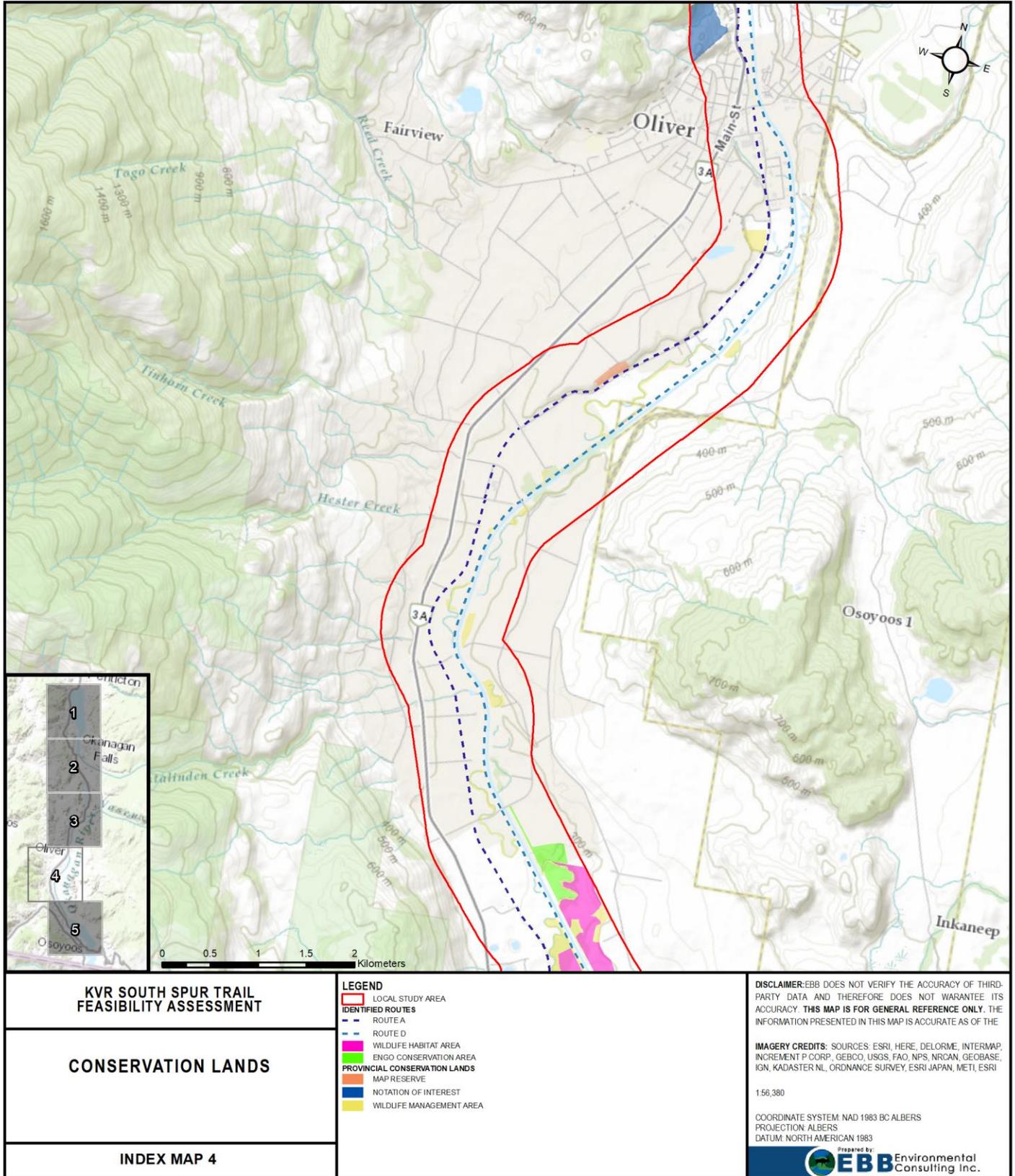


Figure 5-4. Conservation lands occurring within Section 4 of the LSA.

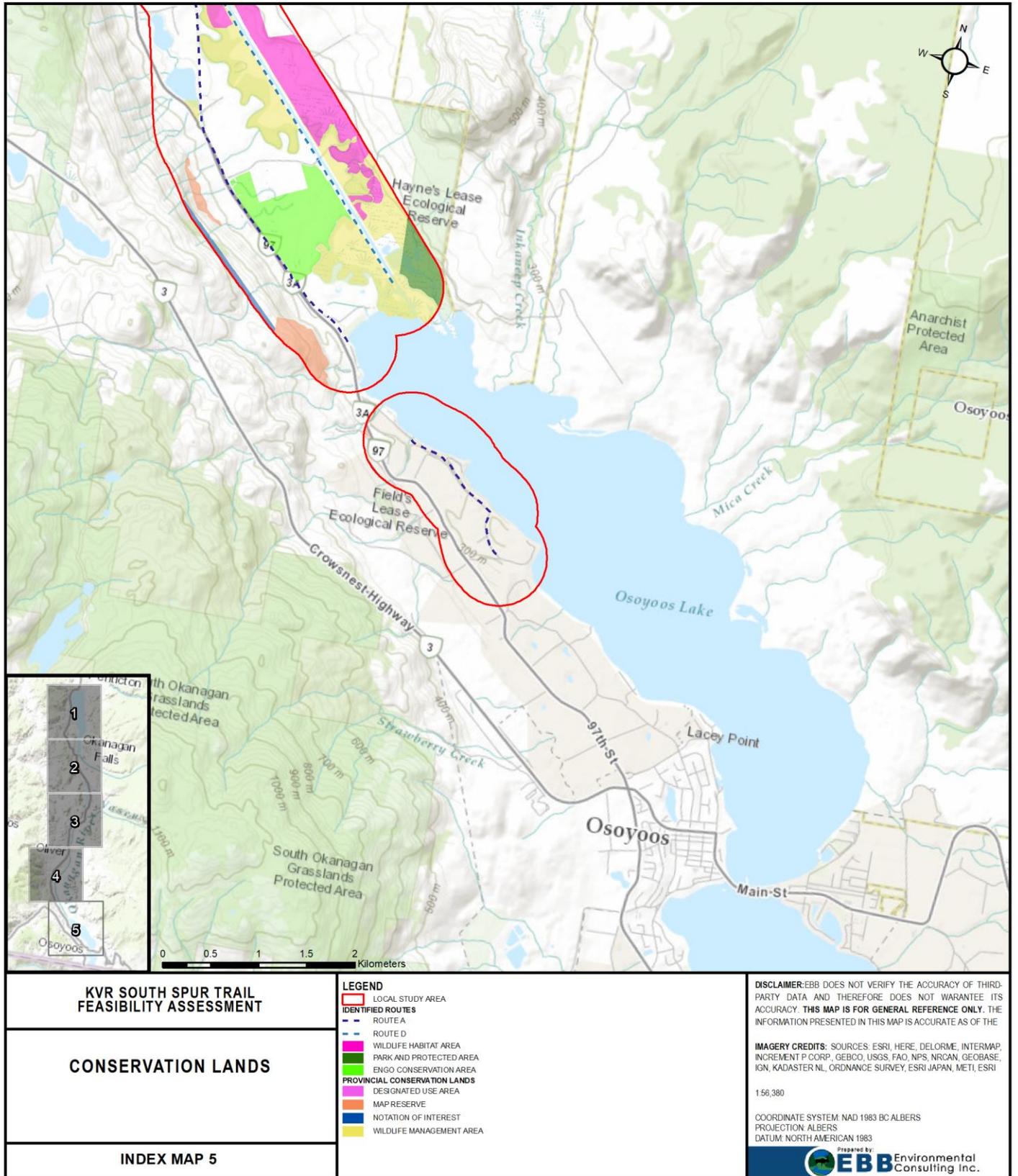


Figure 5-5. Conservation lands occurring within Section 5 of the LSA.

## 6 Identification of Environmental Values

An Environmental Value (EV) is defined as an element of the natural environment that people and the Province care about and see as important for assuring the integrity and well-being of the province’s ecological systems over time (Ministry of Environment 2016). Environmental Values and components for the KVR South Spur are summarized in Table 6-1 and are discussed in detail in the following subsections.

**Table 6-1. Environmental values, components and rationale for study inclusion.**

Identified Environmental Values		
<i>Environmental Value</i>	<i>Component</i>	<i>Rationale for Inclusion</i>
Vegetation	Plant Species at Risk	Provincially and Federally listed plant species at risk are known to occur within the LSA and have the potential to be impacted by any trail development.
	Ecological Communities at Risk	Several Provincially listed ecological communities at risk occur within the LSA and represent important plant associations which provide habitat for wildlife species at risk.
	Sensitive Ecosystems	Numerous sensitive ecosystems occur within the LSA act as important habitats for wildlife and species at risk.
	Critical Habitat	Critical Habitat for one SARA listed vegetation species occurs within the LSA and is protected under SARA.
Wildlife	Wildlife Species at Risk	Numerous documented occurrences of wildlife species at risk, listed by the BC CDC and SARA have been documented within the LSA.
	Breeding Birds	Breeding birds are legally protected under Provincial and Federal legislation. Several bird species at risk have been documented within the LSA.
	Critical Habitat	Critical Habitat for several SARA listed species occur within the LSA and are protected under SARA.
Fish and Fish Habitat	Regionally Important Fish Species	Several regionally important fish species occur within the LSA that are a part of sport fishing. Includes sockeye salmon which are known to spawn within the Okanagan River.
	Fish Species at Risk	One fish species at risk has been identified to occur within the LSA.

## 7 Environmental Effects Assessment

### 7.1 Vegetation

#### 7.1.1 Components

Four components were assessed for the Vegetation Environmental Value:

- plant species at risk which included Provincial red- and blue-listed species and SARA species;
- ecological communities at risk as identified by the Province as being either red- or blue-listed;
- sensitive ecosystems occurring within the LSA; and,
- identified Critical Habitat.

### 7.1.1.1 Plant Species at Risk

Plant species at risk included provincially and SARA listed species. Species listed under SARA as Threatened or Endangered are legally protected, and the protection of these species must be considered, particularly where identified routes occur within Federal lands. Changes in plant species at risk (e.g., number, distribution) act as indicators for effects of trail development.

### 7.1.1.2 Ecological Communities at Risk

The BC CDC is responsible for collection and dissemination of information on ecological communities of concern in British Columbia. Ecological communities are considered at risk based on their provincial conservation status rank which considers total number and condition of occurrences, range and area of occupancy, short- and long-term trends in the foregoing factors, threats, intrinsic vulnerability and environmental specificity. Ecological communities can represent core habitats required for species at risk.

### 7.1.1.3 Sensitive Ecosystems

Sensitive ecosystems provide functions beneficial to human and ecological health, including ecological goods and services that regulate climate, clean freshwater, sustain soils, maintain genetic diversity, recycle nutrients, and pollinate crops (Iverson *et al.* 2008). Sensitive ecosystems include those that are ecologically fragile or considered to be at risk on the provincial landscape. Values of sensitive ecosystems and at risk ecological communities have been categorized by Iverson *et al.* (2008) as either ecological or socio-economic.

**Table 7-1. Summary of ecological and socio-economic values, adapted from Iverson *et al.* (2008).**

Valuation Attributes for Sensitive and At Risk Ecological Communities		
Attribute	Applicable Ecosystems	Description of Attribute
<b>ECOLOGICAL ATTRIBUTES</b>		
At Risk Status	Wetlands Riparian Antelope-brush Steppe Grasslands Sagebrush Steppe Coniferous Woodlands Sparsely Vegetated Mature Forest	At risk species and ecological communities are considered at risk because of restricted distributions and reductions in densities and extent. The South Okanagan provides habitat for a considerable number of species at risk, including several with identified critical habitat defined by the <i>Species at Risk Act</i> .
Fragility	Wetlands Riparian Antelope-brush Steppe Sagebrush Steppe Coniferous Woodlands	Fragility refers to ecosystem sensitivity to a range of disturbance variables that can lead to the decline or loss of ecosystem health or integrity.
High Biodiversity	Wetlands Riparian Antelope-brush Steppe Grasslands Sagebrush Steppe Coniferous Woodlands Mature Forest Seasonally Flooded Agricultural	Indicates ecosystems that, due to the proximity to grasslands to the south and the variety of ecosystems in the landscape, support a wide range of plants and animals. A high proportion of rare and at-risk species are found within these ecosystems.
Specialized Habitats	Coniferous Woodlands	Support many species of plants and animals and are often critical for species at risk.

<b>Valuation Attributes for Sensitive and At Risk Ecological Communities</b>		
<i>Attribute</i>	<i>Applicable Ecosystems</i>	<i>Description of Attribute</i>
Linkages, Travel Corridors and Landscape Connectivity	Mature Forest Seasonally Flooded Agricultural Riparian	These ecosystems can provide opportunities for wildlife to travel between riparian and upland habitats and can act as buffers to other sensitive ecosystems.
Sensitivities to Disturbance	Antelope-brush Steppe Grasslands Sagebrush Steppe	Ecosystems are sensitive to disturbances and may take years or decades to recover following disturbances. These may also be threatened by development due to their location on the landscape and relative ease of development.
Flood Protection and Erosion Reduction	Wetlands Riparian	These ecosystems can help in regulating peak flows and/or water storage during freshet and seasonal high-flows, and can stabilize banks and slow water velocities, minimizing bank erosion and slumping.
<b>SOCIO-ECONOMIC VALUES</b>		
Social Values	Wetlands Riparian Antelope-brush Steppe Grasslands Sagebrush Steppe Coniferous Woodlands Mature Forest	The ecosystem can provide opportunities for environmental education, wildlife viewing, walking, and aesthetic enjoyment. Green space can provide real-estate value to adjacent properties.
Water Quality	Wetlands Riparian	Riparian and wetland ecosystems can store, filter, and maintain water quality through the reduction of the levels of sediment, nutrients, and toxic chemicals in outflow water.

#### 7.1.1.4 Critical Habitat

Critical Habitat refers to SARA defined habitat for Threatened and Endangered species which are afforded legal protection under the Act. Critical Habitat has been identified for one species at risk within the LSA and is therefore considered to be a vegetation EV component.

#### 7.1.2 Baseline Conditions

E-Flora (Klinkenberg 2017) regional checklists for the South Okanagan indicate that greater than 1400 vascular plants and many other non-vascular plants occur within the South Okanagan. Vegetation within the South Okanagan contains a diverse mix of native, naturalized, invasive and at-risk species.

##### 7.1.2.1 Plant Species at Risk

A detailed review of available datasets indicated that 24 plant species at risk, listed by BC CDC or SARA, have been documented in the LSA. Table 7-2 summarizes identified plant species at risk by BC CDC listing and Conservation Framework (CF) priority ranking. Queries of the BC CDC resulted in 72 plant species at risk, inclusive of known occurrences with potential to occur within the LSA. The resulting list of potential plant species at risk is summarized in Appendix C.

**Table 7-2. Summary of BC CDC listed plant species at risk.**

<b>Identified Plant Species at Risk</b>			
<i>Class</i>	<i>CDC List</i>	<i>CF Priority</i>	<i>Count</i>
Vascular Plants	Red	1	5
		2	5
		N/A	2
	Blue	1	2
		2	4
		3	1
		N/A	2
	Non-Vascular Plants	Red	1
Blue		1	1

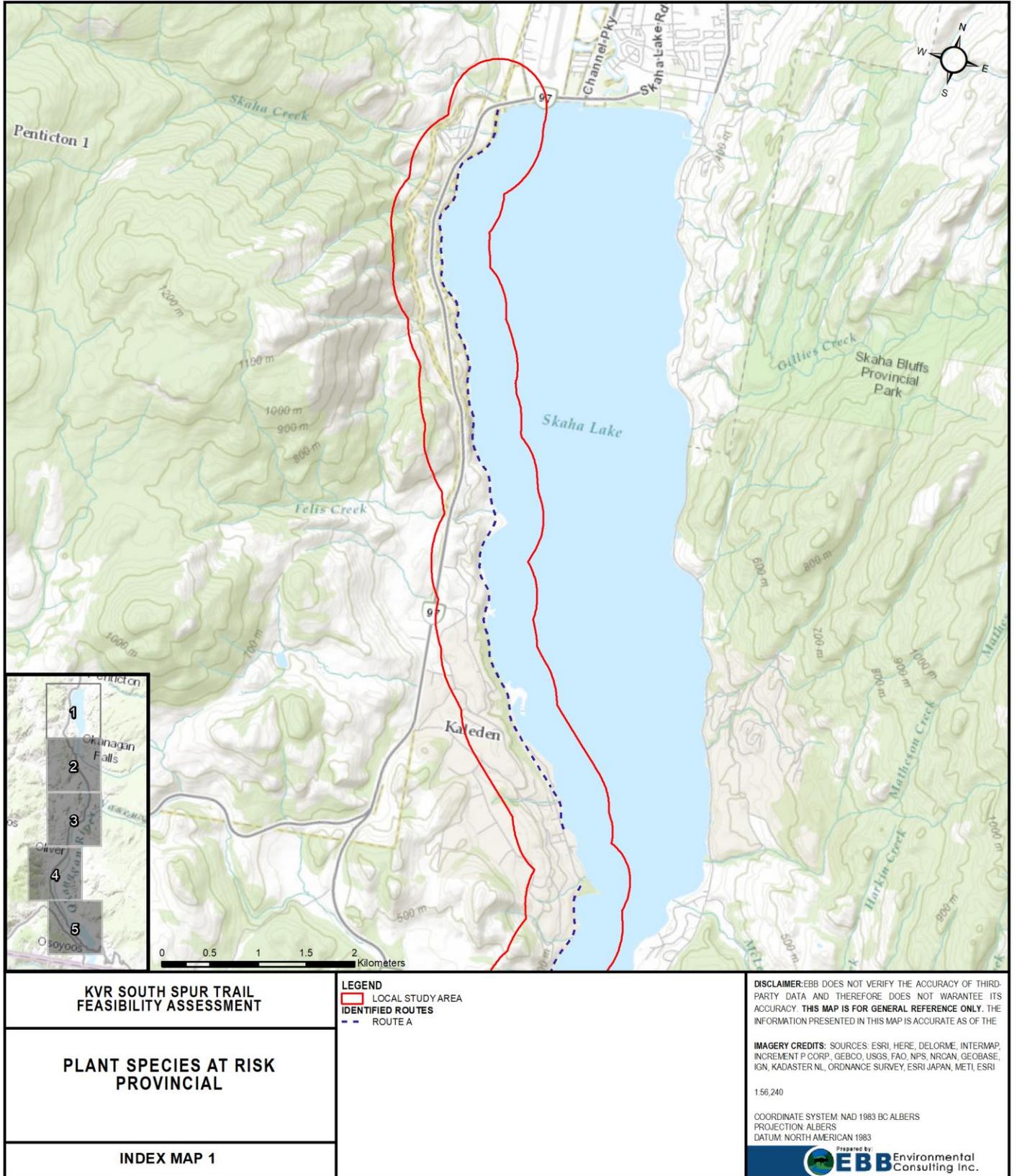


Figure 7-1. No Provincially listed plant species at risk occur within Section 1 of the LSA.

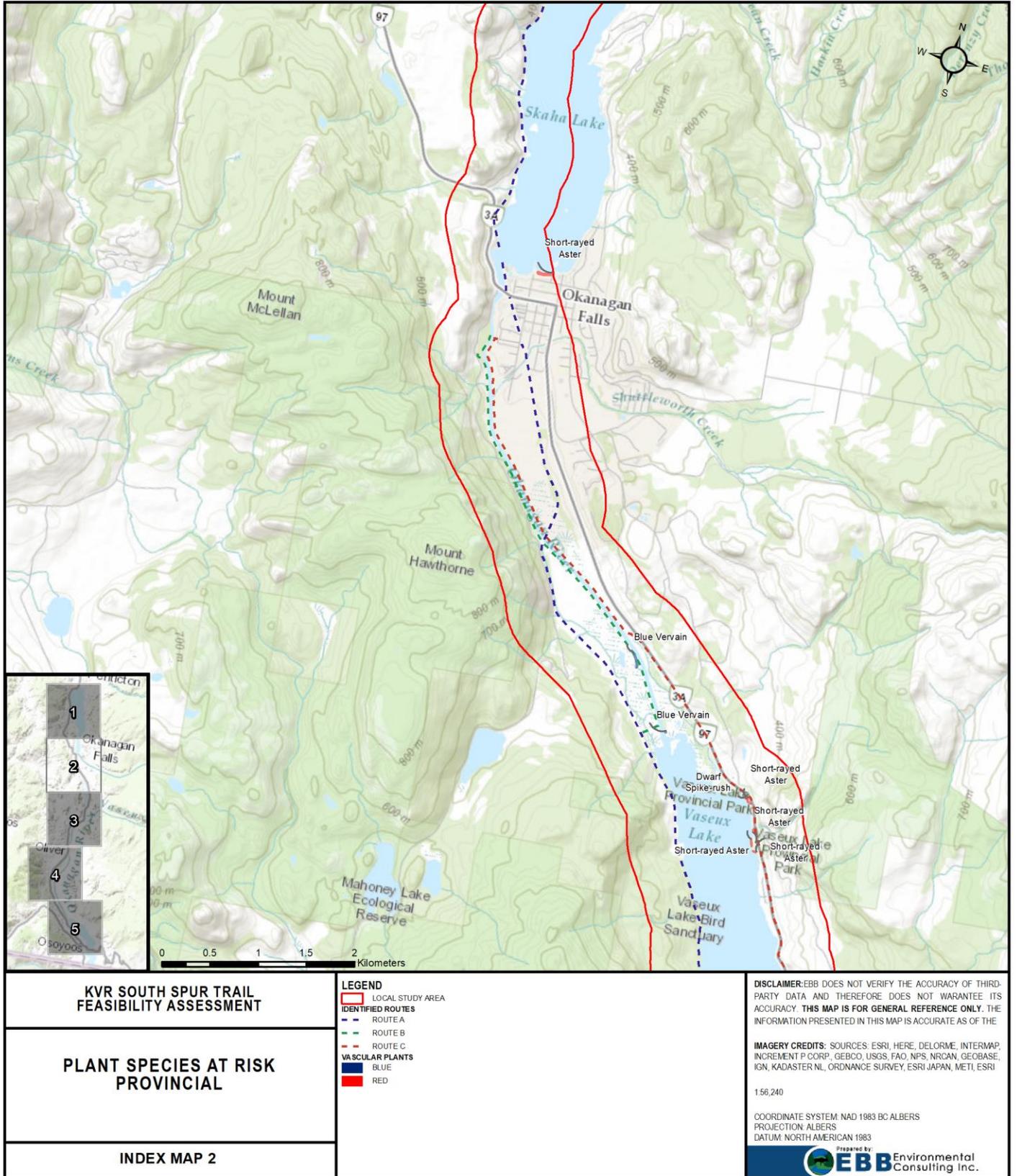


Figure 7-2. Provincially listed plant species at risk within Section 2 of the LSA.

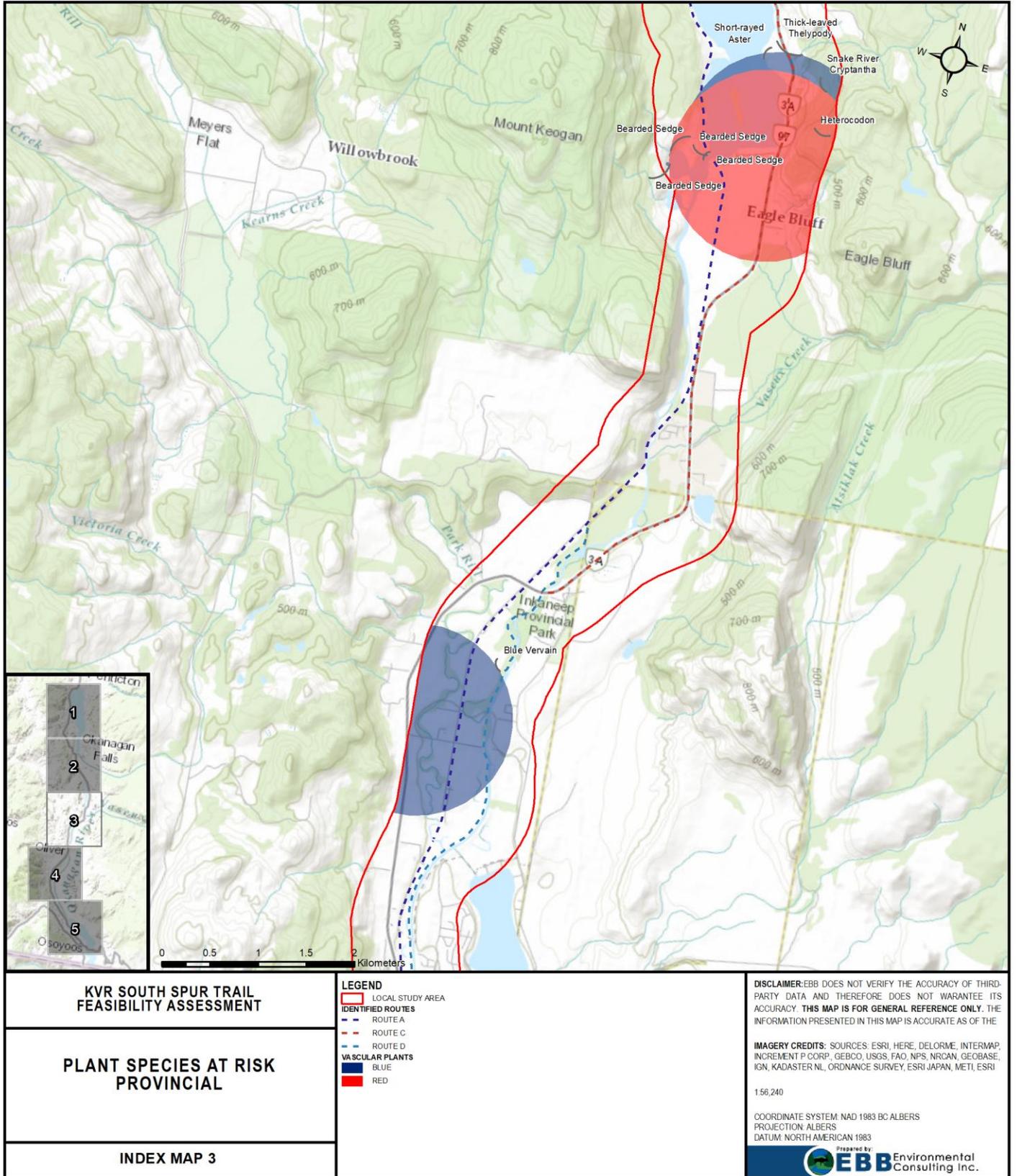


Figure 7-3. Provincially listed plant species at risk within Section 3 of the LSA.

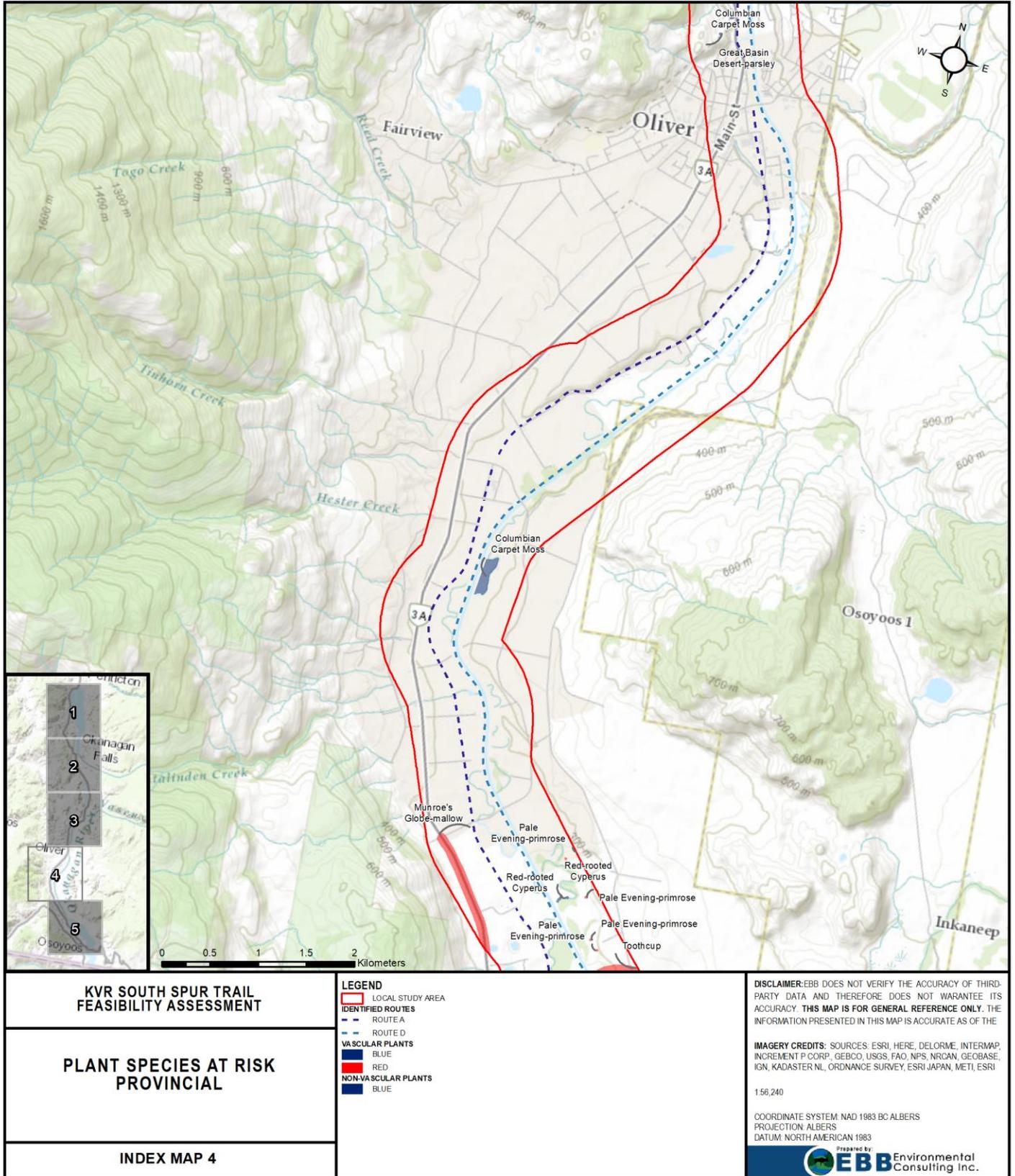


Figure 7-4. Provincially listed plant species at risk within Section 4 of the LSA.

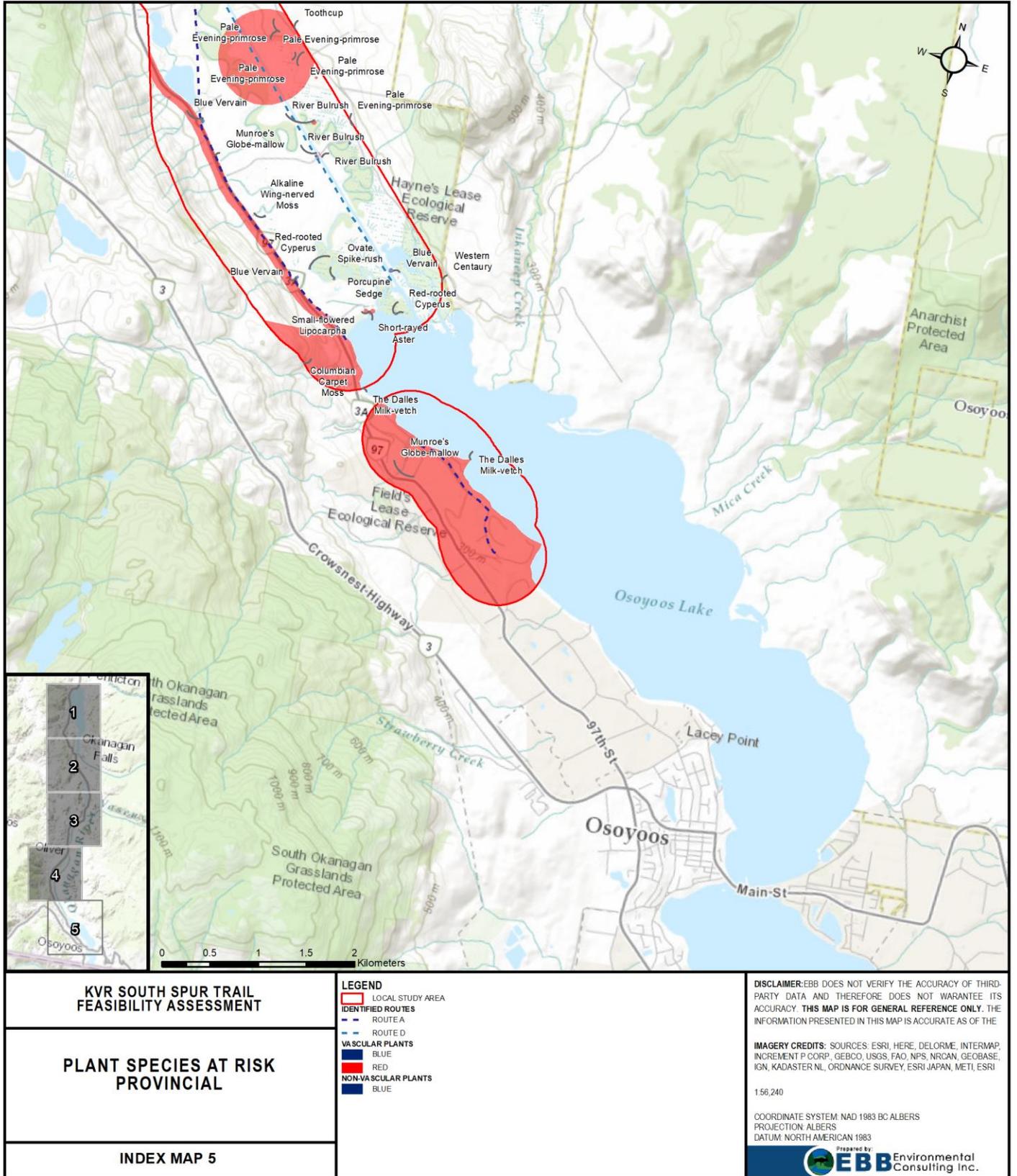


Figure 7-5. Provincially listed plant species at risk within Section 5 of the LSA.

Of the identified plant species at risk occurring within the LSA, five plant species at risk are listed under SARA. A summary of the applicable listing status, CF priority, and affected routes is provided in Table 7-3.

**Table 7-3. SARA listed species at risk identified to occur within the LSA.**

Identified SARA Listed Species at Risk					
English Name	Scientific Name	CDC List	SARA	CF Priority	Route(s) Present
Short-rayed alkali aster	<i>Symphyotrichum frondosum</i>	Red	1-E	1	A, C
Toothcup	<i>Rotala ramosior</i>	Red	1-E	1	A, D
Columbian Carpet Moss	<i>Bryoerythrophyllum columbianum</i>	Blue	1-SC	2	A, D
Alkaline Wing-nerved Moss	<i>Pterygoneurum kozlovii</i>	Blue	1-T	1	D
Small-flowered Lipocarpha	<i>Lipocarpha micrantha</i>	Red	1-E	1	A, D

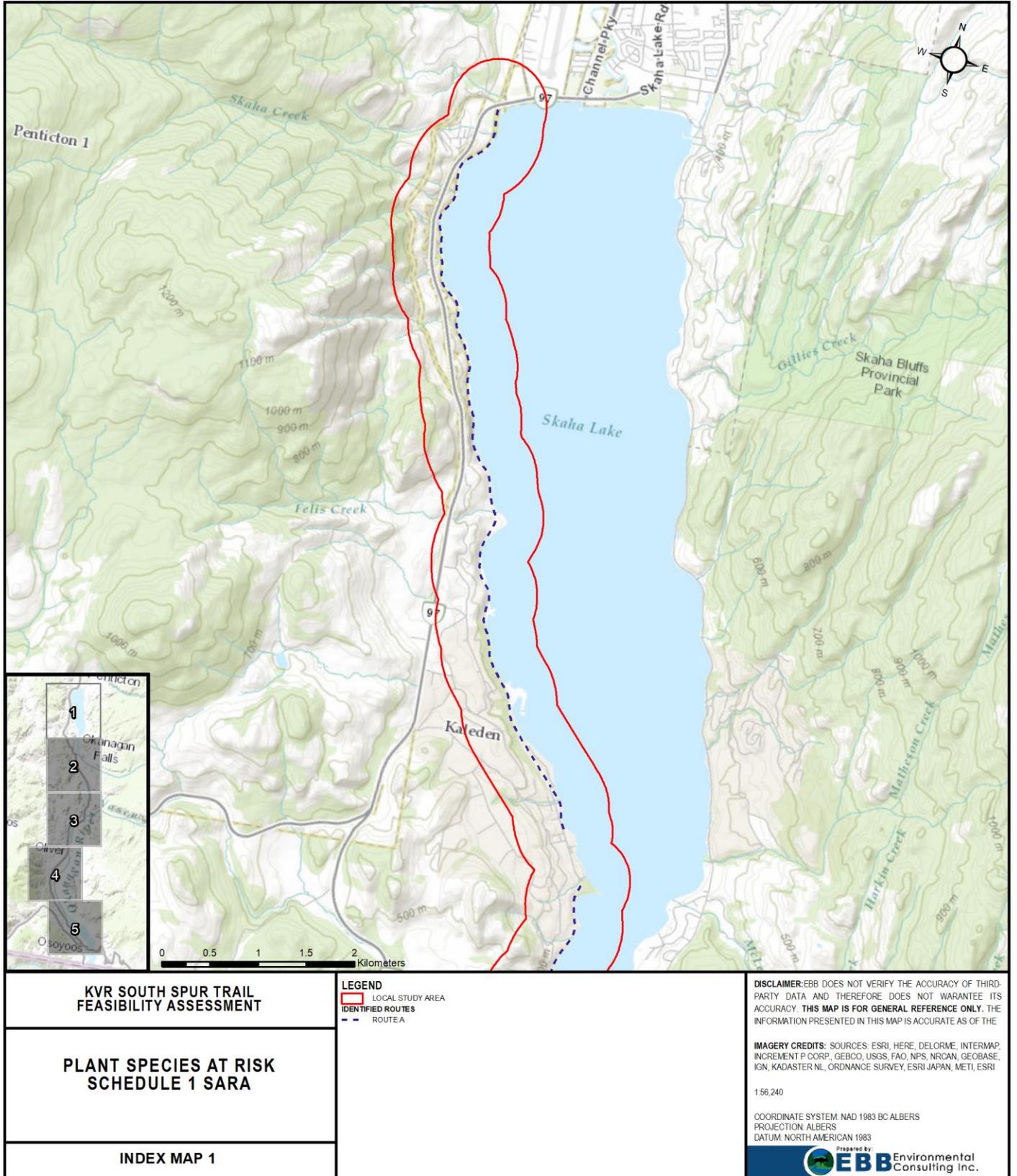


Figure 7-6. No SARA listed plant species at risk within Section 1 of the LSA.

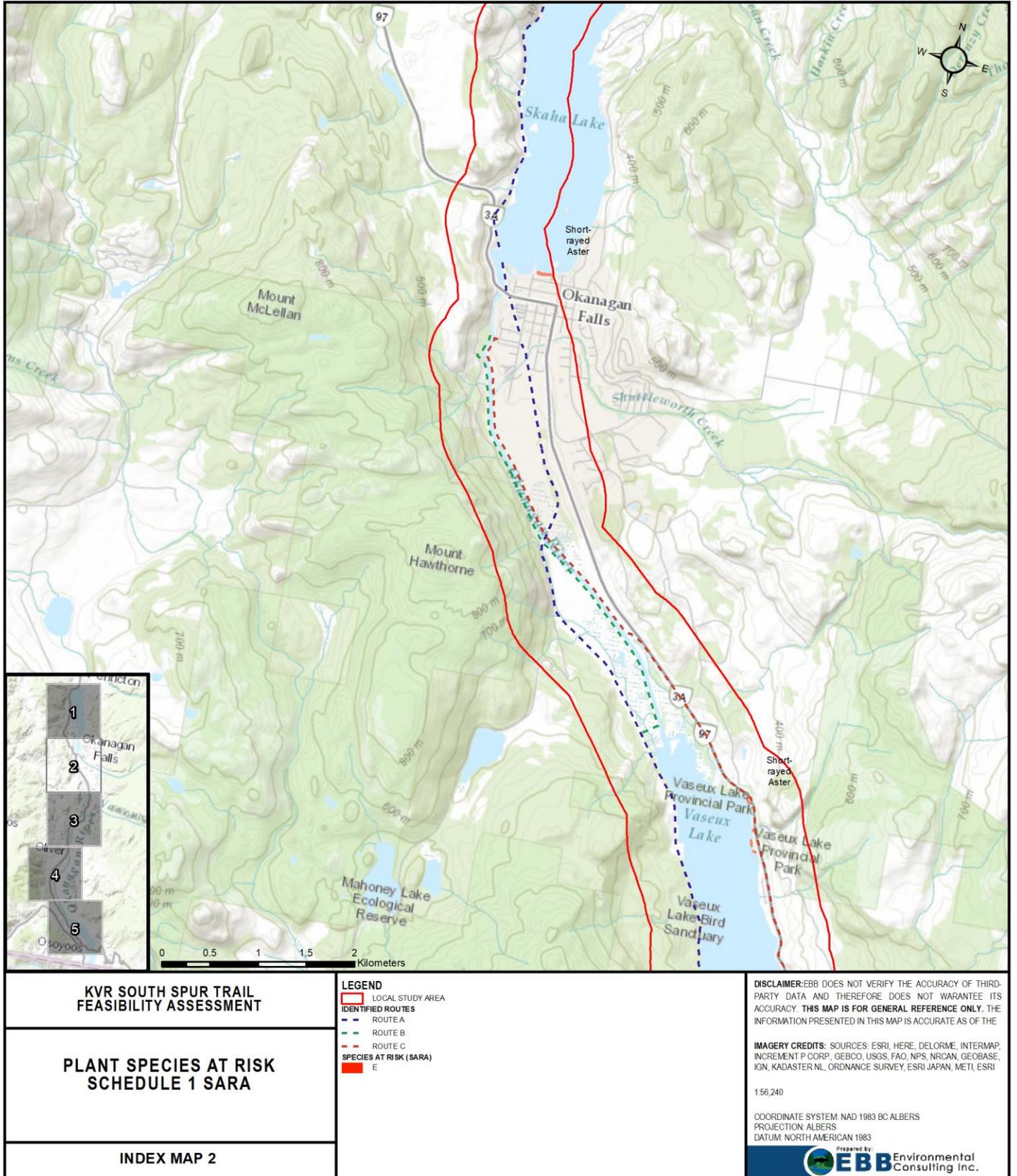


Figure 7-7. SARA listed plant species at risk within the Section 2 of the LSA.

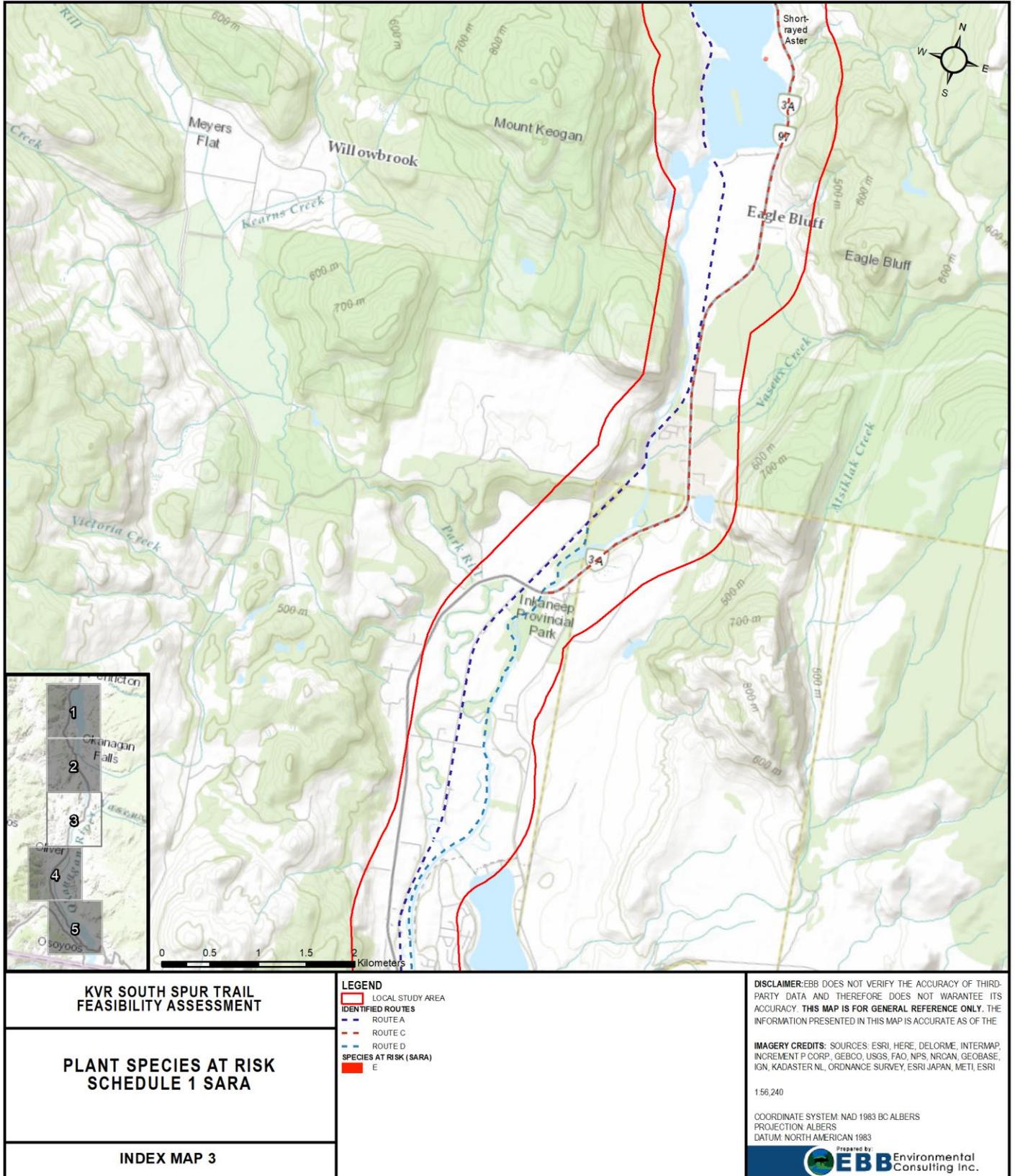


Figure 7-8. SARA listed plant species at risk within Section 3 of the LSA.

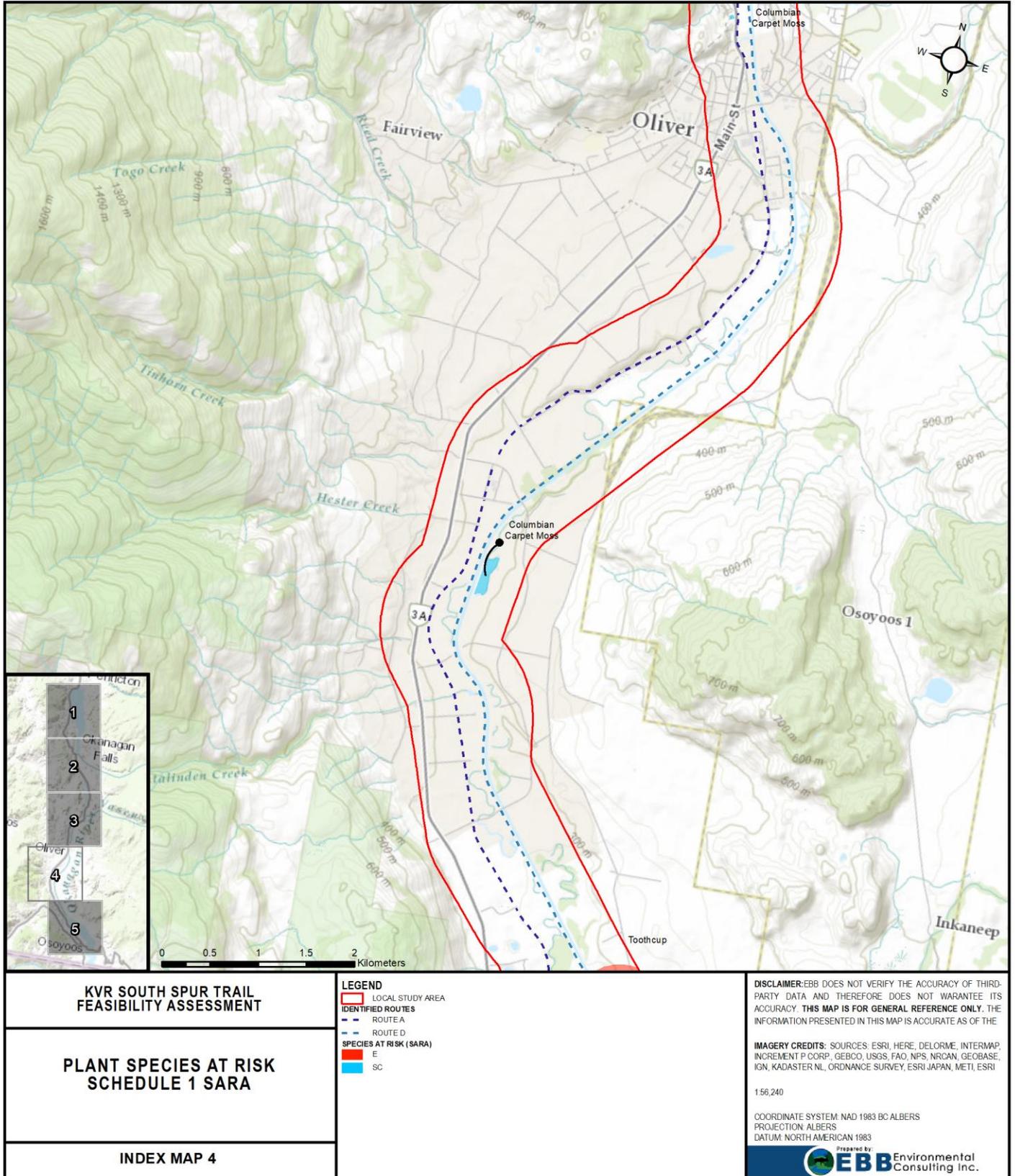


Figure 7-9. SARA listed plant species at risk within Section 4 of the LSA.

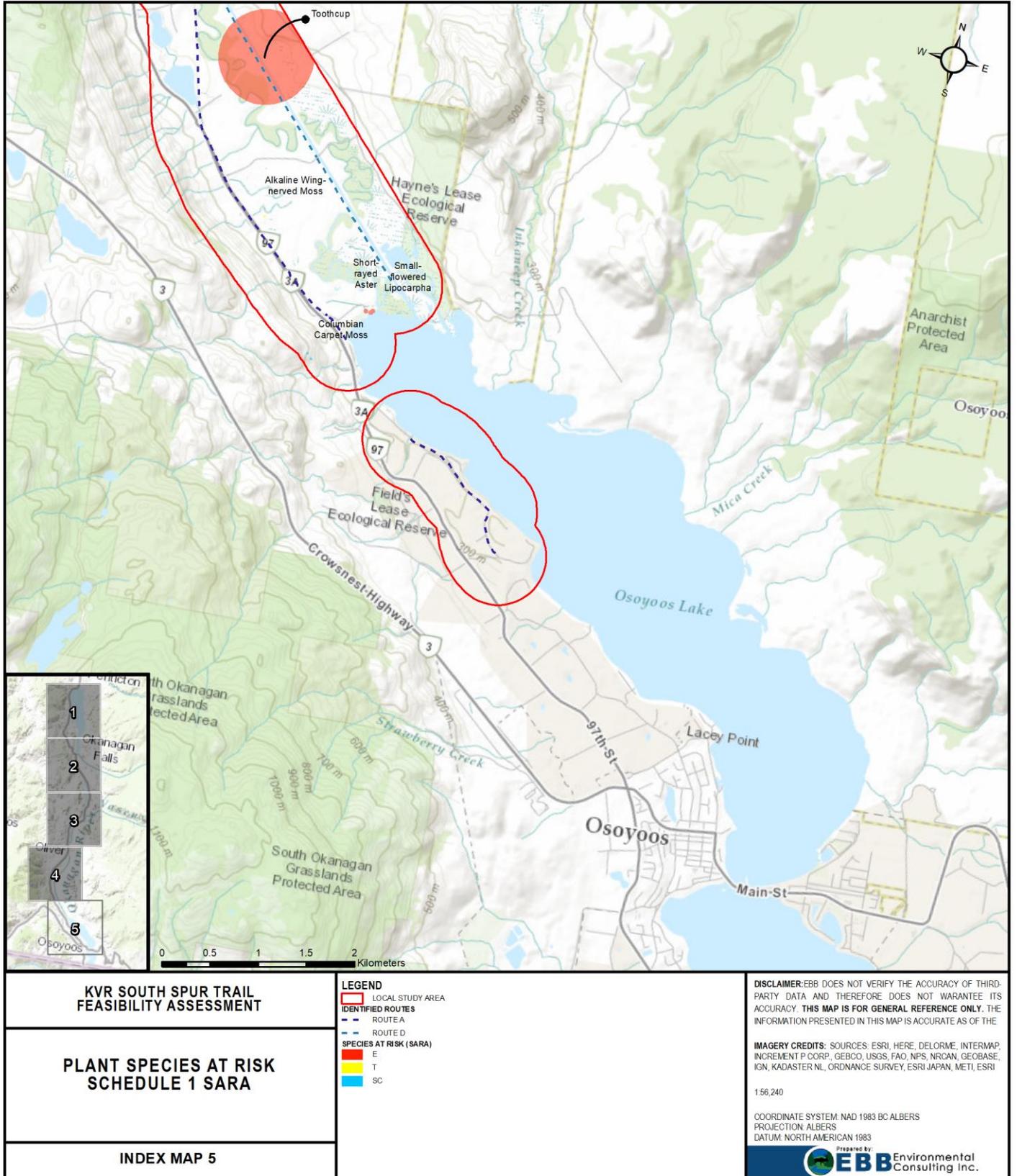


Figure 7-10. SARA listed plant species at risk within Section 5 of the LSA.

### 7.1.2.2 Critical Habitat

Of the identified plant species at risk, legally defined Critical Habitat for one species (short-rayed alkali aster, *Symphyotrichum frondosum*) occurs within the LSA. Known occurrences of this plant species at risk include the northeast shoreline of Vaseux Lake and the southern shoreline of Skaha Lake near Christie Memorial Provincial Park. Critical Habitat for this species is summarized below.

**SHORT-RAYED ALKALI ASTER**  
*Symphyotrichum frondosum*

RED, ENDANGERED (SCH. 1)

Short-rayed alkali aster is a late emergent shoreline species reported primarily from lakeshore habitats in moist drawdown zones of sandy beaches and perimeters of alkali lakes and ponds (COSEWIC 2006). Critical habitat for short-rayed alkali aster includes the area occupied by individual plants or patches of plants including and additional 50-meter critical function zone (Environment Canada 2013). Ecological features integral to the production and maintenance of suitable habitat include:

- Seasonally-flooded shorelines.
- Associated draw-down zone adjacent to shorelines.

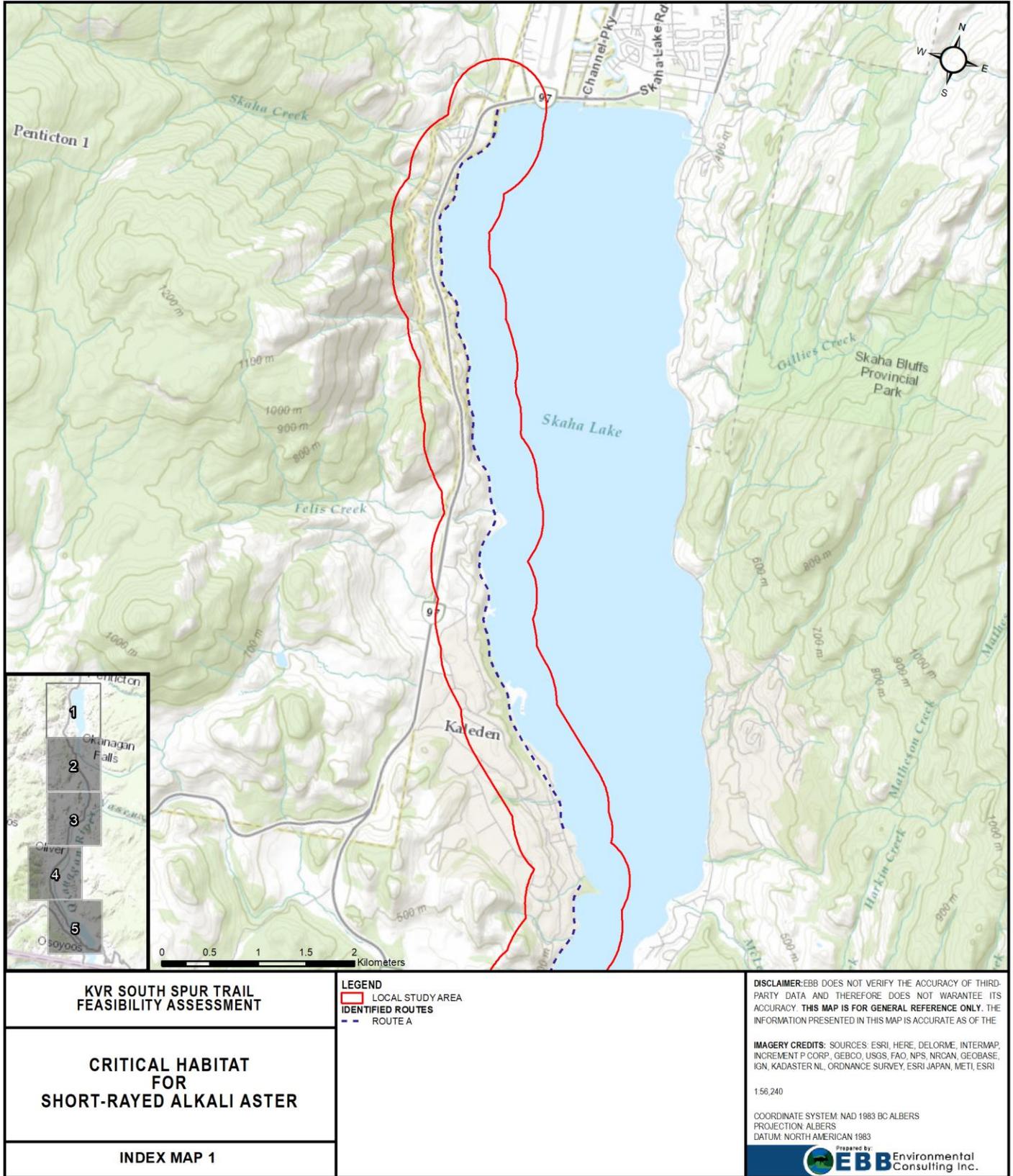


Figure 7-11. No Critical Habitat for short-rayed alkali aster within Section 1 of the LSA.

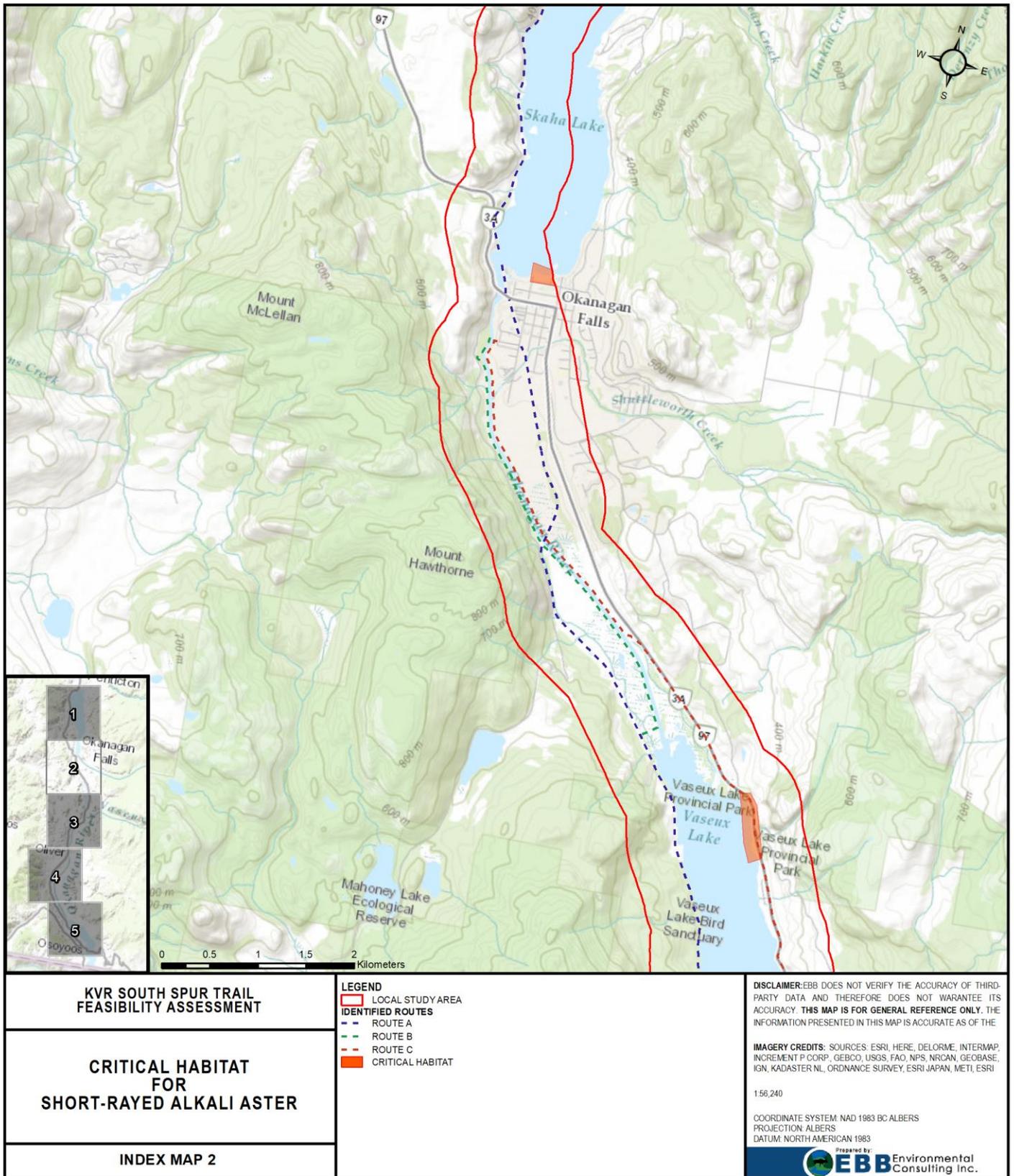


Figure 7-12. Critical Habitat for short-rayed alkali aster with Section 2 of the LSA.

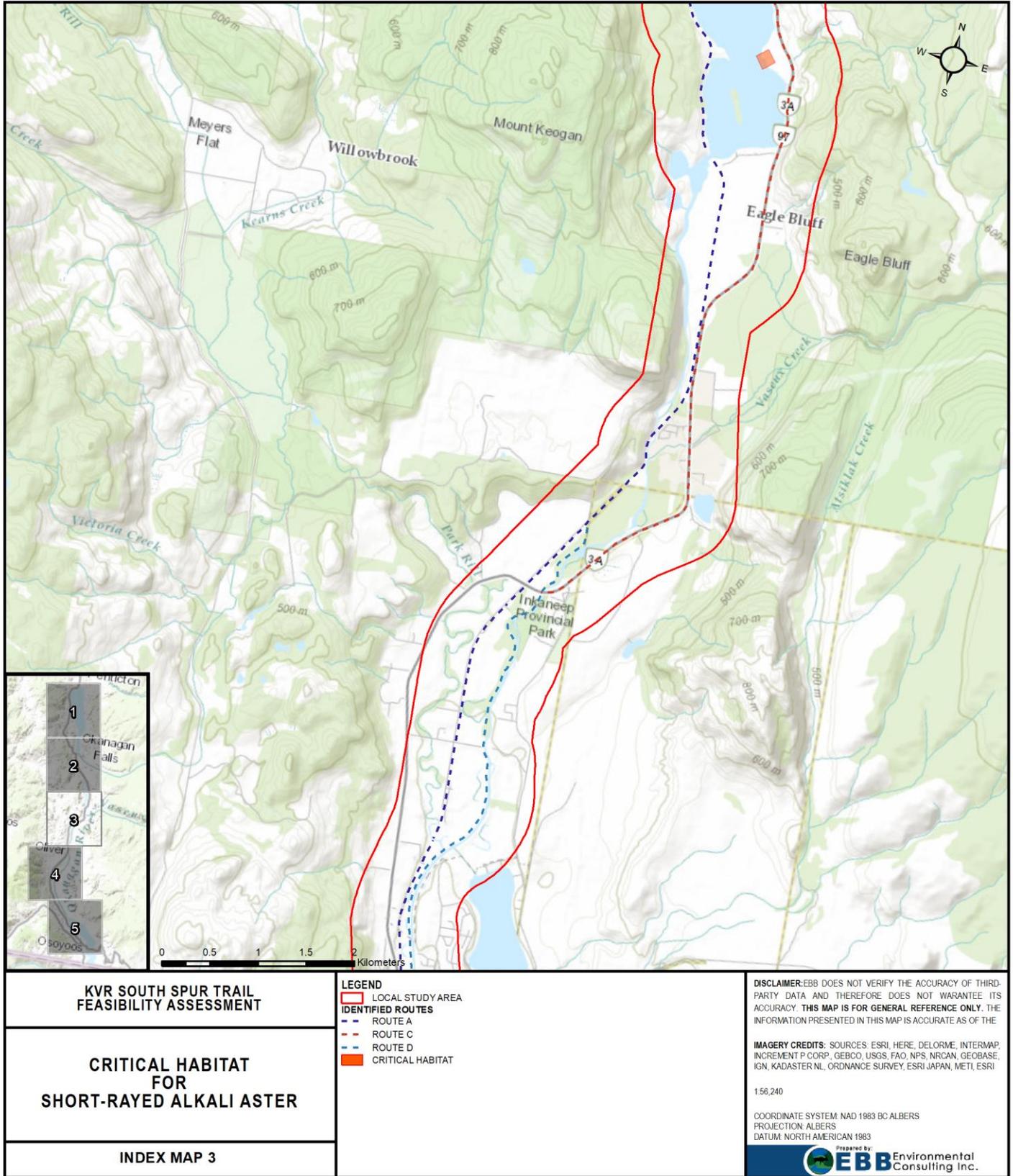


Figure 7-13. Critical Habitat for short-rayed alkali aster with Section 3 of the LSA.

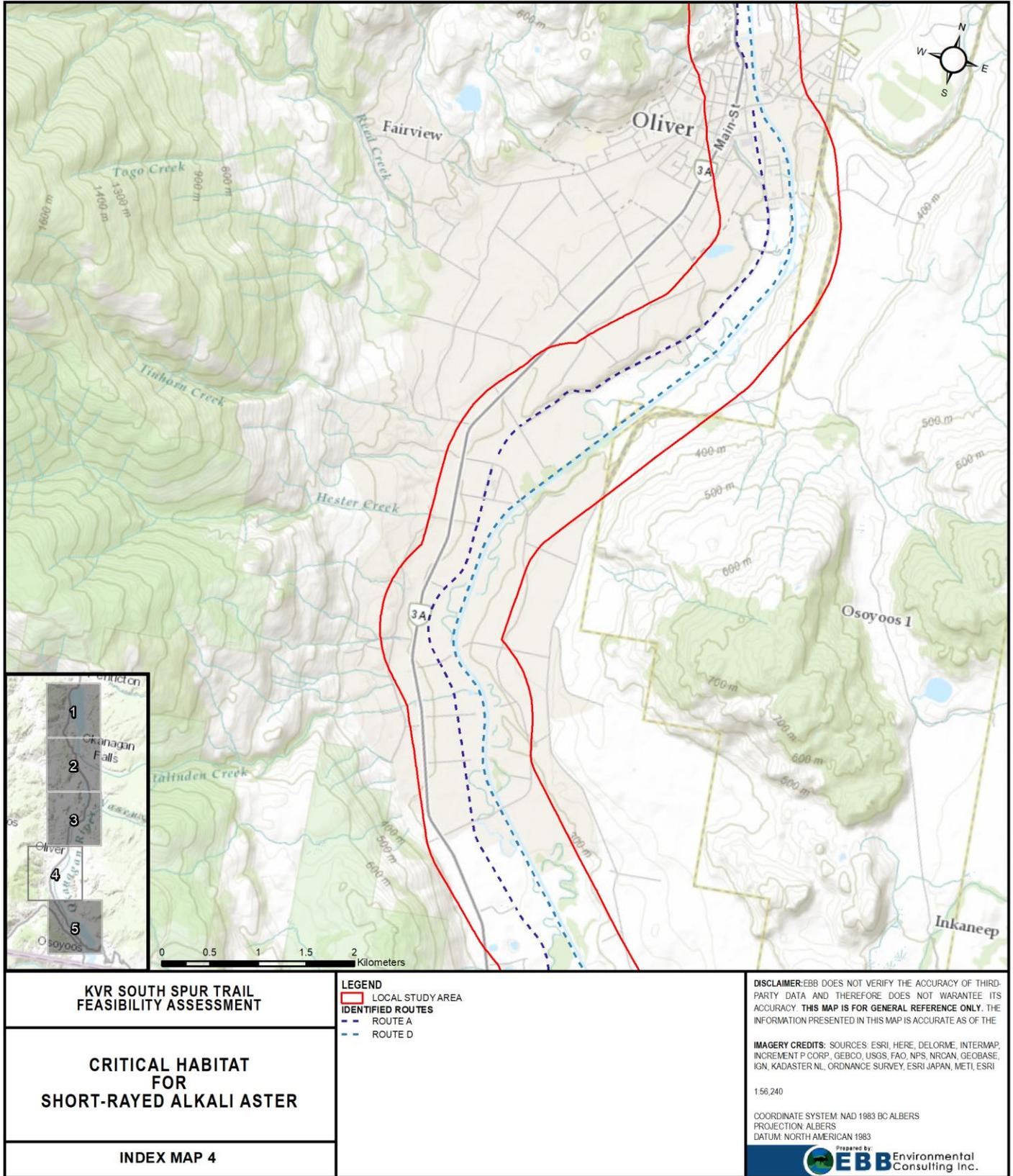


Figure 7-14. No Critical Habitat for short-rayed alkali aster with Section 4 of the LSA.

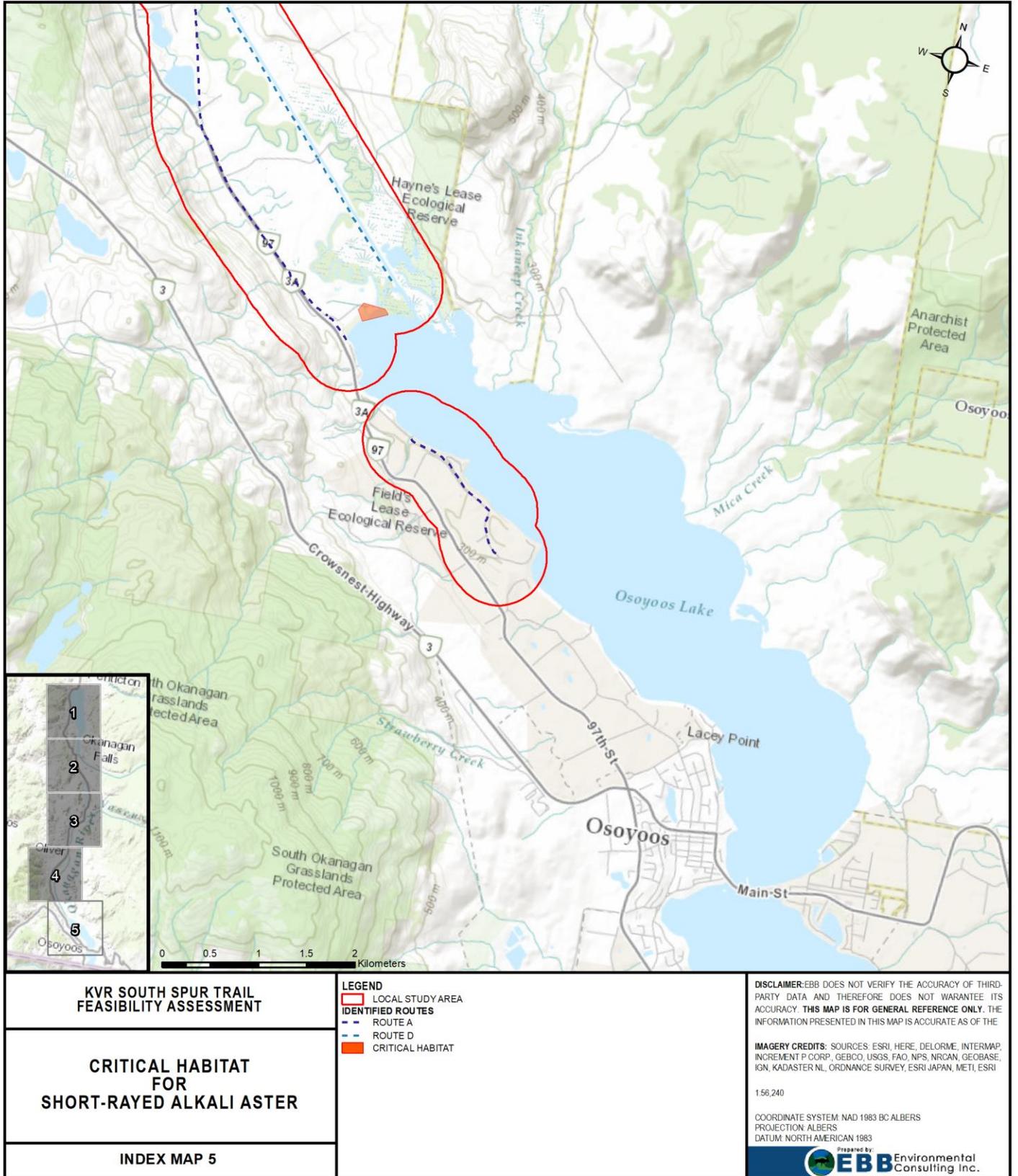


Figure 7-15. Critical Habitat for short-rayed alkali aster with Section 5 of the LSA.

### 7.1.2.3 Invasive Plants

Based on the B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) Invasive Plant Program (IPP) observation and treatment data, thirty-seven species of invasive plants have been documented to occur within 50 m of the identified routes (FLNRORD 2017). Of these, fifteen are listed as either provincial or regional noxious weeds under the Weed Control Regulation (BC Reg. 66/85) and therefore any occupier of Crown lands has a legislated duty to control noxious weeds (Weed Control Act, Section 2).

**Table 7-4. Summary of invasive plants and noxious weeds identified to occur within 50 m of the identified routes.**

Identified Invasive Plants			
English Name	Scientific Name	Regulated Species	Affected Route(s)
Baby's breath	<i>Gypsophila paniculata</i>	No	A, B, C, D
Blueweed	<i>Echium vulgare</i>	Yes	A
Bull thistle	<i>Cirsium vulgare</i>	No	A
Burdock species	<i>Arctium</i> spp.	Yes	A, B, D
Canada thistle	<i>Cirsium arvense</i>	Yes	A, B, C, D
Common tansy	<i>Tanacetum vulgare</i>	Yes	A, B, C
Curly leaf pondweed	<i>Potamogeton crispus</i>	No	C
Dalmatian toadflax	<i>Linaria dalmatica</i>	Yes	A, B, C, D
Diffuse knapweed	<i>Centaurea diffusa</i>	Yes	A, B, C, D
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>	No	C
Fragrant water lily	<i>Nymphaea odorata</i> ssp. <i>odorata</i>	No	C
Hairy cat's-ear	<i>Hypochaeris radicata</i>	No	D
Hoary alyssum	<i>Berteroa incana</i>	No	A, D
Hoary cress	<i>Cardaria draba</i>	No	A
Hound's-tongue	<i>Cynoglossum officinale</i>	Yes	A, B, C, D
Japanese knotweed	<i>Fallopia japonica</i>	Yes	A
Kochia	<i>Kochia scoparia</i>	No	C
Longspine sandbur	<i>Cenchrus longispinus</i>	No	A, C, D
Mullein	<i>Verbascum thapsis</i>	No	A, B, C
Night-flowering catchfly	<i>Silene noctiflora</i>	No	B, C
Perennial sow thistle	<i>Sonchus arvensis</i>	Yes	C
Puncturevine	<i>Tribulus terrestris</i>	Yes	A, C, D

Identified Invasive Plants			
English Name	Scientific Name	Regulated Species	Affected Route(s)
Purple loosestrife	<i>Lythrum salicaria</i>	Yes	A, B, C
Russian knapweed	<i>Acroptilon repens</i>	No	A
Russian olive	<i>Elaeagnus angustifolia</i>	No	D
Russian thistle	<i>Salsola kali</i>	No	D
Scotch thistle	<i>Onopordum acanthium</i>	No	A, D
Shepherd's-purse	<i>Capsella bursa-pastoris</i>	No	A
Spotted knapweed	<i>Centaurea biebersteinii</i>	Yes	B
St. John's wort	<i>Hypericum perforatum</i>	No	A
Sulphur cinquefoil	<i>Potentilla recta</i>	Yes	A, B, C
Tansy ragwort	<i>Senecio jacobaea</i>	Yes	C
Wild buckwheat	<i>Polygonum convolvulus</i>	No	A
Wild four o'clock	<i>Mirabilis nyctaginea</i>	No	A, C, D
Wild mustard	<i>Sinapis arvensis</i>	No	A
Yellow iris	<i>Iris pseudachorus</i>	Yes	A, C
Yellow toadflax	<i>Linaria vulgaris</i>	No	A

#### 7.1.2.4 Sensitive Ecosystems

Sensitive ecosystems within the Local Study Area include 432 element occurrences representing 26 ecosystems. Of this, 94% has been classified as sensitive ecosystems by Iverson *et al.* (2008). The LSA presents a wide diversity of ecosystems, with no one ecosystem representing more than 20% of the total area. Highest representing ecosystems include antelope-brush (14.2%), seasonally flooded fields (11.6%), and coniferous woodlands (14.9%). A summary of sensitive ecosystems, including percent representation within the LSA and routes present is outlined in Table 7-5.

**Table 7-5. Summary of sensitive ecosystems occurring within the LSA.**

Sensitive Ecosystems occurring within the LSA				
SEI Class	SEI Subclass	SEI Code	Percent Represented	Route(s) Present
<b>Antelope Brush Steppe</b> <i>Shrub-steppe ecosystems dominated by antelope-brush.</i>	Antelope Brush Steppe	AS:as	14.2%	A, B, C, D
	Disturbed Antelope Brush Steppe	AS:ds	5.6%	A, B, C, D
<b>Seasonally Flooded Fields</b> <i>Agricultural areas that are often flooded during spring run-off</i>	Seasonally Flooded Fields	FS	11.6%	A, B, C, D

<b>Sensitive Ecosystems occurring within the LSA</b>				
<i>SEI Class</i>	<i>SEI Subclass</i>	<i>SEI Code</i>	<i>Percent Represented</i>	<i>Route(s) Present</i>
<b>Grasslands</b> <i>Ecosystems dominated by bunchgrasses</i>	Grasslands	GR:gr	0.7%	A, B, C, D
	Steep Grasslands	GR:ss	1.5%	A, B, C, D
	Steep, Shallow-soiled Grasslands	GR:st	5.8%	A, B, C, D
<b>Mature Forest</b> <i>Forests dominated by mature coniferous trees; excludes coniferous and broadleaf woodlands.</i>	Mature Forest	MF:co	0.2%	A, B, C
<b>Old Forest</b> <i>Forest ecosystems dominated by large, old coniferous trees.</i>	Old Forest	OF:co	1.1%	A, B, C
<b>Riparian</b> <i>Treed or shrubby ecosystems associated with pond and lake shorelines (fringe), swamps, floodplains, or gullies with intermittent or permanent creeks.</i>	Beach	RI:be	0.3%	A, C, D
	Fringe	RI:ff	0.01%	A
	Floodplain	RI:fp	2.7%	A, C, D
	Gully	RI:gu	0.2%	A, C, D
	River	RI:ri	0.6%	A, C, D
	Shrub	RI:sh	9.4%	A, B, C, D
<b>Sagebrush Steppe</b> <i>Shrub-steppe ecosystems dominated by big sagebrush.</i>	Dominated by big sagebrush and invasive plants	SS:ds	0.2%	A
	Steep, shallow soil sagebrush steppe	SS:sh	0.1%	A, B, C
	Dominated by big sagebrush and bunchgrasses	SS:ss	0.6%	A, C
	Steep slope sagebrush steppe	SS:st	1.7%	A, C, D
<b>Sparsely Vegetated</b> <i>Ecosystems with little vegetation occurring on bedrock or colluvial features.</i>	Cliff	SV:cl	1.7%	A, B, C
	Rocky Outcrop	SV:ro	8.0%	A, B, C, D
	Shrubby Rock Outcrop	SV:sh	1.1%	A, B, D
	Talus	SV:ta	4.2%	A, B, C, D
<b>Coniferous Woodlands</b> <i>Open stands of Douglas-fir or ponderosa pine, often on shallow soils, with typically grassy understories; old Coniferous Woodlands are part of the Old Forest category.</i>	Coniferous Woodlands	WD:co	14.9%	A, B, C, D
<b>Wetlands</b> <i>Ecosystems where the water table is at or near the surface.</i>	Marsh	WN:ms	2.2%	A, B, C, D
	Shallow Open Water	WN:sw	4.6%	A, B, C, D
	Wet meadows	WN:wm	1.1%	A, C, D
<b>Not Sensitive</b>	Not Sensitive	NA	5.7%	A, B, C, D

### 7.1.2.5 Ecological Communities at Risk

A total of 18 provincially listed ecological communities, represented by 259 ecological units, occur within the RSA. The LSA contains six provincially listed ecological communities at risk (Table 7-6), represented by 52 ecosystem units. These ecological communities at risk are intersected by the identified routes, indicating potential for direct impacts to ecological communities at risk. A summary of each of the ecological communities at risk occurring within the LSA is detailed below.

**Table 7-6. Summary of at risk ecological communities intersected by identified routes.**

Ecological Communities at Risk			
<i>At Risk Ecological Community</i>	<i>CDC List</i>	<i>CF Priority</i>	<i>Route(s) Present</i>
Antelope-brush / Needle-and-thread Grass	Red	1	A, C
Baltic Rush – Common Silverweed	Red	2	A, B
Black Cottonwood – Water Birch	Red	1	A, B, C, D
Common Cattail Marsh	Blue	1	A, B, C
Hard Stemmed Bulrush Marsh	Blue	4	A, D
Water Birch / Roses	Red	1	A, B, C, D

#### **ANTELOPE-BRUSH/NEEDLE-AND-THREAD GRASS**

RED

The Antelope-brush / Needle-and-thread Grass ecological community occurs between 280 to 780 m elevation in the hottest and driest climate in British Columbia. It is characterised by an open shrub layer dominated by antelope-brush (*Purshia tridentata*) and big sagebrush (*Artemisia tridentata*) (Iverson 2012). This ecological community commonly occurs on level to gently sloping terraces. Soils are typically deep, rapidly drained and dominated by coarse sands, often with some gravel or cobblestones (Atwood 1998).

#### **BALTIC RUSH – COMMON SILVERWEED**

RED

The Baltic Rush – Common Silverweed ecological community is an uncommon saline marsh in the dry climates of the Southern Interior. Soils are fine textured, poorly to imperfectly drained, with upwards of 10 cm of surface organic accumulation (MacKenzie and Moran 2004).

#### **BLACK COTTONWOOD – WATER BIRCH**

RED

The Black Cottonwood – Water Birch ecological community occurs in valley bottoms or on high-bench floodplains with seasonal highwater tables (BC CDC 2017c). Soil textures range from medium to coarse. Soils are generally classified as Orthic or Gleyed Cumulic Regosols. Dominant tree species include black cottonwood (*Populus trichocarpa*). Typical shrub layer species include water birch (*Betula occidentalis*), Nootka rose (*Rosa nutkana*), red-osier dogwood (*Cornus sericea*) and common snowberry (*Symphoricarpos albus*). Herb layer species vary, and can include star-flowered false Solomon's-sea (*Maianthemum stellatum*), horsetail (*Equisetum hyemale*), common sweet-cicely (*Osmorhiza berteroi*), and American vetch (*Vicia Americana*) (BC CDC 2017c).

**COMMON CATTAIL MARSH**

BLUE

Common cattail marshes are common throughout the interior at low elevations with warmer summers. (MacKenzie and Moran 2004). These sites have organic veneers of well-decomposing, odiferous muck. Soil types can be Humisols and Humic Gleysols.

**HARD-STEMMED BULRUSH MARSH**

BLUE

Hard Stemmed Bulrush Marshes occur in subzones with warm and dry summers. This site association is commonly located in wave-exposed lake embayments with considerable water movement and grassland potholes (MacKenzie and Moran 2004). Plant diversity is typically low in this site association. Soils are commonly Gleysols and Humic Gleysols.

**WATER BIRCH / ROSES**

RED

The Water Birch / Roses ecological community occurs within middle-bench floodplain site, with seasonal high-water tables. Soils are classified as poorly drained Gleysols (BC CDC 2017d). Vegetation for this ecological community is characterized by water birch, mountain alder (*Alnus tenuifolia*), red-osier dogwood and poison ivy (*Toxicodendron rydbergii*).

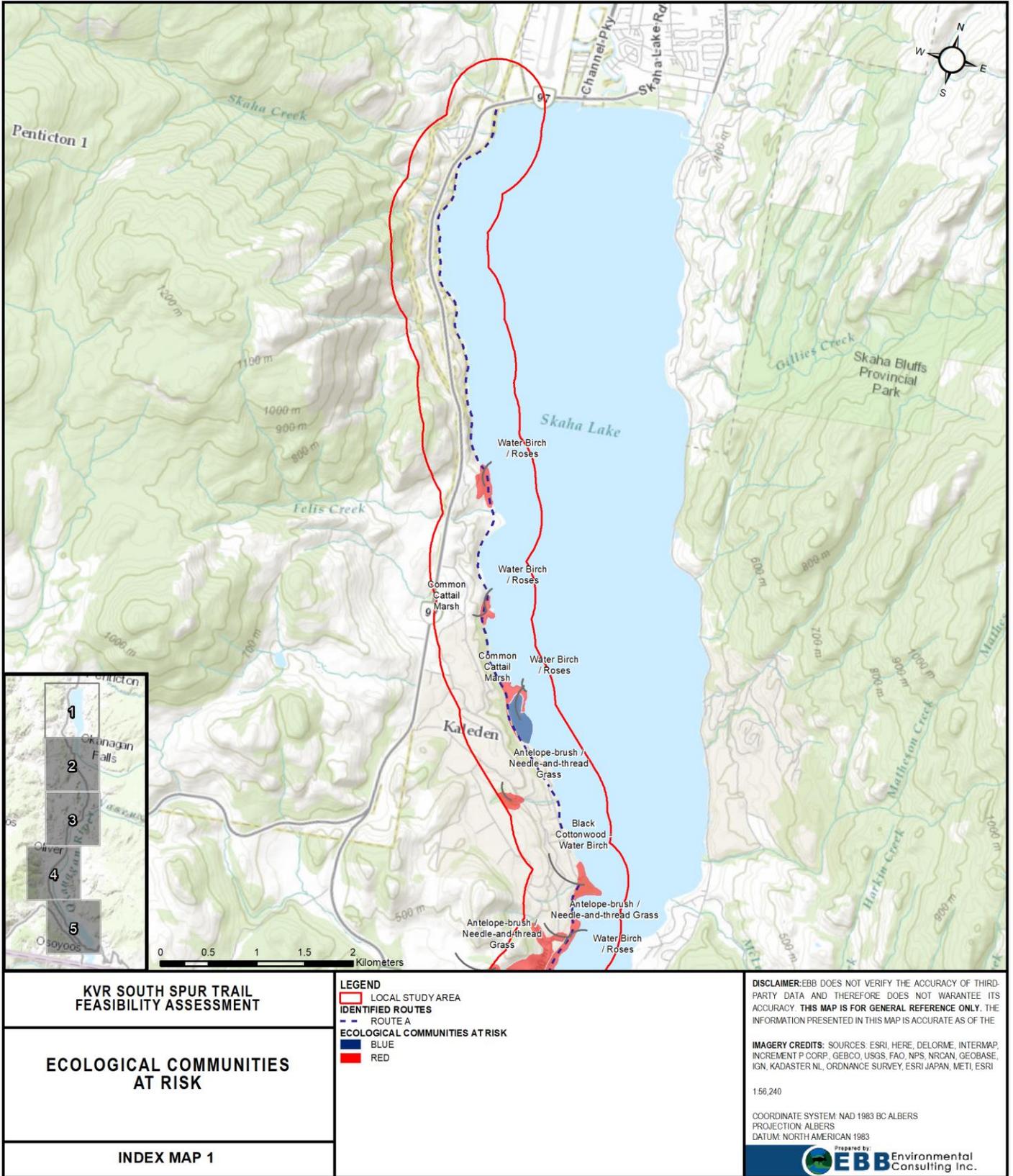


Figure 7-16. Ecological communities at risk within the Section 1 of the LSA.

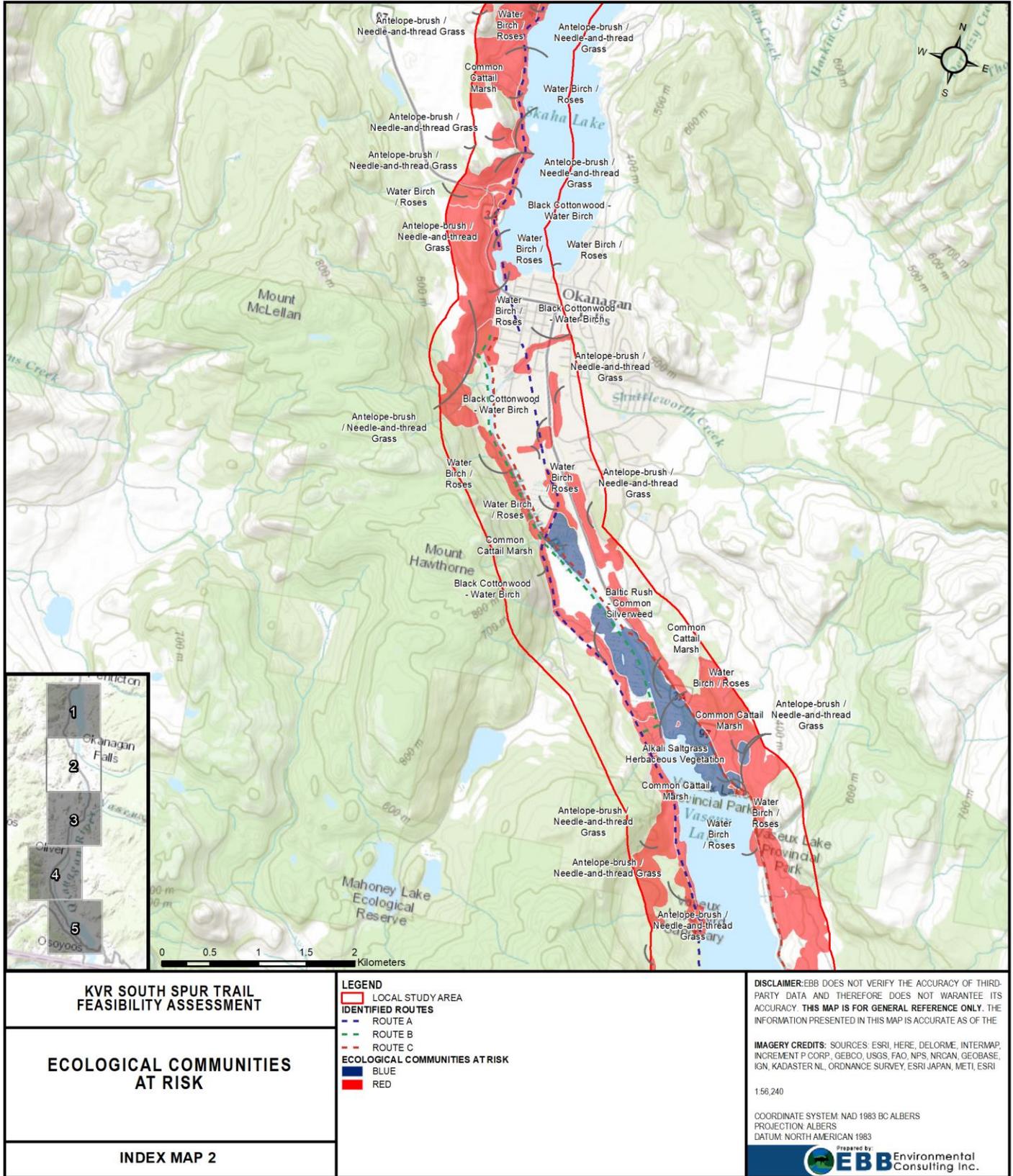


Figure 7-17. Ecological communities at risk within Section 2 of the LSA.

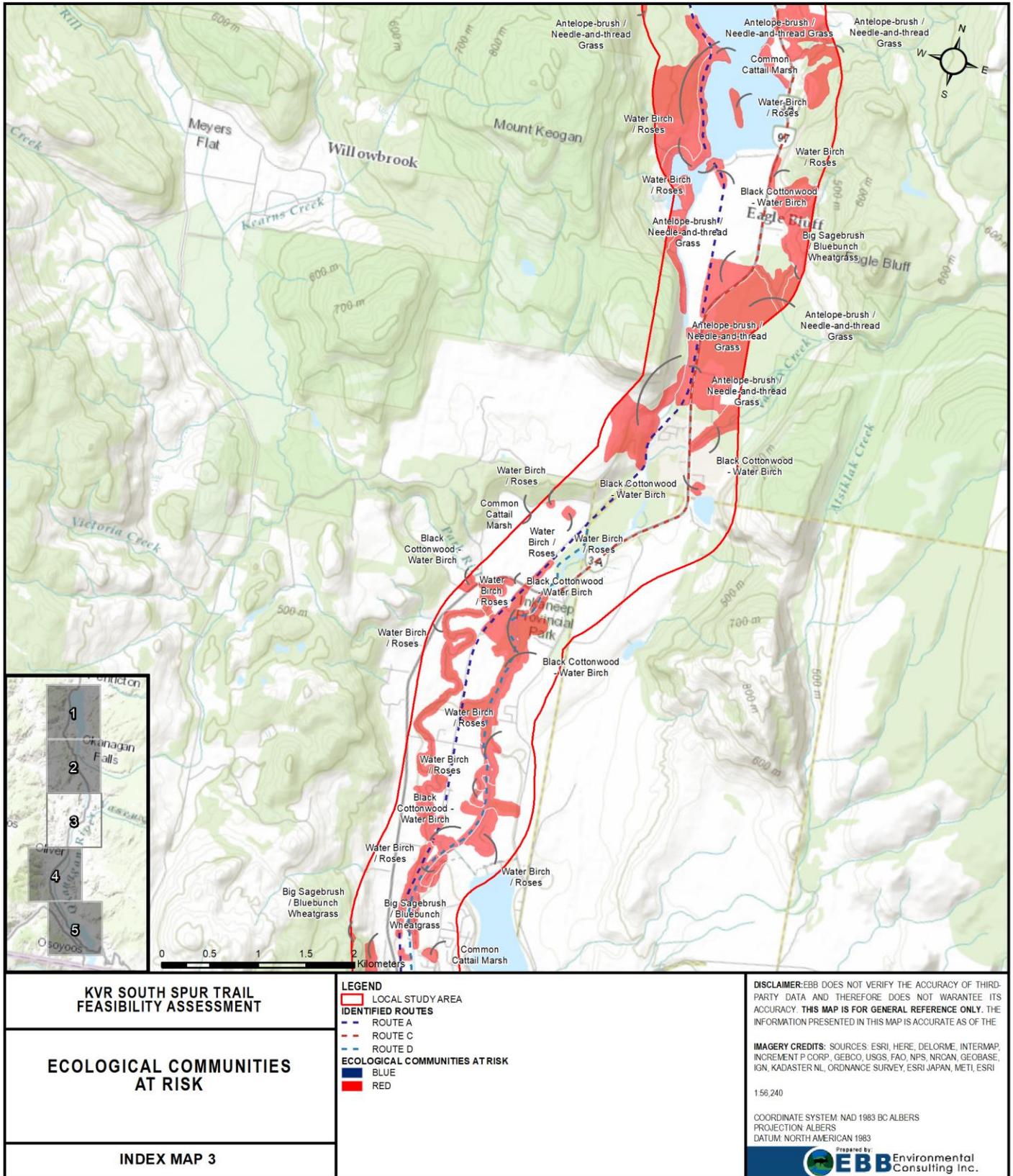


Figure 7-18. Ecological communities at risk within Section 3 of the LSA.

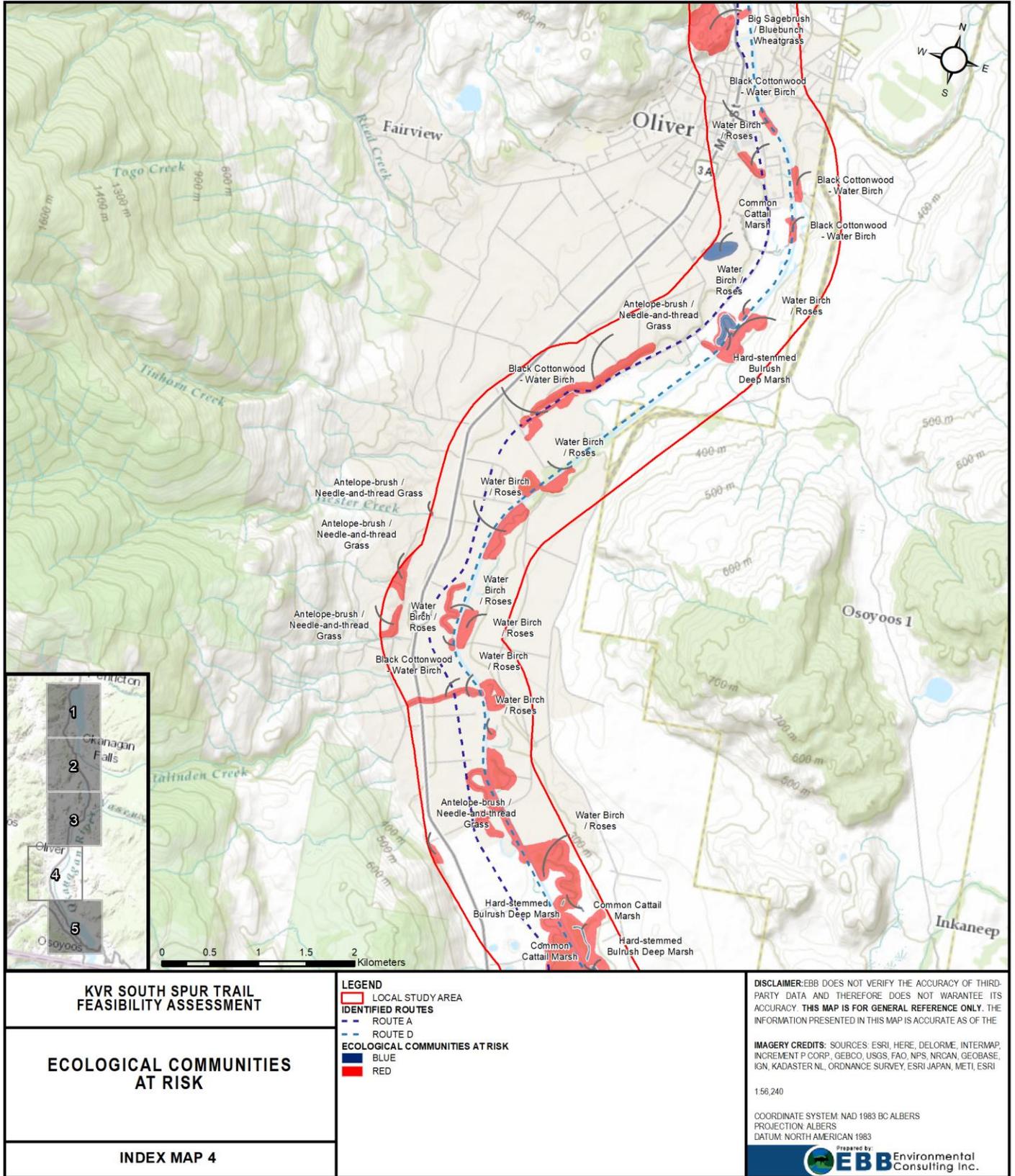


Figure 7-19. Ecological communities at risk within Section 4 of the LSA.

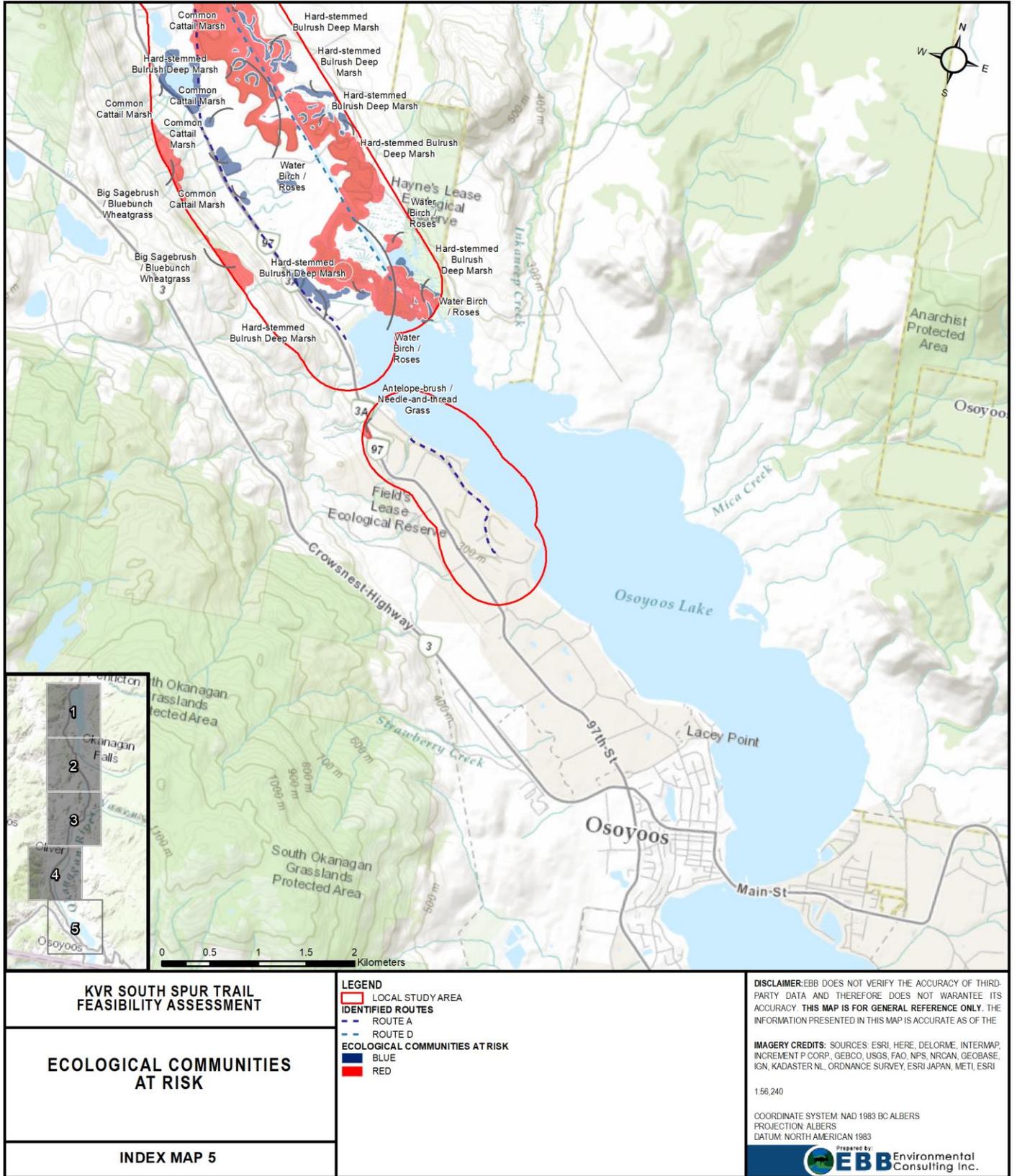


Figure 7-20. Ecological communities at risk within Section 5 of the LSA.

### 7.1.3 Potential Effects

Three broad potential environmental effects on vegetation from trail development and recreational activities have been identified and include the loss of habitat, change in habitat and the introduction of invasive plant species. Habitat loss refers to the permanent alternation of an ecosystem such that the area can no longer sustain vegetation. A change in habitat include several variables that alter the ecosystem such that it no longer functions in a manner consistent with unaffected habitat. Changes in habitat are not necessarily permanent, but do represent changes such as decreased habitat quality, changes in species composition and overall species diversity.

#### 7.1.3.1 Habitat Loss

##### General

It is assumed that during the development of the trail corridor, permanent habit loss will occur where the abandoned railbed is converted to a maintained trail with some degree of surfacing (gravel or asphalt). This assumes that all vegetation is to be removed to maintain minimum trail widths (2.0 m) to accommodate both bicycling and hiking. Additionally, it is assumed that a 0.5 m buffer on either side of the trail will be maintained and kept free of overgrowth, resulting in a total habitat loss of 3.0 m along the entire linear length of the trail corridor.

Six ecological communities at risk have been identified to occur within the LSA, with 52 element occurrences being intersected by the identified routes. Any effects to these will be dependent on the area of occupancy for the element occurrences. Direct impacts to ecological communities at risk will occur where the element occurrence is occupying habitat, whereas indirect impacts to ecological communities at risk are considered the loss of potential habitat. As several documented and historical records for plant species at risk are known to occur with the LSA, habitat loss also includes the loss of any plant species at risk.

Vegetation habitat loss will vary based on two variables, (1) the route taken and (2) the level of existing trail development. In some instances, development of trail infrastructure both on the KVR South Spur corridor and alternative routes has already occurred. All routes were considered functional and undisturbed to quantify the total area expected to be permanently lost. Table 7-7 summarizes the total area of habitat loss by identified route.

**Table 7-7. Summary of total habitat loss for vegetation by identified routes.**

Total Habitat Loss for Vegetation by Identified Route			
Route	Total Habitat Loss (Hectares)	Route Distance (Kilometers)	Per Kilometer Loss in Hectares
A	11.9	47.4	0.25
B	2.00	4.8	0.41
C	0.7	14.9	0.05
D	5.4	20.6	0.26

## Critical Habitat

Critical Habitat occurs for one SARA listed vegetation species at risk within the LSA, occurrences of this species are intersected by the identified routes, resulting in a loss of Critical Habitat. Table 7-15 summarizes the total loss of Critical Habitat by species and identified route.

**Table 7-8. Summary of Critical Habitat loss for SARA listed vegetation at risk.**

Total Critical Habitat Loss for SARA Vegetation by identified Route			
Route	Species	Total Critical Habitat Loss (Hectares)	Route Distance (Kilometers)
C	Short-rayed Alkali Aster	0.003	14.9

### 7.1.3.2 Change in Habitat

Changes in habitat as a direct result of trail development and recreational activities is well documented within the scientific literature (e.g., Boyles and Samson 1985; Barros *et al.* 2013; Ballantyne *et al.* 2016; Barros and Pickering 2017). Changes in habitat can be brought on by several factors common to trails and recreational activities, and include: (1) soil disturbances, (2) introduction and spread of invasive plants, and (3) impacts to native vegetation (B.C. Ministry of Water, Land, and Air Protection [WALP] 2004a).

Soils can be highly susceptible to disturbances such as compaction, exposure, and erosion (WALP 2004a, Pickering *et al.* 2010).

Soil compaction can affect vegetation and ecosystems by:

- Reducing water permeability and infiltration rates.
- Causing increased surface runoff of water.
- Reducing the ability of plants to establish and extend their root systems.
- Restricting burrowing and foraging activities.
- Reducing habitat availability and quality for fish, amphibians, and invertebrates.

Soil exposure and erosion can impact vegetation and ecosystems by:

- Removing topsoil, organic matter and nutrients (Pickering *et al.* 2010),
- Exposing plant root systems, leaving the plant vulnerable to stress.
- Removal of the microbial (cryptogamic) crusts which holds soil particles together, retains soil moisture, and provides nutrients (Atwood and Krannitz 2000)
- Prevents the establishment of new plants.
- Provides the opportunity or the establishment of invasive plants.
- Causes sedimentation of streams.

Native vegetation can be adversely impacted by trails and recreational activities, with the degree of impact varying based on the tolerance of the individual plant species to disturbance. General disturbance variables can include trampling (Mason *et al.* 2015) and the introduction of invasive plants, which has the potential to result in:

- The loss of plant cover and root systems.

- Loss of plant diversity.
- Changes in plant communities.
- Changes in the structure or composition of plant communities.

Species richness and composition has been documented to be reduced along the edge of trails, and up to 5 m away from the trail (Ballantyne *et al.* 2016). These impacts are typically more pronounced on wider, developed trails with gravel or asphalt surfacing. Table 7-9 summarized the total change in habitat based on the 5 m edge effect.

**Table 7-9. Summary of total change in habitat for vegetation by identified routes.**

Total Change in Habitat for Vegetation by Identified Route			
Route	Total Change in Habitat (Hectares)	Route Distance (Kilometers)	Per Kilometer Change in Hectares
A	19.8	47.4	0.42
B	3.2	4.8	0.66
C	1.4	14.9	0.09
D	9.1	20.6	0.44

Wildfires also contribute to changes in habitat, with the degree of change dependant on the fire intensity. Wildfire risk generally increases in areas of human activities and are generally more frequent than natural (*i.e.*, lightning) fire ignitions but tend to burn smaller areas due to detection and suppression (Bar-Massada *et al.* 2014). While the effects of wildfire are often viewed in a negative context, ecologically fire play an important role in developing ecosystem structure, with several plants (e.g., lodgepole pine, ponderosa pine, antelope-brush) being dependant on fires for propagation.

### 7.1.3.3 Invasive Plants

Invasive plants are prevalent within the LSA, with documented invasive plants occupying 91.6 hectares within the LSA. Total occurrences of invasive plants within the LSA are assumed to be substantially higher than what has been documented. The development of a trail and its associated recreational activities has the potential to both introduce and spread invasive plants, which have a wide range of ecological effects, including both native vegetation and wildlife. Impacts to native plants include the reduction of the abundance of native plants, diversity, recruitment, pollination and species survival (Gibson 2010). Invasive plants can detrimentally affect wildlife, fire regimes (WLAP 2004a), water flows and soil properties (Neria *et al.* 2007). The introduction and spread of invasive plants have the potential to also impact visual and recreational aesthetics (WLAP 2004a).

### 7.1.4 General Mitigation Measures

The following mitigation measures are recommended to be applied to any potential trail development to reduce the impact to the vegetation components from habitat loss, changes to the habitat and introduction of invasive species.

## Pre-construction Phase

- A Qualified Environmental Professional (QEP) should survey the development corridor (development footprint and buffer) to identify occurrences of:
  - Plant species at risk
  - Ecological communities at risk
  - Sensitive ecosystems
  - Invasive plants
- All surveys are to be conducted at the appropriate time of the year to ensure proper identification of the above variables.
- Trail routing should be developed on site-specific basis with the final alignment developed to minimize impacts to the vegetation components.
- The route should be surveyed, demarking the alignment, sensitive environmental features, and occurrences of invasive plants.
- Appropriate management plans should be developed to identify procedures, processes, and practices that will minimize impacts to sensitive environmental features.

## Construction Phase

- All sensitive areas should be identified and appropriately demarked to discourage unauthorised access.
- Restrict all construction phase activities to a defined development footprint. High impact activities such as equipment and vehicles are to be restricted to approved areas.
- An environmental monitor (EM) should be retained to ensure that the development boundaries are properly marked out and that the processes identified within any management plan or any terms and conditions of issued permits and/or authorizations are implemented. Should deviations from the approved development footprint or issued permits and/or authorizations occur, a QEP is to be retained to determine any potential environmental effects and remediation.
- All equipment and vehicles used for trail development are to be cleaned prior to arriving to the development footprint to prevent the introduction or propagation of invasive plant species.
- Any disturbed areas must be seeded and revegetated with species native to the area immediately, or as soon as feasible after restoration and final clean-up. If work is completed late into the growing season, revegetation will not likely become established or be effective in preventing surface erosion. In this instance, the disturbed areas are to be protected against surface erosion by hydroseeding with heavy mulch.
- Where warranted, appropriate fencing and signage should be installed to demark sensitive environmental features and discourage unauthorized access.

## Operations and Maintenance Phase

- Undertake monitoring as required to:
  - Identify occurrences of invasive plants to facilitate proactive management.
  - Identify and deactivate unauthorized trails leaving the authorized trail corridor.
  - Identify areas of unauthorized access (e.g., motorized vehicles, camping, dumping).

## 7.2 Wildlife

### 7.2.1 Components

Environmental values for wildlife are indicated by three variables, including wildlife species at risk, breeding birds, and legally defined critical habitat.

#### 7.2.1.1 Wildlife Species at Risk

Wildlife species at risk include provincially blue- and red-listed species and SARA species for vertebrate and invertebrate wildlife. Vertebrate wildlife was further refined by species class: mammals, reptiles, amphibians, turtles, and birds. Where feasible, occurrence data was categorized as confirmed record and potential for occurrence.

#### 7.2.1.2 Breeding Birds

Breeding birds refers to birds that are protected under the *Migratory Birds Convention Act* and non-migratory birds and nests protected under the *BC Wildlife Act*. These are an indicator given the legal protection afforded to these species.

#### 7.2.1.3 Critical Habitat

Critical Habitat refers to SARA defined habitat for Threatened and Endangered species and are therefore afforded legal protection under the Act. Critical Habitat has been identified for several species at risk within the LSA and is therefore considered to be a wildlife EV indicator.

### 7.2.2 Baseline Conditions

#### 7.2.2.1 Species Occurrences

A total of 429 terrestrial wildlife species have been documented in the RSA. A summary of identified wildlife species by class is listed in Table 7-10 and by species in Appendix A.

**Table 7-10. Summary of observed species by class.**

Number of Observed Wildlife Species		
Species Class	Source(s)	Number of Species
Birds	eBird, WSI	323
Mammals	WSI	34
Amphibians	WSI	10
Reptiles	WSI	10
Invertebrates	WSI	50
Turtles	WSI	2

### 7.2.2.2 Breeding Birds

Breeding birds are species that are known or likely to nest and include species protected by both the *Migratory Birds Convention Act* and the *Wildlife Act*. Within the Okanagan-Similkameen Regional District 263 birds have been observed during the breeding window (eBird 2012) and are therefore likely to be breeding.

### 7.2.2.3 Wildlife Species at Risk

Forty-two provincially and federally listed species have been documented in the LSA. Of this, 42 species are provincially listed and, and 31 are SARA listed. Table 7-11 summarizes total number of identified wildlife species at risk by BC CDC listing and CF priority ranking. Queries of the BC CDC resulted in 102 wildlife species at risk, inclusive of known occurrences with potential to occur within the LSA. The resulting list of potential plant species at risk is summarized in Appendix C.

**Table 7-11. Summary of BC CDC listed wildlife species at risk.**

Identified Wildlife Species at Risk			
Class	CDC List	CF Priority	Count
Amphibians	Red	1	1
	Blue	1	1
Birds	Red	1	6
		2	2
	Blue	1	2
		2	6
		4	3
Reptiles	Red	1	1
	Blue	1	3
		2	1
Invertebrates	Red	1	3
	Blue	1	1
		2	3
		4	1

A total of 31 SARA listed wildlife species at risk have been documented to occur within the LSA and include three species of amphibian, nine species of birds, six species of reptiles, four species of mammals, and four species of invertebrates. Individual species are summarised in Table 7-12.

**Table 7-12. SARA listed wildlife species at risk identified to occur within the LSA.**

Identified SARA Wildlife Species at Risk					
English Name	Scientific Name	CDC List	SARA	CF Priority	Route(s) Present
Blotched Tiger Salamander	<i>Ambystoma mavortium</i>	Red	1-E	1	A, B, C, D
Western Toad	<i>Anaxyrus boreas</i>	Yellow	1-SC	1	A, D
Pallid Bat	<i>Antrozous pallidus</i>	Red	1-T	2	C
Burrowing Owl	<i>Athene cunicularia</i>	Red	1-E	2	D
Northern Rubber Boa	<i>Charina bottae</i>	Yellow	1-SC	1	B, C
Common Nighthawk	<i>Chordeiles minor</i>	Yellow	1-T	2	D
Painted Turtle, Rocky Mountain Population	<i>Chrysemys picta</i> pop. 2	Blue	1-SC	2	A, B, C, D
North American Racer	<i>Coluber constrictor</i>	Blue	1-SC	2	A, B, C, D
Western Rattlesnake	<i>Crotalus oreganus</i>	Blue	1-T	1	A, B, C, D
Monarch	<i>Danaus plexippus</i>	Blue	1-E	1	A, D
Bobolink	<i>Dolichonyx oryzivorus</i>	Blue	1-T	2	A, C, D
Spotted Bat	<i>Euderma maculatum</i>	Blue	1-SC	2	A, B, C, D
Rocky Mountain Ridged Mussel	<i>Gonidea angulata</i>	Red	1-E	1	A, D
Barn Swallow	<i>Hirundo rustica</i>	Blue	1-T	2	A, B, C, D
Desert Nightsnake	<i>Hypsiglena chlorophaea</i>	Red	1-E	1	A, B, C
Yellow-breasted Chat	<i>Icteria virens</i>	Red	1-E	1	A, B, C, D
Western Screech-owl, <i>Macfarlanei</i> ssp.	<i>Megascops kennicottii macfarlanei</i>	Blue	1-T	1	A, C
Lewis's Woodpecker	<i>Melanerpes lewis</i>	Blue	1-T	2	A, B, C, D
Little Brown Myotis	<i>Myotis lucifugus</i>	Yellow	1-E	5	C
Sage Thrasher	<i>Oreoscoptes montanus</i>	Red	1-E	1	A, B, C
Long-billed Curlew	<i>Numenius americanus</i>	Blue	1-SC	1	A
White-headed Woodpecker	<i>Picooides albolarvatus</i>	Red	1-E	1	A, B, C
Gopher Snake, <i>Deserticola</i> ssp.	<i>Pituophis catenifer deserticola</i>	Blue	1-T	1	A, D
Western Skink	<i>Plestiodon skiltonianus</i>	Blue	1-SC	1	A, C, D
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	Blue	1-SC	2	A, C, D
Behr's Hairstreak	<i>Satyrium behrii</i>	Red	1-E	1	A, B, C
Great Basin Spadefoot	<i>Spea intermontana</i>	Blue	1-T	1	A, B, C, D

<b>Identified SARA Wildlife Species at Risk</b>					
<i>English Name</i>	<i>Scientific Name</i>	<i>CDC List</i>	<i>SARA</i>	<i>CF Priority</i>	<i>Route(s) Present</i>
Olive Clubtail	<i>Stylurus olivaceus</i>	Red	1-E	1	A, B, C, D
Nuttall's Cottontail	<i>Sylvilagus nuttallii</i>	Blue	1-SC	1	A, C, D
American Badger	<i>Taxidea taxus</i>	Red	1-SC	1	A, B, C, D
Barn Owl	<i>Tyto alba</i>	Red	1-SC	1	D

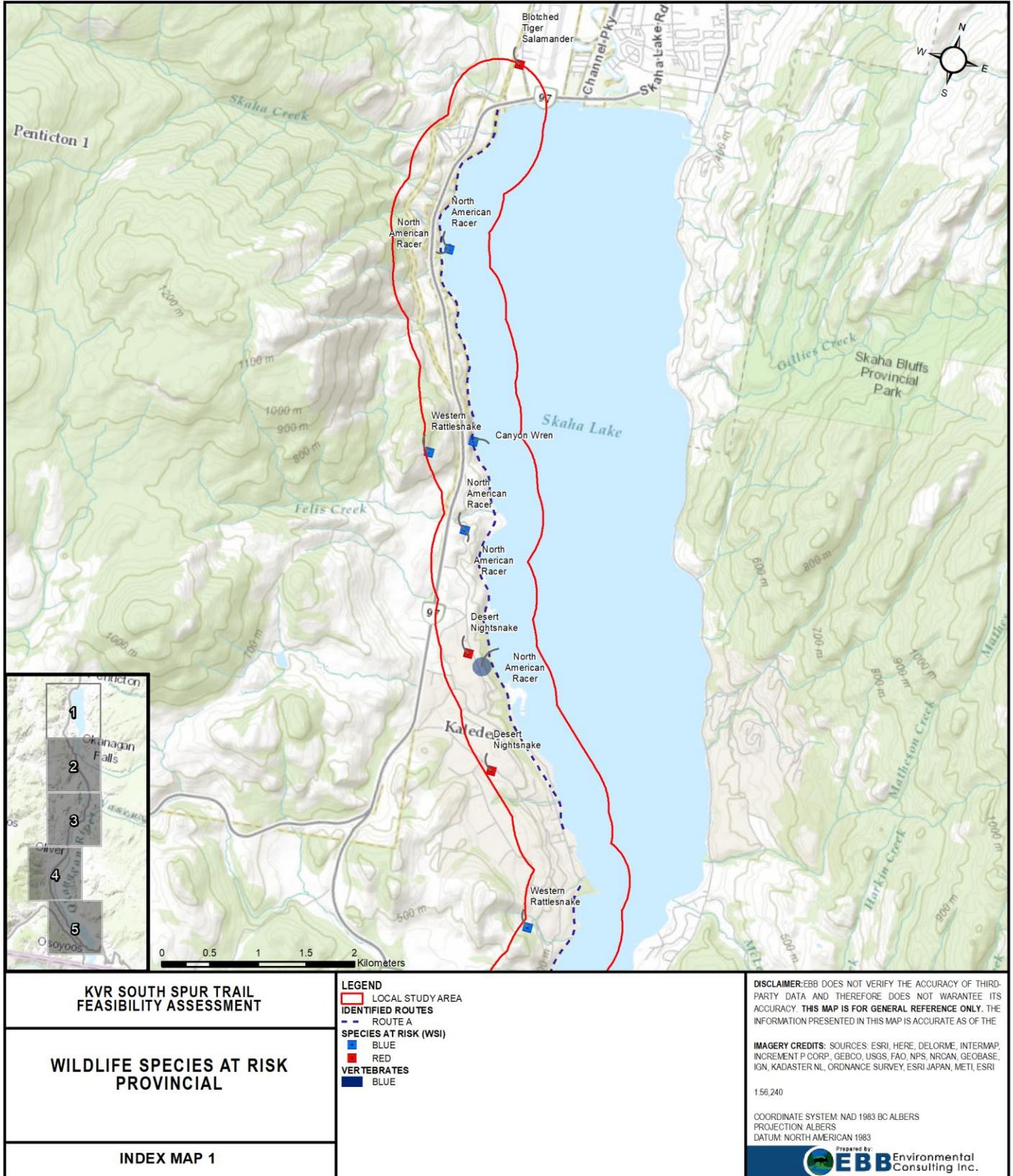


Figure 7-21. BC CDC listed wildlife species, excluding American badger, within Section 1 of the LSA.

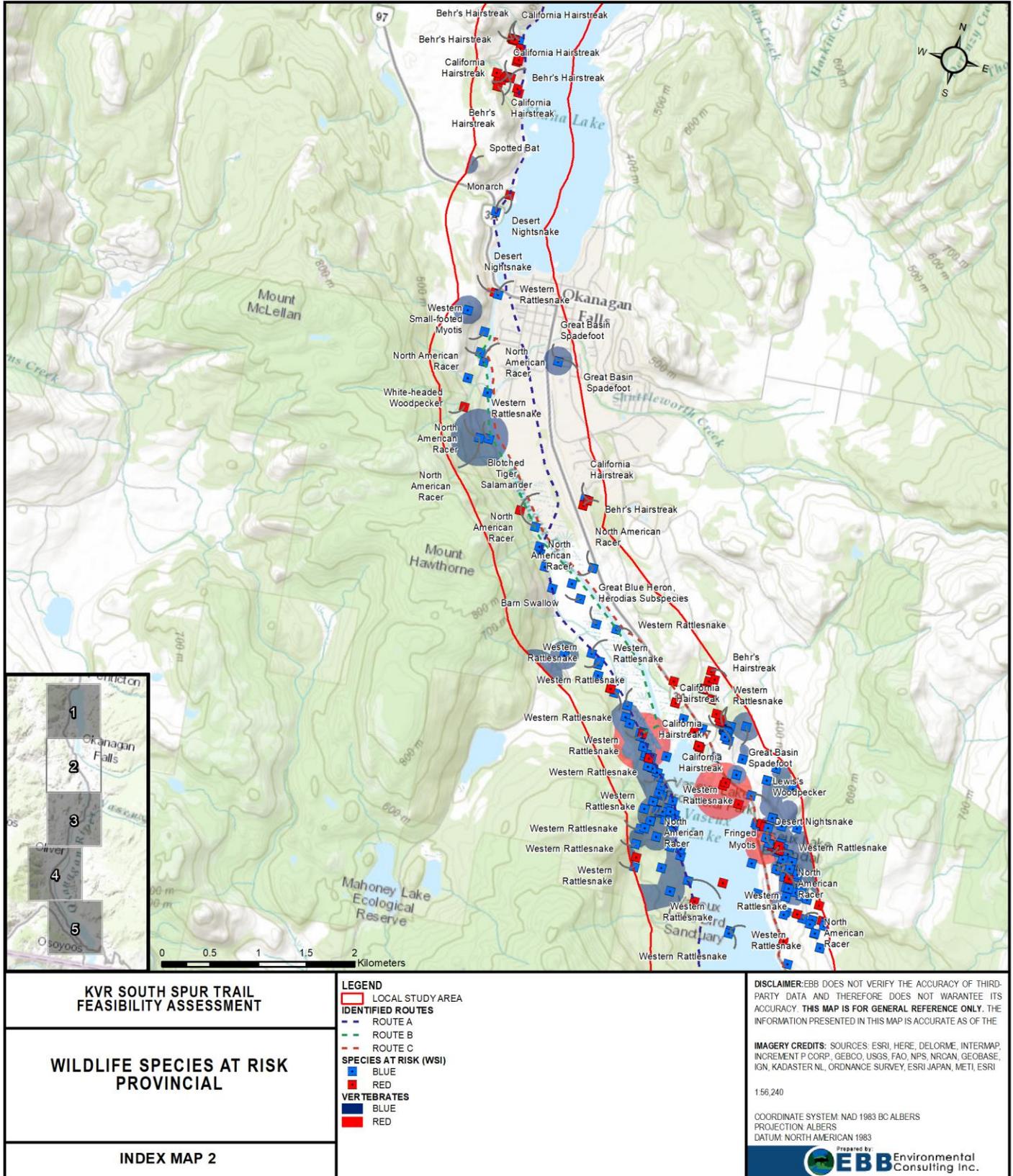


Figure 7-22. BC CDC listed wildlife species, excluding American badger, within Section 2 of the LSA.

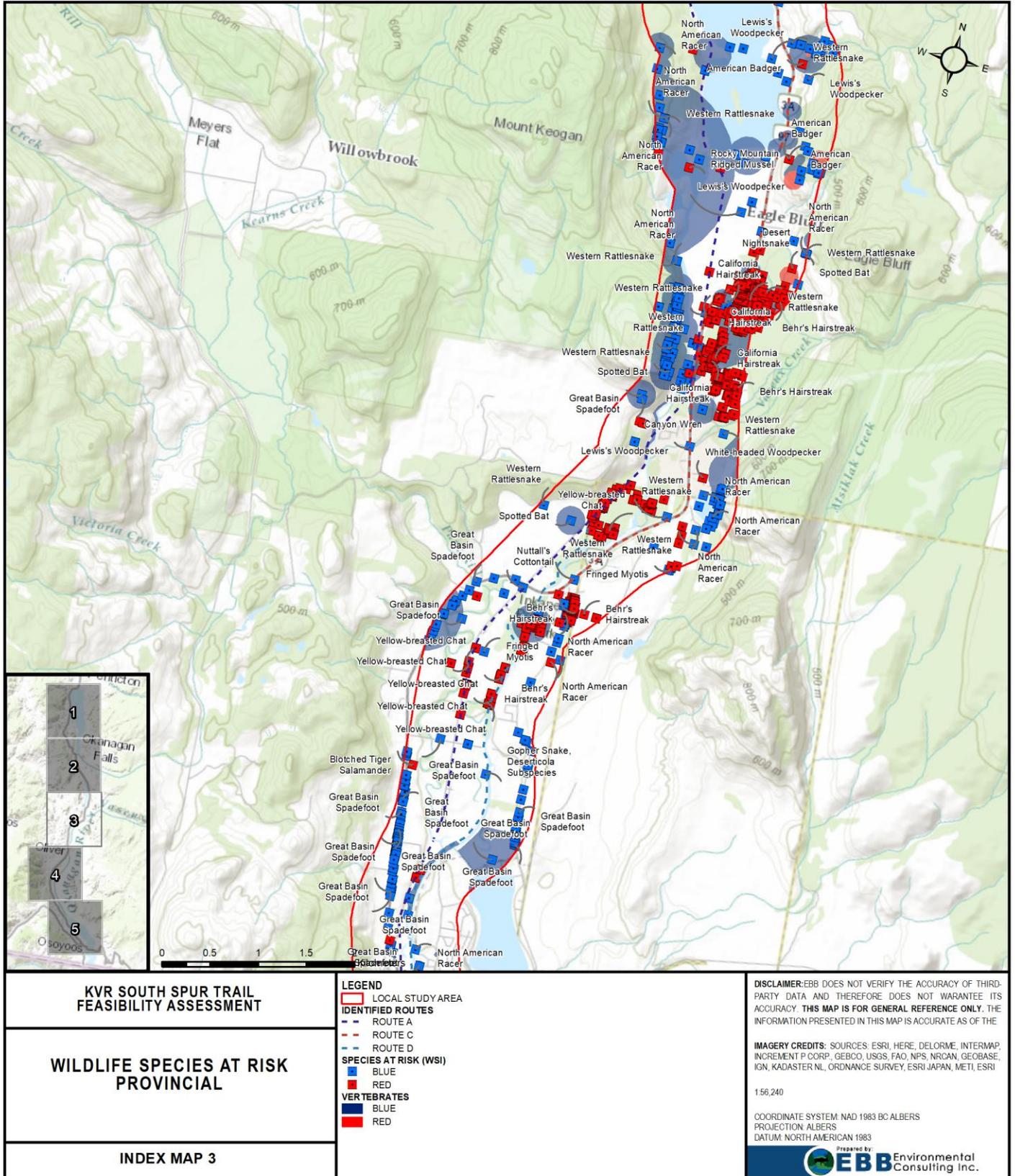


Figure 7-23. BC CDC listed wildlife species, excluding American badger, within Section 3 of the LSA.

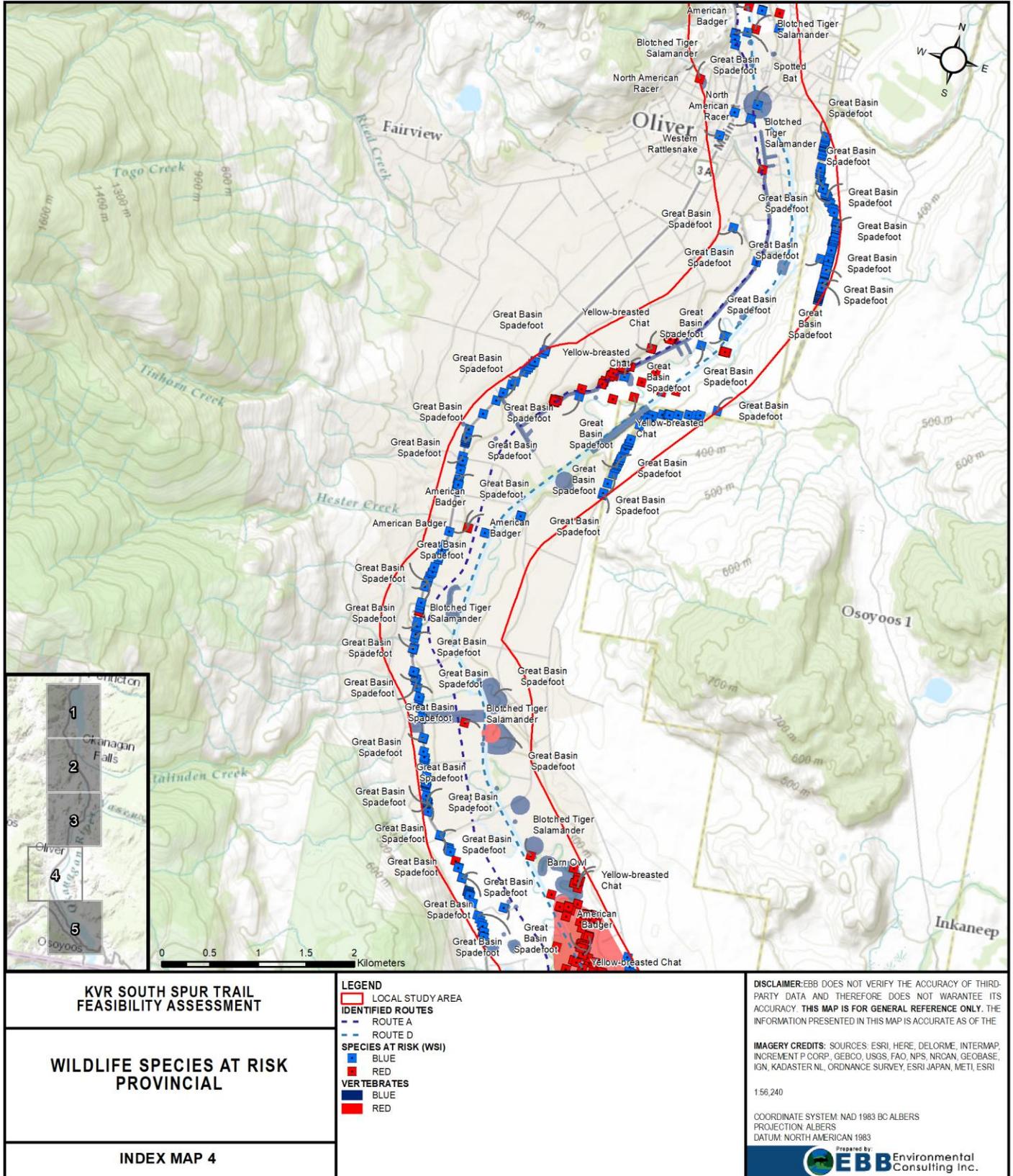


Figure 7-24. BC CDC listed wildlife species, excluding American badger, within Section 4 of the LSA.

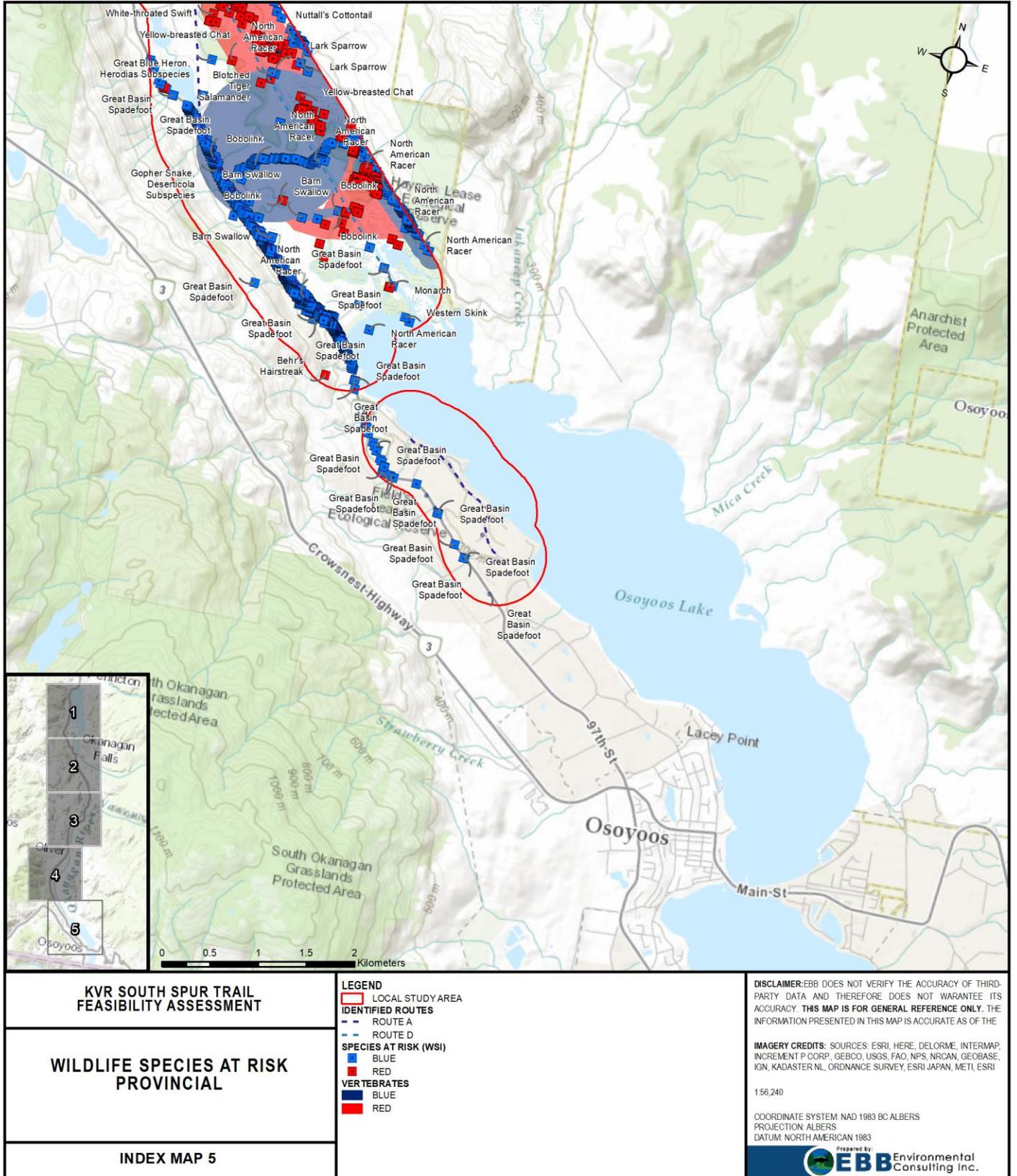
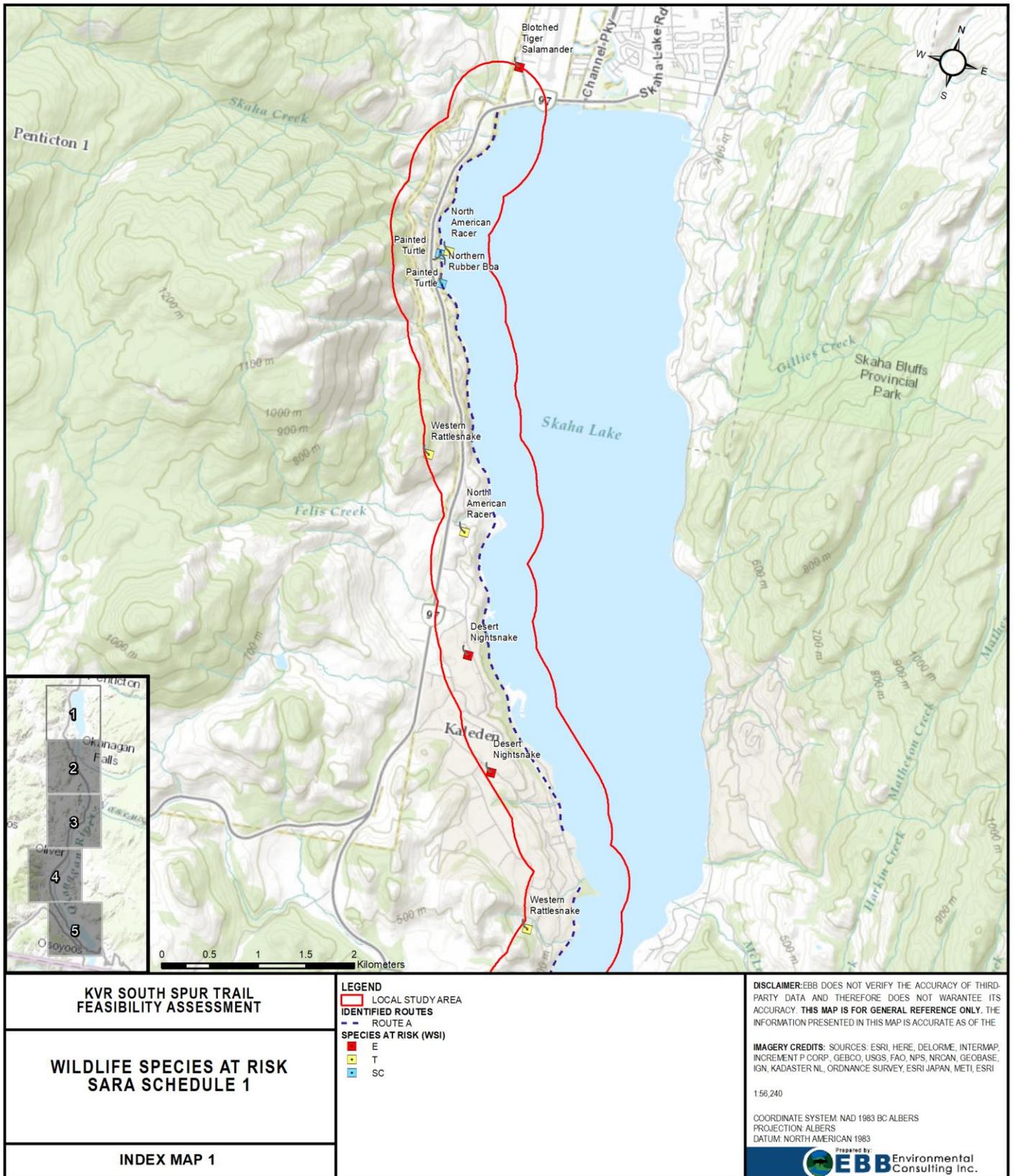


Figure 7-25. BC CDC listed wildlife species, excluding American badger, within Section 5 of the LSA.



**Figure 7-26. SARA listed wildlife species, excluding American badger, within Section 1 of the LSA.**

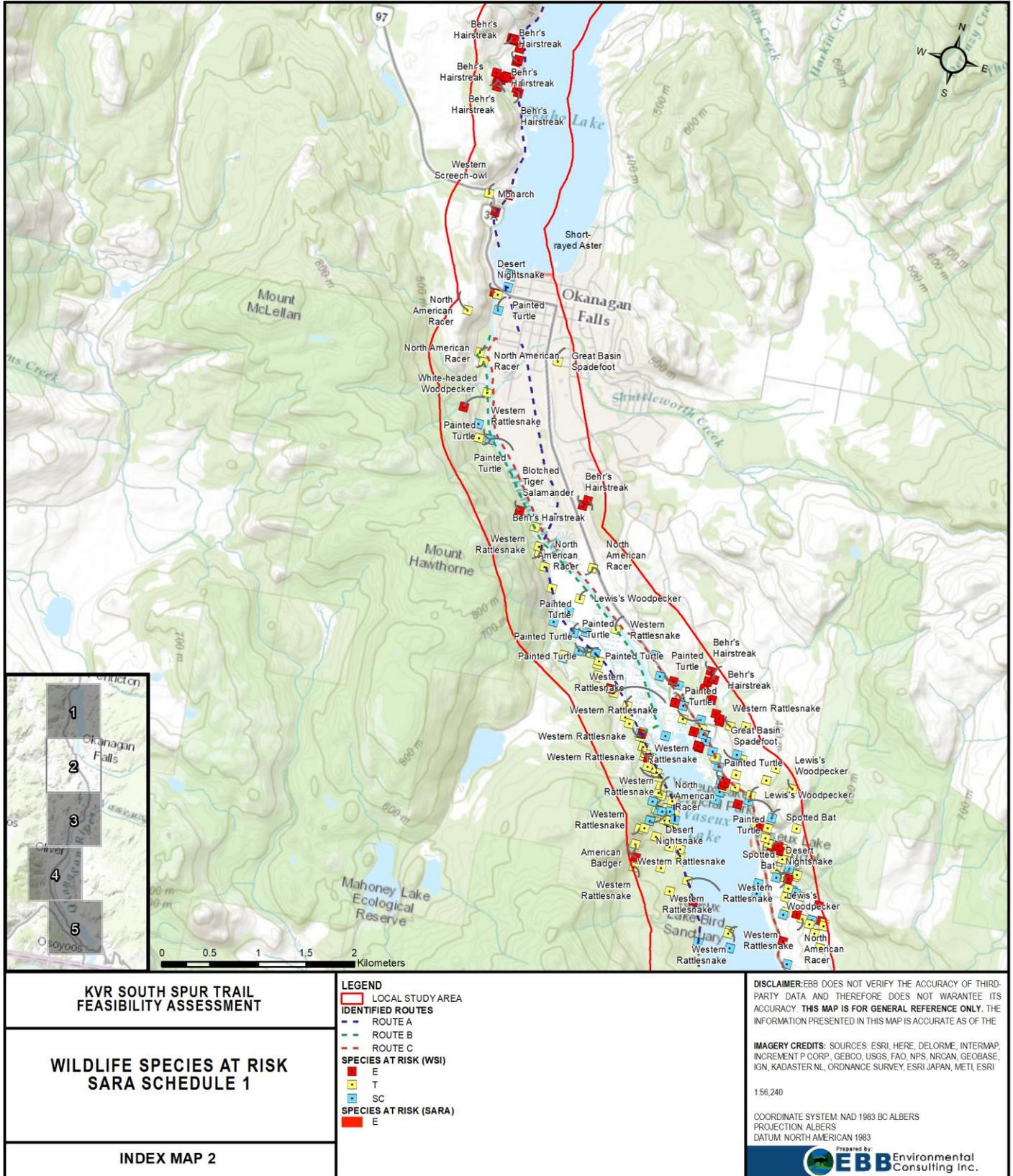


Figure 7-27. SARA listed wildlife species, excluding American badger, within Section 2 of the LSA.

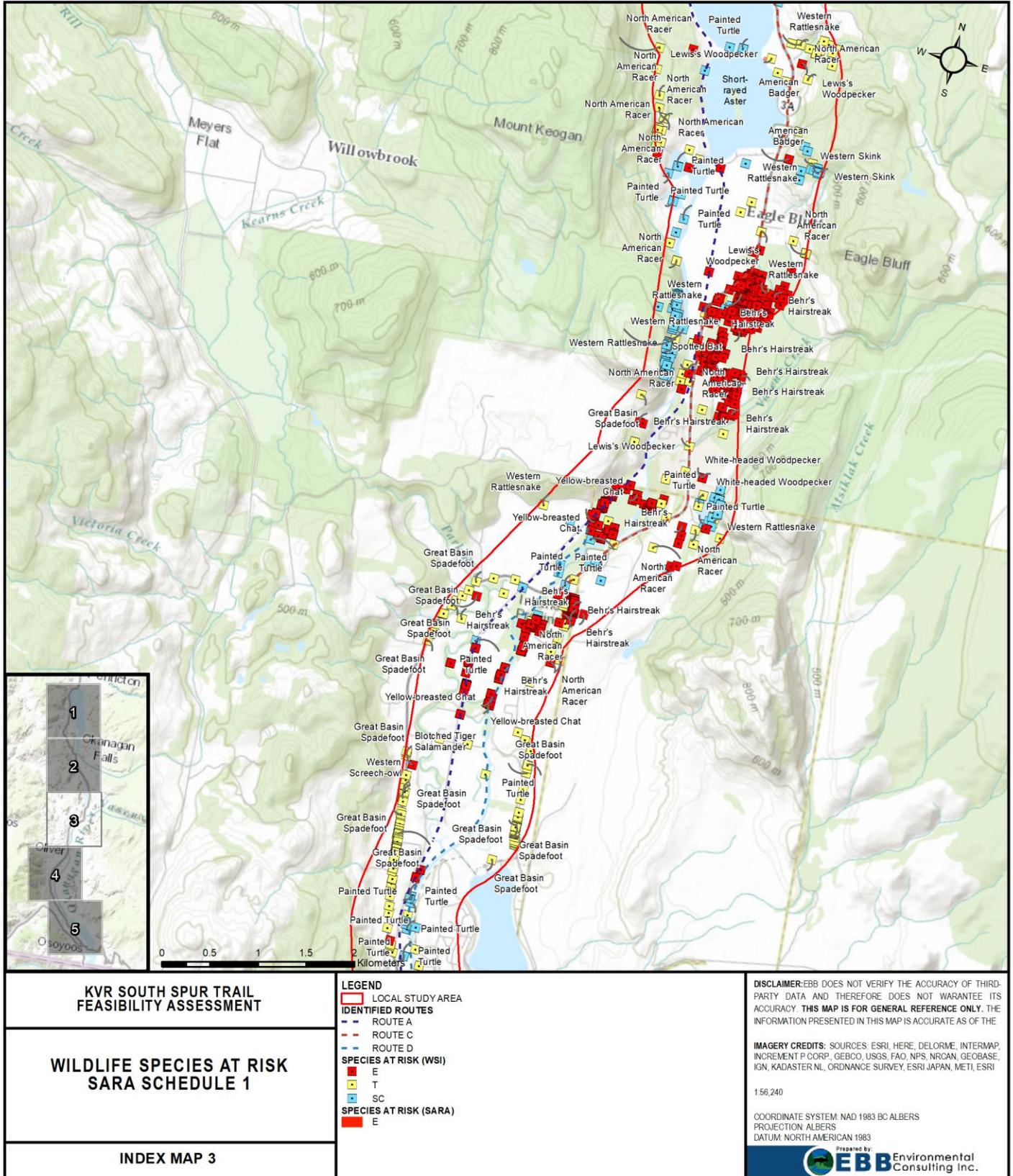


Figure 7-28. SARA listed wildlife species, excluding American badger, within Section 3 of the LSA.

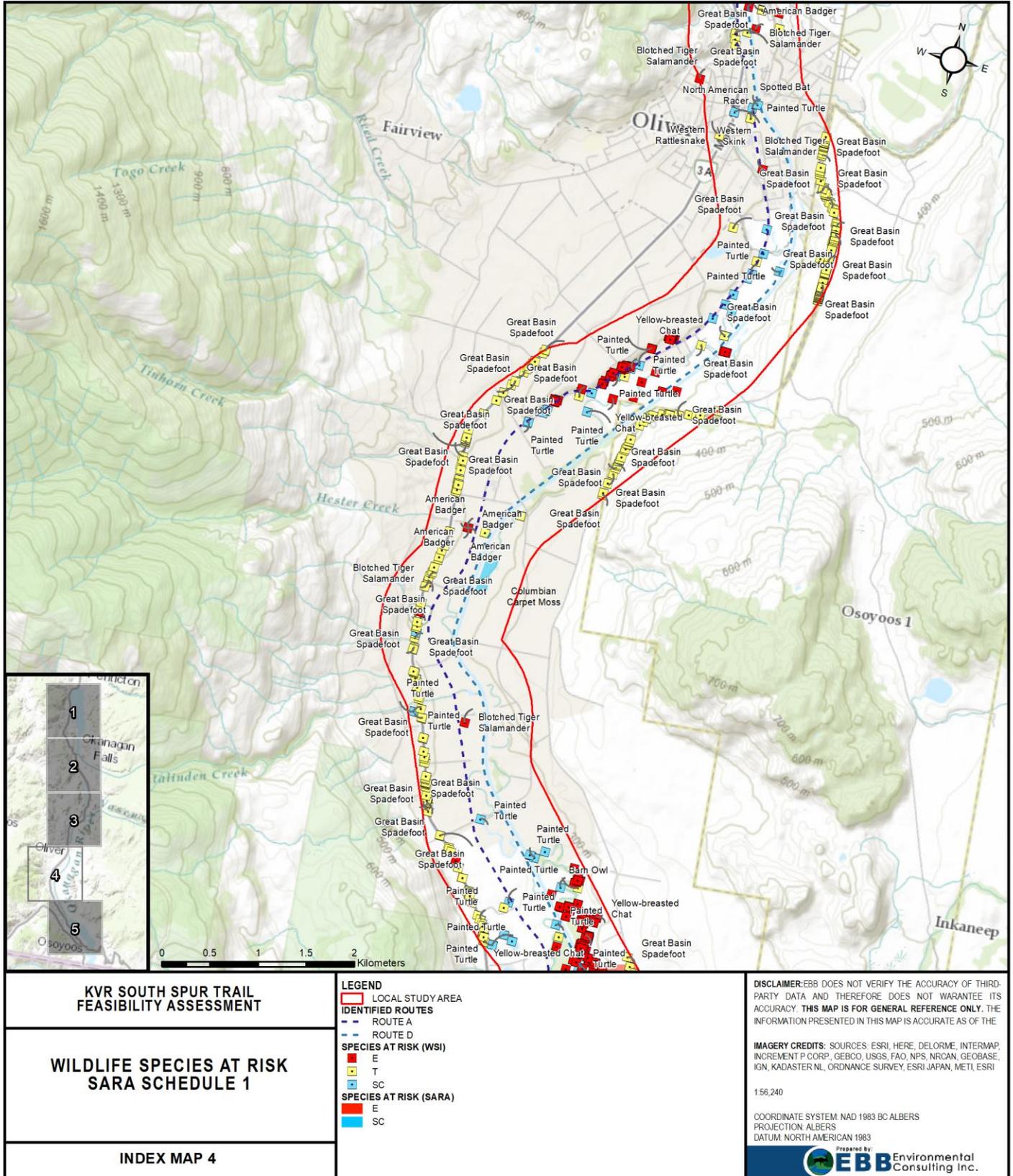


Figure 7-29. SARA listed wildlife species, excluding American badger, within Section 4 of the LSA.

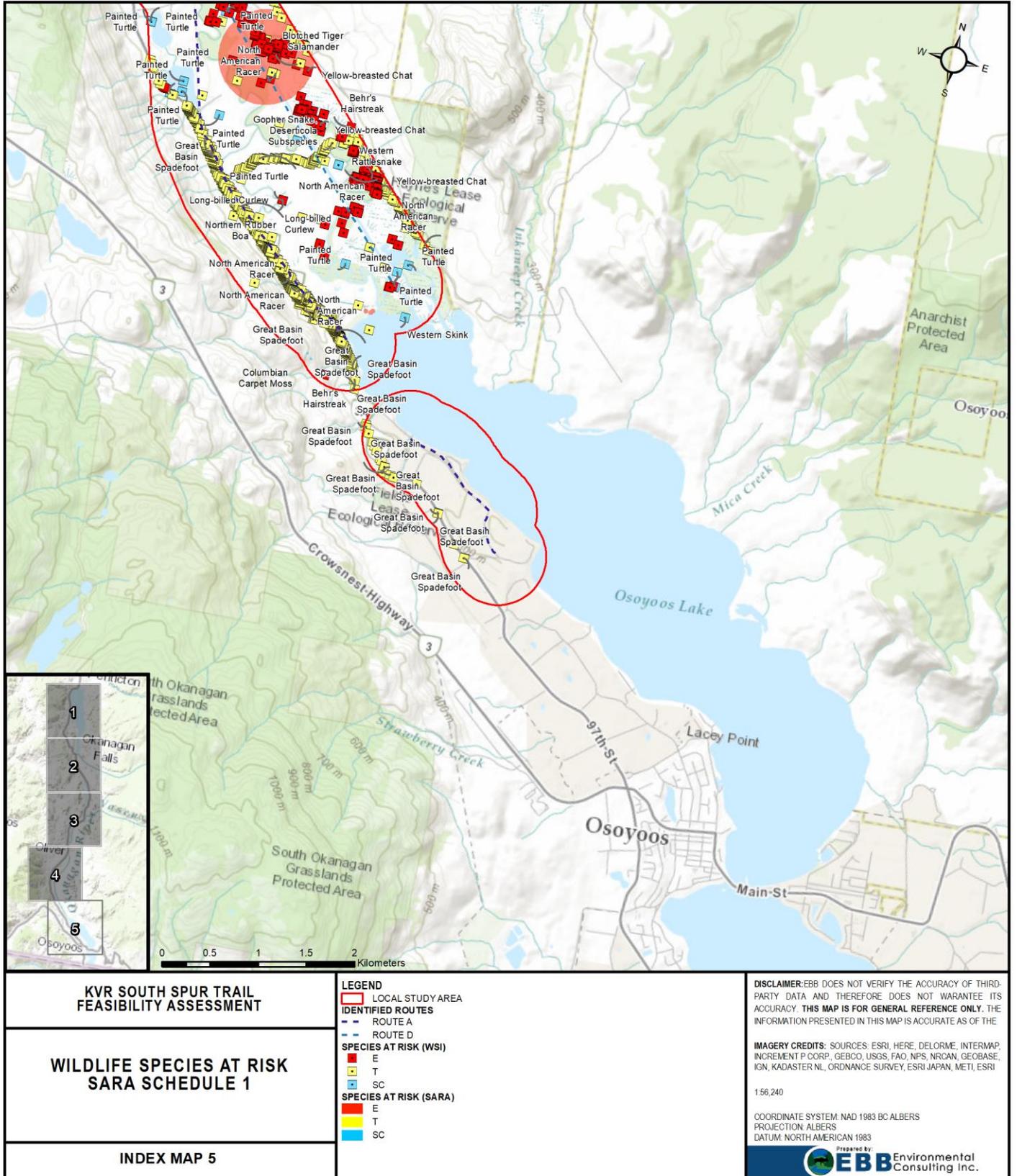


Figure 7-30. SARA listed wildlife species, excluding American badger, within Section 5 of the LSA.

### 7.2.2.4 Critical Habitat

The LSA contains Critical Habitat for four federally listed species: great basin spadefoot, Lewis’s woodpecker, Behr’s hairstreak, and yellow-breasted chat (Table 7-13). A summary of identified critical habitat where it intersects identified route corridors is detailed below.

**Table 7-13. Federally listed wildlife species at risk with identified Critical Habitat within the LSA.**

Species at Risk with Identified Critical Habitat			
English Name	Scientific Name	Status of Critical Habitat	Route(s) Present
Behr’s Hairstreak	<i>Satyrium behrii</i>	Final	A, B, C, D
Great Basin Spadefoot	<i>Spea intermontana</i>	Proposed	A, B, C, D
Lewis’s Woodpecker	<i>Melanerpes lewis</i>	Final	A, B, C, D
Yellow-breasted Chat, <i>aurocollis</i> ssp.	<i>Icteria virens auricollis</i>	Final	A, B, C, D

#### BEHR’S HAIRSTREAK

RED, ENDANGERED (SCH. 1)

#### *Satyrium behrii*

Critical habitat for Behr’s Hairstreak butterfly has been legally defined as having three elements; larval host plants, nectar host plants, and structural elements. Antelope-brush (*Purshia tridentata*) is utilized year-round by Behr’s Hairstreak and is the only known larval host plant for the species (Environment Canada 2016a). Movement of adults is limited to not further than 5 m from the larval host plant, and therefore all antelope-brush plants and soils/litter occurring within 5 m of a plant is considered essential to Behr’s Hairstreak (Environment and Climate Change Canada 2016a). Suitable antelope-brush habitat for Behr’s Hairstreak is considered shrub cover of no less than 10%.

Nectaring plants are important for energetic requirements of adult Behr’s Hairstreak. During the flight period, Behr’s Hairstreak uses one or more species as nectar host plants. These include: common yarrow (*Achillea millefolium*), smooth sumac (*Rhus glabra*), grey horsebrush (*Tetradymia canescens*), buckwheat (*Eriogonum* sp.), creambush oceanspray (*Holodiscus discolor*), tall baby’s-breath (*Gypsophila paniculata*), sweet-clover (*Melilotus* sp.) and fleabane (*Erigeron* sp.). Important biophysical attributes of critical habitat include Antelope-brush plants, mature ponderosa pine (*Pinus ponderosa*) trees and/or other mature trees scattered within Antelope-brush grasslands and standing water and any associated peripheral wetted areas (Environment Canada 2016a).

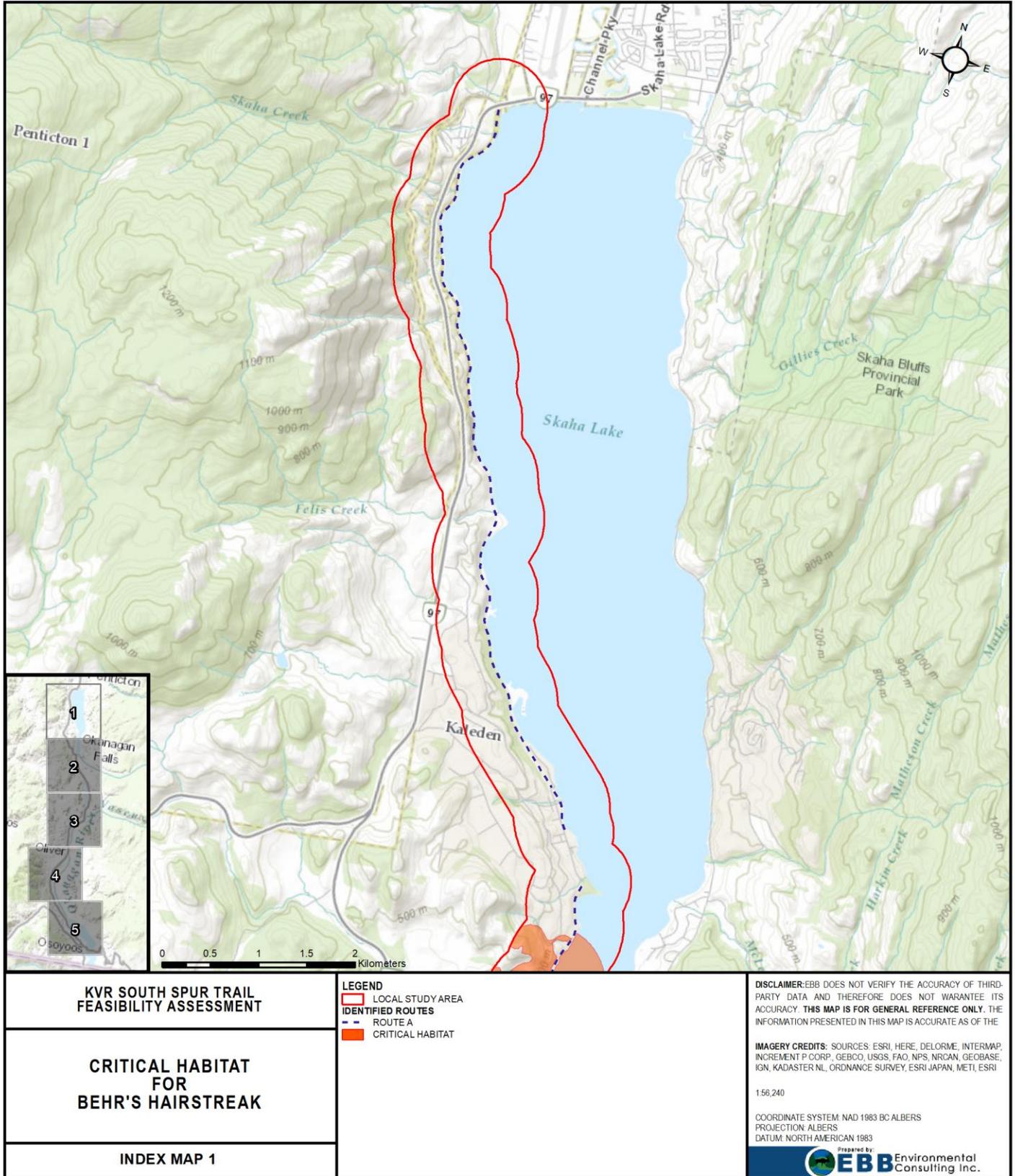


Figure 7-31. Critical Habitat for Behr's Hairstreak within Section 1 of the LSA.

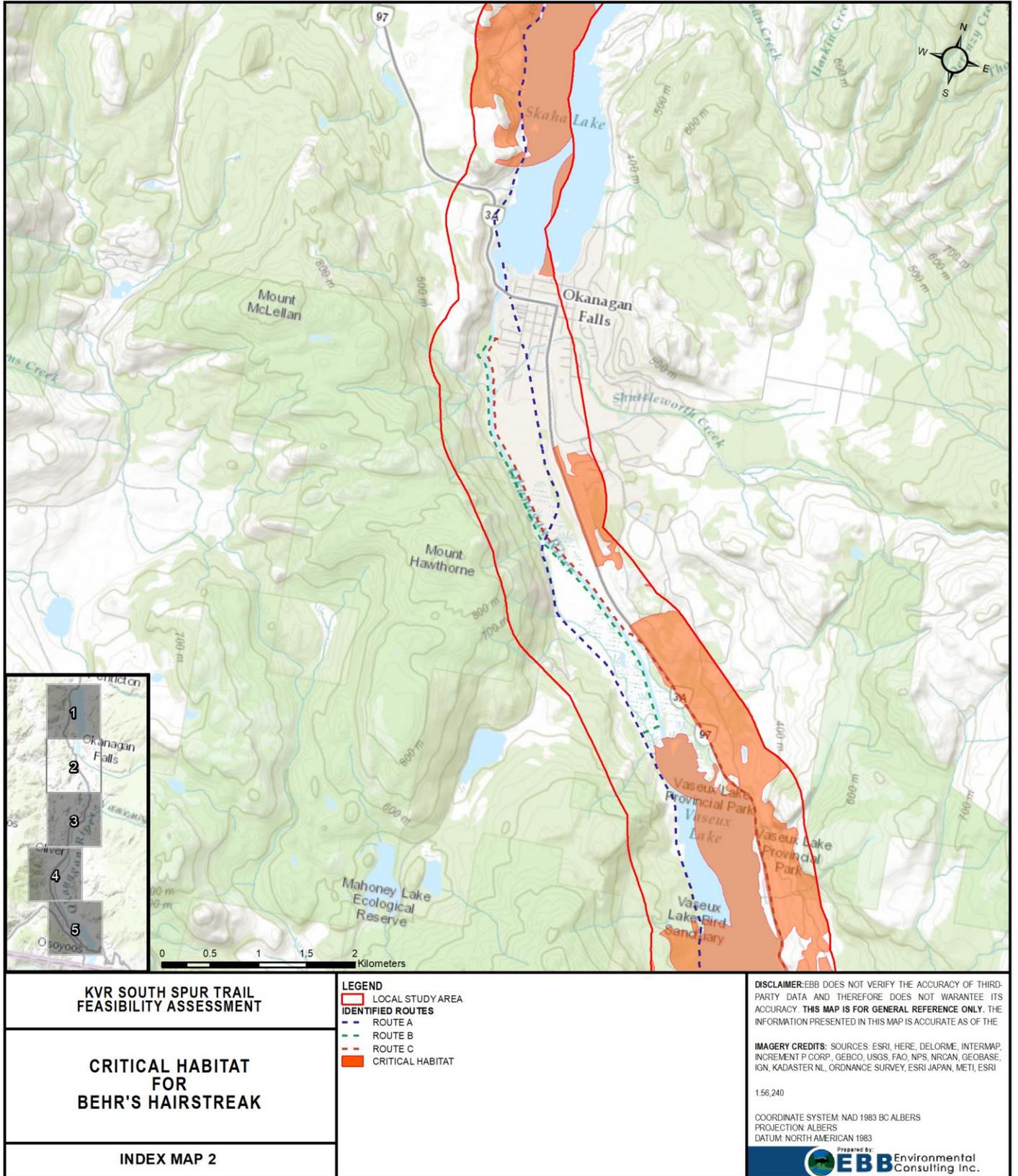


Figure 7-32. Critical Habitat for Behr's Hairstreak within Section 2 of the LSA.

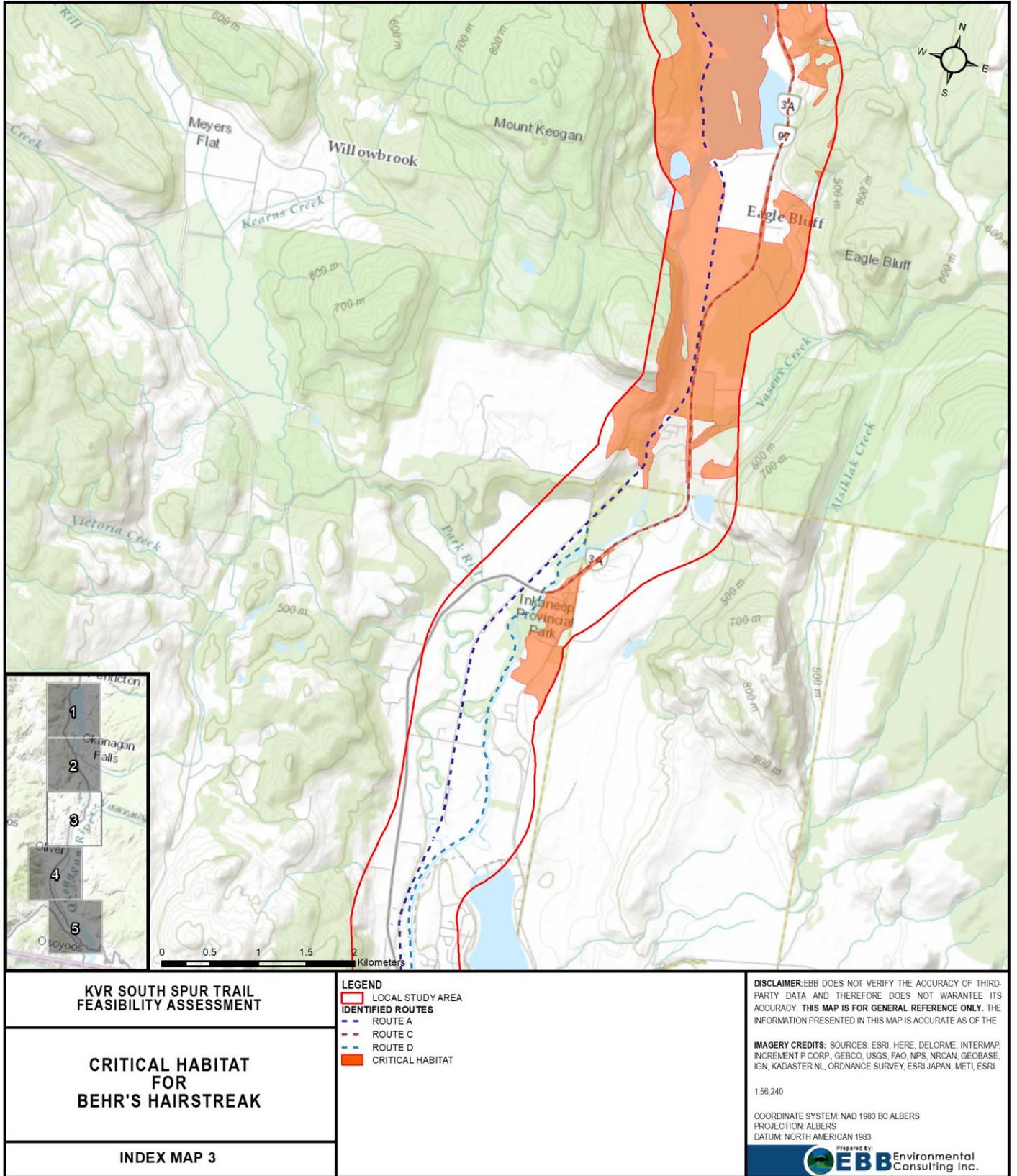


Figure 7-33. Critical Habitat for Behr's Hairstreak within Section 3 of the LSA.

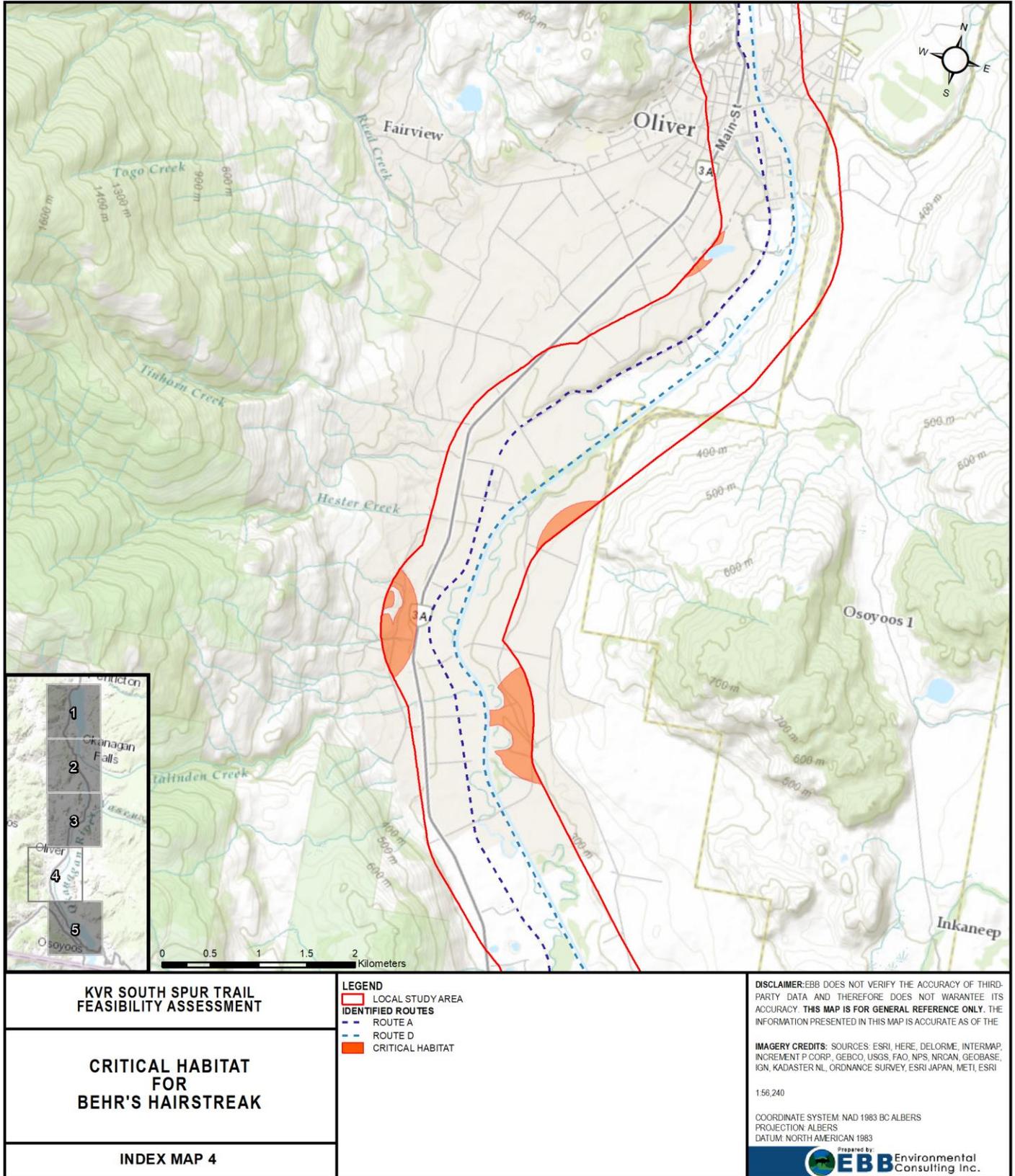


Figure 7-34. Critical Habitat for Behr's Hairstreak within Section 4 of the LSA.

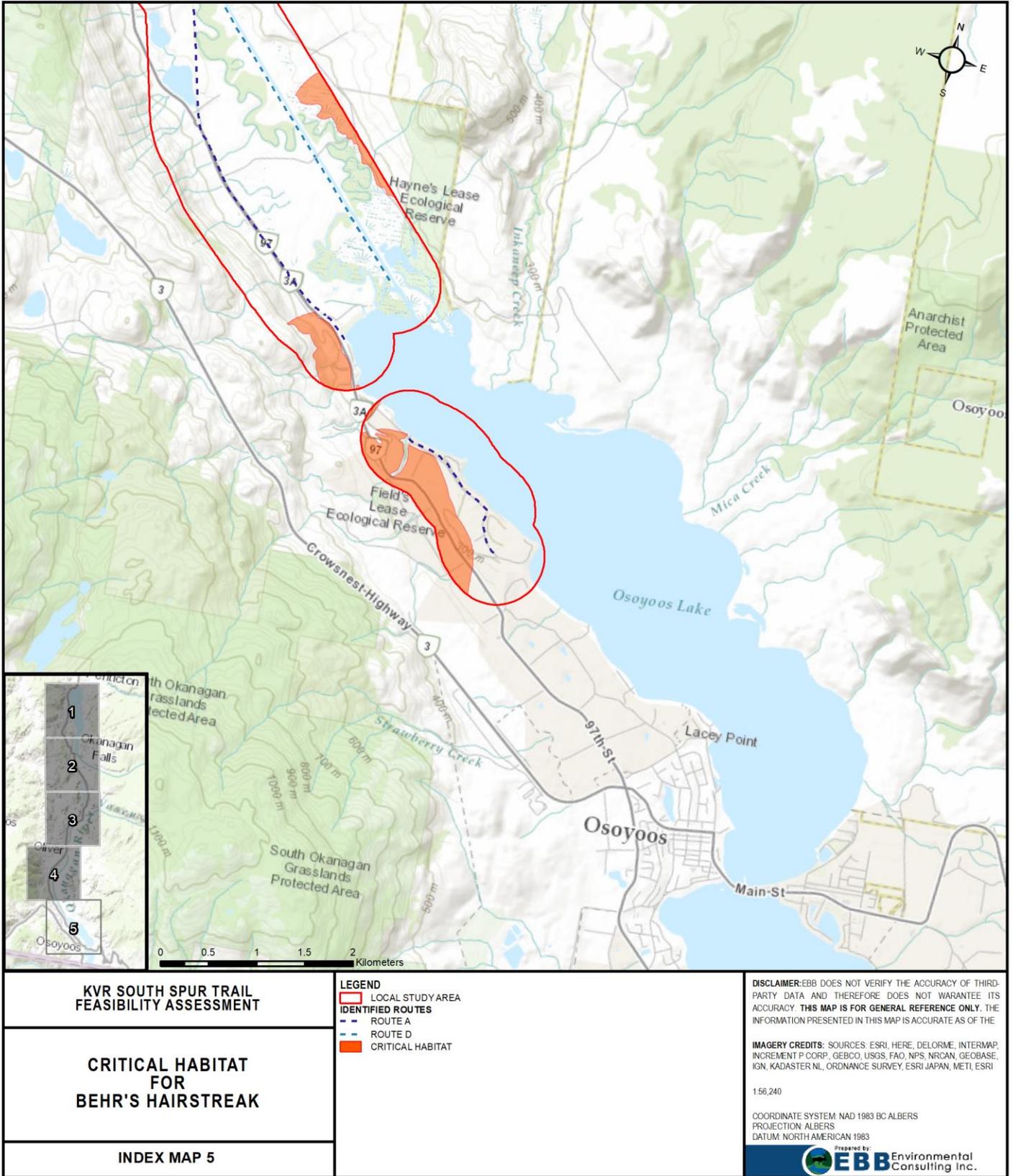


Figure 7-35. Critical Habitat for Behr's Hairstreak within Section 5 of the LSA.

**GREAT BASIN SPADEFOOT**

BLUE, THREATENED (SCH. 1)

*Spea intermontana*

Critical habitat for Great Basin Spadefoot has been divided into “core” critical habitat containing aquatic breeding habitat and surrounding terrestrial habitat and “connectivity” critical habitat (Environment and Climate Change Canada 2017a). Specific habitat requirements and attributes are summarized in Table 7-14.

**Table 7-14. Biophysical attributes of both core and connectivity critical habitat, adapted from Environment and Climate Change Canada (2017a).**

Description of Biophysical Attributes for both Core and Connectivity Critical Habitat			
Lifestage	Function	Biophysical Features(s)	Attributes
<b>Core Critical Habitat</b>			
Adults; juveniles; eggs; tadpoles	Courtship, mating, egg laying; foraging and development	Vernal Ponds (seasonal and temporary wetlands)	<ul style="list-style-type: none"> <li>Wet areas at any time having these features:               <ul style="list-style-type: none"> <li>shallow areas of less than 1 m depth, required for development of eggs and tadpoles.</li> <li>emergent vegetation (e.g., grasses, sedges, rushes), sticks, rocks, or other debris, required to provide egg attachment surfaces.</li> <li>algae, aquatic vegetation, and other organic matter, required as food for tadpoles.</li> </ul> </li> <li>dry areas that become wet areas under the right conditions, identified at any time by: depressions with bare mud, sedges, rushes, or other hydrophilic plants.</li> </ul>
Adults; juveniles; eggs; tadpoles	Courtship, mating, egg laying; foraging and development	Lakes, ponds, marshes, springs, sluggish streams, and seasonally wetted margins around permanent waterbodies	<ul style="list-style-type: none"> <li>Shallow areas less than 1 m depth, required for development of eggs and tadpoles.</li> <li>Emergent vegetation (e.g., grasses, sedges, rushes), sticks, rocks, or other debris, required to provide egg attachment surfaces.</li> <li>Algae, aquatic vegetation, and other organic matter, required as food for tadpoles.</li> <li>Optimally, an absence of predatory fish (sport fish, goldfish (<i>Carassius auratus</i>), and fish used for mosquito control or other purposes).</li> </ul>
Adults; juveniles (metamorphosed)	Foraging, refuge, overwintering, seasonal migrations	Grassland, shrub steppe, open forest	<ul style="list-style-type: none"> <li>Friable (easily crumbled) soils that permit burrowing (e.g., clay loam, fine gravel, clay, sandy soils), existing burrows (may include firmer soils), or naturally occurring holes or crevices.</li> <li>Small vertebrate and invertebrate prey (e.g., earthworms, ants, beetles, flies, grasshoppers, etc.).</li> <li>Active-season refuges: self-made burrows, rodent burrows (ground squirrel, pocket gopher), surface cover objects such as flat rocks and coarse woody debris.</li> <li>Overwintering refuges: self-made burrows, rodent burrows, crevices, or soil mounds that are sufficiently deep to permit access to frost-free areas (40–145 cm).</li> </ul>
<b>Connectivity Critical Habitat</b>			
Adults, juveniles	Dispersal in between, and/or to new core aquatic	Grassland, shrub-steppe, open forest, may include some human modified	<ul style="list-style-type: none"> <li>Friable (easily crumbled) soils that permit burrowing (e.g., clay loam, fine gravel, clay, sandy soils), existing burrows (may include firmer soils), or naturally occurring holes or</li> </ul>

<b>Description of Biophysical Attributes for both Core and Connectivity Critical Habitat</b>			
<i>Lifestage</i>	<i>Function</i>	<i>Biophysical Features(s)</i>	<i>Attributes</i>
<b>Core Critical Habitat</b>			
	and terrestrial habitats	habitats such as urban and agricultural areas	crevices; may also move over patches of human-modified substrates such as pavement, lawns, etc. <ul style="list-style-type: none"> <li>• Small vertebrate and invertebrate prey (e.g., ants, beetles, flies, spiders, etc.).</li> <li>• Refuges: self-made burrows, rodent burrows (ground squirrel, pocket gopher), rocks, logs, coarse woody debris, or other surface cover objects that provide shelter.</li> </ul>

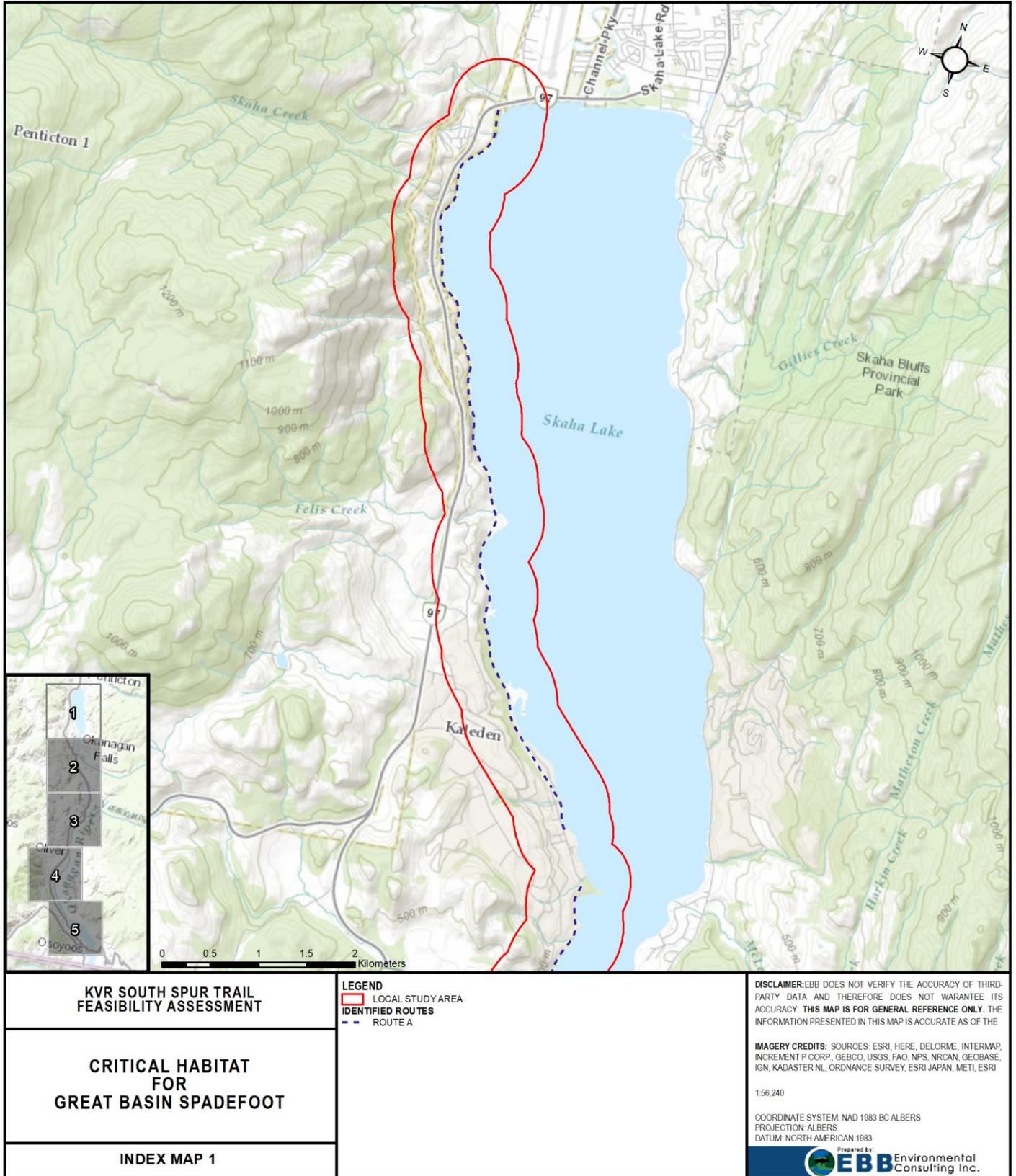


Figure 7-36. NO Critical Habitat for Great Basin Spadefoot within Section 1 of the LSA.

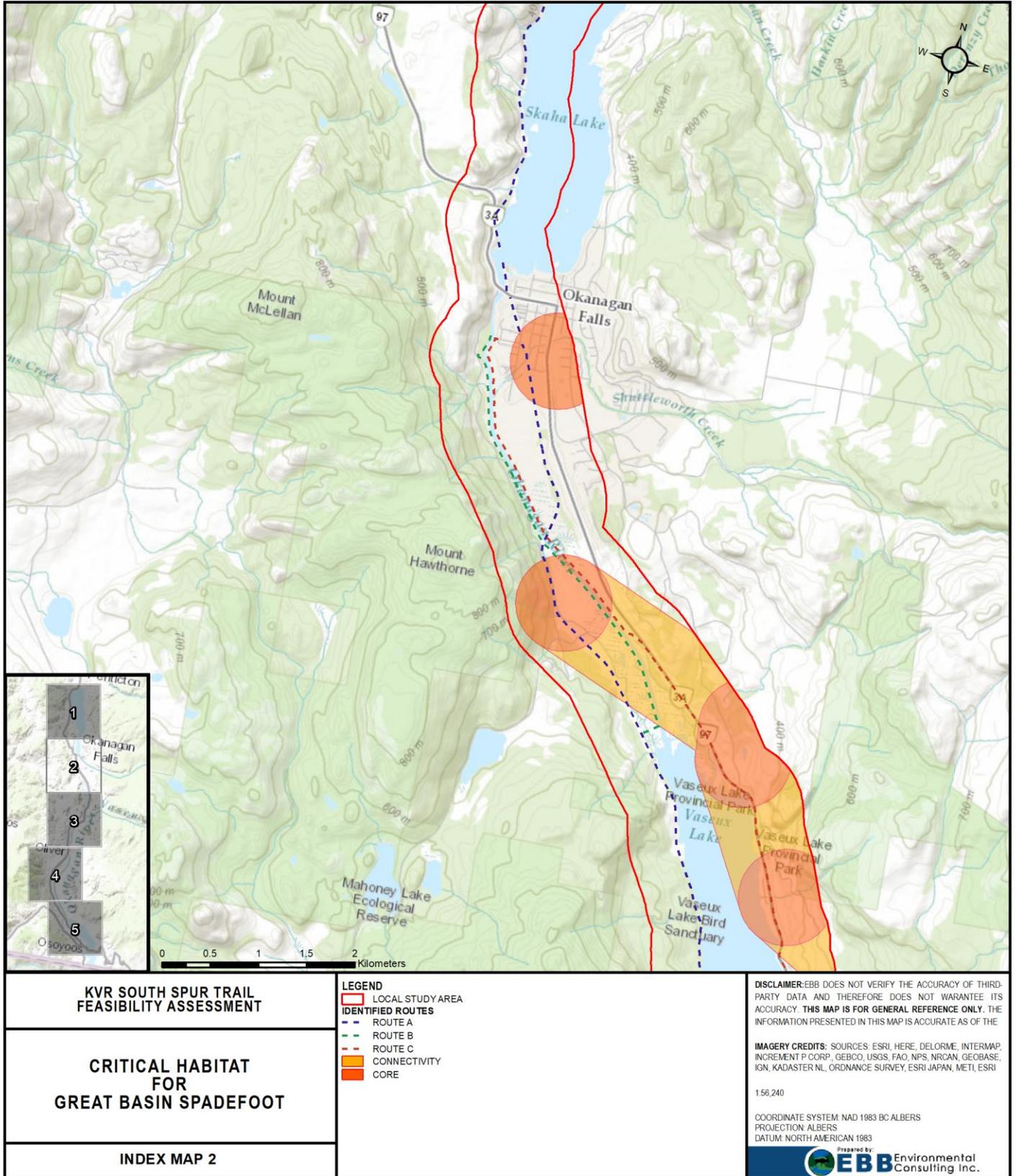
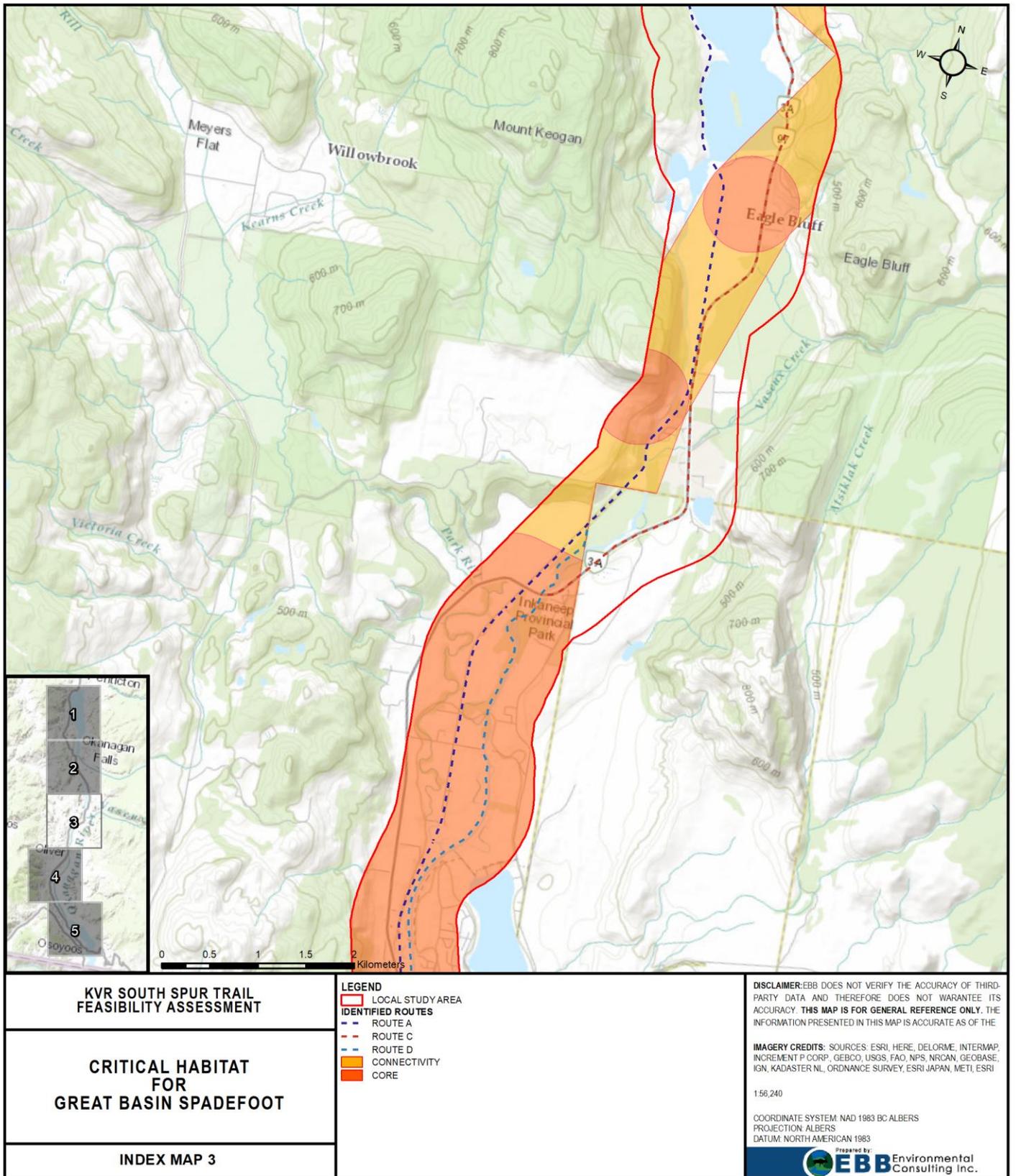


Figure 7-37 . Critical Habitat for Great Basin Spadefoot within Section 2 of the LSA.



**Figure 7-38. Critical Habitat for Great Basin Spadefoot within Section 3 of the LSA.**

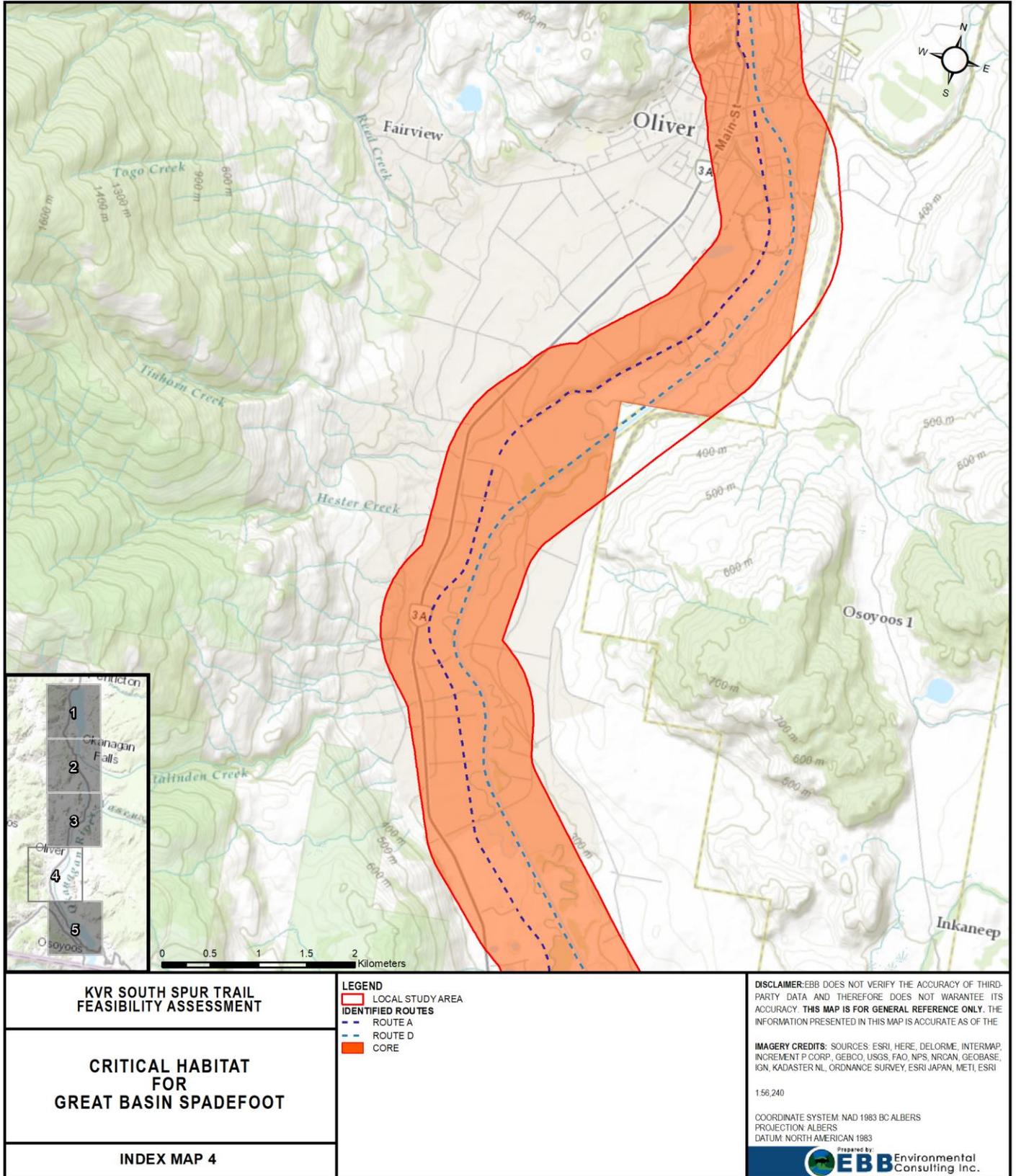


Figure 7-39. Critical Habitat for Great Basin Spadefoot within Section 4 of the LSA.

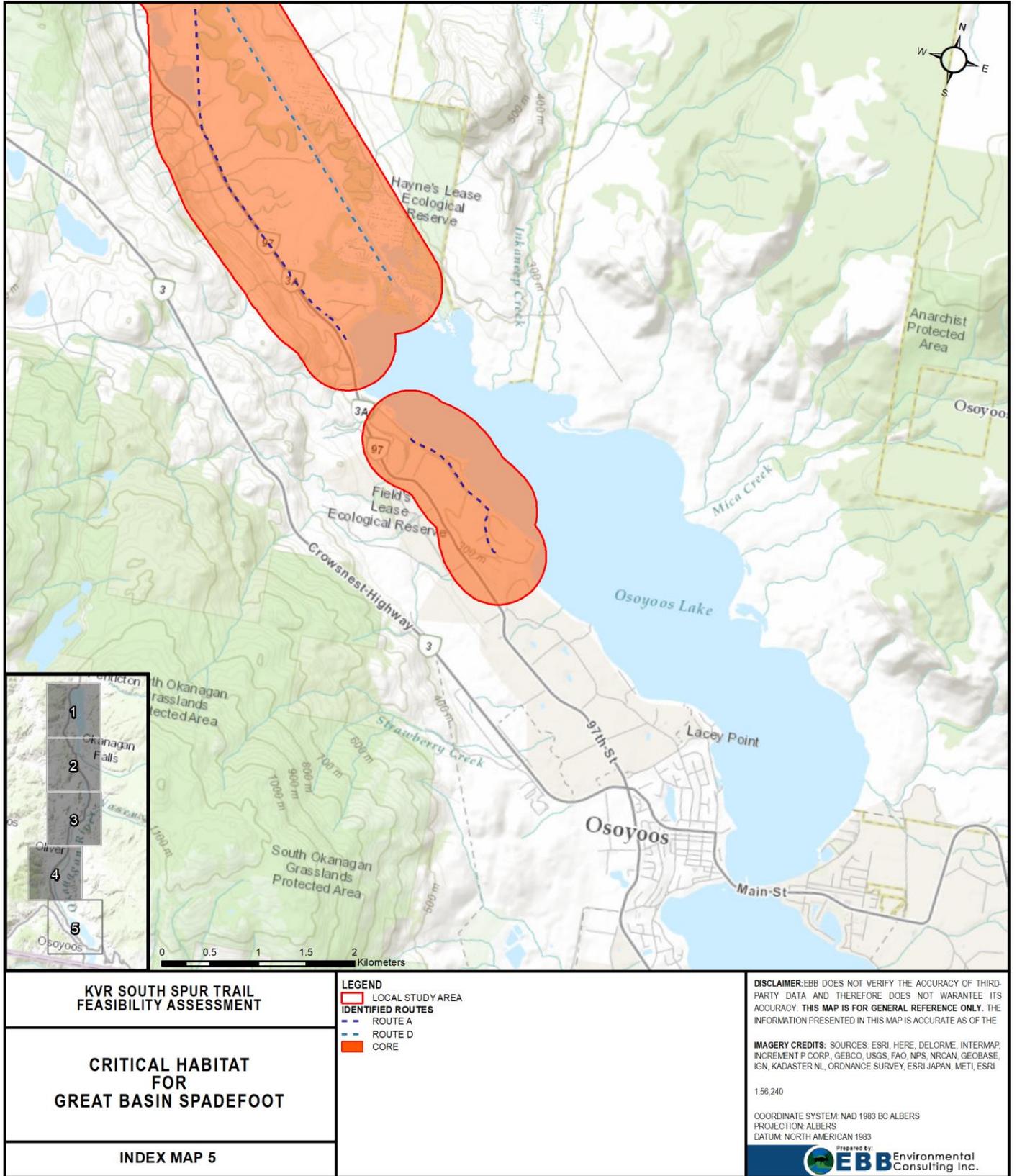


Figure 7-40. Critical Habitat for Great Basin Spadefoot within Section 5 of the LSA.

**LEWIS'S WOODPECKER**

BLUE, THREATENED (SCH. 1)

*Melanerpes lewis*

Lewis's Woodpeckers are birds of open forest, riparian woodland or grassland with scattered trees, which are used as perches and for nesting (COSEWIC 2010). Critical habitat has been defined through habitat suitability modelling within three habitat types, open Ponderosa Pine, riparian cottonwood, and burns. Delineating variable included mean annual precipitation, mean annual temperature, latitude, elevation and BEC variants (Environment and Climate Change Canada 2017b). Within this model, critical habitat was identified wherever specific biophysical attributes occurred, plus a 400-m buffer around known or potential nest trees based on current knowledge of foraging distances. Nesting and foraging attributes include:

- Known Nest Trees:
  - Trees occupied by Lewis's Woodpecker (current or historic), includes some utility poles.
- Potential Nest Trees:
  - Alive or standing dead:
    - Ponderosa pine, black cottonwood (*Populus trichocarpa*), Douglas-fir (*Pseudotsuga menziesii*), trembling aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*), western larch (*Larix occidentalis*), or subalpine fir (*Abies lasiocarp*).
    - Greater than 30 cm diameter at breast height (DBH) in ponderosa pine or black cottonwood stands, or greater than 24 cm DBH in burned stands.
    - With cavities 5 cm in diameter or greater or classified as decay class 2 or greater.
- Foraging:
  - Standing trees do not exceed 35% of canopy closure.
  - Presence of fruit-bearing shrubs and perennial grasses in an understorey later to provide food sources. Presence considered to be a single fruit-bearing shrub or a 10-m square or larger patch with greater than 20% perennial grasses.

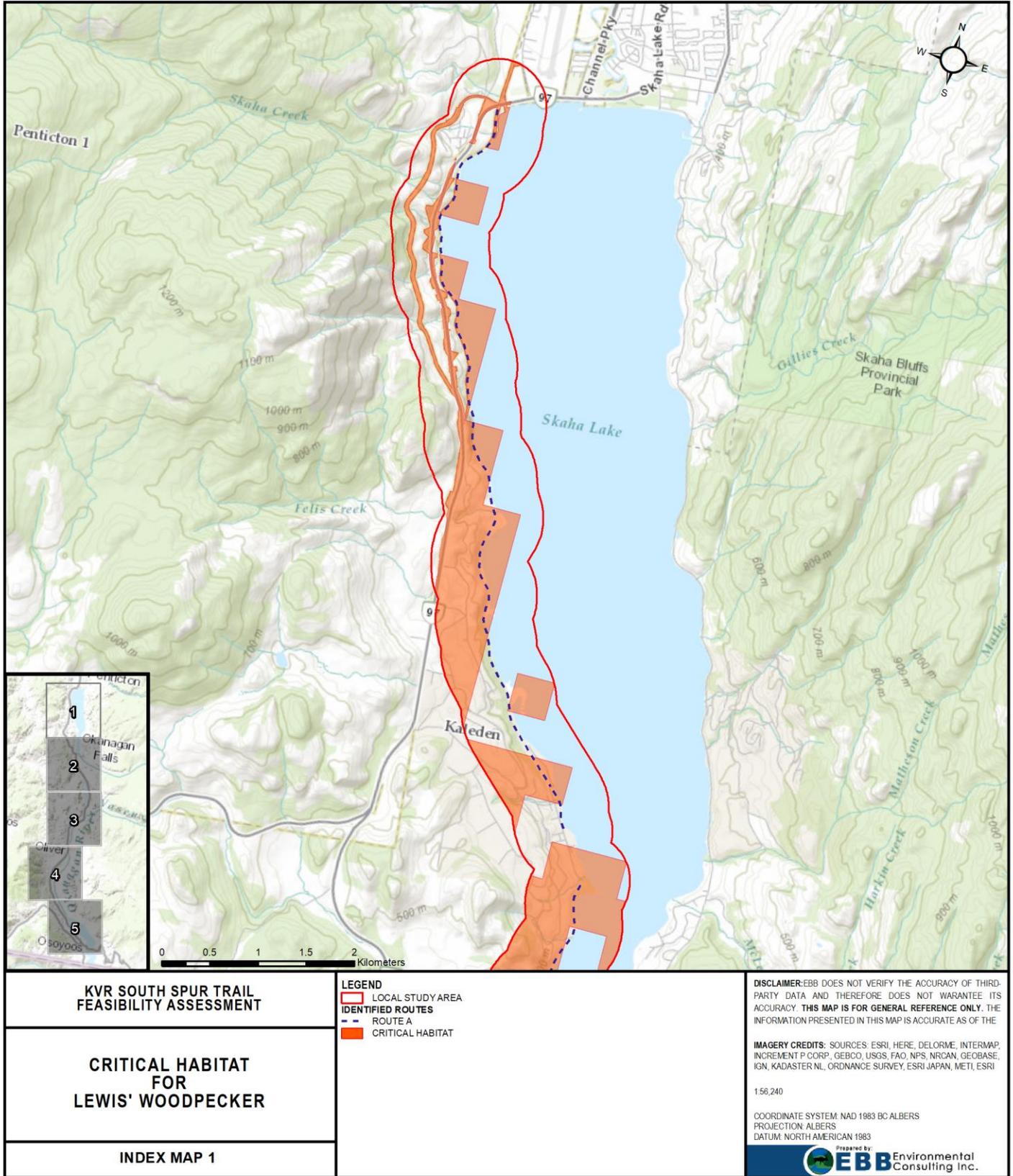
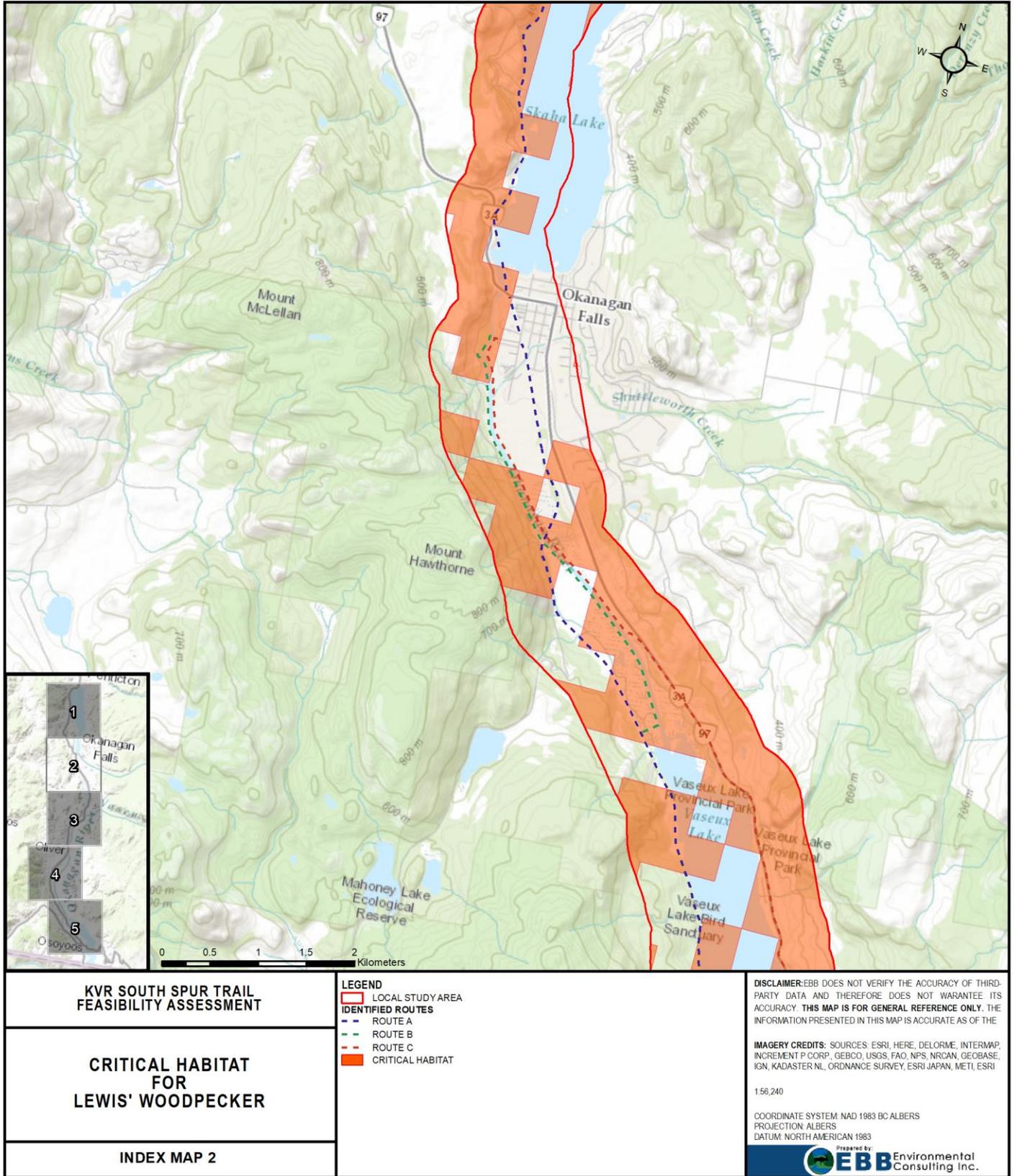


Figure 7-41. Critical Habitat for Lewis’s Woodpecker within Section 1 of the LSA.



**Figure 7-42. Critical Habitat for Lewis's Woodpecker within Section 2 of the LSA.**

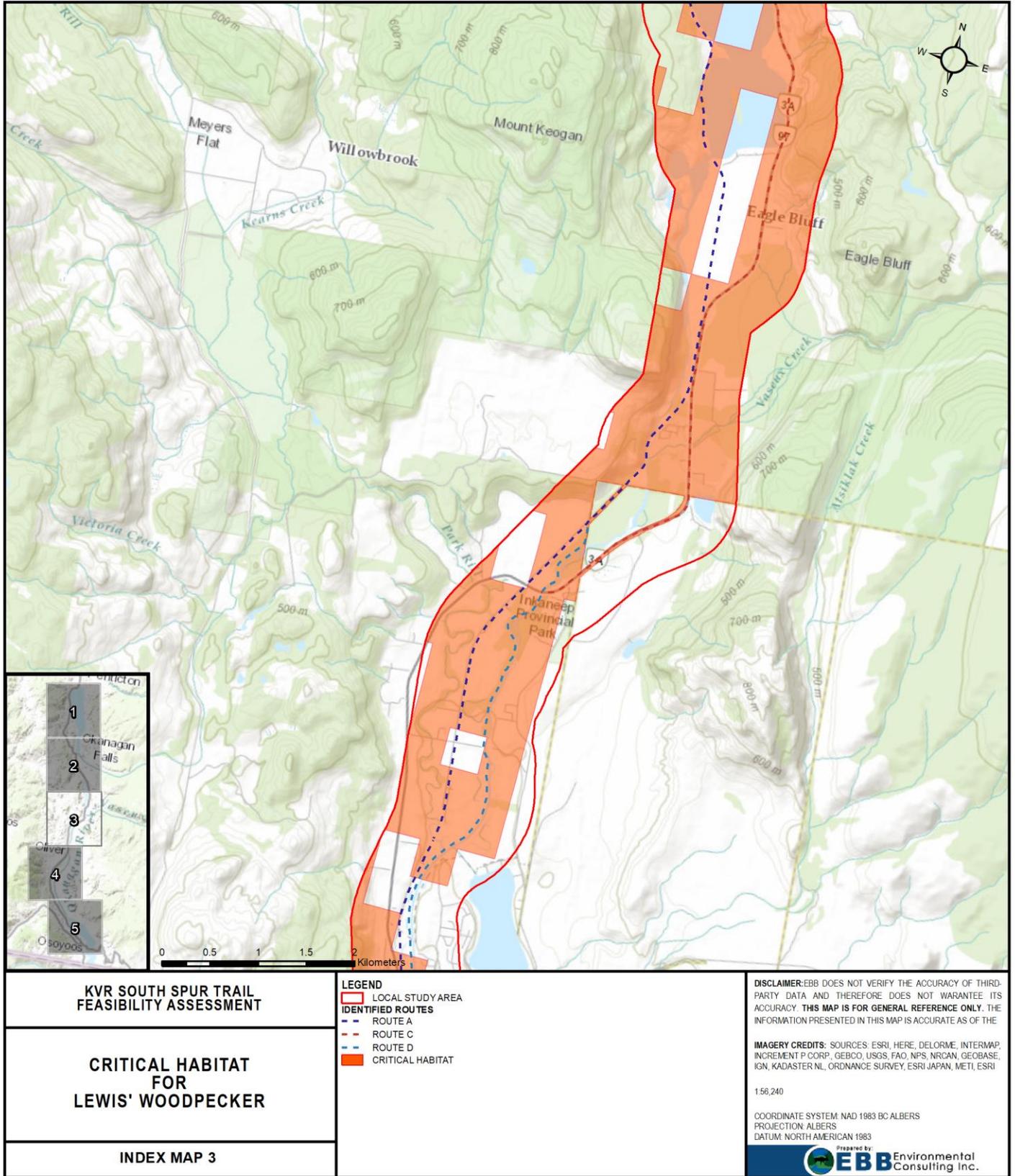


Figure 7-43. Critical Habitat for Lewis’s Woodpecker within Section 3 of the LSA.

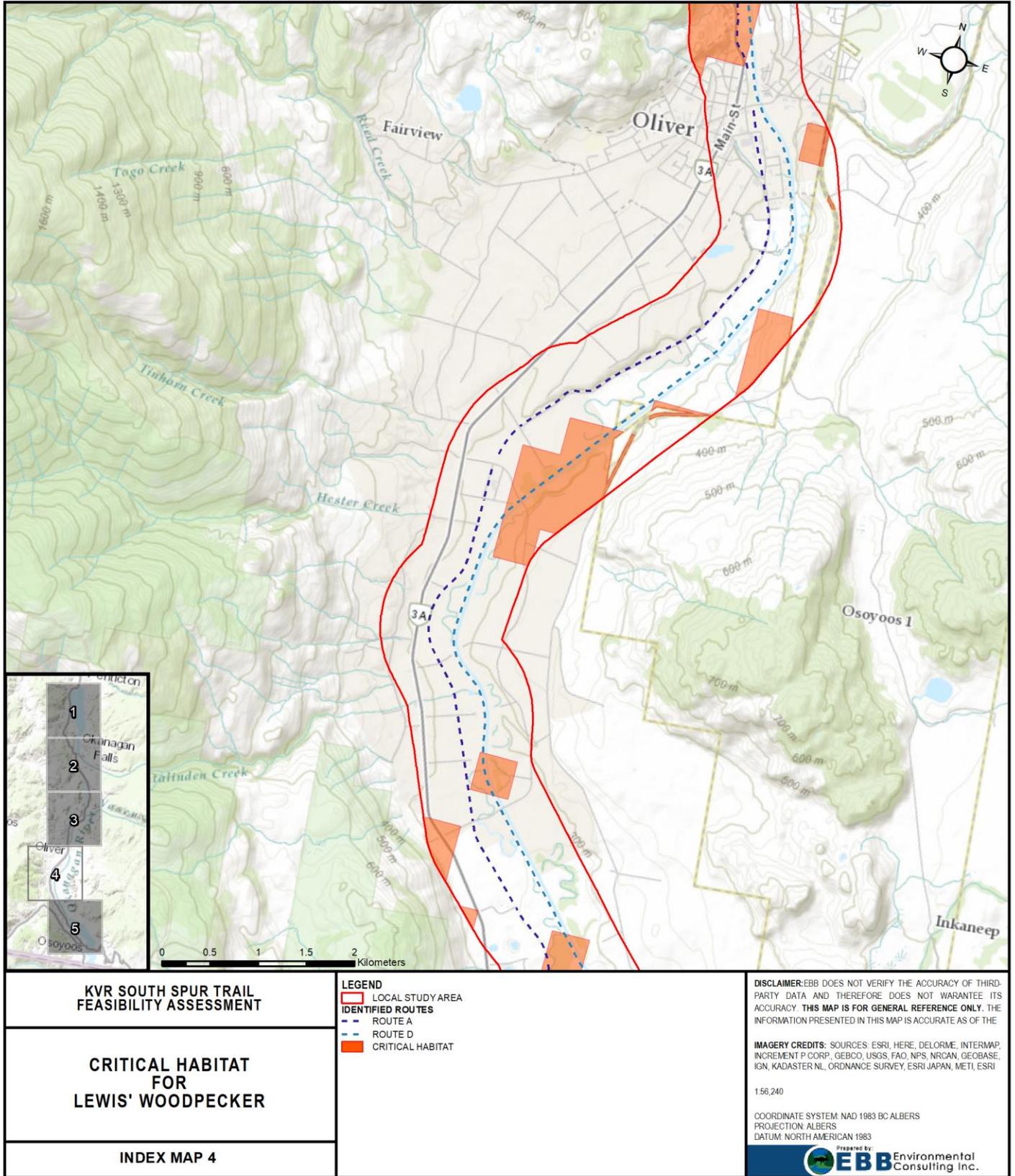


Figure 7-44. Critical Habitat for Lewis’s Woodpecker within Section 4 of the LSA.

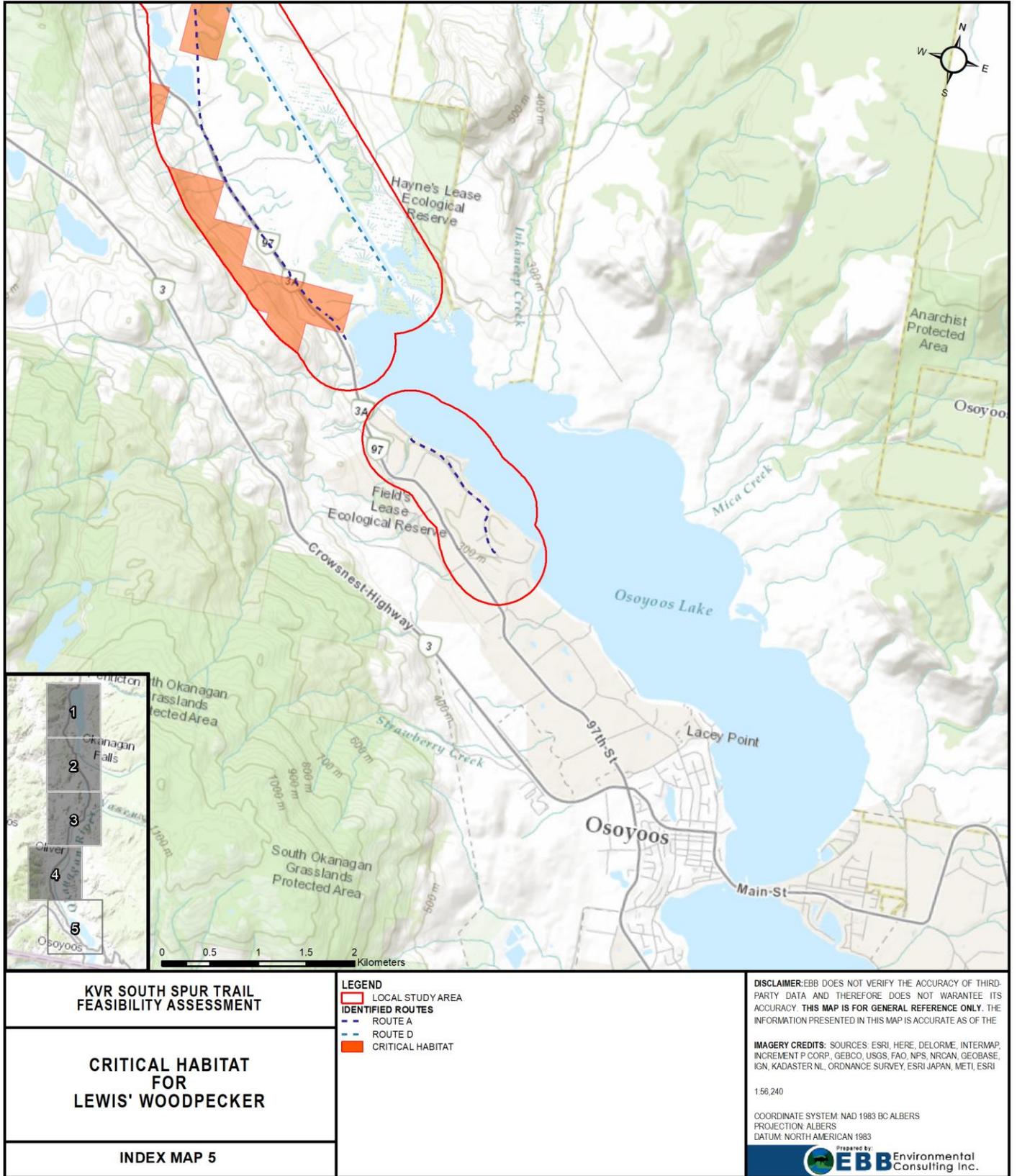


Figure 7-45. Critical Habitat for Lewis's Woodpecker within Section 5 of the LSA.

**YELLOW-BREADED CHAT, *AURICOLLIS* SUBSPECIES**

RED, ENDANGERED (SCH. 1)

*Icteria virens auricollis*

Critical habitat for Yellow-breasted chat, *auricollis* subspecies is divided into two categories: confirmed occupied and suitable habitat. Confirmed occupied breeding habitat is characterized by presence of dense thickets of understory vegetation in low-lying, mid-successional habitat (Environment and Climate Change Canada 2016b). Predominate nest shrub is wild rose (*Rosa* spp.). Common Snowberry (*Symphiocarpus albus*), Red-osier Dogwood (*Cornus stolonifera*), Thistle (*Cirsium* spp.), Saskatoon (*Amelanchier alnifolia*), or Poison Ivy (*Rhus radicans*) are also used for nesting but at lower frequency (Environment and Climate Change Canada 2016b). Average shrub cover is 48%. Trees are present within breeding habitat and include black cottonwood, water birch (*Betula occidentalis*), willow (*Salix* spp.) or mountain alder (*Alnus tenuifolia*). Grass and forbs are always present.

Suitable habitat is considered any habitat polygon with greater than or equal to 50% representation of one of three vegetation communities, including:

- Floodplains with a lack Cottonwood overstory and shrubby understory. Shrubs may include Red-osier Dogwood, Wild Rose, Poison Ivy, Common Snowberry, Water Birch, or Mountain Alder.
- Moist gullies and floodplains with a Trembling Aspen overstory and shrubby understory. Shrubs may include Wild Rose, Common Snowberry, Saskatoon, Red-osier Dogwood, or Poison Ivy.
- Swampy areas characterized by Water Birch and Red-osier Dogwood. Additional shrub species may include wild rose, Poison Ivy, Willow, or Mountain Alder.

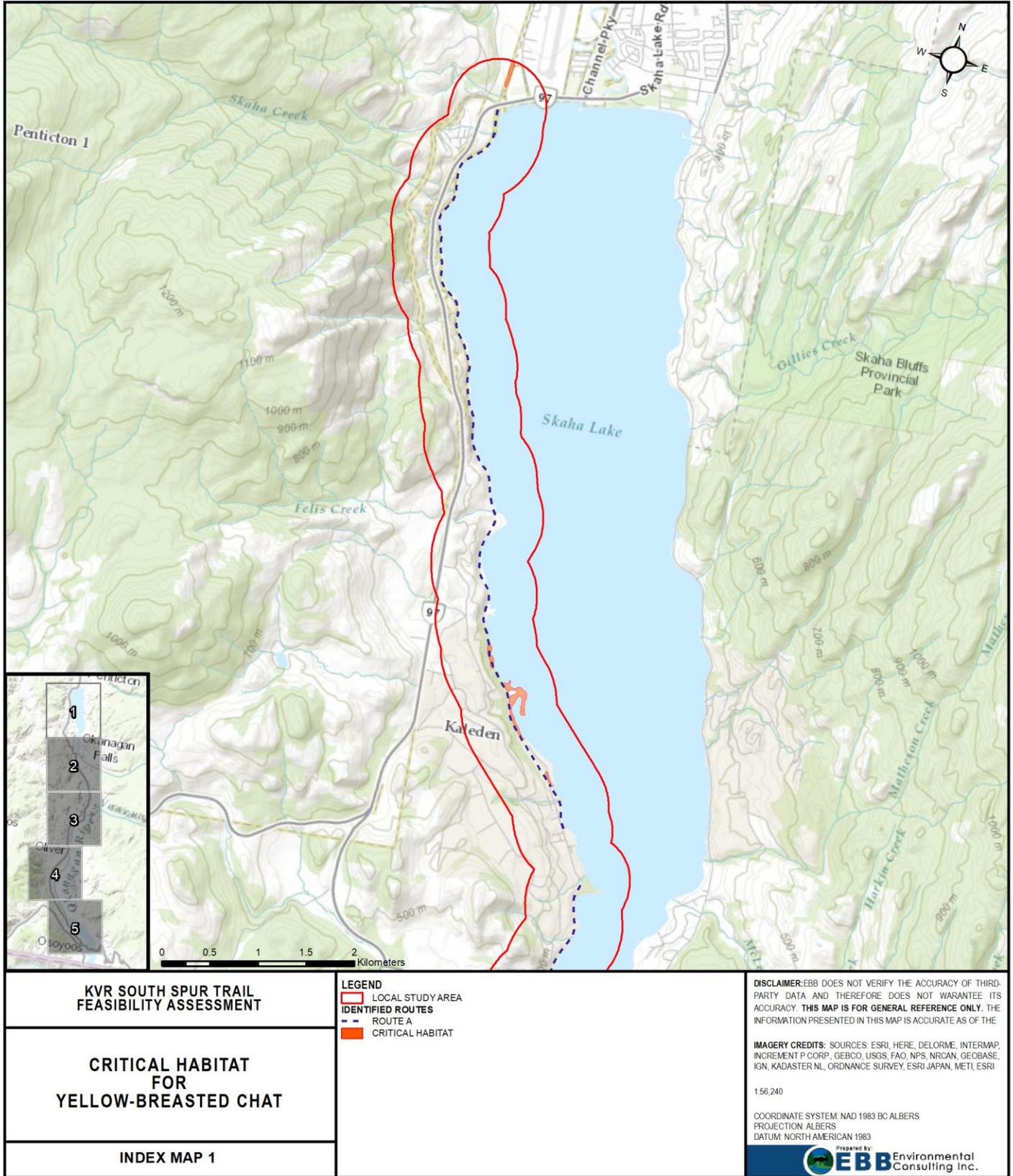


Figure 7-46. Critical Habitat for Yellow-breasted Chat within Section 1 of the LSA.

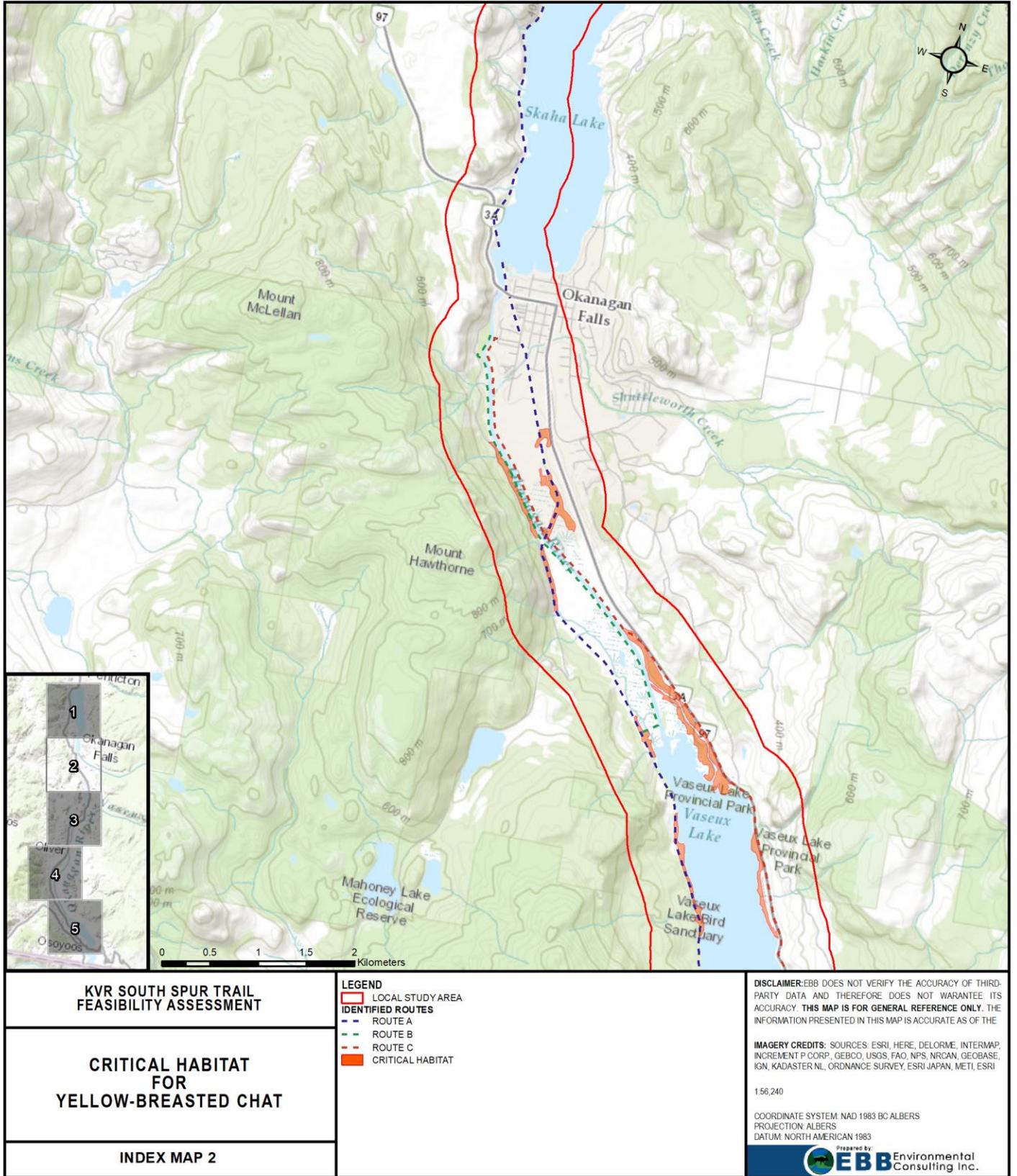


Figure 7-47. Critical Habitat for Yellow-breasted Chat within Section 2 of the LSA.

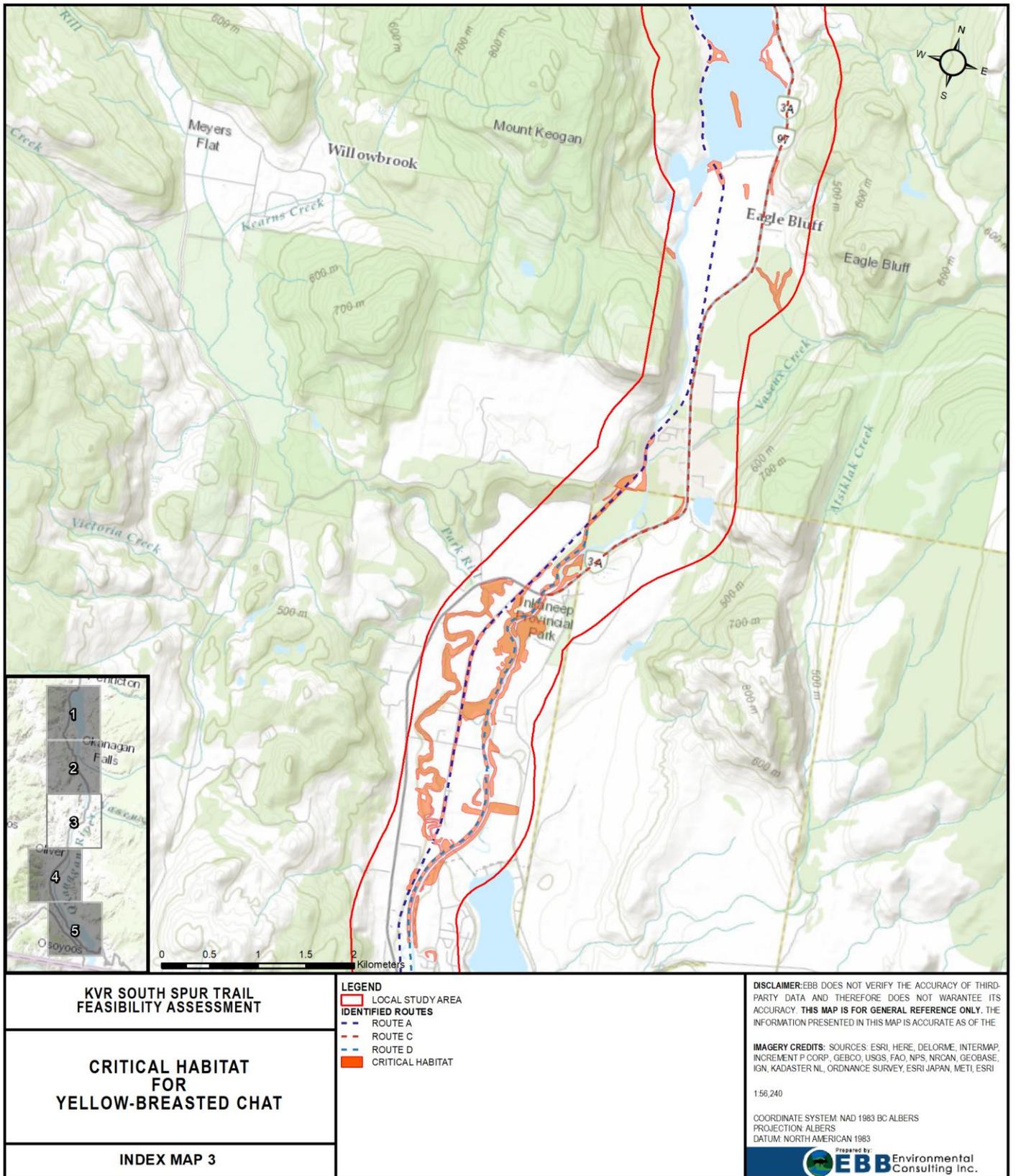


Figure 7-48. Critical Habitat for Yellow-breasted Chat within Section 3 of the LSA.

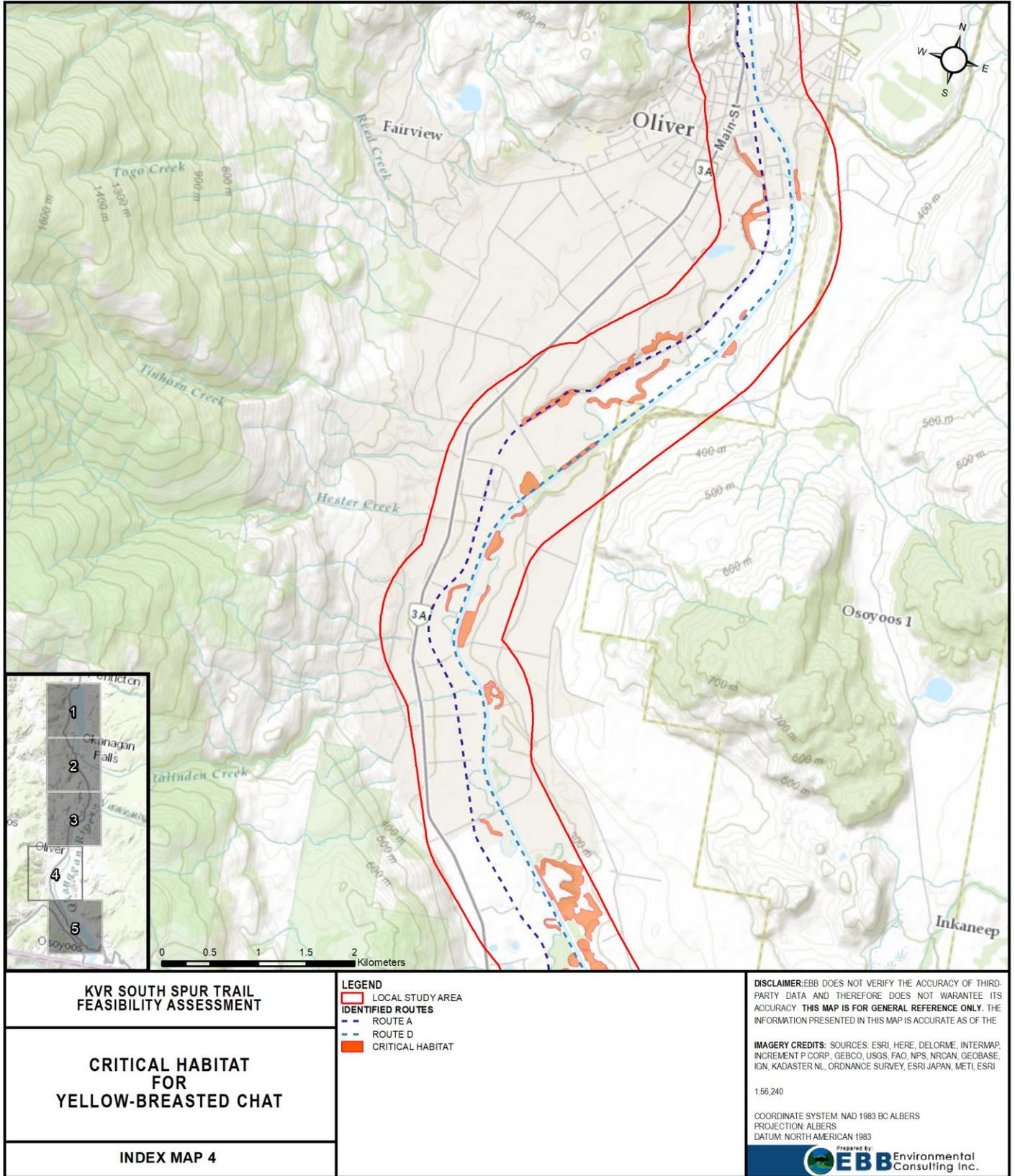


Figure 7-49. Critical Habitat for Yellow-breasted Chat within Section 4 of the LSA.

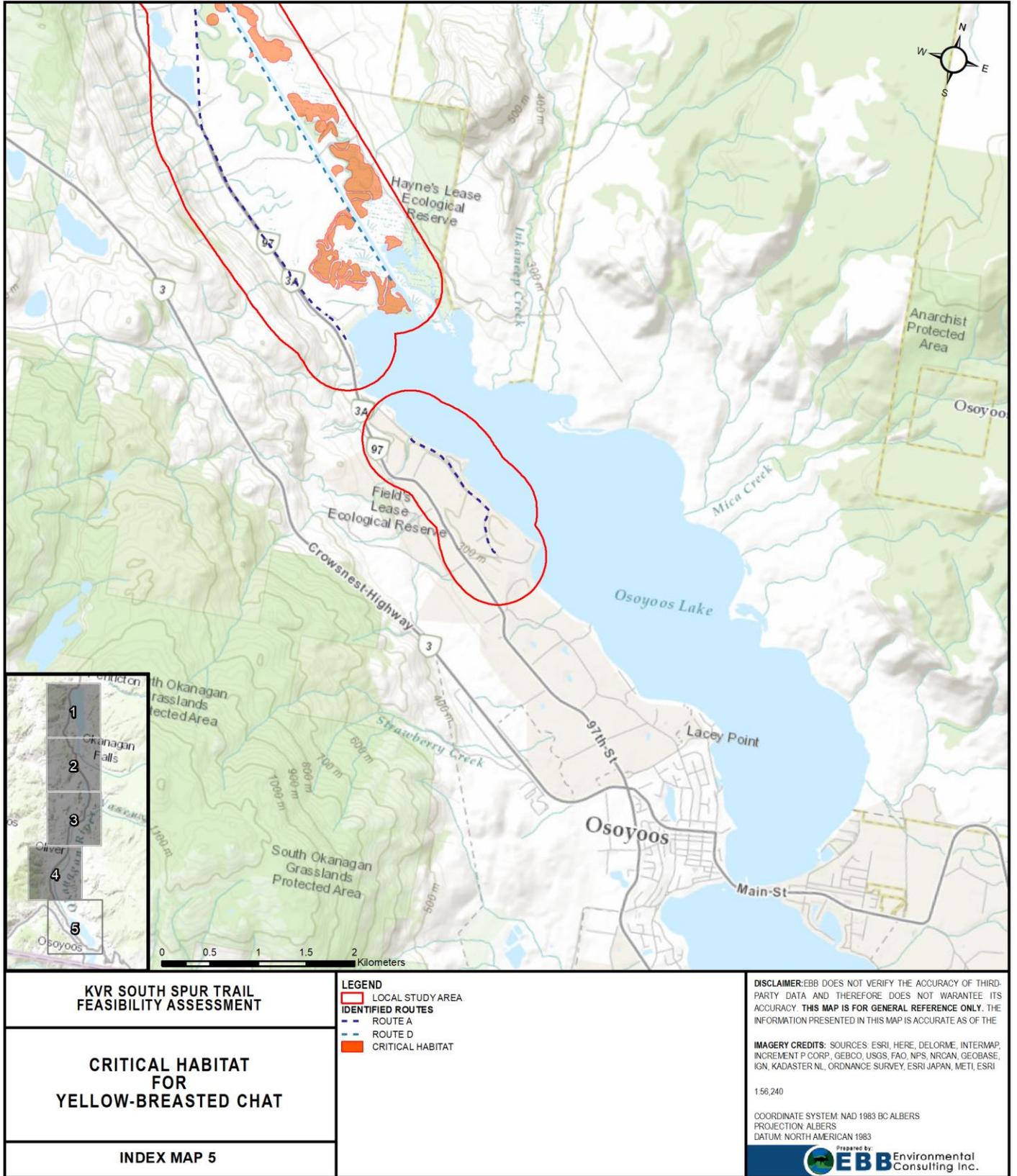


Figure 7-50. Critical Habitat for Yellow-breasted Chat within Section 5 of the LSA.

### 7.2.3 Potential Effects

Five potential environmental effects on wildlife resulting from trail development and recreational activities have been identified:

- Habitat Loss
  - Refers to the long-term or permanent removal or destruction of wildlife habitat.
- Change in Habitat
  - Includes the introduction of invasive specie and habitat fragmentation.
- Mortality, injury and reduction in overall fitness.
- Change in behaviour
- Proximity Disturbances
  - Refers to the alteration in behaviours and habitat use.

#### 7.2.3.1 Habitat Loss

##### General

It is assumed that during development of the trail corridor, permanent habit loss will occur where abandoned railbed is converted to a maintained trail with some degree of surfacing. This assumes that all vegetation will be removed to maintain minimum trail widths (2.0 m) to accommodate cycling and hiking. Additionally, a 0.5 m buffer on either side of the trail will be maintained and kept free of overgrowth, resulting in a total habitat loss of 3.0 m along the entire linear length of the trail corridor. Habitat loss is 11.9 ha for Route A, 2.0 ha for Route B, 0.7 ha for Route C and 5.4 ha for Route D. Refer to Section 7.1.3.1 for additional details.

##### Critical Habitat

Critical Habitat occurs for four SARA listed wildlife species at risk within the LSA, with a number of these occurrences being intersected by identified routes. Table 7-15 summarizes total loss of Critical Habitat by species and identified route.

**Table 7-15. Total Critical Habitat loss by SARA listed species.**

Total Critical Habitat Loss for SARA Wildlife by Identified Route				
Route	Species	Total Critical Habitat Loss (Hectares)	Route Distance (Kilometers)	Per Kilometer Loss in Hectares
A	Behr's Hairstreak	2.5	47.4	0.05
	Great Basin Spadefoot	3.7		0.08
	Lewis's Woodpecker	7.4		0.16
	Yellow Breasted Chat	3.1		0.07
	<b>Total</b>	<b>16.7</b>		<b>0.35</b>
B	Great Basin Spadefoot	0.7	4.8	0.15
	Lewis's Woodpecker	1.5		0.31

Total Critical Habitat Loss for SARA Wildlife by Identified Route				
Route	Species	Total Critical Habitat Loss (Hectares)	Route Distance (Kilometers)	Per Kilometer Loss in Hectares
	Yellow Breasted Chat	0.1		0.02
	<b>Total</b>	<b>2.3</b>		<b>0.48</b>
C	Behr's Hairstreak	0.1	14.9	0.01
	Great Basin Spadefoot	0.5		0.03
	Lewis's Woodpecker	0.6		0.04
	Yellow Breasted Chat	0.2		0.01
	<b>Total</b>	<b>1.4</b>		<b>0.09</b>
D	Great Basin Spadefoot	5.2	20.6	0.25
	Lewis's Woodpecker	2.3		0.11
	Yellow Breasted Chat	2.1		0.10
	<b>Total</b>	<b>9.6</b>		<b>0.47</b>

### 7.2.3.2 Change in Habitat

Changes to habitat for wildlife refer to alterations to physical habitat by direct and indirect impacts which change the suitability of habitat to support wildlife populations. Changes in wildlife habitat include:

- alterations to vegetation community structure;
- creation of edge effect in peripheral areas;
- alterations to microclimate conditions;
- wind firmness of forests areas;
- increased susceptibility to predation;
- decreased availability to food and resources, including access to adjacent habitats (fragmentation);
- noise;
- increased susceptibility to invasive species distribution and abundance;
- shifting of nesting locations for breeding birds; and,
- changes to species composition and diversity.

### 7.2.3.3 Mortality, Injury and Reduction in Fitness

Extent of mortality, injury, and reduction in fitness to wildlife species are dependent on species-specific seasonal vulnerabilities and trail development phase. Amphibians, birds, and small mammals can be particularly vulnerable during clearing and grubbing activities that impact nesting and breeding sites. Reptiles can be vulnerable during seasonal migration events and at site-specific habitat features which encourage use for thermal warming. High-use recreation areas have potential to increase nest predation with predators being drawn in by food and garbage left behind by trail users (Snetsinger and White 2009). Additionally, discarded food has

the potential to increase wildlife mortality by attracting wildlife to trails and roads used by humans, leading to strikes with bicycles and vehicles (Newsome and van Eeden 2017).

Amphibian egg masses, hatchlings, and tadpoles are confined to aquatic habitat until they reach juvenile and adult stages. Sedimentation, introduced deleterious substances (e.g., hydrocarbons), and changes to riparian canopy cover and moist microclimates can adversely affect amphibian health.

Clearing and grubbing during the construction phase as well as vegetation management during the operations and management phase is another source of mortality or injury risk to individuals during the breeding (nesting) window through the clearing of trees, shrubs, and grasses. Of particular risk are ground nesting birds who can be adversely impacted by both construction and maintenance activities and unauthorized off-trail recreational activities which may result in nests being inadvertently trampled.

Reductions in fitness refers to instances where wildlife are frequently disturbed resulting in behavioural and physiological responses such as: increased or decreased locomotion, cardiovascular activity, oxygen consumption, glucose mobilization and body temperature (Tablado and Jenni 2017). These changes can lead to temporary reductions in reproductive behaviours and appetite. Frequent disturbance may lead to the abandonment of preferred habitat and food sources for less suitable habitat and food sources.

#### *7.2.3.4 Change in Behaviour*

Behavioural changes for wildlife species may occur trail development and recreational activities. Disturbances can have both immediate and long-term effects on wildlife (Taylor and Knight 2003) and include changes to behavioural responses that affect predation risk, energy intake and expenditure, and stress responses that affect the physiological well-being of the individual and habitat avoidance (Coppes and Brausch 2013). Behavioral changes include increased alertness, flight responses, food conditioning, displacement from or avoidance of favoured habitat and habituation to people (Marzano and Dandy 2012). Amphibians, reptiles, birds and mammals may disperse temporarily or permanently from areas of disturbance. Food conditioning can involve both changes to dietary preferences and the behaviour and habitat use by wildlife (Newsome and van Eeden 2017). For recreational trails, the common source of food is derived from food scraps and garbage left behind by trail users.

#### *7.2.3.5 Proximity Disturbances*

Impacts arising from proximity of recreational activities vary greatly based on activity and species impacted. These impacts are further influenced by variables that determine how species will react to proximal disturbance. Influencing factors include: number of people approaching, clothing colour, noise levels, odour, distance, and speed of movement (Tablado and Jenni 2015). Species responses are further influenced by intrinsic properties of species and individuals, among these characteristics are variations in sensory abilities, vigilance effort, previous experiences and degree of gregariousness (Tablado and Jenni 2015).

Proximity disturbances are measured in terms of flight (i.e., running/moving/flying away) initiation distance (FID), generally considered as the average distance required for an individual species to flee from cover or nests; and alert response distance (ARD), the average distance required for a species to display behaviours that indicate awareness of potential risk. Flight response impacts energy balance, feeding behaviour, and vulnerability of young, eggs, or fledglings (Marzano and Dandy 2012). Specific life stages and breeding status affect FID responses; breeding species are more sensitive to proximity disturbances than non-breeding. Table 7-16 summarizes FID for select species.

**Table 7-16. Summary of proximity disturbances for select wildlife species.**

<b>Examples of Proximity Disturbance by Species and Activity</b>			
<i>Species/Order</i>	<i>Activity</i>	<i>FID (m)</i>	<i>Source</i>
Western Meadowlark	Hiking – On-trail	30.63	Miller <i>et al.</i> 2001
Western Meadowlark	Hiking – Off-trail	37.73	Miller <i>et al.</i> 2001
Western Meadowlark	Dog on Leash	28.21	Miller <i>et al.</i> 2001
Western Meadowlark	Dog off Leash	36.71	Miller <i>et al.</i> 2001
Mule Deer	Hiking	149.63	Taylor and Knight 2003
Mule Deer	Biking	118.45	Taylor and Knight 2003
Anseriformes – Ducks, Swans and Geese – Breeding	Pedestrian (Hiking)	32.5	Livezey <i>et al.</i> 2016
Charadriiformes – Shorebirds – Breeding	Pedestrian (Hiking)	14.9	Livezey <i>et al.</i> 2016
Falconiformes – Diurnal Birds of Prey – Breeding	Pedestrian (Hiking)	476.0	Livezey <i>et al.</i> 2016
Galliformes – Partridges, Grouse and Turkeys – Breeding	Pedestrian (Hiking)	79.7	Livezey <i>et al.</i> 2016
Passeriformes – Songbirds – Breeding	Pedestrian (Hiking)	8.4	Livezey <i>et al.</i> 2016
Anseriformes – Ducks, Swans and Geese – Non-breeding	Bicycling	74.4	Livezey <i>et al.</i> 2016
Skinks – Amphibians	Hiking	1.91	McGowan <i>et al.</i> 2014

## **7.2.4 General Mitigation Measures**

### **Pre-construction Phase**

- A QEP should survey the development corridor (development footprint and buffer) to conduct inventories and assessments prior to development, including:
  - assessment of habitat suitability for documented and potential occurrences of wildlife species at risk;
  - inventory of species at risk;
  - identify snake hibernacula and potential migration routes; and;
  - inventory of raptor nests.
- Trail routing should be developed on a site-specific basis with the final alignment developed to minimize impacts to moderate and high rated habitat for wildlife species at risk and Critical Habitats.
- The route should be surveyed, demarking the alignment and sensitive environmental features.
- Appropriate management plans should be developed to identify procedures, processes, and practices that will minimize impacts to sensitive environmental features.

### **Construction Phase**

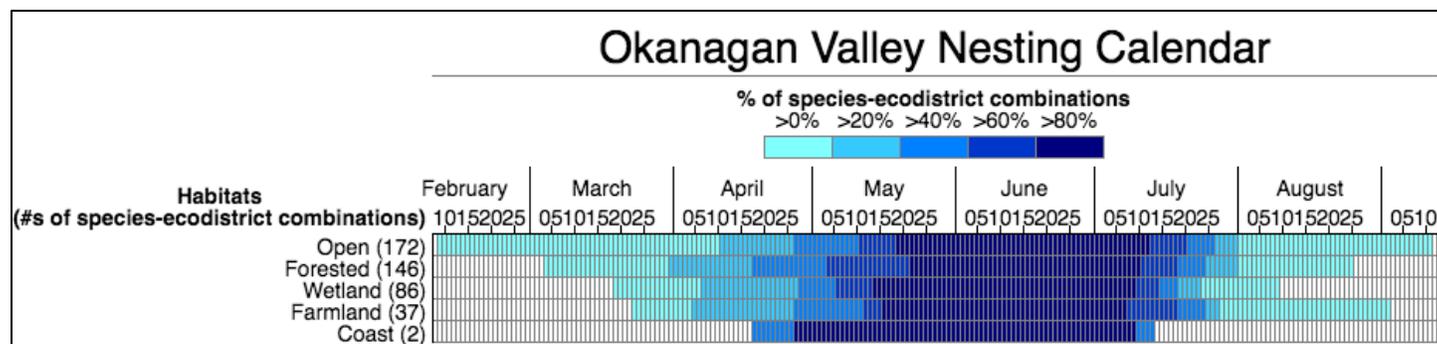
- All sensitive areas should be identified and appropriately demarked to discourage unauthorised access.

- Implement BMPs, including:
  - *Develop with Care 2014: Environmental Guidelines for Urban and Rural Development in British Columbia* (FLNRO 2014)
  - *Guidelines for Amphibians and Reptile Conservation during and Rural and Urban Land Development in British Columbia* (FLNRO 2014)
  - *Guidelines for Raptor Conservation during and Rural and Urban Land Development in British Columbia* (FLNRO 2013)
- A QEP should conduct raptor nest. Radial buffers based on disturbance tolerances of the species should be applied (Table 7-17).

**Table 7-17. Minimum buffers for nesting raptors.**

Minimum Buffers for Nesting Raptors				
Ability to Coexist	Undeveloped	Rural	Urban	Breeding Season Buffer
High and Moderate-High	200 m	100 m	1.5 tree lengths or 50 m from a cliff	100 m
Moderate	500 m	200 m	1.5 tree lengths or 50 m from a cliff	100 m
Low-Moderate and Low	500 m	As advised by a QEP	As advised by a QEP	As advised by a QEP

- Clearing, grubbing and stripping should occur only between August and March of any given year to avoid impacts to nesting birds during sensitive nesting windows, generally considered to be between April 1 and July 31. Figure 7-51 outlines periods of highest probability for nesting birds by habitat.



**Figure 7-51. Nesting calendar for the Okanagan Valley showing periods of highest probability of nesting (Rousseau and Drolet 2015).**

- If vegetation must be removed during the nesting window, a QEP is to be retained to conduct nest surveys and apply appropriate radial buffers to protect active nests from disturbance.
- Where possible, maintain native vegetation and tree drip lines.
- Implement measures to minimize impacts on snakes between April 1 and October 31 when daytime temperatures reach a minimum of 10° C, including:
  - Inspections of vehicles and equipment and stockpiles of material prior to removal.
- Avoid conducting works within riparian habitats wherever feasible to minimize impacts to amphibians.
  - Works are not to be completed between during amphibian overwintering, October 1 and March 1.
- Conduct wildlife salvages where avoidance is not possible.

## Operations and Maintenance Phase

- Time trail maintenance works to occur outside of sensitive nesting window (April 1 to July 31).

### 7.3 Fish and Fish Habitat

#### 7.3.1 Components

Two indicators were identified for fish and fish habitat EV and include fish species at risk and regionally important fish species.

##### 7.3.1.1 Fish Species at Risk

Fish species at risk include Provincially and SARA listed species. Species listed under SARA as Threatened or Endangered are legally protected, and the protection of these species must be considered, particularly where the identified routes occur within Federal lands.

##### 7.3.1.2 Regionally Important Fish Species

Regionally important fish species refers to species that are part of commercial, recreational or aboriginal (CRA) fisheries. Regionally important fish include salmonids and freshwater game fish.

#### 7.3.2 Baseline Conditions

The KVR South Spur Trail corridor occurs adjacent to or crosses waterbodies including Okanagan River, Vaseux Lake, Skaha Lake, Osoyoos Lake, and numerous named and unnamed streams.

##### 7.3.2.1 Regionally Important Fish Species

A review of the provincial Fisheries Inventory Data Queries (FIDQ) and Fisheries Information Summary System (FISS) spatial data for fish observations and distribution identified 30 species of fish known to occur within the RSA. Of these, nine are provincially classified as exotic, 19 as yellow, one as blue, and one as unknown. Regionally important fish species identified to occur within the LSA include: lake trout, brook trout, chinook salmon, sockeye salmon, kokanee, bigmouth bass, smallmouth bass, rainbow trout and steelhead.

##### 7.3.2.2 Fish Species at Risk

One blue-listed species (CF Priority 1), Chiselmouth (*Acrocheilus alutaceus*), was identified within the LSA. No SARA listed fish species at risk were documented within the LSA.

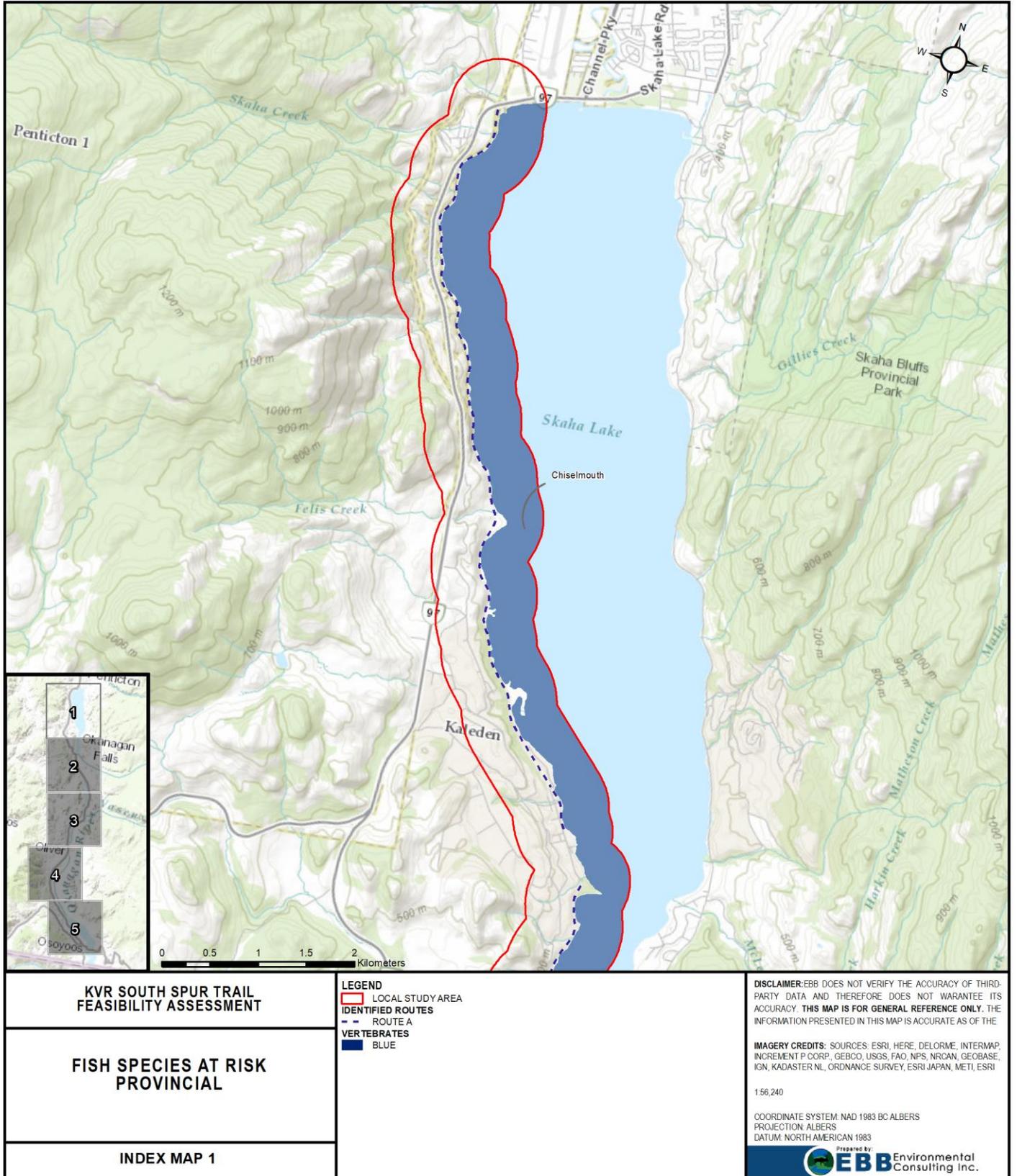


Figure 7-52. BC CDC listed fish species within Section 1 of the LSA.

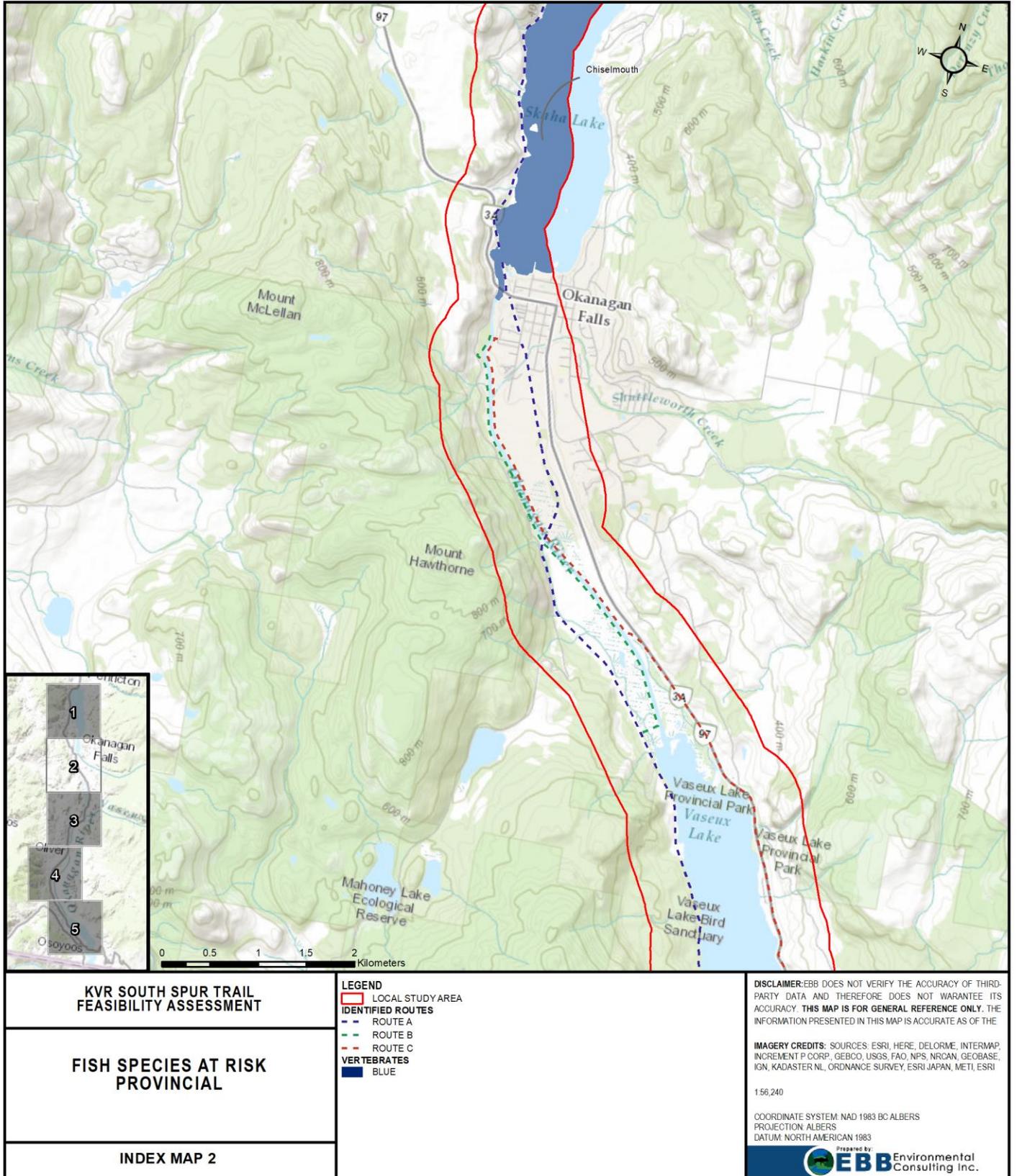


Figure 7-53. BC CDC listed fish species within Section 2 of the LSA.

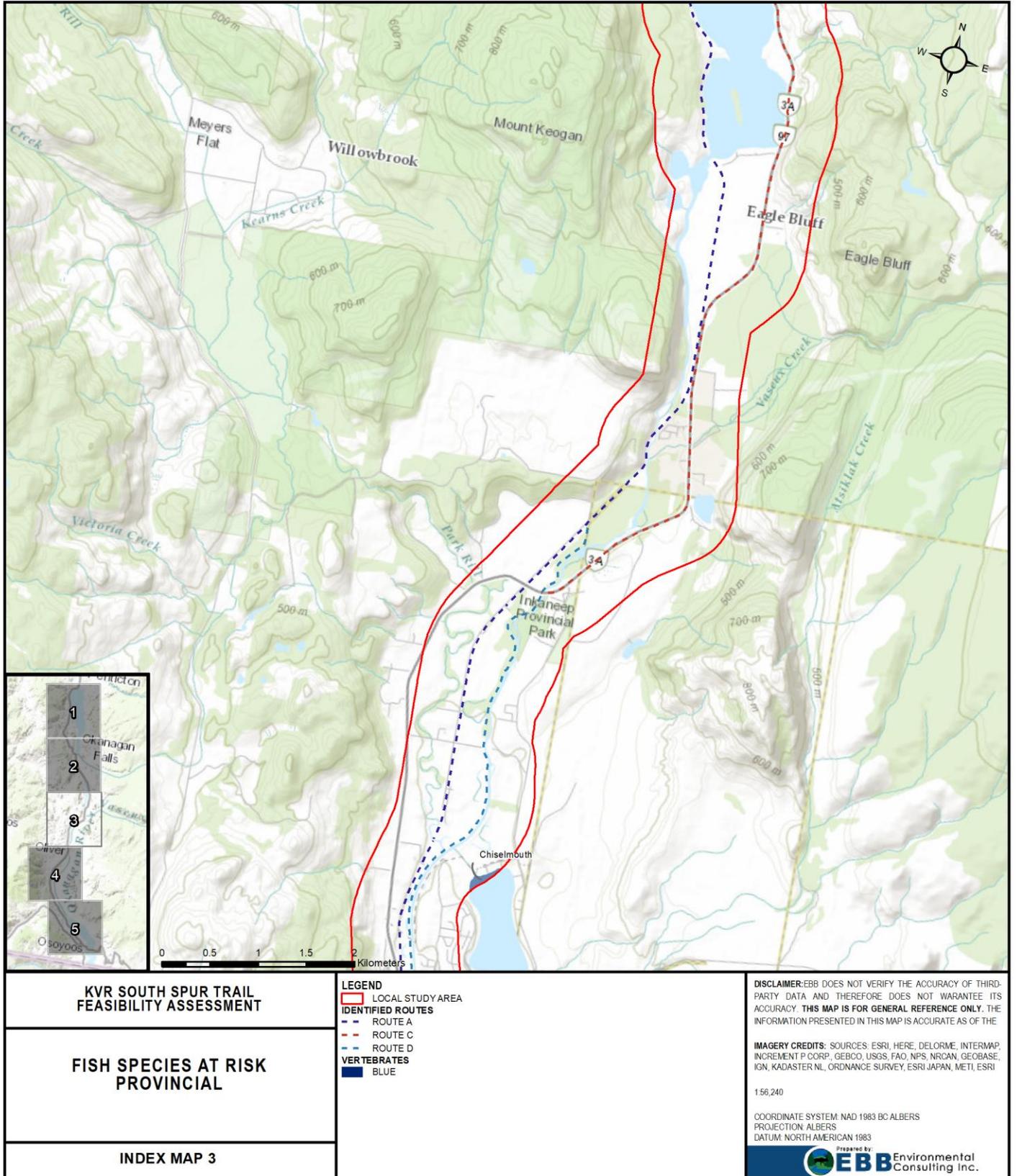


Figure 7-54. BC CDC listed fish species within Section 3 of the LSA.

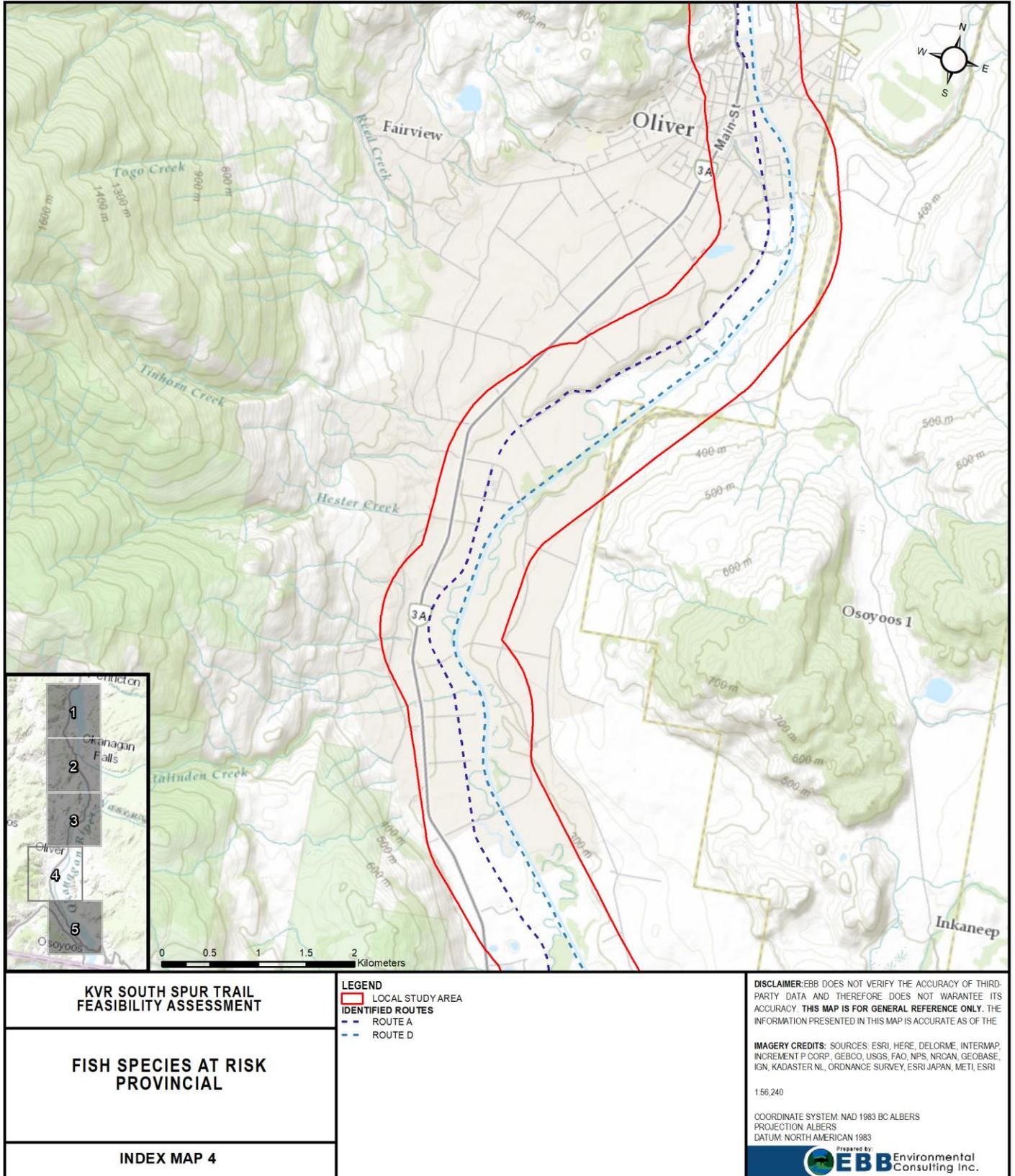


Figure 7-55. No BC CDC listed fish species within Section 4 of the LSA.

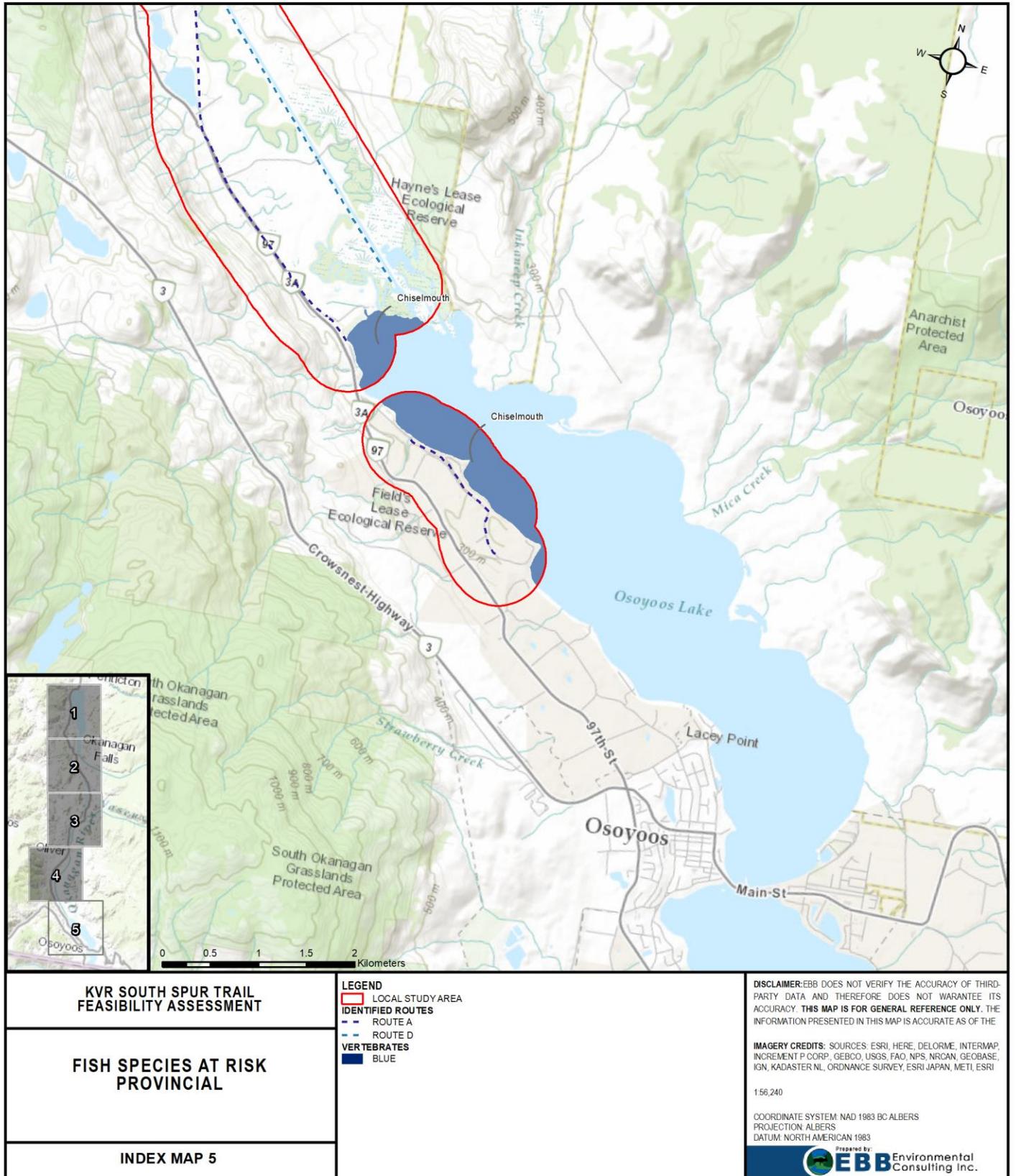


Figure 7-56. BC CDC listed fish species within Section 5 of the LSA.

### 7.3.3 Potential Effects

Impacts associated with trail development are expected to be limited to the construction phase, particularly should any crossings (*i.e.*, bridges) be constructed across the Okanagan River in locations where historical rail trestles were removed. Fisheries and Oceans Canada (DFO) has documented potential impacts and effects of development activities on fish and fish habitat, generally, these effects include:

- Change in Base Flow
- Change in Water Temperature
- Change in Sediment Concentrations
- Change in Nutrient Concentrations
- Change in Contaminant Concentration
- Potential Mortality of Fish/Eggs/Ova
- Change in Habitat Structure and Cover
- Change in Food Supply

Effects can be summarized into two categories:

- Change in habitat quality.
- Changes in fish mortality risk.

#### 7.3.3.1 Change in Habitat Quality

Activities associated with trail development and recreational activities have potential to alter quantity and quality of instream and riparian habitat for salmonids and regionally important fish species. Potential impacts include:

- changes to habitat structures and cover;
- changes in sediment concentrations; and,
- changes to food supply.

Removal of instream structures and riparian vegetation can result in various changes to biophysical condition of the watercourse, including reductions in channel stability, cover, and protection from predators and physical disturbances. Habitat complexity is important in determining density and diversity of aquatic macroinvertebrates (Smokorowski and Pratt 2006), with diversity, biomass and production greater in habitats with higher complexity and large woody debris. Trout biomass has been positively correlated with availability of benthic invertebrates. Loss of diverse habitat and cover have potential to adversely affect fish and their food sources. Habitat quality can be altered through physical changes, including infilling of habitat from introduced sediment, and therefore reducing availability of spawning and rearing habitats.

Alterations to instream aquatic and riparian vegetation can result in changes to food supply and nutrient concentrations. Aquatic food supplies must be plentiful and diverse to sustain watershed productivity. Changes in quantity or composition of food supply, beginning with plants and organic debris that fall into a waterway, can alter the structure of the aquatic community.

### 7.3.3.2 Fish Mortality Risk

Fish mortality risk includes risk of direct mortality and indirect reductions in overall fitness which can increase risk of mortality. Impacts arising from works associated with trail development include:

- direct mortality of fish, egg or ova;
- change in sediment and contamination concentrations;
- increase in water temperatures; and,
- change in nutrient concentrations.

Long-term changes in suspended sediment concentrations may have negative effects on fish health, including:

- elevated blood sugar, plasma glucose, or plasma cortisol levels (i.e., stress response);
- increased cardiac output;
- increased ventilation rates;
- gill damage; and,
- reduced resistance to disease (Robertson *et al.* 2006).

Fish eggs are impacted by sediment deposition, with decreased survival with the percentage of fine sediments ( $\leq 6\text{mm}$ ). Deposition of fine sediments kills eggs by inhibiting gas exchange and removal of toxic metabolites from redds (Robertson *et al.* 2006).

Contaminants such as petroleum hydrocarbons, heavy metals, and pesticides can cause direct toxic effects when released into aquatic environments (Fleeger *et al.* 2003). Effects from increases in contaminant concentrations can range from direct fatality to sublethal chronic effects including changes in both behaviour and physiology. Specific impacts to fish and aquatic organisms vary based on the contaminant released into an aquatic environment.

Water temperature directly affects many physical, biological, and chemical characteristics of a waterway. In elevated temperatures, many coldwater fish, such as trout and salmon, could experience reduced reproductive activity or direct mortality, including egg mortality. High temperatures also encourage microbial breakdown of organic matter, leading to a depletion of dissolved oxygen in the water body.

### 7.3.4 General Mitigation Measures

Overall, the potential effect of any trail development is low and restricted in spatial impact, generally considered to be locations where the trail corridor crosses over the Okanagan River, necessitating the construction of bridge structures. By implementing standard best management practices (BMPs), impacts associated with stream crossing can be effectively managed. Applicable BMPs include:

- *Standards and Best Practices for Instream Works* (WLAP 2004)
- *Measures to Avoid Causing Harm to Fish and Fish Habitat including Aquatic Species at Risk* (DFO 2016)
- *Freshwater Intake End-of-Pipe Fish Screen Guidelines* (DFO 1995)
- *Fish Stream Crossing Guidebook* (FLNRO 2012)
- *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck *et al.* 1993)

## Pre-Construction Phase

Mitigation of impacts to fish and fish habitat are to follow fundamental guidelines established by DFO (DFO 2013), which provide a hierarchy of avoidance, mitigation and offsetting. Wherever feasible, measures to avoid causing serious harm to fish or fish habitat are to be implemented. This is typically established during the design phase of the trail and can include route alterations to take advantage of existing crossings (avoidance) and crossing designs with structures that avoid impacts to instream habitat (e.g., clearspan bridges).

## Construction Phase

Where residual impacts exist following the design of measures to avoid impacts, measures to mitigate impacts to fish and fish habitat are to be implemented and should include the following:

- **Reduced Risk Work Timing:** Instream works are to coincide with the reduced risk period for the Region 8 (Okanagan) stream works windows. For the Okanagan River downstream of Skaha Lake, the reduced risk timing window is July 15 to August 31 of any given year.
- **Instream Work Isolation:** All instream works are to be completed in isolation of flowing water. Isolation may be obtained through the installation of a dam structure around the instream portion of the work area, creating a temporary diversion of flow, and dewatering the isolated area.
- **Fish Salvage:** Prior to the dewatering of an isolated instream work area, fish are to be salvaged from the isolation zone and relocated immediately upstream. Fish salvages are to be conducted by a QEP who has obtained the necessary permits/licenses from the province and DFO,
- **Pump Intake Fish Screening:** Any pump intake used within a fish-bearing watercourse must be fitted with a fish screen. The screen area and mesh size will be selected in accordance with DFO's *Freshwater Intake End-of-Pipe Fish Screen Guidelines* (DFO 1995).
- **Vegetation and Soil Management:** Vegetation clearing, grubbing, and stripping will be limited to the area that is necessary for the construction of any structure in or about a stream.
- **Erosion and Sediment Control:** Prior to the commencement of any works in or about a stream, an erosion and sediment control (ESC) plan should be developed by a QEP and implemented by the contractor. The ESC plan will prescribe BMPs to minimize the input of sediment to stream.
- **Site Reclamation:** Within all stream banks and adjacent lands where erosion is feasible, site reclamation is to be implemented. Disturbed areas should be seeded and planted with native plant species and all stream banks contoured and stabilized.
- **Environmental Monitoring:** For the duration of instream works, an environmental monitor will be retained and present during the instream activities. A water quality monitoring program should be implemented to detect any increases in downstream turbidity and ensure that targets identified within *the Approved Water Quality Guidelines* (Ministry of Environment 2017a).

## 7.4 Cumulative Effects

Cumulative effects refer to changes to environmental, social and economic values caused by combined effects of past, present, and potential future activities and natural processes (Government of British Columbia 2016). Population growth within the RDOS is at a rate of 0.6%, with current projections increasing to 0.84% for the region (South Okanagan Regional Growth Strategy Bylaw No. 2770, 2017). With ongoing population growth in the South Okanagan, pressures for land development for agricultural, residential, commercial and industrial uses will continue to increase. Historic and ongoing effects within the RSA include:

- population growth;
- land conversion (agricultural operations, residential, commercial and industrial land development and fragmentation);
- human interference with natural cycles (i.e., influences on frequency and intensity of wildfires through management and suppression); and,
- disturbances including existing trail networks and historical railway.

Considerable development has occurred within the LSA and RSA, driven by the pressures for land conversions for agricultural operations, residential, commercial and industrial land developments. Land development places pressures on remaining habitat to support viable populations of wildlife to ensure that the populations persist. Continued removal of habitat has potential to impact long-term viability of ecosystems, plant and wildlife populations.

Considering the proposed trail corridor was historically utilized as working railway for over 30 years, many of the impacts to the environmental values have occurred, and while not considered permanent, the natural re-establishment of viable habitat is slow, particularly in antelope-brush habitats where natural revegetation events may occur once every 20 years (USDA n.d.) with reproductive maturity not occurring until 8 to 10 years post establishment (Zlatnik 1999). Natural re-vegetation of the abandoned railway right-of-way is likely incomplete.

Recreational use and development of the trail corridor has been ongoing as a component of the RDOS *Trails Master Plan* (Cascade Environmental Resource Group Ltd. 2012) and include trail improvements such as surfacing, brushing, invasive plant removal, and placement of signage and bollards. Additional known improvement projects include: surfacing upgrades along the KVR South Spur Trail include Osoyoos Lake (91st Street) to Road 21, Skaha Lake from Sutherland Road to Vancouver Place, Kaleden to Okanagan Falls Trail Resurfacing, and Road 22 KVR Trail Boardwalk.

Overall, it is not expected that trail development on either the primary or alternative routes will result in significant cumulative effects.

## 7.5 Risk Assessment

A risk assessment refers to the analysis of environmental values and associated components against the magnitude, degree of consequence (severity of effect) and probability of occurrence assuming application of mitigation measures. Assessment methods as described within *Environmental Mitigation Procedures* (Ministry of Environment 2014) have been implemented to determine the associated risk of development with each environmental component. This include incorporating definitions for consequence and probability rankings. No standardized rankings for duration or frequency occurs within the *Environmental Mitigation Procedures*, therefore

these have been defined on reasonable trail use frequency and overall duration of the impact. The risk assessment assumes that no pre-existing disturbance

Summaries of applicable rankings are provided in Table 7-18 to Table 7-23.

**Table 7-18. Description consequence of effects ranking criteria.**

Consequence of Effects Ranking	
<i>Consequence Level</i>	<i>Environmental Impact</i>
1	Limited damage to minimal area of low significance.
2	Minor effects on biological or physical environment.
3	Moderate environmental effects.
4	Serious environmental effects.
5	Very serious environmental effects.

**Table 7-19. Description probability of occurrence ranking criteria.**

Probability of Occurrence Ranking		
<i>Code</i>	<i>Rank</i>	<i>Frequency</i>
U	Unlikely	Less than 1 event per 100 years.
P	Unlikely but Possible	1 event per 10 to 100 years.
L	Likely	1 event per 1 to 10 years.
V	Very Likely	More than 1 event per year.
E	Extremely Likely	More than 1 event per month.

**Table 7-20. Description magnitude of effects ranking criteria.**

Magnitude of Effects Ranking		
<i>Code</i>	<i>Rank</i>	<i>Description</i>
S	Site-specific	Environmental effects limited to specific portions of the LSA.
L	Local	Environmental effects limited to the LSA.
R	Regional	Environmental effects extend beyond the LSA and may extend beyond the RSA

**Table 7-21. Description of risk ranking criteria.**

Risk Ranking			
<i>Code</i>	<i>Rank</i>	<i>Risk Score</i>	<i>Description</i>
N	Negligible	0.25	Environmental effects are minimal or non-existent.

Risk Ranking			
<i>Code</i>	<i>Rank</i>	<i>Risk Score</i>	<i>Description</i>
L	Low	0.50	Environmental effects are low representing temporary and limited disturbances.
M	Moderate	0.75	Environmental effects are moderate representing permanent disturbances within the LSA.
H	High	1.00	Environmental effects are considerable and represent permanent disturbances beyond the RSA.

**Table 7-22. Description of duration of event criteria.**

Duration	
<i>Qualifier</i>	<i>Duration</i>
Immediate	Less than 1 year
Short-term	Between 1 and 3 years
Moderate-term	Between 3 and 5 years
Long-term	Greater than 5 years

**Table 7-23. Description of the frequency of event criteria.**

Frequency	
<i>Qualifier</i>	<i>Duration</i>
Single	Seasonal Yearly
Occasional	Seasonal Monthly
Regular	Seasonal Weekly
Continuous	Seasonal Daily

**Table 7-24. Summary of risk assessment analysis for Route A.**

Risk Assessment																
Context	Phase	Magnitude	Duration				Frequency			Reversibility		Consequence	Probability of Occurrence	Risk	Risk Score	
			Immediate	Short-term	Medium-term	Long-term	Single Event	Occasional	Regular	Continuous	Reversible					Irreversible
<b>Plant Species at Risk</b> Considering habitat loss/change and direct mortality.	Construction	L	X				X				X		3	P	N	0.25
	Operational	L				X			X		X		3	U	N	0.25
<b>Sensitive Ecosystems</b> Considering loss/change of habitat.	Construction	L	X				X				X		2	P	L	0.5
	Operational	L				X		X			X		2	P	L	0.5
<b>Ecological Communities at Risk</b> Considering loss/change of habitat.	Construction	L	X				X				X		2	P	M	0.75
	Operational	L				X			X		X		2	L	L	0.5
<b>Critical Habitat for Plant Species</b> Considering loss/change of habitat.	Construction	L	None Present within Route									4	U	N	0.25	
	Operational	L	None Present within Route									4	U	N	0.25	
<b>Wildlife Species at Risk</b> Considering loss/change of habitat, mortality, proximity disturbances and changes in behaviour.	Construction	L		X			X				X		2	P	L	0.5
	Operational	L				X			X		X		2	P	L	0.5
<b>Breeding Birds</b> Considering loss/change of habitat, mortality, proximity disturbances and changes in behaviour.	Construction	L	X				X				X		2	P	L	0.5
	Operational	L				X				X	X		3	L	M	0.75
<b>Critical Habitat for Wildlife</b> Considering loss/change of habitat.	Construction	L	X				X				X		4	P	M	0.75
	Operational	L				X				X	X		4	P	M	0.75

Risk Assessment																
Context	Phase	Magnitude	Duration				Frequency				Reversibility		Consequence	Probability of Occurrence	Risk	Risk Score
			Immediate	Short-term	Medium-term	Long-term	Single Event	Occasional	Regular	Continuous	Reversible	Irreversible				
<b>Fish Species at Risk</b> Considered habitat loss/change and direct mortality.	Construction	L	X				X				X		1	P	L	0.5
	Operational	L	X				X				X		1	U	N	0.25
<b>Regionally Important Fish Species</b> Considered habitat loss/change and direct mortality.	Construction	L	X				X				X		2	P	L	0.5
	Operational	L	X				X				X		1	U	N	0.25
<b>Sum of Construction Risk Score</b>															<b>4.50</b>	
<b>Sum of Operational Risk Score</b>															<b>4.00</b>	

**Table 7-25. Summary of risk assessment analysis for Route B.**

Risk Assessment																
Context	Phase	Magnitude	Duration				Frequency				Reversibility		Consequence	Probability of Occurrence	Risk	Risk Score
			Immediate	Short-term	Medium-term	Long-term	Single Event	Occasional	Regular	Continuous	Reversible	Irreversible				
<b>Plant Species at Risk</b> Considering habitat loss/change and direct mortality.	Construction	L	X				X				X		3	U	N	0.25
	Operational	L	X				X				X		3	U	N	0.25
<b>Sensitive Ecosystems</b> Considering loss/change of habitat.	Construction	L	X				X				X		2	P	L	0.5
	Operational	L			X				X		X		2	P	L	0.5
<b>Ecological Communities at Risk</b> Considering loss/change of habitat.	Construction	L	X				X				X		2	L	M	0.75
	Operational	L				X			X		X		2	P	L	0.5
<b>Critical Habitat for Plant Species</b> Considering loss/change of habitat.	Construction	L	None Present within Route										4	U	N	0.25
	Operational	L	None Present within Route										4	U	N	0.25
<b>Wildlife Species at Risk</b> Considering loss/change of habitat, mortality, proximity disturbances and changes in behaviour.	Construction	L	X				X				X		3	L	M	0.75
	Operational	L				X			X		X		3	L	L	0.5
<b>Breeding Birds</b> Considering loss/change of habitat, mortality, proximity disturbances and changes in behaviour.	Construction	L	X				X				X		2	P	L	0.5
	Operational	L				X			X		X		2	P	L	0.5
<b>Critical Habitat for Wildlife</b> Considering loss/change of habitat.	Construction	L				X	X				X		3	P	M	0.75
	Operational	L				X		X			X		2	P	L	0.5

Risk Assessment																
Context	Phase	Magnitude	Duration				Frequency				Reversibility		Consequence	Probability of Occurrence	Risk	Risk Score
			Immediate	Short-term	Medium-term	Long-term	Single Event	Occasional	Regular	Continuous	Reversible	Irreversible				
<b>Fish Species at Risk</b> Considered habitat loss/change and direct mortality.	Construction	L	X				X				X		1	U	N	0.25
	Operational	L	X				X				X		1	U	N	0.25
<b>Regionally Important Fish Species</b> Considered habitat loss/change and direct mortality.	Construction	L	X				X				X		1	U	N	0.25
	Operational	L	X				X				X		1	U	N	0.25
<b>Sum of Construction Risk Score</b>															<b>3.75</b>	
<b>Sum of Operational Risk Score</b>															<b>3.50</b>	

**Table 7-26. Summary of risk assessment analysis for Route C.**

Risk Assessment																
Context	Phase	Magnitude	Duration				Frequency			Reversibility		Consequence	Probability of Occurrence	Risk	Risk Score	
			Immediate	Short-term	Medium-term	Long-term	Single Event	Occasional	Regular	Continuous	Reversible					Irreversible
<b>Plant Species at Risk</b> Considering habitat loss/change and direct mortality.	Construction	L	X				X				X		3	U	N	0.25
	Operational	L				X					X		3	U	N	0.25
<b>Sensitive Ecosystems</b> Considering loss/change of habitat.	Construction	L	X				X				X		2	P	L	0.5
	Operational	L			X				X		X		2	P	L	0.5
<b>Ecological Communities at Risk</b> Considering loss/change of habitat.	Construction	L	X				X				X		2	L	M	0.75
	Operational	L				X			X		X		2	P	L	0.5
<b>Critical Habitat for Plant Species</b> Considering loss/change of habitat.	Construction	L	X				X				X		4	U	L	0.5
	Operational	L				X		X			X		4	U	L	0.5
<b>Wildlife Species at Risk</b> Considering loss/change of habitat, mortality, proximity disturbances and changes in behaviour.	Construction	L	X				X				X		3	L	M	0.75
	Operational	L				X			X		X		3	L	L	0.5
<b>Breeding Birds</b> Considering loss/change of habitat, mortality, proximity disturbances and changes in behaviour.	Construction	L	X				X				X		2	P	L	0.5
	Operational	L				X			X		X		2	P	L	0.5
<b>Critical Habitat for Wildlife</b> Considering loss/change of habitat.	Construction	L				X	X				X		4	P	M	0.75
	Operational	L				X		X			X		2	P	L	0.5

Risk Assessment																
Context	Phase	Magnitude	Duration				Frequency				Reversibility		Consequence	Probability of Occurrence	Risk	Risk Score
			Immediate	Short-term	Medium-term	Long-term	Single Event	Occasional	Regular	Continuous	Reversible	Irreversible				
<b>Fish Species at Risk</b> Considered habitat loss/change and direct mortality.	Construction	L		X			X				X		1	P	N	0.25
	Operational	L		X			X				X		1	P	N	0.25
<b>Regionally Important Fish Species</b> Considered habitat loss/change and direct mortality.	Construction	L		X			X				X		1	P	N	0.25
	Operational	L		X			X				X		1	P	N	0.25
<b>Sum of Construction Risk Score</b>															<b>4.50</b>	
<b>Sum of Operational Risk Score</b>															<b>3.75</b>	

**Table 7-27. Summary of risk assessment analysis for Route D.**

Risk Assessment																
Context	Phase	Magnitude	Duration				Frequency				Reversibility		Consequence	Probability of Occurrence	Risk	Risk Score
			Immediate	Short-term	Medium-term	Long-term	Single Event	Occasional	Regular	Continuous	Reversible	Irreversible				
<b>Plant Species at Risk</b> Considering habitat loss/change and direct mortality.	Construction	L	X				X				X		3	U	N	0.25
	Operational	L				X					X		3	U	N	0.25
<b>Sensitive Ecosystems</b> Considering loss/change of habitat.	Construction	L	X				X				X		2	P	L	0.5
	Operational	L			X				X		X		2	P	L	0.5
<b>Ecological Communities at Risk</b> Considering loss/change of habitat.	Construction	L	X				X				X		2	L	M	0.75
	Operational	L				X			X		X		2	P	L	0.5
<b>Critical Habitat for Plant Species</b> Considering loss/change of habitat.	Construction	L	None Present within the route										4	U	N	0.25
	Operational	L	None Present within the route										4	U	N	0.25
<b>Wildlife Species at Risk</b> Considering loss/change of habitat, mortality, proximity disturbances and changes in behaviour.	Construction	L	X				X				X		3	L	M	0.75
	Operational	L				X			X		X		3	L	L	0.5
<b>Breeding Birds</b> Considering loss/change of habitat, mortality, proximity disturbances and changes in behaviour.	Construction	L	X				X				X		2	P	L	0.5
	Operational	L				X			X		X		2	P	L	0.5
<b>Critical Habitat for Wildlife</b> Considering loss/change of habitat.	Construction	L				X	X				X		4	P	M	0.75
	Operational	L				X		X			X		2	P	L	0.5

Risk Assessment																
Context	Phase	Magnitude	Duration				Frequency				Reversibility		Consequence	Probability of Occurrence	Risk	Risk Score
			Immediate	Short-term	Medium-term	Long-term	Single Event	Occasional	Regular	Continuous	Reversible	Irreversible				
<b>Fish Species at Risk</b> Considered habitat loss/change and direct mortality.	Construction	L		X			X				X		1	P	N	0.25
	Operational	L		X			X				X		1	P	N	0.25
<b>Regionally Important Fish Species</b> Considered habitat loss/change and direct mortality.	Construction	L		X			X				X		1	P	N	0.25
	Operational	L		X			X				X		1	P	N	0.25
<b>Sum of Construction Risk Score</b>															<b>4.25</b>	
<b>Sum of Operational Risk Score</b>															<b>3.50</b>	

## 7.6 Summary of Environmental Effects

Identified environmental values, components, and effects are summarized in Table 7-28. Rankings of environmental effects by route are summarized in Table 7-29, where they are presented as two scores:

- 1) Absolute or raw score that is a sum of all effects for the route;
- 2) A normalized score of effects per each kilometer of trail route.

Where empirical data existed for environmental components, the environmental effects were qualified using a relative ranking score, where impacts on environmental values and components were assigned a higher score than those with less impact. Relative ranking scores were assigned using the following ranks: 1.00, highest impact; 0.75, moderate impact; 0.50; moderate-low impact; and 0.25, lowest impact. Where no empirical data occurred a simplified ranking of occurs (1) or does not occur (0) was utilized.

**Table 7-28. Summary of environmental values and anticipated impacts.**

Environmental Value and Component				Potential Impact	
<i>Environmental Value</i>	<i>Environmental Component</i>	<i>Project Phase Impact</i>	<i>Current Condition</i>	<i>Potential Impact</i>	<i>Assessment Area</i>
Vegetation	Plant Species at Risk	<ul style="list-style-type: none"> <li>Construction</li> <li>Operations &amp; Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>24 plant species at risk known to occur within the LSA including 2 SARA listed species.</li> </ul>	<ul style="list-style-type: none"> <li>Loss of habitat</li> <li>Change in habitat</li> <li>Introduction of invasive plant species</li> </ul>	LSA
	Sensitive Ecosystems	<ul style="list-style-type: none"> <li>Construction</li> <li>Operations &amp; Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>25 sensitive habitats occur within the LSA.</li> </ul>	<ul style="list-style-type: none"> <li>Loss of habitat</li> <li>Change in habitat</li> <li>Introduction of invasive plant species</li> </ul>	LSA
	Ecological Communities at Risk	<ul style="list-style-type: none"> <li>Construction</li> <li>Operations &amp; Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Six ecological communities at risk documented to occur within the LSA, including 12 blue and 4 red.</li> </ul>	<ul style="list-style-type: none"> <li>Loss of habitat</li> <li>Change in habitat</li> <li>Introduction of invasive plant species</li> </ul>	LSA
	Critical Habitat	<ul style="list-style-type: none"> <li>Construction</li> <li>Operations &amp; Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Critical Habitat for short-rayed alkali aster documented within the LSA.</li> </ul>	<ul style="list-style-type: none"> <li>Loss of habitat</li> <li>Change in habitat</li> <li>Introduction of invasive plant species</li> </ul>	LSA
Wildlife	Wildlife Species at Risk	<ul style="list-style-type: none"> <li>Construction</li> <li>Operations &amp; Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>42 wildlife species at risk occur within the LSA, including 31 SARA listed species.</li> </ul>	<ul style="list-style-type: none"> <li>Loss of habitat</li> <li>Change in habitat</li> <li>Mortality, injury and reduction in fitness</li> <li>Changes in behaviour</li> <li>Proximity disturbances</li> </ul>	LSA
	Breeding Birds	<ul style="list-style-type: none"> <li>Construction</li> <li>Operations &amp; Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>263 species of birds are suspected to nest within the Okanagan-Similkameen.</li> </ul>	<ul style="list-style-type: none"> <li>Loss of habitat</li> <li>Change in habitat</li> <li>Mortality, injury and reduction in fitness</li> <li>Changes in behaviour</li> <li>Proximity disturbances</li> </ul>	LSA, RSA
	Critical Habitat	<ul style="list-style-type: none"> <li>Construction</li> <li>Operations &amp; Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Critical Habitat for four wildlife species at risk</li> </ul>	<ul style="list-style-type: none"> <li>Loss of habitat</li> <li>Change in habitat</li> </ul>	LSA

Environmental Value and Component				Potential Impact	
<i>Environmental Value</i>	<i>Environmental Component</i>	<i>Project Phase Impact</i>	<i>Current Condition</i>	<i>Potential Impact</i>	<i>Assessment Area</i>
			are identified within the LSA.		
Fish and Fish Habitat	Regionally Important Fish Species	<ul style="list-style-type: none"> <li>Construction</li> <li>Operations &amp; Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Nine regionally important fish species have been documented to occur within the LSA.</li> </ul>	<ul style="list-style-type: none"> <li>Change in habitat quality</li> <li>Change in mortality risk</li> </ul>	LSA
	Fish Species at Risk	<ul style="list-style-type: none"> <li>Construction</li> <li>Operations &amp; Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>One blue-listed fish species at risk has been documented to occur within the LSA.</li> </ul>	<ul style="list-style-type: none"> <li>Change in habitat quality</li> <li>Change in mortality risk</li> </ul>	LSA

**Table 7-29. Ranking of environmental effects by identified route.**

Ranking of Environmental Effects by Identified Route																					
Route	Route Length (km)	Ranked Risk – Construction	Ranked Risk – Operational	Ranked Number of Conservation Lands	Ranked Number of BC CDC Occurrences	Ranked Number of SARA Listed Occurrences	Ranked Absolute Habitat Loss	Ranked Relative Habitat Loss	Ranked Absolute Change in Habitat	Ranked Relative Change in Habitat	Ranked Absolute Critical Habitat Loss	Ranked Number of Sensitive Habitat	Ranked Number of Ecological Communities at Risk	Ranked Number of Invasive Plant Species	Mortality, Injury and Reduction in Overall Fitness	Change in Behaviour	Proximity Disturbances	Change in Fish Habitat Quality	Change in Risk to Fish Mortality	Raw Score	Relative Effects per km
A	47.4	1	1	1	1	1	1	0.5	1	0.5	1	1	1	1	1	1	1	1	1	17.0	0.36
B	4.8	0.25	0.25	0.5	0.25	0.25	0.75	1	0.5	1	0.5	0.5	0.5	0.25	1	1	1	0	0	9.25	1.93
C	14.9	1	0.75	1	0.5	0.75	0.25	0.25	0.25	0.25	0.25	0.75	0.5	0.75	1	1	1	0	0	10.25	0.69
D	20.6	0.5	0.25	0.25	0.75	0.5	0.5	0.75	0.75	0.75	0.75	0.25	0.25	0.5	1	1	1	0	0	9.75	0.47

## 8 Evaluation of Trail Routes

Analysis of environmental effects on potential trail routes occurred on four route options including:

- Route A, Primary, KVR South Spur;
- Route B, Alternative, Okanagan River Dike, North of Vaseux Lake;
- Route C, Alternative, East Side of Vaseux Lake and Okanagan River; and,
- Route D, Alternative, Okanagan River Dike, South of McAlpine Bridge.

Analytical evaluations of environmental effects are summarized in Table 7-29, above.

Route A resulted in a considerably higher overall impact to the identified environmental values largely due to the overall linear distance of the corridor. While the alternative routes (C to D) scored lower than Route A, these impacts occur over linear distances of less than half of the distance of Route A. Normalizing the effects over the linear distances for each of the identified routes resulted in a shift in the overall environmental effect associated with each identified route, with Route A resulting in the lowest relative effect per kilometer compared to the alternative routes.

### 8.1 Recommended Route

For any route selection, evaluated effects assessment and existing trail development(s) must be considered to provide a selection that minimizes overall disturbance to the environment. On this basis, route selection should be prioritized by utilizing established trail networks over the re-development of trail corridors that have or are in the process of establishing functional habitats. To minimize the overall environmental effect resulting from any proposed trail development, it is recommended that a synthesis of routes, including portions of Routes A, C and D be selected for any proposed trail development. This considers existence of developed and impacted trail routes with the lowest relative effect on the environment. The recommended route is outlined in Figure 8-1.

The recommended route is considered to be the preferred route due to several variables, (1) the route represents corridors that have the lowest overall impact to the identified environmental values, (2) the route takes advantage of existing infrastructure, therefore minimizing the potential for increased habitat loss and fragmentation, and (3) minimizes the effects of the trail within several protected areas.

While this route represents the least environmental effect based on the analysis of the available data, two variables will influence any final route selection, specifically, (1) the route data used as the baseline for assessment crosses through several properties identified as private and not as lands managed by the Province, use of roads as alternative routes to bypass these private lands for any official trail may require authorization and/or permitting from the managing authority (individual municipalities, RDOS, or the B.C. Ministry of Transportation and Infrastructure) and (2) authorizations and permits will be required for route sections occurring within Federally managed lands within the vicinity of Vaseux Lake. Any trail development within Federally managed lands will require a Section 73 permit under *Species at Risk Act* and depending on the final route location, may require a permit under the Wildlife Area Regulations. Prohibitions under the Wildlife Area Regulations pertinent to any proposed trail development include:

- damaging, destroying, or removing a plant;
- destroying or molesting animals or carcasses, nests or eggs thereof; and,

- disturbing or removing any soil, sand, gravel or other material.

Additionally, several prohibitions are in place that will affect recreational activities within the Vaseux-Bighorn NWA and must be therefore effectively managed throughout the operational phase of the trail. These include:

- hunting or fishing,
- allowing any domestic animal (e.g., dogs) to run at large;
- swimming, picnicking, camping, or carrying on any other recreational activity or lighting or maintaining a fire; and,
- dumping or depositing any rubbish, waste material, or substance that would degrade or alter the quality of the environment.

Provided that any proposed trail development does not interfere with the conservation of wildlife, a Section 4 permit may be obtained to permit activities within the Vaseux-Bighorn NWA that would be otherwise prohibited.

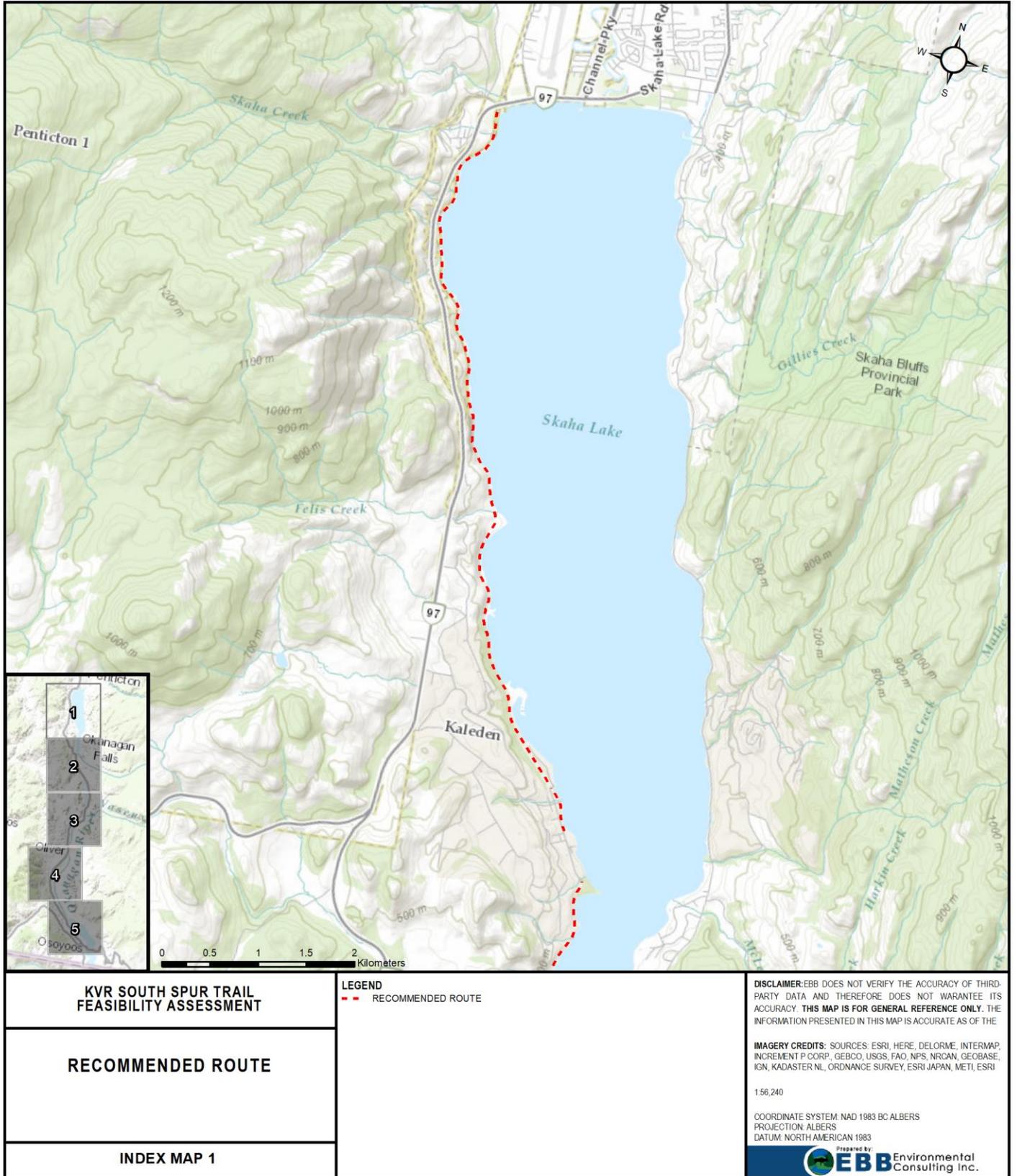
Federally managed lands along Vaseux Lake contains Critical Habitat for several SARA listed species, as well as the potential for and confirmed presence of numerous other SARA listed species. Any activities that may affect a listed species, any part of its critical habitat or the residences of its individuals are prohibited under SARA, and therefore a permit must be obtained to carry on the activity. Permits will only be issued when the minister believes:

- the activity is scientific research relating to the conservation of the species and conducted by qualified persons;
- the activity benefits the species or is required to enhance its chance of survival in the wild; or
- affecting the species is incidental to the carrying out of the activity.

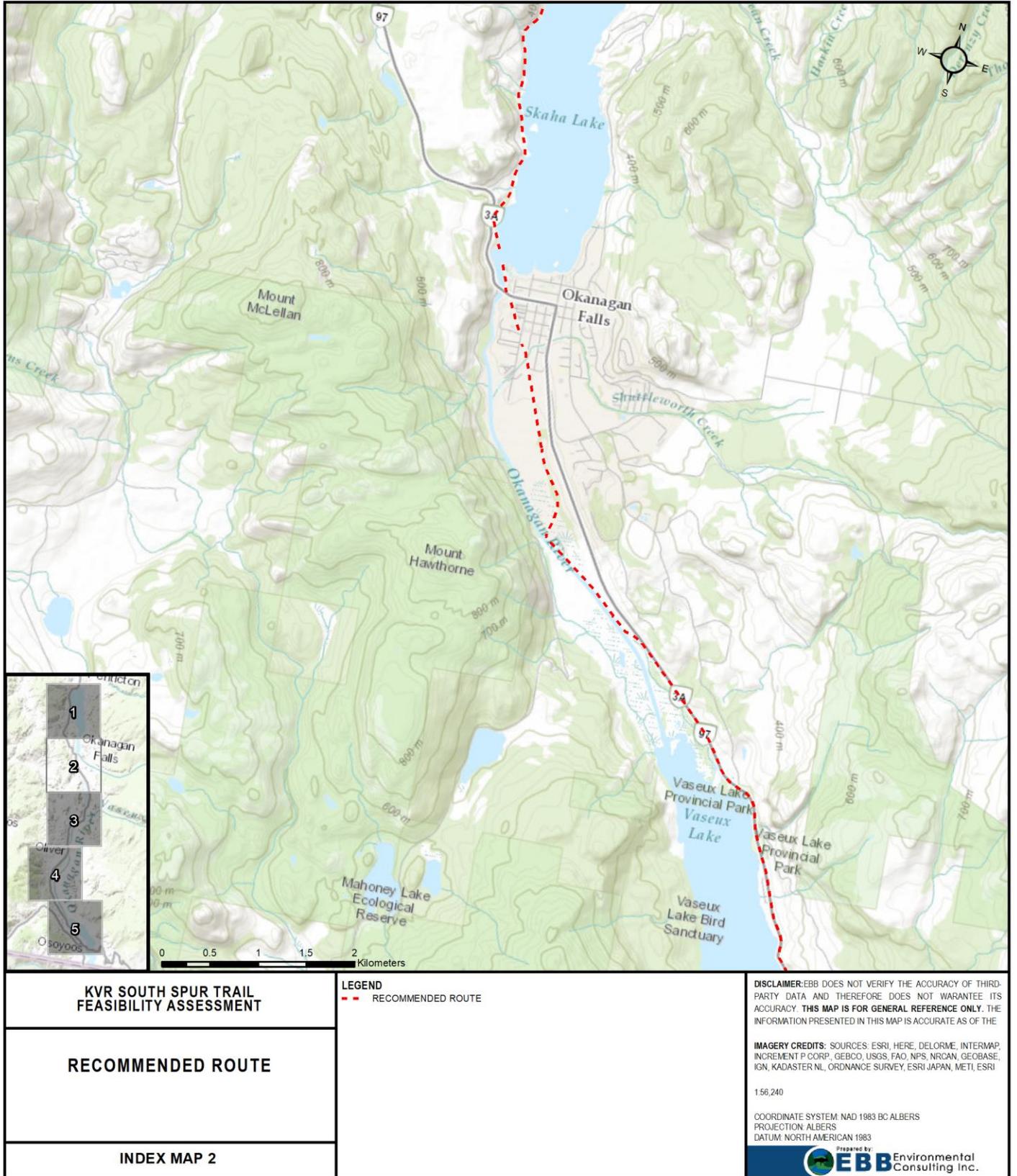
And that:

- all reasonable alternatives to the activity that would reduce the impact on the species have been considered and the best solution has been adopted;
- all feasible measures will be taken to minimize the impact of the activity on the species or its critical habitat or the residences of its individuals; and,
- the activity will not jeopardize the survival or recovery of the species.

Any trail development proposal must demonstrate that the provisions indicated above are satisfied within any proposal documentation and that the required Federal permits have been or will be obtained.



**Figure 8-1. Recommended route within Section 1 of the LSA.**



**Figure 8-2. Recommended route within Section 2 of the LSA.**

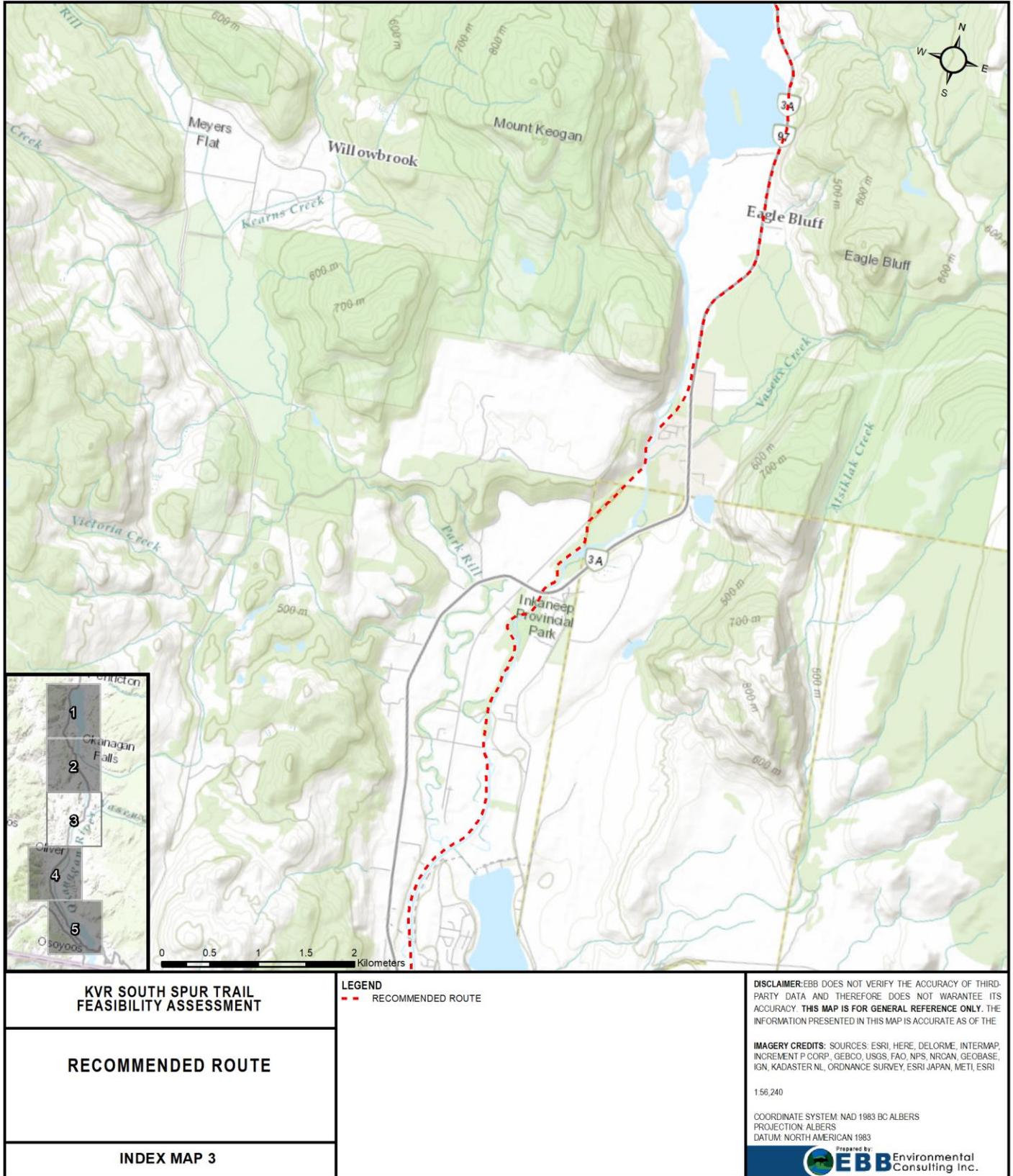
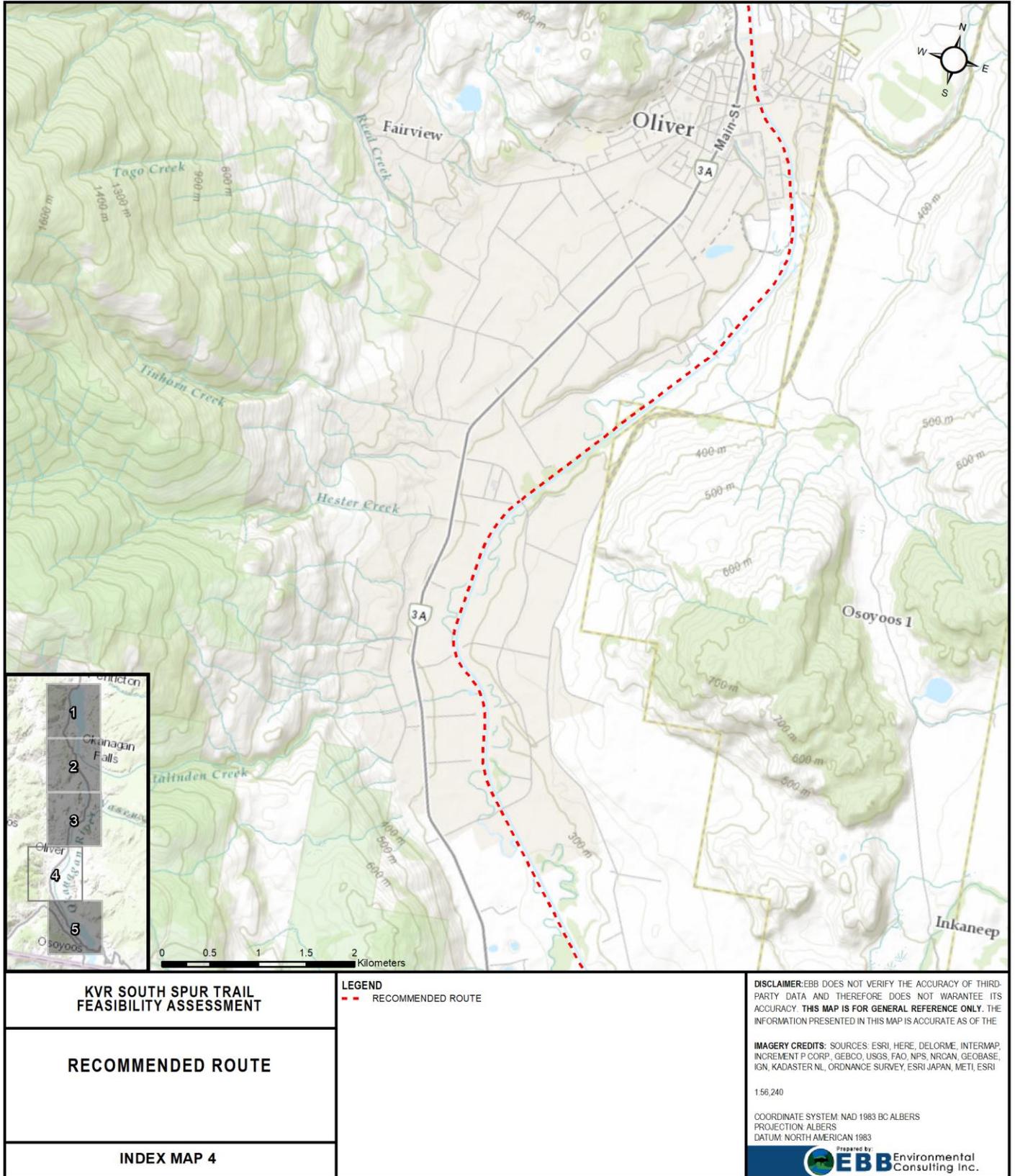
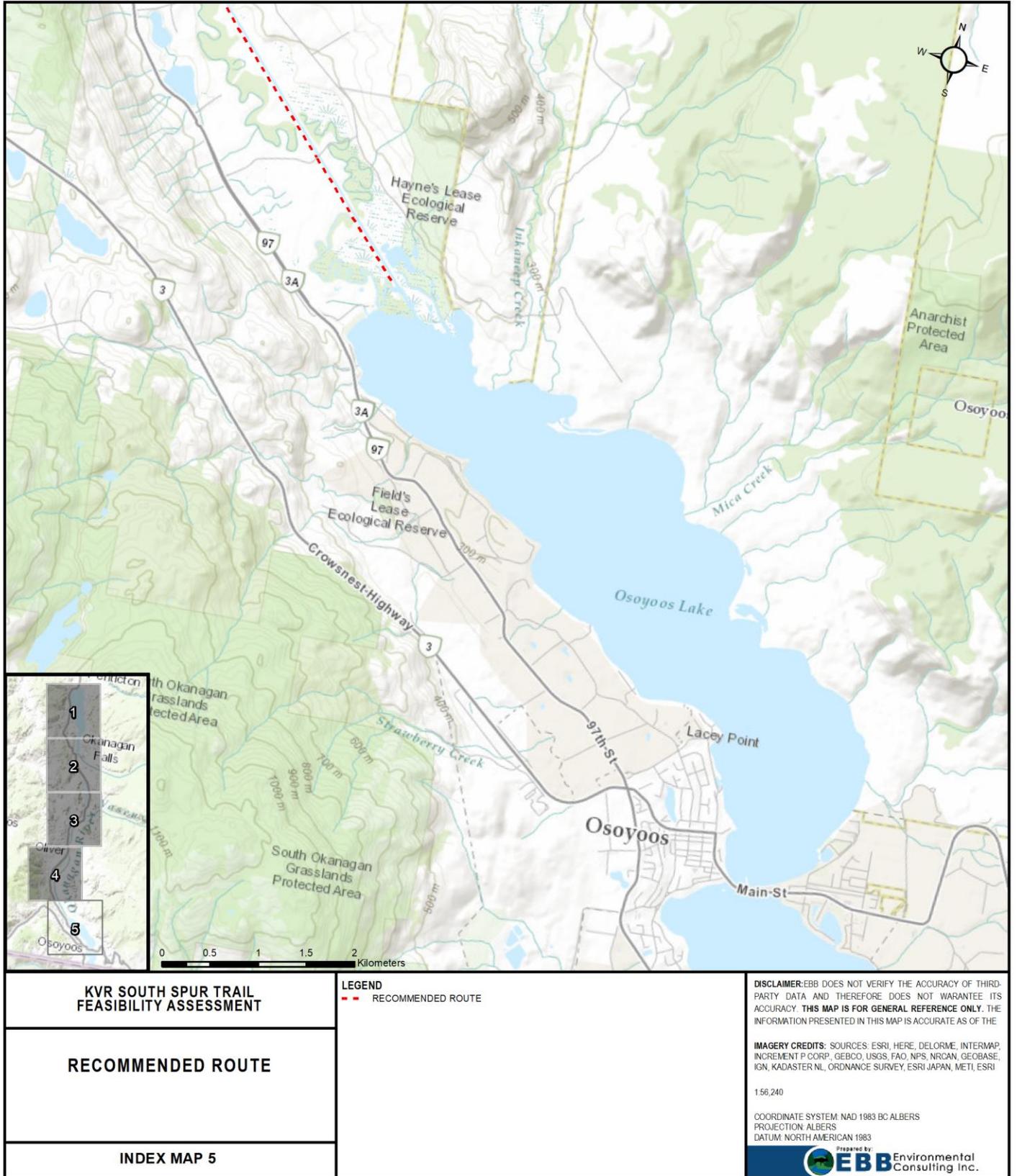


Figure 8-3. Recommended route within Section 3 of the LSA.



**Figure 8-4. Recommended route within Section 4 of the LSA.**



**Figure 8-5. Recommended route within Section 5 of the LSA.**

## 9 Impact Mitigation Strategies

Environmental impact mitigation in British Columbia is guided by the B.C. *Environmental Mitigation Policy* and associated *Environmental Mitigation Procedures*. The overall purpose of mitigation is to maintain integrity, natural functions, processes, and resilience of ecosystems (Ministry of Environment 2014). The Province has established a mitigation hierarchy which establishes a standardized structure to guide development and application of mitigation measures. This hierarchy is outlined in Figure 9-1 and is prioritized from highest (preferred) to lowest mitigation component.

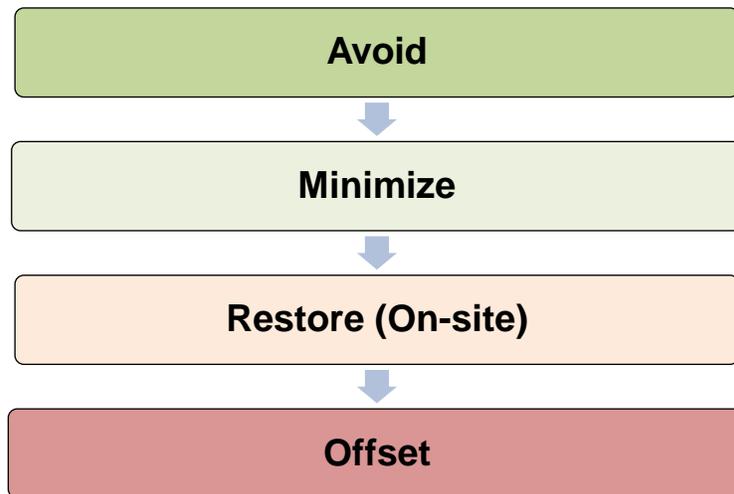


Figure 9-1. Mitigation hierarchy.

General mitigation measures have been identified within the environmental effects assessment (Section 7) for identified environmental values. These measures, in addition to any other site-specific measures, are to be implemented where applicable to any proposed trail development. The following principles should be considered during evaluation of any trail development proposal:

1. To the extent feasible, avoid impacting valued habitat including sensitive ecosystems, ecological communities at risk, and Critical Habitat.
2. Design site-specific mitigation measures following route selection and ground-truthing of environmental values.
3. Trail routes should be designed to prioritize use of existing trail infrastructure rather than developing new trails, thereby avoiding additional impacts to environmental values.
4. Where water crossings are required for trail continuity, crossings should be designed to utilize existing structures where feasible. Priority of development is considered:

Use of existing crossing structures → construction of clear span structures → pier/piling structures

e.g., the Route A corridor crosses the Okanagan River at 11N 313431E 5466550N, with no existing structure at this existing crossing point; however, an existing drop structure occurs approximately 150m

upstream, with existing trails present on both left and right banks. Utilization of this structure would avoid any additional impacts to fish or fish habitat.

5. Restrict off-trail access including unauthorized trails and off-leash dogs.
6. Develop public educational tools, including signage.
7. Mitigation measures may include the installation of structures that facilitate wildlife movement, minimize wildlife injury and mortality, control bicycle speeds, and restrict off-trail activities.

## 9.1 Disposition of Lands for Conservation

Procedures for disposition of lands for conservation purposes have been established by the Province as outlined within the *Land Procedure: Management of Crown Lands for Conservation Purposes* (FLNRO 2015). This procedure outlines legislative mechanisms and procedures involved in disposition of lands for conservation purposes, either as Administered Conservation Lands (ACLs) or Wildlife Management Areas (WMAs). Protection of conservation lands are initiated through an application for a *Land Act* reserve/withdrawal to ensure that the land is managed for conservation purposes. Legislative tools available for disposition of lands for conservation include the *Land Act*, *Wildlife Act*, *Park Act*, and *Greenbelt Act*.

Specific provisions under the Acts include:

- Section 4(2) of the *Wildlife Act* designates power to the minister to designate lands as wildlife management areas.
- Section 5(1) of the *Park Act* states whereby the Lieutenant Governor in Council may establish areas of Crown land as a park, conservancy, or recreation area.
- Section 3 of the *Greenbelt Act* states whereby the Lieutenant Governor in Council may reserve Crown land as greenbelt land.
- Section 16 (1) of the *Land Act* allows for the minister to temporarily withdraw Crown land from disposition for any purpose the ministry considers advisable in the public interest, including the use of a government body.
- Section 17 (1) of the *Land Act* allows the minister to designate a portion of Crown land for a particular use or for conservation of natural resources.

High-value habitat is defined as habitats within the ROW that are classified as sensitive habitats, or Critical Habitat and contain ecological communities at risk. Analysis of identified high-value habitat resulted in 3.08 ha of high-value habitat, with all habitat patch sizes less than 1 ha. Overall, high-value habitats are represented by small, isolated patches along the entire length of the KVR South Spur corridor. The greatest concentration of high-value habitat occurs immediately southwest of Deer Park Estates (8598 Highway 97, Oliver, B.C.)

## 9.2 Relative Costs for Implementation

Costing for implementation of mitigation measures are provided as relative estimations based on the recommended route. Relative cost estimates are summarized in Table 9-1.

**Table 9-1. Summary of relative costs for the implementation of management strategies.**

Relative Costs Associated with Mitigation Strategy Implementation			
<i>Environmental Component</i>	<i>Strategy</i>	<i>Description</i>	<i>Relative Cost</i>
Fish and Fish Habitat	Avoidance	<ul style="list-style-type: none"> <li>Utilize existing watercourse crossing structures, thereby avoiding any additional impacts to fish or fish habitat.</li> </ul>	Zero
	Mitigation	<ul style="list-style-type: none"> <li>Installation of a clear span bridge structure, including Implementation of BMPs, ESC measures, reclamation, restoration, fish salvage(s), and cost of structure.</li> </ul>	Moderate
		<ul style="list-style-type: none"> <li>Installation of a piling bridge structure, including Implementation of BMPs, ESC measures, reclamation, restoration, fish salvage(s), offsetting measures, and cost of structure.</li> </ul>	High
	Compensation	<ul style="list-style-type: none"> <li>Habitat complexing and riparian planting</li> </ul>	Moderate
		<ul style="list-style-type: none"> <li>Habitat creation, side channels and overwintering habitat.</li> </ul>	High
Breeding Birds	Avoidance	<ul style="list-style-type: none"> <li>Schedule trail development construction activities outside of the sensitive nesting window (April 1 to July 31).</li> </ul>	Zero
		<ul style="list-style-type: none"> <li>Identify (survey) raptor nests (active and inactive) and avoid damage to nest trees.</li> </ul>	Low
	Mitigation	<ul style="list-style-type: none"> <li>For works occurring within the sensitive nesting window, conduct nesting surveys.</li> </ul>	Moderate
Wildlife and Wildlife Habitat	Avoidance	<ul style="list-style-type: none"> <li>Adjust trail alignment to avoid disturbances to sensitive wildlife habitat features, such as cavity nesting trees, antelope-brush, and rocky outcrops.</li> </ul>	Zero
	Mitigation	<ul style="list-style-type: none"> <li>Installation of raised boardwalks within sensitive habitats, including potential migration routes.</li> </ul>	Moderate
		<ul style="list-style-type: none"> <li>Installation of barriers (e.g. fencing) that discourage off-trail activities while maintaining movement access for wildlife.</li> </ul>	Moderate
		<ul style="list-style-type: none"> <li>Installation of features that control the speed of bicycles within sensitive habitats.</li> </ul>	Low
		<ul style="list-style-type: none"> <li>Implement a public education and outreach program, including signage.</li> </ul>	Low
		<ul style="list-style-type: none"> <li>Provide and maintain garbage bins at central locations to facilitate food and garbage management.</li> </ul>	Low
	Compensation	<ul style="list-style-type: none"> <li>Provide habitat compensation for any sensitive wildlife habitat that cannot be avoided and is damaged or destroyed resulting from trail development.</li> </ul>	High
Critical Habitat	Avoidance	<ul style="list-style-type: none"> <li>Limit trail development to the existing disturbed trail surface. Do not install permanent, hard-surface structures (<i>i.e.</i>, asphalt).</li> </ul>	Zero
	Mitigation	<ul style="list-style-type: none"> <li>Implement a public education and outreach program, including signage.</li> </ul>	Low
		<ul style="list-style-type: none"> <li>Identify potential nest trees for Lewis's woodpecker, inventory and monitor.</li> </ul>	Low
		<ul style="list-style-type: none"> <li>Install physical barriers to discourage and/or prevent unauthorized access into Critical Habitat.</li> </ul>	High

Relative Costs Associated with Mitigation Strategy Implementation			
<i>Environmental Component</i>	<i>Strategy</i>	<i>Description</i>	<i>Relative Cost</i>
	Compensation	<ul style="list-style-type: none"> <li>Provide suitable habitat for compensation for impacted Critical Habitat. Restore and enhance.</li> </ul>	High
Sensitive Habitat	Avoidance	<ul style="list-style-type: none"> <li>Refine trail routing on a site-specific scale to route around sensitive habitat, particularly within existing edge and transitional areas.</li> </ul>	Zero
		<ul style="list-style-type: none"> <li>Restrict trail development to the existing disturbed path.</li> </ul>	Zero
	Mitigation	<ul style="list-style-type: none"> <li>Install raised boardwalks adjacent to habitats that are seasonally or permanently wetted (e.g., wetlands, riparian, fields) to minimize ground disturbance, sedimentation and soil compaction.</li> </ul>	Moderate
		<ul style="list-style-type: none"> <li>Implement a public education and outreach program, including signage.</li> </ul>	Low
		<ul style="list-style-type: none"> <li>Install physical barriers to discourage off-trail activities and access into sensitive habitat.</li> </ul>	Moderate
	Compensation	<ul style="list-style-type: none"> <li>Provide suitable habitat for a compensation ratio. Carry out enhancements to improve habitat.</li> </ul>	High
Ecological Communities at Risk	Avoidance	<ul style="list-style-type: none"> <li>Re-route the trail to avoid impacting functional ecological communities.</li> </ul>	Zero
		<ul style="list-style-type: none"> <li>Restrict trail development to the existing disturbed path.</li> </ul>	Zero
	Mitigation	<ul style="list-style-type: none"> <li>Implement a public education and outreach program, including signage.</li> </ul>	Low
		<ul style="list-style-type: none"> <li>Install physical barriers to discourage off-trail activities and access into sensitive habitat.</li> </ul>	Moderate
Invasive Plants	Mitigation	<ul style="list-style-type: none"> <li>Implement a public education and outreach program, including signage.</li> </ul>	Low

## 10 Discussion and Recommendations

### 10.1 Analysis Limitations

As outlined in Section 3.8, this feasibility study was limited to high-level data analysis, with no field assessments to ground-truth and verify the occurrence of the environmental components (EC) being conducted. Variations in the mapped element occurrences and actual conditions are expected. These variations have the potential to both increase and decrease the environmental effects of the proposed trail development. True representative environmental effects will not be fully known until the selected route is ground-truthed.

### 10.2 Existing Disturbance

As outlined throughout the assessment, various levels of pre-existing disturbance occur throughout the trail corridor, with known trail development occurring between Penticton and Okanagan Falls, full development of the International Hike and Bike Trail from McAlpine Bridge (north of Oliver) to Osoyoos, and pockets of development at the southern extent of the KVR South Spur ROW. As the route was historically a working railway and only fully decommissioned in the early 1990's, there has been limited time for the ROW to be fully restored and residual effects of the railway are expected. Additionally, anecdotal information provided by conservation land managers, online resources, as well as personal observations indicate that the trail is regularly utilized by both pedestrians and cyclists. This existing use is not fully known, particularly in terms of the frequency of use. Many

of the potential effect may therefore already be occurring. This may result in a reduction of the magnitude of the effect of any proposed trail development.

### 10.3 Study Needs

Any trail development proposals must include a baseline environmental values assessment to ground-truth and update species occurrence and habitat suitability.

### 10.4 Trail Management Plan

Prior to trail establishment, a trail management plan should be developed with detailed specific measures to maintain the trail, including:

- identification of operational policy, procedures, guidelines and standards;
- identification of formal parking locations and associated infrastructure;
- development and implementation of educational tools, including signage, outlining trail rules, safety and etiquette; and,
- identification of habitat enhancement opportunities.

The trail management plan should be developed in a manner that is consistent with the *Trails Strategy for British Columbia* (FLNRO 2012) and the *Operational Policy for Authorizing Recreational Mountain Bike Trails on Provincial Crown Land* (FLNRO 2013).

### 10.5 Monitoring, Evaluation and Adaptive Management

#### 10.5.1 Monitoring

Monitoring provides trail managers with measurable parameters that can be used to evaluate effects of trail use on the environment and to respond to changing conditions in a reasonable timeframe. Recommended monitoring parameters, timelines, and targets are summarized in Table 10-1.

**Table 10-1. Summary of monitoring and evaluation of environmental values.**

Monitoring and Evaluation Recommendations			
Monitoring Parameter	Timeline	Description	Evaluation Target
Invasive Plants	Biannually	Monitor the trail corridor for existing and new occurrences of noxious weeds. Implement weed management.	Less than or equal occurrence of invasive plants.
Habitat Degradation and off-Trail Impacts	Biannually	Includes habitat changes associated with trail drift, unauthorised trails, garbage, and unmanaged/authorized camping.	Less than or equal occurrences of habitat degradation.
Habitat Enhancement	Biannually	Includes both opportunistic enhancements and required (regulatory) enhancements (e.g. <i>Fisheries Act</i> ).	For regulatory enhancements, meet or exceed all requirements. For opportunistic enhancements, develop desired targets.
Unauthorized Use	Biannually	Includes identification trail uses not consistent with the trail, such as motorized use, unauthorized trails,	No unauthorized use.

Monitoring and Evaluation Recommendations			
Monitoring Parameter	Timeline	Description	Evaluation Target
		camping, dumping, vandalism, campfire, hunting, and fishing.	
Dog on-leash Compliance	Biannually	Estimations of compliance with dogs on-leash within Federally managed lands using camera traps.	No dogs off leash.
Pedestrian and cycling use	Biannually	Obtain trail use metrics utilising traffic counters (e.g. infrared detectors and magnetometers) to determine the overall trail use and associated pressures.	N/A

### 10.5.2 Evaluation

In addition to the identified evaluation targets for recommended monitoring parameters, the overarching trail management plan should be re-evaluated every five years, unless monitoring results indicate a need for earlier re-evaluation.

### 10.5.3 Adaptive Management

Adaptive management refers to adjustment of management actions based on changing environmental landscapes, scientific research, and management goals. This allows for land managers, through monitoring and analysis, to adjust management actions including improvements or abandonment.

Adjustments to management options will vary depending on effects to environmental values, but can include:

- seasonal trail closures;
- re-routing of trails; and,
- de-activation/permanent closure of trails.

## 11 Conclusion

Trail routing along the historic KVR South Spur Corridor is influenced by legislative frameworks and environmental values. The South Okanagan is an area of considerable biological and ecological significance despite being altered by human use (Iverson *et al.* 2008) placing greater pressure on the remaining ecosystems to support ecological communities and wildlife habitat. Evaluation of the proposed trail route and alternatives has resulted in the identification of a route that, at a high-level, results in the least amount of environmental effects should the trail be developed. Common broad concerns expressed by conservation land managers included maintaining the ecological integrity and ecosystem function of the conservation lands, maintaining habitat connectivity and minimizing fragmentation, addressing invasive plants, and the overall impact of increased recreational users on wildlife.

Should the Province explore any trail development proposals, it is strongly recommended that trail routes be designed to prioritize the use of existing trail infrastructure rather than developing new trails, thereby avoiding additional impacts to the environmental values.

## 12 Legislation Cited

- Canadian Wildlife Act, RSC, 1985, c. W-9.
- Fisheries Act, RSC, 1985, c. F-14.
- Forest and Range Practices Act, SBC, 2002, c. 69.
- Migratory Birds Convention Act, SC, 1994, c. 22.
- Migratory Birds Regulations, CRC, c. 1035.
- Migratory Birds Sanctuaries Regulation, CRC, c. 1036.
- Species at Risk Act, SC, 2002, c. 29.
- Water Sustainability Act, SBC, 2014, c. 15.
- Water Sustainability Regulation, BC Reg 36/2016.
- Weed Control Act, RSBC, 1996, c. 487
- Weed Control Regulation, BC Reg. 66/85
- Wildlife Act, RSBC, 1996, c. 488.
- Wildlife Area Regulations, CRC, c 1609.
- Wildlife Management Area Use and Access Regulation, BC Reg 24/2015.

## 13 Literature Cited

- Atwood, L.B., and P.G. Krannitz. 2000. Effect of the Microbiotic crust of the antelope-brush (*Purshia tridentata*) shrubb-steppe on soil moisture. In I.M. Darling (ed.) *Proceedings of a conference on the biology and management of species and habitats at risk, Kamloops, B.C., 15-19 Feb. 1999. Volume Two*. B.C. Ministry of Environment, Lands, and Parks, Victoria, B.C., and University College of the Cariboo, Kamloops, B.C., 520 pp.
- Ballantyne, M., D.M. Treby, J. Quarmby, and C.M. Pickering. 2016. Comparing the impacts of different types of recreational trails on grey box grassy-woodland vegetation: lessons for conservation and management. *Australian Journal of Botany*, 64: 246-259.
- Bar-Massada, A., V.C. Radeloff and S.I. Stewart. 2014. Biotic and abiotic effects of human settlements in the wildland-urban interface. *BioScience* 64(5): 429-437.
- Barros, A., and C.M. Pickering. 2017. How networks of informal trails cause landscape level damage to vegetation. *Environmental Management* 60: 57-68.
- Barros, A., J. Gonnet, and C. Pickering. 2013. Impacts of informal trails on vegetation and soils in the highest protected areas in the Southern Hemisphere. *Journal of Environmental Management*, 127: 50-60.
- B.C. Conservation Data Centre. 2002. Species Ranking in British Columbia. Wildlife in British Columbia at Risk Series. B.C. Ministry of Sustainable Resource Management. Victoria, B.C. [Online] <http://www.env.gov.bc.ca/wld/documents/ranking.pdf> Accessed 08 March 2018.
- B.C. Conservation Data Centre. 2017a. BC Species and Ecosystems Explorer. B.C. Ministry of Environment, Victoria B.C. [Online] <http://a100.gov.bc.ca/pub/eswp/> Accessed: 28 November 2017

- B.C. Conservation Data Centre: CDC iMap [web application]. 2017b. Victoria, British Columbia, Canada. [Online] <http://maps.gov.bc.ca/ess/sv/cdc/> Accessed: 28 November 2017.
- B.C. Conservation Data Centre. 2017c. Conservation Status Report: Populus trichocarpa - Betula occidentalis. B.C. Ministry of Environment. [Online] <http://a100.gov.bc.ca/pub/eswp/> Accessed: 28 November 2017.
- B.C. Conservation Data Centre. 2017d. Ecological Community Summary: Populus trichocarpa - Betula occidentalis. B.C. Ministry of Environment. [Online] <http://a100.gov.bc.ca/pub/eswp/> Accessed: 28 November 2017.
- B.C. Conservation Data Centre. 2017e Ecological Community Summary: Betula occidentalis / Rosa spp. B.C. Ministry of Environment. [Online] <http://a100.gov.bc.ca/pub/eswp/> Accessed: 28 November 2017.
- B.C. Ministry of Environment. 2009. Conservation Framework: Conservation Priorities for Species and Ecosystems Primer. B.C. Ministry of Environment, Ecosystems Branch, Victoria, B.C.
- B.C. Ministry of Environment. 2011. South Okanagan Wildlife Management Area DRAFT Management Plan. B.C. Ministry of Environment., Planning Section, Kootenay Okanagan Region.
- B.C. Ministry of Environment. 2017a. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture. B.C. Ministry of Environment, Water Sustainability Branch, Victoria, B.C.
- B.C. Ministry of Environment. 2017b. Wildlife Species Inventory: Spatial Data. B.C. Ministry of Environment, Knowledge Management Branch, Victoria, B.C.
- B.C. Ministry of Forests. 2000. Chapter 10: Recreation Trail Management. In B.C. Ministry of Forests Recreation Manual. Victoria, B.C. [Online] <https://www.for.gov.bc.ca/hfp/publications/00201/> Accessed 06 December 2017.
- B.C. Ministry of Forests, Lands, and Natural Resource Operations. 2012. Trails Strategy for British Columbia B.C. Ministry of Forests, Lands, and Natural Resource Operations, Victoria, B.C. [Online] [http://www.sitesandtrailsbc.ca/documents/Trail-Strategy-for-BC\\_V6\\_Nov2012.pdf](http://www.sitesandtrailsbc.ca/documents/Trail-Strategy-for-BC_V6_Nov2012.pdf) Accessed 22 January 2018.
- B.C. Ministry of Forests, Lands, and Natural Resource Operations. 2013. Authorizing Recreational Mountain Bike Trails on Provincial Crown Land: Operational Policy. B.C. Ministry of Forests, Lands, and Natural Resource Operations, Victoria, B.C. [Online] <http://www.sitesandtrailsbc.ca/documents/mountain-bike-policy.pdf> Accessed 22 January 2018.
- B.C. Ministry of Forests, Lands, and Natural Resource Operations. 2015. Land Procedure: Management of Crown Lands for Conservation Purposes. B.C. Ministry of Forests, Lands, and Natural Resource Operations. [Online] [https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/conservation\\_crown\\_land.pdf](https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/conservation_crown_land.pdf) Accessed 22 January 2018.
- B.C. Ministry of Forests, Lands, Natural Resource Operation and Rural Development. 2017. Invasive Alien Plant Program: IAPP Site Layer. B.C. Ministry of Forests, Lands, Natural Resource Operation and Rural Development, Victoria, B.C. Accessed: 11 December 2017.
- B.C. Ministry of Water, Land and Air Protection. 2003a. Inkaneep Provincial Park, Purpose Statement and Zoning Plan. B.C. Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Victoria, B.C.
- B.C. Ministry of Water, Land and Air Protection. 2003b. Management Direction Statement for Vaseux Protected Area. B.C. Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Victoria, B.C.

- B.C. Ministry of Water, Land and Air Protection. 2003c. Vasuex Lake Provincial Park, Purpose Statement and Zoning Plan. B.C. Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Victoria, B.C.
- B.C. Ministry of Water, Land and Air Protection. 2003d. Management Direction Statement for White Lake Grasslands Protected Area. B.C. Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Victoria, B.C.
- B.C. Ministry of Water, Land and Air Protection. 2004a. Best Management Practices for Recreational Activities on Grasslands in the Thompson and Okanagan Basins: WLAP BMP Series. B.C. Ministry of Water, Land and Air Protection, Ecosystem Standards and Planning, Biodiversity Branch. Victoria, B.C. 92 pp. [Online] [http://www.env.gov.bc.ca/wld/documents/bmp/grasslands\\_th\\_ok\\_bmp.pdf](http://www.env.gov.bc.ca/wld/documents/bmp/grasslands_th_ok_bmp.pdf) Accessed: 13 December 2017.
- B.C. Ministry of Water, Land and Air Protection. 2004b. Accounts and Measures for Managing Identified Wildlife. Identified Wildlife Management Strategy, Version 2004. B.C. Ministry of Water, Land and Air Protection, Victoria, B.C. [Online] <http://www.env.gov.bc.ca/wld/frpa/iwms/accounts.html> Accessed: 11 December 2017.
- B.C. Ministry of Water, Land and Air Protection. 2004c. Standards and Best Practices for Instream Works. B.C. Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Victoria, B.C.
- B.C. Ministry of Water, Land and Air Protection. 2005. Haynes' Lease Ecological Reserve: Purpose Statement. B.C. Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Victoria, B.C.
- Boyle, S.J., and F.B. Samson. 1985. Effects of Nonconsumptive recreation on Wildlife: A Review. *Wildlife Society Bulletin* 13(2): 110-116.
- Cascade Environmental Resource Group Ltd. 2012. Regional District of Okanagan-Similkameen Trails Master Plan. Unpublished Report prepared for the Regional District of Okanagan-Similkameen.
- Chilibeck, B., G. Chislett and G. Norris. 1992. Land development guidelines for the protection of aquatic habitat. Department of Fisheries and Oceans. Ottawa, ON. 129 pp.
- COSEWIC 2006. COSEWIC assessment and status report on the short-rayed alkali aster *Symphyotrichum frondosum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 22 pp.
- COSEWIC. 2010. COSEWIC assessment and status report on the Lewis's Woodpecker *Melanerpes lewis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 23 pp.
- COSEWIC. 2012. COSEWIC assessment and status report on the Behr's Hairstreak *Satyrium behrii* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 48 pp.
- Cross. L.D. High Peaks Engineering: Rocky Mountain Marvels. Victoria, B.C.: Heritage House Publishing Co, 2014.
- Demarchi, D.A. 2011. The British Columbia ecoregion classification. Third Edition, March 2011. B.C. Ministry of Environment, Ecosystem Information Section, Victoria, B.C. [Online] <http://www.env.gov.bc.ca/ecology/ecoregions/index.html> Accessed: 29 November 2017.
- Department of Fisheries and Oceans. 1995. Freshwater intake end-of-pipe fish screen guidelines. Department of Fisheries and Oceans. Ottawa, ON. iii + 27 pp.
- eBird. 2012. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. [Online] <http://www.ebird.org>. Accessed: 30 November 2017

- Environment Canada. 2011. Vaseux-Bighorn National Wildlife Area Management Plan. Environment Canada, Ottawa, vi + 52 pp.
- Environment Canada. 2013. Recovery Strategy for the Short-rayed Alkali Aster (*Symphyotrichum frondosum*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. XIX pp. + Appendix.
- Environment and Climate Change Canada. 2016a. Recovery Strategy for the Behr's Hairstreak (*Satyrrium behrii*) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. 2 parts, 28 pp. + 16 pp.
- Environment and Climate Change Canada. 2016b. Recovery Strategy for the Yellow-breasted Chat *auricollis* subspecies (*Icteria virens auricollis*) (Southern Mountain population) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. v + 31 pp.
- Environment and Climate Change Canada. 2017a. Recovery Strategy for the Great Basin Spadefoot (*Spea intermontana*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. 2 parts, 31 pp. + 40 pp.
- Environment and Climate Change Canada. 2017b. Recovery Strategy for the Lewis's Woodpecker (*Melanerpes lewis*) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. vi + 40 pp.
- Fleeger, J.W., K.R. Carman, and R.M. Nisbet. Indirect effects of contaminants in aquatic ecosystems. *The Science of the Total Environment* 317: 207-233.
- Fisheries and Oceans Canada. 2013. Fisheries Protection Policy Statement. Ecosystem Programs Policy, Fisheries and Oceans Canada. Ottawa, ON. 22 pp.
- Fisheries and Oceans Canada. 2016. Measures to avoid causing harm to fish and fish habitat including aquatic species at risk. [Online] <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html> Accessed 30 November 2017.
- Gibson, M. 2010. Weeds: a brief introduction. *The Victorian Naturalist* 27(4): 96-103.
- Government of British Columbia. 2016. Cumulative Effects Framework Interim Policy for the Natural Resource Sector. [Online] [https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/cumulative-effects/cef-interimpolicy-oct\\_14\\_-2\\_2016\\_signed.pdf](https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/cumulative-effects/cef-interimpolicy-oct_14_-2_2016_signed.pdf) Accessed: 22 January 2018.
- Iverson, K., D. Curran, T. Flemming, and A. Haney. 2008. Sensitive ecosystems inventory Okanagan Valley: Vernon to Osoyoos, 2000 – 2007. Methods, ecological descriptions, results, and conservation tools. Technical Report Series No. 495. Canadian Wildlife Service, Pacific and Yukon Region, Environmental Stewardship Branch, British Columbia. 224 pp.
- Iverson, K. 2012. Ecosystem status report for *Purshia tridentata* / *Hesperostipa comate* (antelope-brush / needle-and-thread grass) in British Columbia. Prepared for B.C. Ministry of Environment, Conservation Data Centre, Victoria, B.C. 34 pp.
- Kangas, K., M. Luoto, A. Ihantola, E. Tomppo, and P. Siikamäki. 2010. Recreation-induced changes in boreal bird communities in protected areas. *Ecological Applications* 20(6): 1775-1786.
- Klinkenberg, B. (Editor) 2017. E-Flora BC: Electronic Atlas of the Flora of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver. [Online] <http://ibis.geog.ubc.ca/biodiversity/eflora/> Accessed: 11 December 2017

- Lloyd, D., K. Angove, G. Hope, and C. Thompson. 1990. A guide to site identification and interpretation for the Kamloops Forest District. Land Management Handbook Number 23. BC Ministry of Forests. Research Branch. Victoria, BC. 407 pp.
- Livezey, K.B., E. Fernández-Juricic, and D.T. Blumstein. 2016. Database of bird flight initiation distances to assist in estimating effects from human disturbance and delineating buffer areas. *Journal of Fish and Wildlife Management* 7(1): 181-191.
- MacKenzie, W.H. and J.R. Moran. 2004. Wetlands of British Columbia: a guide to identification. Resource Branch, B.C. Ministry of Forests, Victoria, B.C. Land Management Handbook No. 52.
- McLeod EM, P-J. Guay, A.J. Taysom, R.W. Robinson, M.A. Weston. 2013. Buses, Cars, Bicycles and Walkers: The Influence of the Type of Human Transport on the Flight Responses of Waterbirds. PLoS ONE 8(12): e82008.
- McGowan, M.M., P.D. Patel, J.D. Stroh and D.T Blumstein. 2015. The effects of human presence and human activity on risk assessment and flight initiation distance in skinks. *Ethnology* 120: 1-9.
- Mason, S. D. Newsome, S. Moore and R. Admiraal. 2015. Recreational trampling negatively impacts vegetation structure of an Australian biodiversity hotspot. *Biodiversity & Conservation* 24: 2685-2707.
- Miller, S.G., R.L. Knight, and C.K. Miller. 2001. Wildlife response to pedestrians and dogs. *Wildlife Society Bulletin* 29(1): 124-132.
- Neira, C. L.A. Levin, E.D. Grosholz, and G. Mendoza. 2007. Influence of invasive *Spartina* growth stages on associated macrofaunal communities. *Biological Invasions* 9: 975-993.
- Newsome, T.M and L.M. van Eeden. 2017. The effects of food waste on wildlife and humans. *Sustainability* 9: 1-9.
- Pickering, C.M., W. Hill, D. Newsome, and Y. Leung. 2010. Comparing hiking, mountain biking, and horse riding impacts on vegetation and soils in Australia and the United States of America. *Journal of Environmental Management* 91: 551-562.
- Robertson, M.J., D.A. Scruton, R.S. Gregory and K.D. Clarke. 2006. Effects of sediment on freshwater fish and fish habitat. Canadian Technical Report of Fisheries and Aquatic Sciences, 2644: v + 37 pp.
- Rousseu, F. and B. Drolet. 2015. *Prediction of the nesting phenology of birds in Canada*. In: J. Husse: and D. Lepage. *Bird Nesting Calendar Query Tool*. Project NestWatch. Bird Studies Canada. / Études d'Oiseaux Canada. [Online] <http://www.birdscanada.org/volunteer/pnw/rnest/> Accessed 22 January 2018.
- Sanford, B. 2002. *McCulloch's Wonder: The Story of the Kettle Valley Railway*. Whitecap Books, Vancouver, BC.
- Smokorowski, K.E. and T.C. Pratt. 2006. Effects of a change in physical structure and cover on fish and fish habitat. Canadian Technical Report of Fisheries and Aquatic Sciences, 2642. iv + 52
- Snetsinger, S.D. and K. White. 2009. Recreation and Trail Impacts on Wildlife Species of Interest in Mount Spokane State Park. Pacific Biodiversity Institute, Winthrop, Washington. 60 pp.
- St. John, D., and S. Desjardins. 2003. Biogeography of Behr's hairstreak (*Satyrium behrii* columbia McDunnough 1944) in the South Okanagan. Part 1: inventory survey and mapping. Part 2: mark recapture study. Unpublished report. Okanagan University College, Kelowna, British Columbia. 18 pp.

- Tablado, Z., and L. Jenni. 2017. Determinants of uncertainty in wildlife response to human disturbance. *Biological Reviews* 92: 216-233.
- Taylor, A.R., and R.L. Knight. 2003. Wildlife responses to recreation and associated visitor perceptions. *Ecological Applications* 13(4): 951-963.
- Thompson, B. 2015. Recreational trails reduce the density of ground-dwelling birds in protected areas. *Environmental Management* 55: 1181-1190.
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service. N.D. Plant Fact Sheet: Antelope bitterbrush *Purshia tridentata* (Pursh) DC. [Online] [https://plants.usda.gov/factsheet/pdf/fs\\_putr2.pdf](https://plants.usda.gov/factsheet/pdf/fs_putr2.pdf) Accessed: 22 January 2018.
- Williston, P. 2000. Floristics and distribution patterns of lichens and bryophytes in microbotic crusts of British Columbia's ponderosa pine forests. In I.M. Darling (ed.) *Proceedings of a conference on the biology and management of species and habitats at risk, Kamloops, B.C., 15-19 Feb. 1999. Volume Two*. B.C. Ministry of Environment, Lands, and Parks, Victoria, B.C., and University College of the Cariboo, Kamloops, B.C., 520 pp.
- Zlatnik, E. 1999. *Purshia tridentata*. In: *Fire Effects Information System*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. [Online] <http://www.fs.fed.us/database/feis/plants/shrub/putri/all.html> Accessed: 22 January 2018.

# APPENDIX A

## Documented Occurrences of Common Wildlife

The following tables summarize the documented occurrence of common and secure (*i.e.*, not at risk) wildlife species within the Okanagan-Similkameen Region.

Common and Secure Wildlife Species			
Class	Species Name	Scientific Name	CDC List
Amphibian	Northwestern Salamander	<i>Ambystoma gracile</i>	Yellow
Amphibian	Long-toed Salamander	<i>Ambystoma macrodactylum</i>	Yellow
Amphibian	American Bullfrog	<i>Lithobates catesbeianus</i>	Exotic
Amphibian	Wood Frog	<i>Lithobates sylvaticus</i>	Yellow
Amphibian	Northern Pacific Treefrog	<i>Pseudacris regilla</i>	Yellow
Amphibian	Columbia Spotted Frog	<i>Rana luteiventris</i>	Yellow
Bird	Northern Saw-whet Owl	<i>Aegolius acadicus</i>	Yellow
Bird	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Yellow
Bird	Wood Duck	<i>Aix sponsa</i>	Yellow
Bird	Chukar	<i>Alectoris chukar</i>	Exotic
Bird	American Wigeon	<i>Anas americana</i>	Yellow
Bird	Blue-winged Teal	<i>Anas discors</i>	Yellow
Bird	Mallard	<i>Anas platyrhynchos</i>	Yellow
Bird	Sandhill Crane	<i>Antigone canadensis</i>	Yellow
Bird	Black-chinned Hummingbird	<i>Archilochus alexandri</i>	Yellow
Bird	Long-eared Owl	<i>Asio otus</i>	Yellow
Bird	Redhead	<i>Aythya americana</i>	Yellow
Bird	Cedar Waxwing	<i>Bombycilla cedrorum</i>	Yellow
Bird	Canada Goose	<i>Branta canadensis</i>	Yellow
Bird	Great Horned Owl	<i>Bubo virginianus</i>	Yellow
Bird	Red-tailed Hawk	<i>Buteo jamaicensis</i>	Yellow
Bird	California Quail	<i>Callipepla californica</i>	Exotic
Bird	Wilson's Warbler	<i>Cardellina pusilla</i>	Yellow
Bird	Turkey Vulture	<i>Cathartes aura</i>	Yellow

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

Common and Secure Wildlife Species			
Class	Species Name	Scientific Name	CDC List
Bird	Veery	<i>Catharus fuscescens</i>	Yellow
Bird	Killdeer	<i>Charadrius vociferus</i>	Yellow
Bird	Common Nighthawk	<i>Chordeiles minor</i>	Yellow
Bird	Marsh Wren	<i>Cistothorus palustris</i>	Yellow
Bird	Northern Flicker	<i>Colaptes auratus</i>	Yellow
Bird	Western Wood-pewee	<i>Contopus sordidulus</i>	Yellow
Bird	American Crow	<i>Corvus brachyrhynchos</i>	Yellow
Bird	Common Raven	<i>Corvus corax</i>	Yellow
Bird	Steller's Jay	<i>Cyanocitta stelleri</i>	Yellow
Bird	Pileated Woodpecker	<i>Dryocopus pileatus</i>	Yellow
Bird	Gray Catbird	<i>Dumetella carolinensis</i>	Yellow
Bird	Least Flycatcher	<i>Empidonax minimus</i>	Yellow
Bird	Dusky Flycatcher	<i>Empidonax oberholseri</i>	Yellow
Bird	Willow Flycatcher	<i>Empidonax traillii</i>	Yellow
Bird	Horned Lark	<i>Eremophila alpestris</i>	Yellow
Bird	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	Yellow
Bird	Peregrine Falcon	<i>Falco peregrinus</i>	No Status
Bird	American Kestrel	<i>Falco sparverius</i>	Yellow
Bird	Wilson's Snipe	<i>Gallinago delicata</i>	Yellow
Bird	Common Loon	<i>Gavia immer</i>	Yellow
Bird	MacGillivray's Warbler	<i>Geothlypis tolmiei</i>	Yellow
Bird	Common Yellowthroat	<i>Geothlypis trichas</i>	Yellow
Bird	Northern Pygmy-Owl	<i>Glaucidium gnoma</i>	Yellow
Bird	House Finch	<i>Haemorhous mexicanus</i>	Yellow
Bird	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Yellow
Bird	Bullock's Oriole	<i>Icterus bullockii</i>	Yellow
Bird	Northern Shrike	<i>Lanius excubitor</i>	Yellow
Bird	Song Sparrow	<i>Melospiza melodia</i>	Yellow

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

<b>Common and Secure Wildlife Species</b>			
<b>Class</b>	<b>Species Name</b>	<b>Scientific Name</b>	<b>CDC List</b>
Bird	Brown-headed Cowbird	<i>Molothrus ater</i>	Yellow
Bird	Nashville Warbler	<i>Oreothlypis ruficapilla</i>	Yellow
Bird	Osprey	<i>Pandion haliaetus</i>	Yellow
Bird	House Sparrow	<i>Passer domesticus</i>	Exotic
Bird	Savannah Sparrow	<i>Passerculus sandwichensis</i>	Yellow
Bird	Lazuli Bunting	<i>Passerina amoena</i>	Yellow
Bird	Gray Partridge	<i>Perdix perdix</i>	Exotic
Bird	Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	Yellow
Bird	Common Poorwill	<i>Phalaenoptilus nuttallii</i>	Yellow
Bird	Ring-necked Pheasant	<i>Phasianus colchicus</i>	Exotic
Bird	Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	Yellow
Bird	Black-billed Magpie	<i>Pica hudsonia</i>	Yellow
Bird	American Three-toed Woodpecker	<i>Picoides dorsalis</i>	Yellow
Bird	Downy Woodpecker	<i>Picoides pubescens</i>	Yellow
Bird	Hairy Woodpecker	<i>Picoides villosus</i>	Yellow
Bird	Spotted Towhee	<i>Pipilo maculatus</i>	Yellow
Bird	Western Tanager	<i>Piranga ludoviciana</i>	Yellow
Bird	Pied-billed Grebe	<i>Podilymbus podiceps</i>	Yellow
Bird	Black-capped Chickadee	<i>Poecile atricapillus</i>	Yellow
Bird	Mountain Chickadee	<i>Poecile gambeli</i>	Yellow
Bird	Vesper Sparrow	<i>Pooecetes gramineus</i>	Yellow
Bird	Sora	<i>Porzana carolina</i>	Yellow
Bird	Virginia Rail	<i>Rallus limicola</i>	Yellow
Bird	Rock Wren	<i>Salpinctes obsoletus</i>	Yellow
Bird	Say's Phoebe	<i>Sayornis saya</i>	Yellow
Bird	Calliope Hummingbird	<i>Selasphorus calliope</i>	Yellow
Bird	Yellow Warbler	<i>Setophaga petechia</i>	Yellow
Bird	Western Bluebird	<i>Sialia mexicana</i>	Yellow

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

<b>Common and Secure Wildlife Species</b>			
<b>Class</b>	<b>Species Name</b>	<b>Scientific Name</b>	<b>CDC List</b>
Bird	Pygmy Nuthatch	<i>Sitta pygmaea</i>	Yellow
Bird	Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>	Yellow
Bird	Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>	Yellow
Bird	Pine Siskin	<i>Spinus pinus</i>	Yellow
Bird	American Goldfinch	<i>Spinus tristis</i>	Yellow
Bird	Brewer's Sparrow	<i>Spizella breweri</i>	Yellow
Bird	Clay-colored Sparrow	<i>Spizella pallida</i>	Yellow
Bird	Chipping Sparrow	<i>Spizella passerina</i>	Yellow
Bird	Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	Yellow
Bird	Eurasian Collared-Dove	<i>Streptopelia decaocto</i>	Exotic
Bird	Barred Owl	<i>Strix varia</i>	Yellow
Bird	Western Meadowlark	<i>Sturnella neglecta</i>	Yellow
Bird	European Starling	<i>Sturnus vulgaris</i>	Exotic
Bird	Tree Swallow	<i>Tachycineta bicolor</i>	Yellow
Bird	Violet-green Swallow	<i>Tachycineta thalassina</i>	Yellow
Bird	House Wren	<i>Troglodytes aedon</i>	Yellow
Bird	American Robin	<i>Turdus migratorius</i>	Yellow
Bird	Eastern Kingbird	<i>Tyrannus tyrannus</i>	Yellow
Bird	Western Kingbird	<i>Tyrannus verticalis</i>	Yellow
Bird	Cassin's Vireo	<i>Vireo cassinii</i>	Yellow
Bird	Warbling Vireo	<i>Vireo gilvus</i>	Yellow
Bird	Red-eyed Vireo	<i>Vireo olivaceus</i>	Yellow
Bird	Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	Yellow
Bird	Mourning Dove	<i>Zenaida macroura</i>	Yellow
Bird	Acorn Woodpecker	<i>Melanerpes formicivorus</i>	Accidental
Bird	Alder Flycatcher	<i>Empidonax alnorum</i>	Yellow
Bird	American Black Duck	<i>Anas rubripes</i>	Exotic
Bird	American Coot	<i>Fulica americana</i>	Yellow

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

<b>Common and Secure Wildlife Species</b>			
<b>Class</b>	<b>Species Name</b>	<b>Scientific Name</b>	<b>CDC List</b>
Bird	American Dipper	<i>Cinclus mexicanus</i>	Yellow
Bird	American Pipit	<i>Anthus rubescens</i>	Yellow
Bird	American Redstart	<i>Setophaga ruticilla</i>	Yellow
Bird	American Tree Sparrow	<i>Spizelloides arborea</i>	Yellow
Bird	Anna's Hummingbird	<i>Calypte anna</i>	Yellow
Bird	Arctic Tern	<i>Sterna paradisaea</i>	Yellow
Bird	Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	Accidental
Bird	Baird's Sandpiper	<i>Calidris bairdii</i>	Unknown
Bird	Barrow's Goldeneye	<i>Bucephala islandica</i>	Yellow
Bird	Belted Kingfisher	<i>Megaceryle alcyon</i>	Yellow
Bird	Bewick's Wren	<i>Thryomanes bewickii</i>	Yellow
Bird	Black Phoebe	<i>Sayornis nigricans</i>	Accidental
Bird	Black Tern	<i>Chlidonias niger</i>	Yellow
Bird	Black-and-white Warbler	<i>Mniotilta varia</i>	Yellow
Bird	Black-backed Woodpecker	<i>Picoides arcticus</i>	Yellow
Bird	Black-bellied Plover	<i>Pluvialis squatarola</i>	Yellow
Bird	Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	Accidental
Bird	Black-capped Vireo	<i>Vireo atricapilla</i>	Accidental
Bird	Black-necked Stilt	<i>Himantopus mexicanus</i>	No Status
Bird	Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	Accidental
Bird	Black-throated Gray Warbler	<i>Setophaga nigrescens</i>	Yellow
Bird	Black-throated Sparrow	<i>Amphispiza bilineata</i>	Accidental
Bird	Blue Jay	<i>Cyanocitta cristata</i>	Yellow
Bird	Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	Accidental
Bird	Bohemian Waxwing	<i>Bombycilla garrulus</i>	Yellow
Bird	Bonaparte's Gull	<i>Chroicocephalus philadelphia</i>	Yellow
Bird	Boreal Chickadee	<i>Poecile hudsonicus</i>	Yellow
Bird	Boreal Owl	<i>Aegolius funereus</i>	Yellow

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

<b>Common and Secure Wildlife Species</b>			
<b>Class</b>	<b>Species Name</b>	<b>Scientific Name</b>	<b>CDC List</b>
Bird	Brambling	<i>Fringilla montifringilla</i>	No Status
Bird	Brown Creeper	<i>Certhia americana</i>	Yellow
Bird	Bufflehead	<i>Bucephala albeola</i>	Yellow
Bird	Cackling Goose	<i>Branta hutchinsii</i>	Yellow
Bird	Canvasback	<i>Aythya valisineria</i>	Yellow
Bird	Cassin's Finch	<i>Haemorhous cassinii</i>	Yellow
Bird	Cattle Egret	<i>Bubulcus ibis</i>	No Status
Bird	Chestnut-backed Chickadee	<i>Poecile rufescens</i>	Yellow
Bird	Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	Accidental
Bird	Cinnamon Teal	<i>Spatula cyanoptera</i>	Yellow
Bird	Clark's Nutcracker	<i>Nucifraga columbiana</i>	Yellow
Bird	Common Goldeneye	<i>Bucephala clangula</i>	Yellow
Bird	Common Merganser	<i>Mergus merganser</i>	Yellow
Bird	Common Redpoll	<i>Acanthis flammea</i>	Yellow
Bird	Common Tern	<i>Sterna hirundo</i>	Unknown
Bird	Cooper's Hawk	<i>Accipiter cooperii</i>	Yellow
Bird	Dark-eyed Junco	<i>Junco hyemalis</i>	Yellow
Bird	Dickcissel	<i>Spiza americana</i>	Accidental
Bird	Dunlin	<i>Calidris alpina</i>	Yellow
Bird	Dusky Grouse	<i>Dendragapus obscurus</i>	Yellow
Bird	Eastern Phoebe	<i>Sayornis phoebe</i>	Yellow
Bird	Eurasian Wigeon	<i>Mareca penelope</i>	No Status
Bird	Ferruginous Hawk	<i>Buteo regalis</i>	Unknown
Bird	Fox Sparrow	<i>Passerella iliaca</i>	Yellow
Bird	Franklin's Gull	<i>Leucophaeus pipixcan</i>	Unknown
Bird	Gadwall	<i>Mareca strepera</i>	Yellow
Bird	Garganey	<i>Spatula querquedula</i>	Accidental
Bird	Glaucous Gull	<i>Larus hyperboreus</i>	No Status

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

<b>Common and Secure Wildlife Species</b>			
<b>Class</b>	<b>Species Name</b>	<b>Scientific Name</b>	<b>CDC List</b>
Bird	Glaucous-winged Gull	<i>Larus glaucescens</i>	Yellow
Bird	Golden Eagle	<i>Aquila chrysaetos</i>	Yellow
Bird	Golden-crowned Kinglet	<i>Regulus satrapa</i>	Yellow
Bird	Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>	Yellow
Bird	Gray Jay	<i>Perisoreus canadensis</i>	Yellow
Bird	Gray-crowned Rosy Finch	<i>Leucosticte tephrocotis</i>	Yellow
Bird	Great Blue Heron	<i>Ardea herodias</i>	No Status
Bird	Great Egret	<i>Ardea alba</i>	Accidental
Bird	Greater Scaup	<i>Aythya marila</i>	Yellow
Bird	Greater White-fronted Goose	<i>Anser albifrons</i>	Yellow
Bird	Greater Yellowlegs	<i>Tringa melanoleuca</i>	Yellow
Bird	Green-winged Teal	<i>Anas crecca</i>	Yellow
Bird	Hammond's Flycatcher	<i>Empidonax hammondii</i>	Yellow
Bird	Harlequin Duck	<i>Histrionicus histrionicus</i>	Yellow
Bird	Harris's Sparrow	<i>Zonotrichia querula</i>	Unknown
Bird	Hermit Thrush	<i>Catharus guttatus</i>	Yellow
Bird	Herring Gull	<i>Larus argentatus</i>	Yellow
Bird	Hooded Merganser	<i>Lophodytes cucullatus</i>	Yellow
Bird	Horned Grebe	<i>Podiceps auritus</i>	Yellow
Bird	Iceland Gull	<i>Larus glaucoides</i>	Yellow
Bird	Indigo Bunting	<i>Passerina cyanea</i>	Accidental
Bird	Lapland Longspur	<i>Calcarius lapponicus</i>	Unknown
Bird	Least Sandpiper	<i>Calidris minutilla</i>	Yellow
Bird	Least Tern	<i>Sternula antillarum</i>	Accidental
Bird	LeConte's Sparrow	<i>Ammodramus leconteii</i>	Yellow
Bird	Lesser Black-backed Gull	<i>Larus fuscus</i>	Accidental
Bird	Lesser Goldfinch	<i>Spinus psaltria</i>	Accidental
Bird	Lesser Yellowlegs	<i>Tringa flavipes</i>	Yellow

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

Common and Secure Wildlife Species			
Class	Species Name	Scientific Name	CDC List
Bird	Lincoln's Sparrow	<i>Melospiza lincolnii</i>	Yellow
Bird	Little Gull	<i>Hydrocoloeus minutus</i>	Accidental
Bird	Loggerhead Shrike	<i>Lanius ludovicianus</i>	Accidental
Bird	Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	Yellow
Bird	Magnolia Warbler	<i>Setophaga magnolia</i>	Yellow
Bird	Marbled Godwit	<i>Limosa fedoa</i>	Unknown
Bird	Merlin	<i>Falco columbarius</i>	Yellow
Bird	Mew Gull	<i>Larus canus</i>	Yellow
Bird	Mountain Bluebird	<i>Sialia currucoides</i>	Yellow
Bird	Mourning Warbler	<i>Geothlypis philadelphia</i>	Yellow
Bird	Mute Swan	<i>Cygnus olor</i>	Exotic
Bird	Northern Goshawk	<i>Accipiter gentilis</i>	Yellow
Bird	Northern Harrier	<i>Circus hudsonius</i>	Yellow
Bird	Northern Mockingbird	<i>Mimus polyglottos</i>	No Status
Bird	Northern Parula	<i>Setophaga americana</i>	Accidental
Bird	Northern Pintail	<i>Anas acuta</i>	Yellow
Bird	Northern Shoveler	<i>Spatula clypeata</i>	Yellow
Bird	Northern Waterthrush	<i>Parkesia noveboracensis</i>	Yellow
Bird	Orange-crowned Warbler	<i>Oreothlypis celata</i>	Yellow
Bird	Pacific Loon	<i>Gavia pacifica</i>	Yellow
Bird	Pacific Wren	<i>Troglodytes pacificus</i>	Yellow
Bird	Pacific-slope Flycatcher	<i>Empidonax difficilis</i>	Yellow
Bird	Palm Warbler	<i>Setophaga palmarum</i>	Yellow
Bird	Pectoral Sandpiper	<i>Calidris melanotos</i>	Unknown
Bird	Pine Grosbeak	<i>Pinicola enucleator</i>	Yellow
Bird	Prairie Warbler	<i>Setophaga discolor</i>	Accidental
Bird	Purple Finch	<i>Haemorhous purpureus</i>	Yellow
Bird	Red Crossbill	<i>Loxia curvirostra</i>	Yellow

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

<b>Common and Secure Wildlife Species</b>			
<b>Class</b>	<b>Species Name</b>	<b>Scientific Name</b>	<b>CDC List</b>
Bird	Red Phalarope	<i>Phalaropus fulicarius</i>	Unknown
Bird	Red-breasted Merganser	<i>Mergus serrator</i>	Yellow
Bird	Red-breasted Nuthatch	<i>Sitta canadensis</i>	Yellow
Bird	Red-necked Grebe	<i>Podiceps grisegena</i>	Yellow
Bird	Red-throated Loon	<i>Gavia stellata</i>	Yellow
Bird	Ring-billed Gull	<i>Larus delawarensis</i>	Yellow
Bird	Ring-necked Duck	<i>Aythya collaris</i>	Yellow
Bird	Rock Pigeon	<i>Columba livia</i>	Exotic
Bird	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	Yellow
Bird	Ross's Goose	<i>Anser rossii</i>	Accidental
Bird	Ruby-crowned Kinglet	<i>Regulus calendula</i>	Yellow
Bird	Ruddy Duck	<i>Oxyura jamaicensis</i>	Yellow
Bird	Ruddy Turnstone	<i>Arenaria interpres</i>	Yellow
Bird	Ruffed Grouse	<i>Bonasa umbellus</i>	Yellow
Bird	Rufous Hummingbird	<i>Selasphorus rufus</i>	Yellow
Bird	Sabine's Gull	<i>Xema sabini</i>	No Status
Bird	Sagebrush Sparrow	<i>Artemisospiza nevadensis</i>	Accidental
Bird	Sanderling	<i>Calidris alba</i>	Yellow
Bird	Sedge Wren	<i>Cistothorus platensis</i>	Accidental
Bird	Semipalmated Plover	<i>Charadrius semipalmatus</i>	Yellow
Bird	Semipalmated Sandpiper	<i>Calidris pusilla</i>	Unknown
Bird	Sharp-shinned Hawk	<i>Accipiter striatus</i>	Yellow
Bird	Snow Bunting	<i>Plectrophenax nivalis</i>	Yellow
Bird	Snow Goose	<i>Anser caerulescens</i>	Yellow
Bird	Snowy Owl	<i>Bubo scandiacus</i>	Unknown
Bird	Solitary Sandpiper	<i>Tringa solitaria</i>	Yellow
Bird	Sooty Grouse	<i>Dendragapus fuliginosus</i>	Yellow
Bird	Spotted Sandpiper	<i>Actitis macularius</i>	Yellow

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

<b>Common and Secure Wildlife Species</b>			
<b>Class</b>	<b>Species Name</b>	<b>Scientific Name</b>	<b>CDC List</b>
Bird	Swainson's Thrush	<i>Catharus ustulatus</i>	Yellow
Bird	Swamp Sparrow	<i>Melospiza georgiana</i>	Yellow
Bird	Tennessee Warbler	<i>Oreothlypis peregrina</i>	Yellow
Bird	Townsend's Solitaire	<i>Myadestes townsendi</i>	Yellow
Bird	Townsend's Warbler	<i>Setophaga townsendi</i>	Yellow
Bird	Trumpeter Swan	<i>Cygnus buccinator</i>	Yellow
Bird	Varied Thrush	<i>Ixoreus naevius</i>	Yellow
Bird	Vaux's Swift	<i>Chaetura vauxi</i>	Yellow
Bird	Western Sandpiper	<i>Calidris mauri</i>	Yellow
Bird	Whimbrel	<i>Numenius phaeopus</i>	Unknown
Bird	White-breasted Nuthatch	<i>Sitta carolinensis</i>	Yellow
Bird	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	Yellow
Bird	White-faced Ibis	<i>Plegadis chihi</i>	Accidental
Bird	White-tailed Ptarmigan	<i>Lagopus leucura</i>	Yellow
Bird	White-throated Sparrow	<i>Zonotrichia albicollis</i>	Yellow
Bird	White-winged Crossbill	<i>Loxia leucoptera</i>	Yellow
Bird	White-winged Scoter	<i>Melanitta fusca</i>	Yellow
Bird	Wild Turkey	<i>Meleagris gallopavo</i>	Exotic
Bird	Willet	<i>Tringa semipalmata</i>	Accidental
Bird	Wilson's Phalarope	<i>Phalaropus tricolor</i>	Yellow
Bird	Wood Thrush	<i>Hylocichla mustelina</i>	Accidental
Bird	Yellow-rumped Warbler	<i>Setophaga coronata</i>	Yellow
Bivalve	Western Pearlshell	<i>Margaritifera falcata</i>	Yellow
Invertebrate	Roadside Skipper	<i>Amblyscirtes vialis</i>	Yellow
Invertebrate	Arctic Skipper	<i>Carterocephalus palaemon</i>	Yellow
Invertebrate	Common Wood-nymph	<i>Cercyonis pegala</i>	Yellow
Invertebrate	Northern Checkerspot	<i>Chlosyne palla</i>	Yellow
Invertebrate	Dispirited Tiger Beetle	<i>Cicindela depressula</i>	Yellow

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

<b>Common and Secure Wildlife Species</b>			
<b>Class</b>	<b>Species Name</b>	<b>Scientific Name</b>	<b>CDC List</b>
Invertebrate	Prairie Long-lipped Tiger Beetle	<i>Cicindela nebraskana</i>	Yellow
Invertebrate	Western Tiger Beetle	<i>Cicindela oregona</i>	Yellow
Invertebrate	Cow Path Tiger Beetle	<i>Cicindela purpurea</i>	Yellow
Invertebrate	Oblique-lined Tiger Beetle	<i>Cicindela tranquebarica</i>	Yellow
Invertebrate	Common Ringlet	<i>Coenonympha tullia</i>	Yellow
Invertebrate	Orange Sulphur	<i>Colias eurytheme</i>	Yellow
Invertebrate	Pink-edged Sulphur	<i>Colias interior</i>	Yellow
Invertebrate	Western Sulphur	<i>Colias occidentalis</i>	Yellow
Invertebrate	Clouded Sulphur	<i>Colias philodice</i>	Yellow
Invertebrate	Western Tailed Blue	<i>Cupido amyntula</i>	Yellow
Invertebrate	Okanagan Robber Fly	<i>Efferiaokanagana</i>	
Invertebrate	Common Alpine	<i>Erebia epipsodea</i>	Yellow
Invertebrate	Large Marble	<i>Euchloe ausonides</i>	Yellow
Invertebrate	Desert Marble	<i>Euchloe lotta</i>	Yellow
Invertebrate	Square-spotted Blue	<i>Euphilotes battoides</i>	Yellow
Invertebrate	Anicia Checkerspot	<i>Euphydryas anicia</i>	Yellow
Invertebrate	Chalcedon Checkerspot	<i>Euphydryas chalcedona</i>	Yellow
Invertebrate	Silvery Blue	<i>Glaucopsyche lygdamus</i>	Yellow
Invertebrate	Common Branded Skipper	<i>Hesperia comma</i>	Yellow
Invertebrate	Juba Skipper	<i>Hesperia juba</i>	Yellow
Invertebrate	Lorquin's Admiral	<i>Limenitis lorquini</i>	Yellow
Invertebrate	Purplish Copper	<i>Lycaena helloides</i>	Yellow
Invertebrate	Blue Copper	<i>Lycaena heteronea</i>	Yellow
Invertebrate	Mourning Cloak	<i>Nymphalis antiopa</i>	Yellow
Invertebrate	Canadian Swallowtail	<i>Papilio canadensis</i>	Yellow
Invertebrate	Pale Swallowtail	<i>Papilio eurymedon</i>	Yellow
Invertebrate	Western Tiger Swallowtail	<i>Papilio rutulus</i>	Yellow
Invertebrate	Northern Scorpion	<i>Paruroctonus boreus</i>	

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

<b>Common and Secure Wildlife Species</b>			
<b>Class</b>	<b>Species Name</b>	<b>Scientific Name</b>	<b>CDC List</b>
Invertebrate	Northern Crescent	<i>Phyciodes cocyta</i>	Yellow
Invertebrate	Pale Crescent	<i>Phyciodes pallida</i>	Yellow
Invertebrate	Cabbage White	<i>Pieris rapae</i>	Exotic
Invertebrate	Boisduval's Blue	<i>Plebejus icarioides</i>	Yellow
Invertebrate	Acmon Blue	<i>Plebejus lupini</i>	Yellow
Invertebrate	Melissa Blue	<i>Plebejus melissa</i>	Yellow
Invertebrate	Acadian Hairstreak	<i>Satyrrium acadica</i>	
Invertebrate	Grey Hairstreak	<i>Strymon melinus</i>	Yellow
Mammal	Coyote	<i>Canis latrans</i>	Yellow
Mammal	Big Brown Bat	<i>Eptesicus fuscus</i>	Yellow
Mammal	North American Porcupine	<i>Erethizon dorsatum</i>	Yellow
Mammal	Silver-haired Bat	<i>Lasionycteris noctivagans</i>	Yellow
Mammal	Hoary Bat	<i>Lasiurus cinereus</i>	Yellow
Mammal	Striped Skunk	<i>Mephitis mephitis</i>	Yellow
Mammal	Meadow Vole	<i>Microtus pennsylvanicus</i>	Yellow
Mammal	House Mouse	<i>Mus musculus</i>	Exotic
Mammal	Long-tailed Weasel	<i>Mustela frenata</i>	Yellow
Mammal	Californian Myotis	<i>Myotis californicus</i>	Yellow
Mammal	Long-eared Myotis	<i>Myotis evotis</i>	Yellow
Mammal	Long-legged Myotis	<i>Myotis volans</i>	Yellow
Mammal	Yuma Myotis	<i>Myotis yumanensis</i>	Yellow
Mammal	Bushy-tailed Woodrat	<i>Neotoma cinerea</i>	Yellow
Mammal	Mule Deer	<i>Odocoileus hemionus</i>	Yellow
Mammal	White-tailed Deer	<i>Odocoileus virginianus</i>	Yellow
Mammal	Common Muskrat	<i>Ondatra zibethicus</i>	Yellow
Mammal	North American Deermouse	<i>Peromyscus maniculatus</i>	Yellow
Mammal	Columbian Mouse	<i>Peromyscus oreas</i>	
Mammal	Raccoon	<i>Procyon lotor</i>	Yellow

APPENDIX A: DOCUMENTED OCCURRENCES OF WILDLIFE

<b>Common and Secure Wildlife Species</b>			
<b>Class</b>	<b>Species Name</b>	<b>Scientific Name</b>	<b>CDC List</b>
Mammal	Cougar	<i>Puma concolor</i>	Yellow
Mammal	Red Squirrel	<i>Tamiasciurus hudsonicus</i>	Yellow
Mammal	American Black Bear	<i>Ursus americanus</i>	Yellow
Reptiles	Painted Turtle bellii	<i>Chrysemys picta bellii</i>	
Reptiles	Northern Alligator Lizard	<i>Elgaria coerulea</i>	Yellow
Reptiles	Terrestrial Gartersnake	<i>Thamnophis elegans</i>	Yellow
Reptiles	Common Gartersnake	<i>Thamnophis sirtalis</i>	Yellow
Turtle	Pond Slider	<i>Trachemys scripta</i>	Exotic

# APPENDIX B

## Documented Species at Risk within the Local Study Area

The following table summarize the documented occurrence of at risk wildlife and plant species within the Okanagan-Similkameen Region.

Documented Species at Risk				
English Name	Scientific Name	CDC List	SARA	CF Priority
<b>AMPHIBIANS</b>				
Blotched Tiger Salamander	<i>Ambystoma mavortium</i>	Red	1-E	1
Western Toad	<i>Anaxyrus boreas</i>	Yellow	1-SC	2
Great Basin Spadefoot	<i>Spea intermontana</i>	Blue	1-T	1
<b>BIRDS</b>				
White-throated Swift	<i>Aeronautes saxatalis</i>		Blue	4
Grasshopper Sparrow	<i>Ammodramus savannarum</i>		Red	1
Great Blue Heron, <i>Herodias</i> Subspecies	<i>Ardea herodias herodias</i>		Blue	2
Burrowing Owl	<i>Athene cunicularia</i>	1-E	Red	2
Canyon Wren	<i>Catherpes mexicanus</i>		Blue	4
Lark Sparrow	<i>Chondestes grammacus</i>		Blue	2
Bobolink	<i>Dolichonyx oryzivorus</i>	1-T	Blue	2
Barn Swallow	<i>Hirundo rustica</i>	1-T	Blue	2
Caspian Tern	<i>Hydroprogne caspia</i>		Blue	2
Yellow-breasted Chat	<i>Icteria virens</i>	1-E	Red	1
California Gull	<i>Larus californicus</i>		Blue	4
Western Screech-owl, <i>Macfarlanei</i> Subspecies	<i>Megascops kennicottii macfarlanei</i>	1-T	Blue	1
Lewis's Woodpecker	<i>Melanerpes lewis</i>	1-T	Blue	2
Long-billed Curlew	<i>Numenius americanus</i>	1-SC	Blue	1
Sage Thrasher	<i>Oreoscoptes montanus</i>	DD	Red	1
American White Pelican	<i>Pelecanus erythrorhynchos</i>		Red	1
White-headed Woodpecker	<i>Picoides albolarvatus</i>	1-E	Red	1
Brewer's Sparrow, <i>Breweri</i> Subspecies	<i>Spizella breweri breweri</i>		Red	2
Barn Owl	<i>Tyto alba</i>	1-SC	Red	1

APPENDIX B: DOCUMENTED SPECIES AT RISK WITHIN THE LOCAL STUDY AREA

<b>Documented Species at Risk</b>				
<i>English Name</i>	<i>Scientific Name</i>	<i>CDC List</i>	<i>SARA</i>	<i>CF Priority</i>
<b>MAMMALS</b>				
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	Blue		2
Spotted Bat	<i>Euderma maculatum</i>	Blue	1-SC	2
Fringed Myotis	<i>Myotis thysanodes</i>	Blue	3-DD	3
Great Basin Pocket Mouse	<i>Perognathus parvus</i>	Blue		2
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	Blue	1-SC	2
Nuttall's Cottontail	<i>Sylvilagus nuttallii</i>	Blue	1-SC	1
American Badger	<i>Taxidea taxus</i>	Red	1-E	1
<b>REPTILES</b>				
Northern Rubber Boa	<i>Charina bottae</i>	Yellow	1-SC	1
North American Racer	<i>Coluber constrictor</i>	Blue	1-SC	2
Western Rattlesnake	<i>Crotalus oreganus</i>	Blue	1-T	1
Desert Nightsnake	<i>Hypsiglena chlorophaea</i>	Red	1-E	1
Gopher Snake, <i>Deserticola</i> Subspecies	<i>Pituophis catenifer deserticola</i>	Blue	1-T	1
Western Skink	<i>Plestiodon skiltonianus</i>	Blue	1-SC	1
<b>TURTLES</b>				
Painted Turtle, Rocky Mountain Population	<i>Chrysemys picta</i> pop. 2	Blue	1-SC	2
<b>FISH</b>				
Chiselmouth	<i>Acrocheilus alutaceus</i>	Blue		2
<b>BIVALVES</b>				
Rocky Mountain Ridged Mussel	<i>Gonidea angulata</i>	Red	1-E	1
<b>INSECTS</b>				
Vivid Dancer	<i>Argia vivida</i>	Blue		2
Immaculate Green Hairstreak	<i>Callophrys affinis</i>	Blue		2
Monarch	<i>Danaus plexippus</i>	Blue	1-E	1
Western River Cruiser	<i>Macromia magnifica</i>	Blue		2
Behr's Hairstreak	<i>Satyrrium behrii</i>	Red	1-E	1
California Hairstreak	<i>Satyrrium californica</i>	Blue		4

APPENDIX B: DOCUMENTED SPECIES AT RISK WITHIN THE LOCAL STUDY AREA

<b>Documented Species at Risk</b>				
<i>English Name</i>	<i>Scientific Name</i>	<i>CDC List</i>	<i>SARA</i>	<i>CF Priority</i>
Olive Clubtail	<i>Stylurus olivaceus</i>	Red	1-E	1
<b>VASCULAR PLANTS</b>				
River Bulrush	<i>Bolboschoenus fluviatilis</i>	Red		1
Bearded Sedge	<i>Carex comosa</i>	Blue		3
Porcupine Sedge	<i>Carex hystericina</i>	Blue		2
Red-rooted Cyperus	<i>Cyperus erythrorhizos</i>	Blue		1
Dwarf Spike-rush	<i>Eleocharis coloradoensis</i>	Red		2
Ovate Spike-rush	<i>Eleocharis ovata</i>	Blue		1
Small-flowered Lipocarpha	<i>Lipocarpha micrantha</i>	Red	1-E	1
Hairgrass Dropseed	<i>Sporobolus airoides</i>	Red		2
The Dalles Milk-vetch	<i>Astragalus sclerocarpus</i>	Red		2
Cut-leaved Water-parsnip	<i>Berula erecta</i>	Blue		2
Heterocodon	<i>Heterocodon rariflorus</i>	Blue		2
Great Basin Desert-parsley	<i>Lomatium simplex</i>	Blue		-
Pale Evening-primrose	<i>Oenothera pallida</i> ssp. <i>pallida</i>	Red		2
Snake River Cryptantha	<i>Oreocarya sheldonii</i>	Red		-
Toothcup	<i>Rotala ramosior</i>	Red	1-E	1
Munroe's Globe-mallow	<i>Sphaeralcea munroana</i>	Red		2
Short-rayed Aster	<i>Symphyotrichum frondosum</i>	Red	1-E	1
Thick-leaved Thelypody	<i>Thelypodium laciniatum</i>	Blue		-
Blue Vervain	<i>Verbena hastata</i> var. <i>scabra</i>	Blue		2
Western Centaury	<i>Zeltnera exaltata</i>	Red		1
<b>NON-VASCULAR PLANTS</b>				
Columbian Carpet Moss	<i>Bryoerythrophyllum columbianum</i>	Blue	1-SC	2
Alkaline Wing-nerved Moss	<i>Pterygoneurum kozlovii</i>	Blue	1-T	1

# APPENDIX C

## *Potentially Occurring Species at Risk*

---

The attached document summarizes the results of BC CDC queries for potentially occurring at risk wildlife and plant species within the Okanagan-Similkameen Region based on habitat requirements.

## BC Species and Ecosystems Explorer Search Results

Scientific Name	English Name	Provincial	Status				CF	Priority
			BC List	COSEWIC	SARA	Global		
<i>Achnatherum thurberianum</i>	Thurber's needlegrass	S2 (2017)	Red			G5 (1987)	1	
<i>Aeronautes saxatalis</i>	White-throated Swift	S3S4B (2015)	Blue			G5 (1996)	4	
<i>Aeshna constricta</i>	Lance-tipped Darner	S2S3 (2015)	Blue			G5 (2016)	2	
<i>Agastache urticifolia</i>	nettle-leaved giant-hyssop	S3 (2015)	Blue			G5 (2000)	2	
<i>Ammannia robusta</i>	scarlet ammannia	S1 (2015)	Red	E (2001)	1-E (2003)	G5 (1993)	1	
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	S1S2B (2015)	Red			G5 (1996)	1	
<i>Anaxyrus boreas</i>	Western Toad	S4 (2016)	Yellow	SC (2012)	1-SC (2005)	G4 (2008)	2	
<i>Antrozous pallidus</i>	Pallid Bat	S2 (2015)	Red	T (2010)	1-T (2003)	G4 (2015)	2	
<i>Apodemia mormo</i>	Mormon Metalmark	S1 (2013)	Red	E (2014)	1-E (2005)	G5 (2016)	1	
<i>Ardea herodias herodias</i>	Great Blue Heron, <i>herodias</i> subspecies	S3? (2017)	Blue			G5T5 (2000)	2	
<i>Argia vivida</i>	Vivid Dancer	S2S3 (2015)	Blue	SC (2015)		G5 (2015)	2	
<i>Asio flammeus</i>	Short-eared Owl	S3B,S2N (2015)	Blue	SC (2008)	1-SC (2012)	G5 (2014)	2	
<i>Astragalus sclerocarpus</i>	The Dalles milk-vetch	S1S2 (2015)	Red			G5 (1989)	2	
<i>Astragalus spaldingii</i>	Spalding's milk-vetch	S1 (2015)	Red			G3G4 (2003)		
<i>Athene cunicularia</i>	Burrowing Owl	S1B (2015)	Red	E (2017)	1-E (2003)	G4 (2014)	2	
<i>Berula erecta</i>	cut-leaved water-parsnip	S3 (2015)	Blue			G4G5 (1984)	2	
<i>Bidens vulgata</i>	tall beggarticks	S2S3 (2015)	Blue			G5 (1987)	1	
<i>Boechera sparsiflora</i>	stretching sungrass	SH (2015)	Red			G5 (1988)	2	
<i>Bolboschoenus fluviatilis</i>	river bulrush	S2 (2015)	Red			G5 (2015)	1	
<i>Botaurus lentiginosus</i>	American Bittern	S3B (2015)	Blue			G5 (2016)	2	
<i>Brickellia oblongifolia</i> var. <i>oblongifolia</i>	narrow-leaved brickellia	S3 (2015)	Blue			G5T5 (1997)	3	
<i>Buteo swainsoni</i>	Swainson's Hawk	S2B (2015)	Red			G5 (1996)	2	
<i>Callophrys affinis</i>	Immaculate Green Hairstreak	S3 (2013)	Blue			G5 (1998)	2	
<i>Carex comosa</i>	bearded sedge	S3 (2016)	Blue			G5 (1998)	3	
<i>Carex hystericina</i>	porcupine sedge	S2S3 (2016)	Blue			G5 (1984)	2	

<i>Carex scopulorum</i> var. <i>bracteosa</i>	Holm's Rocky Mountain sedge	S2S3 (2000)	Blue			G5T3T5 (2002)	2
<i>Castilleja minor</i> var. <i>exilis</i>	annual paintbrush	S2 (2015)	Red			G5T5 (1995)	2
<i>Catherpes mexicanus</i>	Canyon Wren	S3? (2015)	Blue	NAR (1992)		G5 (1996)	4
<i>Charina bottae</i>	Northern Rubber Boa	S4 (2012)	Yellow	SC (2016)	1-SC (2005)	G5 (2016)	1
<i>Chondestes grammacus</i>	Lark Sparrow	S3S4B (2015)	Blue			G5 (2009)	2
<i>Chordeiles minor</i>	Common Nighthawk	S4B (2015)	Yellow	T (2007)	1-T (2010)	G5 (2014)	2
<i>Chrysemys picta</i>	Painted Turtle	S3 (2012)	No Status	E/SC (2006)	1-E/SC (2007)	G5 (2016)	2
<i>Chrysemys picta</i> pop. 2	Painted Turtle - Intermountain - Rocky Mountain Population	S2S3 (2012)	Blue	SC (2016)	1-SC (2007)	G5T2T3 (2008)	2
<i>Cicindela decemnotata</i>	Badlands Tiger Beetle	S1S3 (2017)	Red			G4 (2008)	2
<i>Cicindela pugetana</i>	Sagebrush Tiger Beetle	S3S4 (2017)	Blue			G4 (2016)	2
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	S5 (2015)	Yellow	SC (2016)		G5 (1996)	2
<i>Coluber constrictor</i>	North American Racer	S3 (2012)	Blue	T (2015)	1-SC (2006)	G5 (2016)	2
<i>Contopus cooperi</i>	Olive-sided Flycatcher	S3S4B (2015)	Blue	T (2007)	1-T (2010)	G4 (2008)	2
<i>Coreopsis tinctoria</i> var. <i>atkinsoniana</i>	Atkinson's coreopsis	S2 (2015)	Red			G5T5 (2000)	2
<i>Corynorhinus townsendii</i>	Townsend's Big-eared Bat	S3S4 (2015)	Blue			G4 (2015)	2
<i>Crotalus oreganus</i>	Western Rattlesnake	S3 (2012)	Blue	T (2015)	1-T (2005)	G5 (2016)	2
<i>Cryptantha watsonii</i>	Watson's cryptantha	S2S3 (2015)	Blue			G5 (1988)	2
<i>Cyperus erythrorhizos</i>	red-rooted cyperus	S3? (2015)	Blue			G5 (1984)	1
<i>Cypseloides niger</i>	Black Swift	S2S3B (2015)	Blue	E (2015)		G4 (2015)	2
<i>Danaus plexippus</i>	Monarch	S3B (2013)	Blue	E (2016)	1-SC (2003)	G4 (2015)	2
<i>Dolichonyx oryzivorus</i>	Bobolink	S3B (2015)	Blue	T (2010)	1-T (2017)	G5 (2014)	2
<i>Eleocharis coloradoensis</i>	dwarf spike-rush	S2 (2015)	Red			GNR	2
<i>Eleocharis geniculata</i>	bent spike-rush	S1 (2015)	Red	E (2009)	1-E (2011)	G5 (1990)	1
<i>Eleocharis ovata</i>	ovate spike-rush	S2S3 (2015)	Blue			G5 (1992)	1
<i>Empidonax wrightii</i>	Gray Flycatcher	S3B (2015)	Blue	NAR (1992)		G5 (1996)	2
<i>Enallagma clausum</i>	Alkali Bluet	S3 (2015)	Blue			G5 (2015)	2
<i>Epilobium halleanum</i>	Hall's willowherb	S2S3 (2012)	Blue			G5 (1988)	2
<i>Epipactis gigantea</i>	giant helleborine	S4 (2016)	Yellow	NAR (2015)	3	G4	2

							(2009)	
<i>Eremophila alpestris merrilli</i>	Horned Lark, <i>merrilli</i> subspecies	S3? (2017)	Blue				G5T4 (2016)	4
<i>Erigeron poliospermus</i> var. <i>poliospermus</i>	cushion daisy	S3 (2015)	Blue				G4T4 (1997)	2
<i>Erythemis collocata</i>	Western Pondhawk	S3S4 (2015)	Blue				G5 (2016)	2
<i>Erythranthe suksdorfii</i>	Suksdorf's monkey-flower	S2 (2015)	Red				G4 (1994)	2
<i>Euderma maculatum</i>	Spotted Bat	S3S4 (2015)	Blue	SC (2014)		1-SC (2005)	G4 (2015)	2
<i>Euphagus carolinus</i>	Rusty Blackbird	S3S4B (2015)	Blue	SC (2017)		1-SC (2009)	G4 (2014)	2
<i>Falco mexicanus</i>	Prairie Falcon	S2 (2015)	Red	NAR (1996)			G5 (1996)	2
<i>Falco peregrinus anatum</i>	Peregrine Falcon, <i>anatum</i> subspecies	S2?B (2010)	Red	NAR (2017)		1-SC (2012)	G4T4 (2006)	2
<i>Galba truncatula</i>	Attenuate Fossaria	S3S5 (2015)	Blue				G5 (2008)	2
<i>Gayophytum humile</i>	dwarf groundsmoke	S2S3 (2000)	Blue				G5 (1990)	2
<i>Gayophytum ramosissimum</i>	hairstem groundsmoke	S2 (2015)	Red				G5 (1987)	2
<i>Gentiana affinis</i>	prairie gentian	S1S2 (2015)	Red				G5 (1999)	2
<i>Gilia sinuata</i>	shy gilia	SH (2015)	Red				G5 (1987)	1
<i>Gonidea angulata</i>	Rocky Mountain Ridged Mussel	S2 (2014)	Red	E (2010)		1-SC (2005)	G3 (2007)	1
<i>Hemizonella minima</i>	small-headed tarweed	S3 (2017)	Blue				G4 (1991)	2
<i>Hemphillia camelus</i>	Pale Jumping-slug	S3 (2015)	Blue				G4 (2006)	2
<i>Hesperia nevada</i>	Nevada Skipper	S3S4 (2013)	Blue				G5 (2006)	2
<i>Hesperostipa spartea</i>	porcupinegrass	S2S3 (2015)	Blue				G5 (1984)	3
<i>Heterocodon rariflorus</i>	heterocodon	S3 (2015)	Blue				G5 (1988)	2
<i>Hirundo rustica</i>	Barn Swallow	S3S4B (2015)	Blue	T (2011)		1-T (2017)	G5 (2014)	2
<i>Hydroprogne caspia</i>	Caspian Tern	S3B (2015)	Blue	NAR (1999)			G5 (1996)	2
<i>Hypsiglena chlorophaea</i>	Desert Nightsnake	S1 (2012)	Red	E (2011)		1-E (2003)	G5 (2016)	1
<i>Icteria virens</i>	Yellow-breasted Chat	S1S2B (2015)	Red	E (2011)		1-E (2003)	G5 (1996)	1
<i>Iva axillaris</i>	poverty-weed	S3 (2015)	Blue				G5 (2012)	2
<i>Lappula occidentalis</i> var. <i>cupulata</i>	western stickseed	S2 (2017)	Red				G5T5 (1998)	2
<i>Larus californicus</i>	California Gull	S2S3B (2015)	Blue				G5 (1996)	4
<i>Lathrocasis tenerrima</i>	slender gilia	S1 (2015)	Red				G5	2

							(1988)	
<i>Leptosiphon harknessii</i>	Harkness' linanthus	S1 (2016)	Red				G4? (2001)	1
<i>Lepus townsendii</i>	White-tailed Jackrabbit	SX (2015)	Red				G5 (1996)	2
<i>Libellula pulchella</i>	Twelve-spotted Skimmer	S3 (2015)	Blue				G5 (2015)	4
<i>Limenitis archippus</i>	Viceroy	SX (2013)	Red				G5 (2009)	2
<i>Limosella acaulis</i>	Owyhee mudwort	S2 (2015)	Red				G5 (1990)	1
<i>Lindernia dubia</i> var. <i>anagallidea</i>	false-pimpernel	S2S3 (2001)	Blue				G5T4 (1997)	2
<i>Lipocarpa micrantha</i>	small-flowered lipocarpa	S1 (2017)	Red	E (2002)	1-E (2005)		G5 (2002)	1
<i>Lithobates pipiens</i>	Northern Leopard Frog	S1 (2016)	Red	E (2009)	1-E (2003)		G5 (2002)	1
<i>Lupinus sulphureus</i>	sulphur lupine	S1S2 (2015)	Red				G5 (1987)	2
<i>Lycaena nivalis</i>	Lilac-bordered Copper	S3 (2013)	Blue				G5 (1998)	4
<i>Marsilea vestita</i>	hairy water-clover	S2 (2015)	Red				G5 (2011)	1
<i>Megascops kennicottii</i> <i>macfarlanei</i>	Western Screech-Owl, <i>macfarlanei</i> subspecies	S3 (2017)	Blue	T (2012)	1-T		G5T4 (2000)	1
<i>Melanerpes lewis</i>	Lewis's Woodpecker	S2S3B (2015)	Blue	T (2010)	1-T (2012)		G4 (2001)	2
<i>Micranthes idahoensis</i>	Idaho saxifrage	S2S3 (2015)	Blue				G4? (1995)	1
<i>Myotis ciliolabrum</i>	Western Small-footed Myotis	S2S3 (2015)	Blue				G5 (2015)	3
<i>Myotis lucifugus</i>	Little Brown Myotis	S4 (2015)	Yellow	E (2013)	1-E (2014)		G3 (2015)	5
<i>Myotis thysanodes</i>	Fringed Myotis	S3 (2015)	Blue	DD (2004)	3 (2005)		G4 (2014)	3
<i>Neoholmgrenia andina</i>	Andean evening-primrose	S1 (2015)	Red				G4 (1986)	1
<i>Nicotiana attenuata</i>	wild tobacco	S1 (2015)	Red				G4 (1994)	1
<i>Numenius americanus</i>	Long-billed Curlew	S3B (2015)	Blue	SC (2011)	1-SC (2005)		G5 (2014)	2
<i>Oenothera pallida</i> ssp. <i>pallida</i>	pale evening-primrose	S1 (2005)	Red				G5T4Q (1991)	2
<i>Oenothera suffrutescens</i>	scarlet gaura	S2 (2015)	Red				G5 (2012)	2
<i>Ophiogomphus occidentis</i>	Sinuous Snaketail	S3 (2015)	Blue				G5 (2015)	2
<i>Oreamnos americanus</i>	Mountain Goat	S3 (2015)	Blue				G5 (1996)	1
<i>Oreocarya sheldonii</i>	Snake River cryptantha	S2 (2013)	Red				GNR	
<i>Oreoscoptes montanus</i>	Sage Thrasher	S1B (2015)	Red	E (2010)	1-E (2003)		G4 (2015)	1
<i>Orobanche corymbosa</i> ssp. <i>mutabilis</i>	flat-topped broomrape	S3 (2015)	Blue				G4T3? (2000)	2

<i>Orthocarpus barbatus</i>	Grand Coulee owl-clover	S2 (2015)	Red	E (2005)	1-E (2006)	G2G3 (2008)	2
<i>Ovis canadensis</i>	Bighorn Sheep	S3? (2015)	Blue			G4 (2008)	3
<i>Pectocarya penicillata</i>	winged combseed	S1 (2015)	Red			G5 (1990)	2
<i>Pekania pennanti</i>	Fisher	S3 (2015)	Blue			G5 (2005)	2
<i>Phacelia ramosissima</i> var. <i>ramosissima</i>	branched phacelia	S2 (2011)	Red	E (2005)	1-E (2006)	G5?TNR	1
<i>Phanogomphus graslinellus</i>	Pronghorn Clubtail	S2S3 (2015)	Blue			G5 (2015)	2
<i>Phlox speciosa</i> ssp. <i>occidentalis</i>	showy phlox	S2 (2008)	Red	T (2004)	1-T (2006)	G5TNR	2
<i>Pholisora catullus</i>	Common Sootywing	S3 (2013)	Blue			G5 (2009)	4
<i>Phrynosoma douglasii</i>	Pygmy Short-horned Lizard	SX (2012)	Red	XT (2007)	1-XX (2003)	G5 (2005)	2
<i>Physaria didymocarpa</i> ssp. <i>didymocarpa</i>	common twinpod	S2S3 (2015)	Blue			G5T4 (1994)	3
<i>Picoides albolarvatus</i>	White-headed Woodpecker	S1 (2015)	Red	E (2010)	1-E (2003)	G4 (1996)	2
<i>Pituophis catenifer deserticola</i>	Gopher Snake, <i>deserticola</i> subspecies	S2S3 (2012)	Blue	T (2013)	1-T (2005)	G5T5 (2016)	2
<i>Plestiodon skiltonianus</i>	Western Skink	S3 (2012)	Blue	SC (2014)	1-SC (2005)	G5 (2016)	1
<i>Poa fendleriana</i> ssp. <i>fendleriana</i>	mutton grass	S1 (2000)	Red			G5T5 (1997)	2
<i>Polites sabuleti</i>	Sandhill Skipper	S2 (2013)	Red			G5 (1998)	2
<i>Polites sonora</i>	Sonora Skipper	S1S2 (2013)	Red	NAR (2016)	1-SC (2007)	G4 (2006)	1
<i>Polystichum kruckebergii</i>	Kruckeberg's holly fern	S3 (2015)	Blue			G4 (2011)	3
<i>Potamogeton nodosus</i>	long-leaved pondweed	S3? (2015)	Blue			G5 (2012)	2
<i>Potentilla supina</i> ssp. <i>paradoxa</i>	bushy cinquefoil	S3? (2015)	Blue			G5 (1985)	2
<i>Promenetus umbilicatellus</i>	Umbilicate Sprite	S2S3 (2015)	Blue			G4 (2015)	2
<i>Psiloscops flammeolus</i>	Flammulated Owl	S3B (2015)	Blue	SC (2010)	1-SC (2003)	G4 (2000)	2
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	S3 (2015)	Blue	SC (2007)	1-SC (2009)	G5 (2003)	2
<i>Ribes cognatum</i>	northern gooseberry	S1S2 (2015)	Red			G5T4 (1994)	1
<i>Rotala ramosior</i>	toothcup	S1 (2015)	Red	E (2014)	1-E (2003)	G5 (1984)	1
<i>Salix amygdaloides</i>	peach-leaf willow	S3 (2017)	Blue			G5 (2015)	2
<i>Sandbergia whitedii</i>	Whited's halimolobos	S2S3 (2016)	Blue			G3? (2000)	2
<i>Satyrium behrii</i>	Behr's Hairstreak	S1 (2013)	Red	E (2012)	1-E	G5 (2006)	1

<i>Satyrium californica</i>	California Hairstreak	S3 (2013)	Blue			G5 (2009)	4
<i>Satyrium semiluna</i>	Half-moon Hairstreak	S1 (2013)	Red	E (2006)	1-E (2007)	G4 (2007)	1
<i>Schoenoplectiella saximontana</i>	Rocky Mountain clubrush	S1? (2015)	Red			G5 (1990)	1
<i>Selaginella standleyi</i>	Standley's selaginella	S3? (2017)	Blue			G5T3T5 (2011)	2
<i>Sorex merriami</i>	Merriam's Shrew	S1 (2015)	Red			G4 (2016)	1
<i>Sorex preblei</i>	Preble's Shrew	S1S2 (2015)	Red			G4 (2016)	1
<i>Spea intermontana</i>	Great Basin Spadefoot	S3 (2016)	Blue	T (2007)	1-T (2003)	G5 (2002)	1
<i>Speyeria mormonia erinna</i>	Mormon Fritillary, <i>erinna</i> subspecies	S1S2 (2013)	Red			G5T4 (2003)	1
<i>Sphaeralcea munroana</i>	Munroe's globe-mallow	SX (2015)	Red			G4 (1987)	2
<i>Sphenopholis obtusata</i>	prairie wedgegrass	S1S2 (2015)	Red			G5 (1985)	1
<i>Sphyrapicus thyroideus thyroideus</i>	Williamson's Sapsucker, <i>thyroideus</i> subspecies	SNRB (2012)	No Status	E (2017)	1-E (2006)	G5T4 (2016)	2
<i>Spiranthes diluvialis</i>	Ute lady's tresses	S1 (2015)	Red			G2G3 (2014)	1
<i>Spizella breweri breweri</i>	Brewer's Sparrow, <i>breweri</i> subspecies	S2B (2005)	Red			G5T5 (2016)	2
<i>Sporobolus airoides</i>	hairgrass dropseed	S2 (2015)	Red			G5 (1988)	2
<i>Sporobolus compositus</i> var. <i>compositus</i>	rough dropseed	S3 (2005)	Blue			G5T5 (1995)	2
<i>Stagnicola apicina</i>	Abbreviate Pondsnail	S2S3 (2015)	Blue			GUQ (2015)	2
<i>Stuckenia vaginata</i>	sheathing pondweed	S3 (2015)	Blue			G5 (2015)	3
<i>Stylurus olivaceus</i>	Olive Clubtail	S2 (2015)	Red	E (2011)	1-E	G4 (2016)	1
<i>Sylvilagus nuttallii</i>	Nuttall's Cottontail	S3 (2015)	Blue	SC (2016)	1-SC (2007)	G5 (1996)	2
<i>Symphotrichum frondosum</i>	short-rayed aster	S1 (2011)	Red	E (2006)	1-E (2007)	G4 (1987)	1
<i>Taxidea taxus</i>	American Badger	S2 (2015)	Red	E (2012)	1-SC (2018)	G5 (2012)	1
<i>Trifolium cyathiferum</i>	cup clover	S3 (2017)	Blue			G4 (1990)	2
<i>Triglochin debilis</i>	slender arrow-grass	S2S3 (2015)	Blue			G4 (1987)	2
<i>Tyto alba</i>	Barn Owl	S2? (2015)	Red	T (2010)	1-SC (2003)	G5 (1996)	2
<i>Verbena hastata</i> var. <i>scabra</i>	blue vervain	S2S3 (2012)	Blue			G5T5 (2002)	2

## Search Summary

**Time Performed** Fri Mar 09 12:55:34 PST 2018

**Results** 159 records.

**Search  
Criteria**

Search Type: Plants & Animals

AND Regional Districts: Okanagan-Similkameen (OSRD) ( Restricted to Red, Blue, and Legally designated species )

AND Habitat Types: Agriculture,Anthropogenic,Forest,Grassland/Shrub,Lakes,Riparian,Rock/Sparsley Vegetated  
Rock,Stream/River,Wetland ( Restricted to Red, Blue, and Legally designated species )

AND BGC Zone:BG, PP

Sort Order:Scientific Name Ascending

**Notes**

1. Citation: B.C. Conservation Data Centre. 2018. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C.  
Available: <http://a100.gov.bc.ca/pub/eswp/> (accessed Mar 9, 2018).

2. Forest District, MoE Region, Regional District and habitat lists are restricted to species that breed in the Forest District, MoE Region, Regional District or habitat (i.e., species will not be placed on lists where they occur only as migrants).

3. The data contained in the Results Export in BCSEE are provided under the [Open Government License - BC](#).

[Modify Search](#) | [New Search](#) | [Results](#)