# CONSERVATION IN ACTION:

## An Educator's Guide to Species at Risk in BC

## Grades 8 – 12




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February 2015
Written and edited by
DG Blair, Blair Whitehead & Associates
and Kelly Nordin
Published by Wilderness Committee

WILDERNESS COMMITTEE

# CONSERVATION IN ACTION:
## An Educator's Guide to Species at Risk in BC for Grades 8 - 12

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**Spotted owl:** Isabelle Groc
**Garry oak ecosystem:** Michael Wheatley


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The Wilderness Committee is Canada's largest membership-based, citizen-funded wilderness preservation organization.

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Grade 9 and 10 students in Jennifer Cacaci's art class at South Kamloops Secondary School who produced artwork featuring BC's species at risk.


*Gwen Barlee speaks at a student art exhibition to raise awareness about species at risk. (Michael Wheatley)*

## PREFACE

British Columbia is renowned for its spectacular wilderness and wildlife. Pocket deserts, old-growth forests, grasslands, Garry oak meadows, sparkling lakes and wild rivers form the ecological fabric of our province. These wild places are also home to many wild creatures. Vancouver Island marmots, spotted owls, grizzly bears, phantom orchids and tiger salamanders are just a sampling of the amazing wildlife found here. They are also just a handful of the hundreds of species that are now at risk in BC.

The Wilderness Committee has been working hard for many years to raise awareness about BC's species at risk, and to inspire the public to take action. Since 1980, we have helped protect millions of hectares of wilderness including the Khutzeymateen Grizzly Bear Sanctuary and Carmanah Walbran Provincial Park. We have also set legal precedents to safeguard endangered wildlife, including legal judgments requiring the protection of endangered killer whale habitat.

In partnership with teachers, wildlife biologists and curriculum specialists, we have developed *CONSERVATION IN ACTION: An Educator's Guide to Species at Risk in BC for Grades 8 - 12*, an inquiry-based curriculum resource that can be integrated into a variety of classes for BC secondary schools. This resource gives students the opportunity to learn about species at risk in their local environment, understand the threats those species face and identify what they can do to help. It encourages students to become scientists in the field as well as educated citizens.

Understanding and solving issues related to BC's species at risk cannot be done within a single discipline. Different issues require different approaches. As a result, this program promotes collaborative activities that facilitate outdoor learning experiences where students and teachers can work within their communities. The resource emphasizes collaborations among teachers from different subject areas including science, social studies, English, art and other disciplines.

**Today, many children have become experts at playing video games and navigating the web, but they may have never looked into a pond or listened to frog calls in the wild.** Studies are finding that the separation between children and nature is linked to increases in attention-deficit disorder, child obesity and other health problems.

This resource does not attempt to be a complete guidebook on species at risk in BC. Rather, we envision it as a way for teachers to work together across a variety of disciplines and introduce endangered species-related issues using real-world activities and problem-solving tools. It will also help teachers provide multimedia resources and facilitate community connections for local schools. Through field trips and hands-on exposure to local community groups, conservation biologists and naturalists, we hope this program will inspire students to gain a deeper knowledge of species at risk in their communities.

*CONSERVATION IN ACTION* gives students the opportunity to address a "real-world" issue in their own backyard. The guiding principle of this program is to develop educated citizens who are inspired to learn about the topic from different perspectives, help make decisions and work toward lasting solutions.

**Gwen Barlee**
Policy Director,
Wilderness Committee


*"I Am A Killer Whale" by Maddy, Grade 10, South Kamloops Secondary School*

## Primer for Teachers: Introduction to Species at Risk in BC

In our home province, British Columbia, an astounding array of plants and animals lives in an equally amazing range of ecosystems – from pocket deserts to old-growth forests, wetlands to grasslands and eelgrass beds to Garry oak meadows. This biological diversity (or "biodiversity" for short) includes everything from majestic humpback whales and colourful sea stars in our coastal waters to petite burrowing owls and elegant grasses in the interior of the province.

The term "biodiversity" refers not only to the diversity of species and ecosystems, but also to genetic diversity within different populations of a species. BC has the highest biodiversity of all the Canadian provinces and territories. It is home to over 1,250 species of mammals, birds, fish, reptiles and amphibians, as well as 4,500 marine invertebrates, 35,000 insects and 3,190 vascular plants.[1] Humans are an important part of these rich ecosystems; indeed our very existence depends on healthy, functioning ecosystems, as does that of all organisms. Rich biodiversity is essential to healthy ecosystems.

*Oregon spotted frog (David Blevins)*

As our human population grows, the impact of our actions and the demands on ecosystems and their organisms also grows. As we use more land and resources, habitats – areas upon which species depend – are lost or damaged, and populations are not able to continue to grow and thrive. The result may be a decline in the numbers of individuals in a population, the number of populations, and/or the size of the area in which these populations exist. In serious cases, these "species at risk" may decline to the point of being lost forever from BC.

For example, a century ago, 500 pairs of northern spotted owls could be found in the old-growth forests of southwestern mainland British Columbia. After a century of logging in their old-growth habitat, just 14 owls remain in the wild as of 2014. In Canada, this species is only found in British Columbia. Spotted owls cannot survive in young forests. They rely on old-growth forests to breed, forage and raise their young.

## Why should we care?

Ecosystems are essential to all life, including humans; they provide us with oxygen, food, clean water, a stable climate, medicines, productive soils and nutrients. Ecosystems are also essential to maintain healthy people, societies and economies. Not only do we obtain renewable resources from ecosystems, they provide a myriad of "services," including flood control, creation of fertile soils, pollination services and enrichment for our lives through recreation and aesthetic enjoyment opportunities[2]. It is important that we preserve healthy ecosystems for the long-term survival of species that rely on them – and for future human generations.

*Western skink (Jakob Dulisse)*

## Why do some species become at risk?

Many interrelated and complex factors determine why some species are at risk, but the loss and degradation of habitat is the primary cause. Other important factors include genetic and reproductive isolation of populations due to fragmentation of habitat, suppression of natural events like floods or fires, environmental contamination, pesticides, overharvesting, climate change, disease and pressure by invasive species[3].

Habitat loss and degradation are closely linked to the impacts of increasing human populations and increased consumption, which in turn increase the extraction, processing and transportation of natural resources, often impacting other resources such as water and soil. While many species are resilient and able to tolerate some stress, the cumulative effects of a multiplicity of factors may lead to a reduction in the overall health and reproductive success of a population.

*Phantom orchid (Isabelle Groc)*

## What is being done?

Species that are in decline or at risk of extinction are classified into different groups based on their level of risk of further decline, so that ideally, protection and recovery efforts can be prioritized. In BC, there are provincial and federal categories of risk.

The federal government's *Species at Risk Act* (SARA) defines the level of risk in four categories:

- **Special concern** – a species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats,
- **Threatened** – a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction,
- **Endangered** – a wildlife species that is facing imminent extirpation or extinction, and
- **Extirpated** – a wildlife species that no longer exists in the wild in [a given region], but exists elsewhere in the wild[4].

The BC Conservation Data Centre (CDC) systematically collects and disseminates information on plants, animals and ecosystems (ecological communities) at risk in British Columbia, and has the most comprehensive list of species at risk in the province. The CDC has two species at risk classification categories:

- **Blue list** – includes species and ecosystems of special concern (formerly vulnerable), and
- **Red list** – includes any ecological communities, native species and subspecies that are extirpated, endangered or threatened in British Columbia[5].

A total of 1,529 species (including subspecies and populations) are designated at risk by the BC Conservation Data Centre as of February 2015, and 785 of these are on the red list[6].

The CDC assigns provincial conservation ranks to all species in British Columbia. Species that are usually considered "at risk" have the following ranks: S1 (critically imperiled), S2 (imperiled) and S3 (vulnerable).

However, combined ranks are occasionally given when the exact rank of a species is uncertain. For example, some species may be given the rank of S3S4, which is between S3 (vulnerable) and S4 (apparently secure).

*Many species at risk, like the yellow-breasted chat, are especially vulnerable to habitat loss and degradation. (Jared Hobbs)*

Typically this means that the status of the species is not entirely known, often because data is insufficient, and biologists are not sure how well the species is doing.

Some species at risk are well studied. But for many others, not enough is known about the status, threats, population size and distribution. As a result, the species may not be listed. This means the risk of the species disappearing or becoming more severely threatened may increase before society has a chance to acknowledge and address the decline.

The "precautionary principle" denotes a duty to prevent harm when it is within our power to do so, even when all the evidence is not in. If we apply this principle and include those species that are probably at risk but where not enough information supports listing, the number of species at risk in BC is actually much higher than the 1,529 species currently red- and blue-listed by the CDC. Instead, the number of species at risk is approximately 1,900.[7]

Only a tiny fraction of species that are listed as at risk in BC have any special legal protection. The provincial government of British Columbia has no stand-alone endangered species act[8] to provide legal protection to BC's at-risk biodiversity. Two pieces of legislation provide some level of legal protection. The *BC Wildlife Act* legally designates only four species as threatened or endangered (Vancouver Island marmot, sea otter, burrowing owl and American white pelican). The federal legislation, SARA, lists 228 species at risk found in BC as of February 2015[9]. These numbers represent just 15 per cent of the BC species at risk identified by the BC Conservation Data Centre.

While relatively few species at risk have legal protection in BC, many groups are actively working to identify, monitor, protect and restore populations of species at risk. The prioritizing of these conservation actions is guided by the provincial government's Conservation Framework[10]. Recovery planning is in progress for many species at risk, but very few species have protection in place for habitats critical to their survival and recovery.

A range of strategies has been developed for protecting species and ecosystems at risk, including a few measures that limit development and resource extraction activities and minimize habitat degradation and contamination.[11] Some strategies include legally protecting sensitive areas, requiring environmental assessments of development projects, implementing wildlife conservation measures, avoiding some large development projects altogether, regulating industrial activities to minimize pollutant release and setting climate change goals. However, legal protection of critical habitat – the areas species at risk need to survive and recover – is lacking in British Columbia.

*Volunteers create posters of species at risk in BC at the Wilderness Committee office in Vancouver, in preparation for a public event. (Isabelle Groc)*


*Students march in Vancouver's annual Earth Day Parade. (Michael Wheatley)*

## Take Action

As individuals as well as collectively, students can be active in helping to protect and recover species and ecosystems at risk. Many of our daily actions have a direct or indirect impact on species and their habitats. Become informed about species at risk in your local area, and inquire about what you can do to help these species directly. In addition, take action to ensure BC has laws to protect species at risk and the critical habitat they need to survive and recover.

*High school students organize an annual event for Earth Day in Vancouver. (Michael Wheatley)*


*Making signs for events and rallies at the WC office. (Alexis Stoymenoff)*

*Elise gathered hundreds of signatures to protect endangered species. (Isabelle Groc)*

After she heard that BC does not have endangered species legislation and that her favourite animal, the American badger, is not doing well in the province, an 11-year-old North Vancouver student named Elise decided to get involved.

In just five months, she gathered over 800 signatures calling for an endangered species law. She first knocked on her neighbours' doors, then she sent petitions to her family and collected signatures at the local dog park. Elise's story was featured on Global TV. She also speaks at public events and in schools about species at risk and how children and youth can become involved and raise more awareness.

*Artist Unknown, Grade 9, South Kamloops Secondary School*

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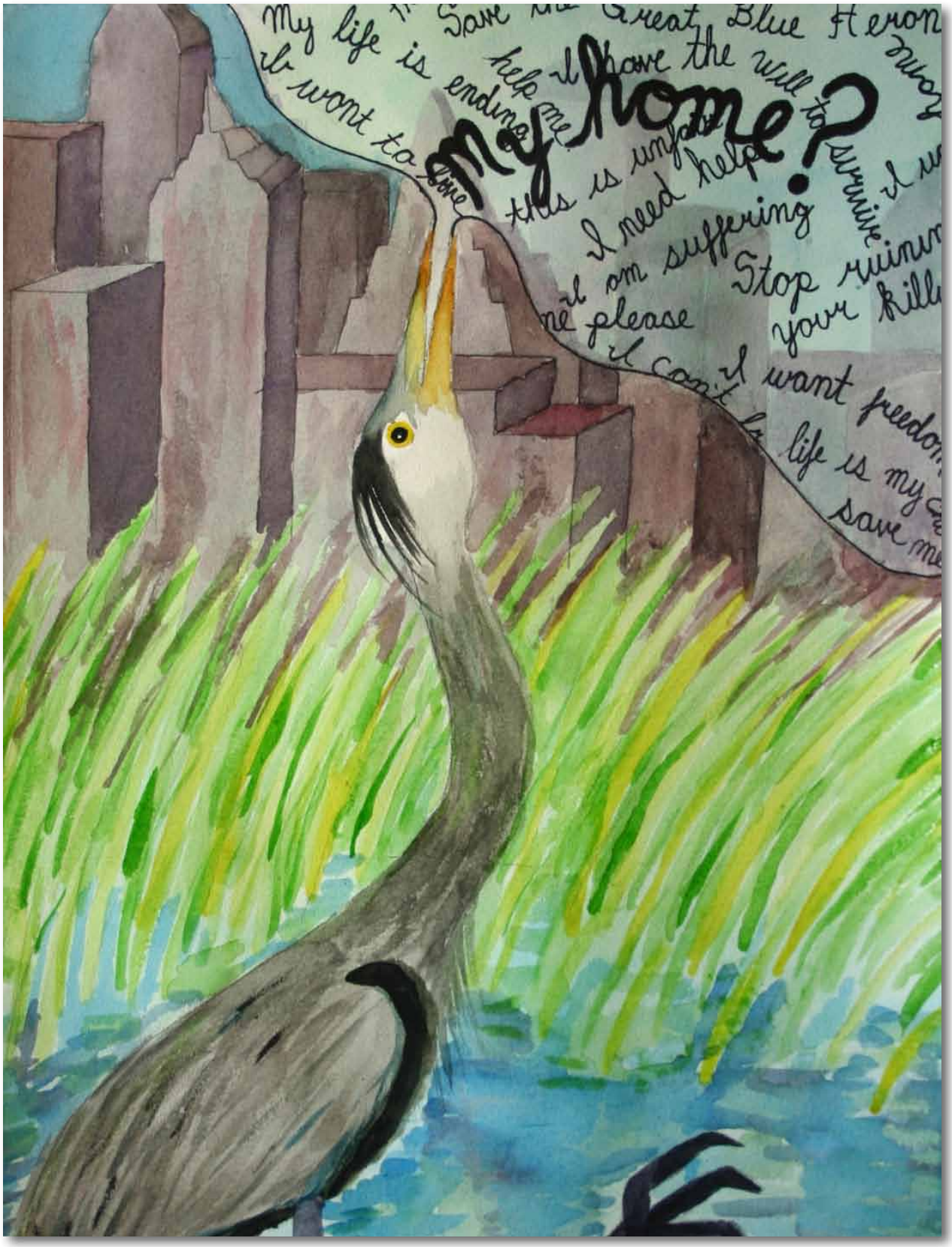
*There are many online resources that provide helpful information about BC species at risk. (Alexis Stoymenoff)*




*"If I Could Talk" by Emily, Grade 10, South Kamloops Secondary School*

## Student Fact Sheet

Our home province, British Columbia, is also home to an amazing variety of plants and animals living in an equally amazing variety of ecosystems. This biological diversity (or "biodiversity" for short) includes everything from majestic humpback whales and colourful sea stars in our coastal waters to petite burrowing owls and elegant grasses in the interior of the province.

BC has the richest biodiversity of all the Canadian provinces and territories. British Columbia is home to over 1,250 species of mammals, birds, fish, reptiles and amphibians, as well as 4,500 marine invertebrates, 35,000 insects and 3,190 vascular plants. Humans are an integral component of these rich ecosystems – indeed our very existence depends on healthy, functioning ecosystems, as does that of all organisms. Rich biodiversity is essential to healthy ecosystems.

### What are species at risk?

As our human population grows, so do the impacts of our actions and the demands on ecosystems. As a direct or indirect result, some populations of species are not able to continue to grow and thrive. This can lead to a drop in the numbers of individuals in a population, the number of populations and/or the size of the area where these species are found. These "species at risk" may decline to the point of being lost forever from BC. Some of these species may live in your community.

Learn about species at risk near you using the **BC Species and Ecosystems Explorer:**
http://a100.gov.bc.ca/pub/eswp

*Barn owls (Art Wolfe)*

### Why do some species become at risk?

Many complex factors determine why species are at risk. Some major factors include:

- Habitat loss, degradation and fragmentation
- Genetic and reproductive isolation
- Limiting of natural events, such as fires, that some species require as part of their life cycle
- Contamination of habitat
- Overharvesting
- Climate change
- Disease
- Alteration of habitat by invasive species

When human populations increase in areas like cities, more space and resources are required to support them. While most species are able to take some stress, the combination of factors that many species face eventually leads to the declining health of a population – sometimes leading to the species being at risk of extirpation (becoming locally extinct) or extinction.

## Protecting species at risk

Governments, organizations and institutions have identified species that are at risk in BC. Both the federal government (through the *Species at Risk Act*) and the provincial government (through the BC Conservation Data Centre) track species and ecosystems at risk in British Columbia. BC has no stand-alone endangered species act that provides legal protection to the full range of BC's at-risk biodiversity.

Of the two main pieces of legislation that provide some level of legal protection, the *BC Wildlife Act* has only four species listed, while the *Species at Risk Act* (SARA) lists a total of 228 species at risk. This represents only 15 per cent of the 1,529 species identified as at risk by the BC Conservation Data Centre as of February 2015.

Some species at risk are well studied. But for many others, information is lacking and not enough is known about the species' status, threats, population size and distribution. As a result, the species may not be listed. This means the risk of the species disappearing or becoming more severely threatened may increase before society has a chance to acknowledge and address the decline.

The "precautionary principle" denotes a duty to prevent harm when it is within our power to do so, even when all the evidence is not in. If we apply this principle and include those species that are probably at risk but where not enough information supports listing, the number of species at risk in BC is actually much higher than the 1,529 species currently red- and blue-listed by the CDC. Instead, the number of species at risk is approximately 1,900.

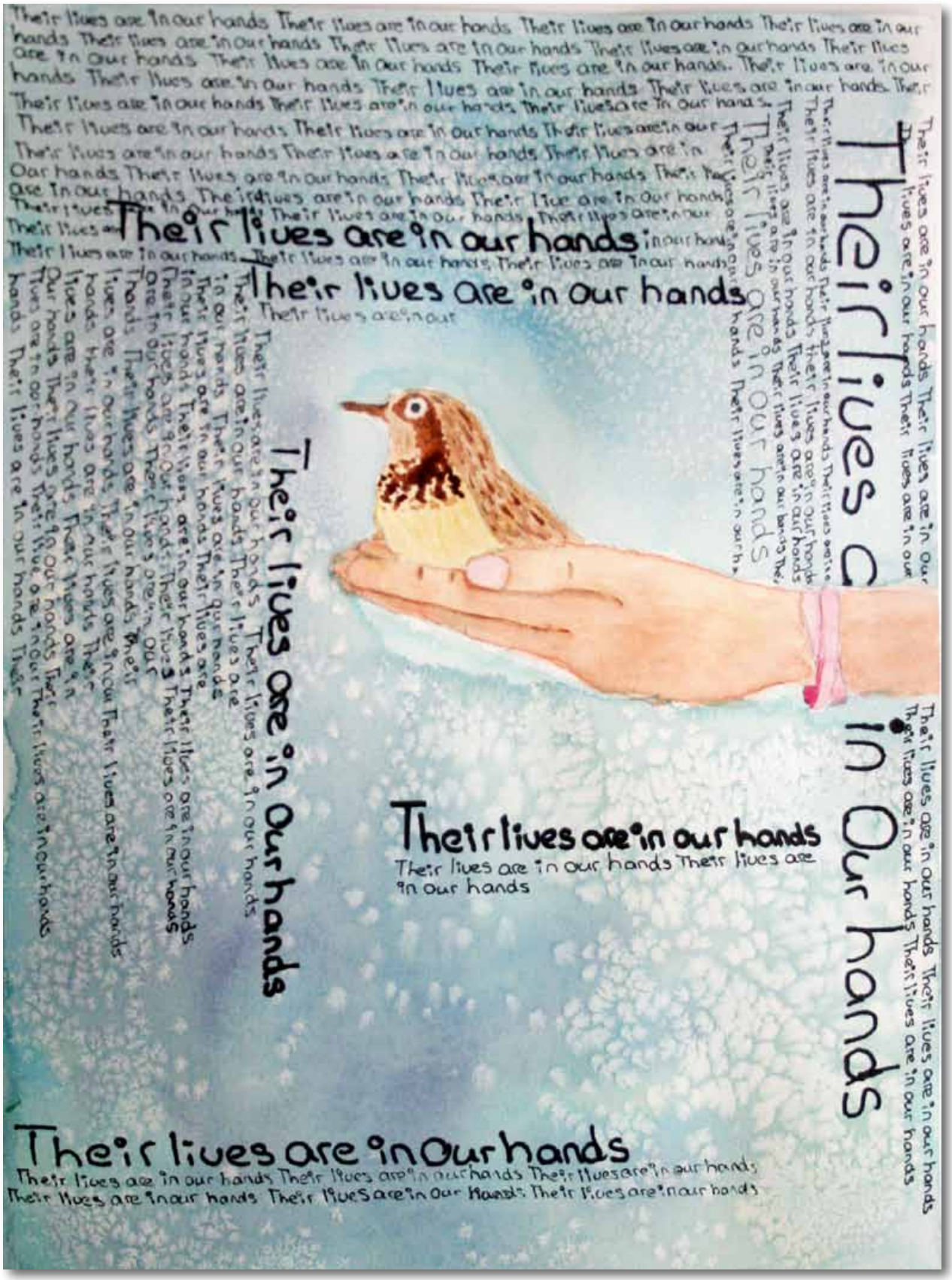
*Grizzly bear (John E. Marriott)*

*Monarch butterfly (Jim Flynn)*

## Take Action

As individuals as well as collectively, we can be active in ensuring the protection and recovery of species and ecosystems at risk. Many of our daily actions have a direct or indirect impact on species and their habitats. Become informed about species at risk in your local area, and inquire about what you can do to help these species directly. In addition, take action to ensure BC has laws to protect species at risk and the critical habitat they need to survive and recover. You can contact organizations like the Wilderness Committee or other environmental groups in your area to find out about specific ways to get involved.

*Garry oak ecosystem (Michael Wheatley)*




*"Their Lives Are In Our Hands" by Megan, Grade 9, South Kamloops Secondary School*

# ACTIVITY 1:

## What Do You Know About SAR? Introduction to Species at Risk

**ACTIVITY SUMMARY:** Students find out what they already know – and don't know – about species at risk through an introductory, interactive activity. During the activity, students physically move to different areas of the learning space to indicate whether they believe a series of statements are true or false. After reviewing information about species at risk by reading the *Student Fact Sheet* (p. 15), groups of students analyze a case example and share findings with the whole class.

**GRADE LEVEL:** 8-12

**SUBJECT AREA(S):** Science, Social Studies

**LEARNING OUTCOMES:**

It is expected students will…

- Identify prior knowledge about species at risk
- Gain understanding of species at risk, including legal designations, factors in species decline and recovery efforts

**TIME REQUIRED:** One period (approx. 1.5 hours)

**KEY WORDS:** Species at risk, biodiversity, ecosystem, threats, recovery plan

**MATERIALS:**

- *Student Fact Sheet: British Columbia's Species at Risk*, one per student
- Species at risk case example (access online, see p. 21) one per 3-4 students
- Paper and markers
- Painter's tape, masking tape or chalk to designate "True" and "False" areas

**SETTING:** Clear space, indoors or outdoors

**SKILLS:** Listening, decision-making, gathering information

**PROCEDURE/STEPS:**

*Great blue heron (Paul Colangelo)*

### Did You Know?

The **great blue heron** (*Ardea herodias*) is a member of the family Ardeidae (herons, egrets and bitterns). Although herons resemble birds such as cranes, they are not in the same family. Herons are one of the bird groups that have "powder down" – feathers that disintegrate into a fine powder, which is used during preening (smoothing and cleaning) to absorb and remove dirt and other matter that can reduce the birds' waterproofing and insulation.

Two subspecies occur in BC, the coastal form *A. h. fannini* and the interior form *A. h. herodias*. Great blue herons nest in trees. Stanley Park, located in the city of Vancouver, is home to one of the largest urban great blue heron colonies in North America. They have been nesting at their current location since 2001, and have been documented nesting in various other locations in Stanley Park as far back as 1921.

## Part 1 – Accessing Prior Knowledge

**1)** Before starting the activity, clear an area in the classroom or move to an open area (e.g. outdoor space, gymnasium) so that the students can move freely and easily from one side to the other. Identify one side of the learning space as "True" and the other side "False" by placing signs on the walls or using chalk or tape to mark the floor or ground. There should be enough space between each side so groups of students remain separated, but close enough so that all students can hear responses and engage in discussion, regardless of which side they are on.

**2)** To start, ask all the students to stand between the two signs in the centre of the learning space. Provide the following directions to the students: "I will be providing a series of statements.* After each statement is read aloud, decide if you think it is true or false. Walk to the appropriate side of the learning area to indicate your decision and stand under or near the sign. Try not to be influenced by the choices of other students! Before the next statement is provided, return to the centre."

**3)** Pace the reading of statements so that the activity is quick and lively, while allowing for some brief discussion amongst the students. Ideally, each student will independently determine if the statement is true or false, but there is bound to be some discussion; some students will be influenced by the words and actions of others. This can become a subtext to the activity.

**4)** Pause to debrief a statement when a significant number of students choose the incorrect answer, or when there appears to be a high degree of uncertainty. Keep note of these statements, but avoid lengthy explanations or discussions. There will be time revisit and explore concepts more fully in the next part of the activity. Alternatively, these statements can be used to guide a follow-up research activity based on the primer and/or self-directed research on the web.

**5)** Debrief after all the statements have been read by asking the students what they learned that surprised them the most.

**For true/false statements, see page 23.*

*Students examine endangered western painted turtles during a field trip at a local park. (Isabelle Groc)*

## Part 2 – Delving Deeper: Case Study Review

**1)** Distribute the *Student Fact Sheet: British Columbia's Species at Risk* from this curriculum (p. 15) so each student has a copy. Direct each student to identify at least one concept or area of understanding that they would like to know more about, based on the true/false activity. Ask them to review the *Student Fact Sheet,* carefully reading the section(s) on the area(s) they identified.

**2)** Organize students into groups of 3 or 4. Supply each group with a fact sheet or brochure related to a case example of one species at risk. Direct the students to read through the fact sheet, noting the following: the current status of the species (BC and federal), estimated size of population, distribution in BC, type of habitat, primary threat to population(s) and recovery plan. Online fact sheets and brochures about BC species at risk may be found at:

http://www.env.gov.bc.ca/wld/list.htm

http://ibis.geog.ubc.ca/biodiversity/efauna/

http://www.sccp.ca (south coast and Vancouver Island species)

Encourage students to use the *Student Fact Sheet*: *British Columbia's Species at Risk* and the glossary included in this curriculum as a reference to help understand concepts and definitions.

**3)** Facilitate a class discussion, exploring understandings in light of new knowledge. Option: Explore how humans are dependent upon and benefit from healthy ecosystems (e.g. life-sustaining services, health benefits, human needs including employment, community well-being, etc.). See http://www.biodiversitybc.org/EN/main/why/109.html

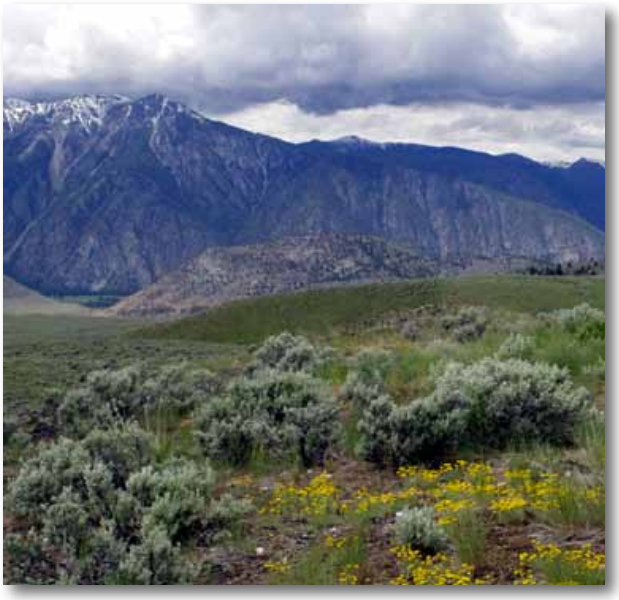
### EVALUATION:

Have students…

- Create a true/false quiz about the species at risk example in their fact sheet or brochure and "test" their fellow students
- Write a short essay: "Should species at risk be protected? Why or why not?"
- Write a journal entry: "What I will do to protect endangered or threatened species"

### EXTENSION:

After running the true/false activity, facilitate a discussion about how other people can influence your decision when responding to a question.



*The South Okanagan-Similkameen region is one of BC's most endangered ecosystems. (Gwen Barlee)*

*"The Canada Warbler" by Amy, Grade 10, South Kamloops Secondary School*

## Species at Risk True/False Statements

**1)** Over the past 550 million years, Earth has had five major extinction events in which half to three-quarters of all the species existing at that time became extinct in a short geological time span. There is evidence that we are now in the midst of the sixth major extinction event.

☑ **True**

☐ **False**

"Our results confirm that current extinction rates are higher than would be expected from the fossil record, highlighting the need for effective conservation measures."

http://www.nature.com/nature/journal/v471/n7336/full/nature09678.html

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**2)** All life is closely interconnected in ecosystems. Therefore, healthy organisms are dependent upon healthy ecosystems. Humans are the exception because we have created technology to overcome this dependency.

☐ **True**

☑ **False**

Humans are equally dependent upon and benefit directly from diverse and healthy ecosystems, including:

- Life-sustaining services or "ecological services" such as food and oxygen production, water purification and climate moderation
- Health benefits
- Human needs, including employment
- Community well-being
- Spiritual values
- Securing our future

http://www.biodiversitybc.org/EN/main/why/109.html

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**3)** "Species at risk" is a shorthand way of saying "populations of a species that are at risk of further decline to the point of impacting survival of the species."

☑ **True**

☐ **False**

**4)** The term "species at risk" refers to any plant or animal species that only occurs in small numbers.

☐ **True**

☑ **False**

The term "species at risk" also refers to any plant or animal species that occurs in a small or limited region or a small number of locations, as well as those that occur in small numbers.

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**5)** The biological diversity, or "biodiversity," of BC is approximately the same as other provinces in Canada.

☐ **True**

☑ **False**

BC has more native species and subspecies than any other province. This is due to the province's diverse array of ecosystems, ranging from marine and coastal rainforest to alpine ecosystems, aquatic to semi-arid and desert ecosystems.

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**6)** "Extirpated" refers to a species whose populations are thriving in a region.

☐ **True**

☑ **False**

Extirpated: The species no longer exists in a specified region (e.g. BC) where a population once existed; populations of the species do exist in other regions.

Extinct: No living individual of the species exists anywhere; a species may be functionally extinct when the few remaining individuals cannot reproduce at a sufficient rate to increase the size of the population.

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**7)** Since the arrival of the first European settlers, more than 30 known wildlife species have become extinct in Canada, five of which were in BC.

☑ **True**

☐ **False**

---

**8)** There are numerous factors resulting in the decline of a species, leading to extinction or extirpation. Habitat loss and degradation is the most prevalent factor that leads to extinction or extirpation. The second most prevalent factor is non-native (introduced) species. Other factors include reproductive isolation, environmental contamination, overharvesting and climate change.

☑ **True**

☐ **False**

**9)** Up to two thousand species are considered at risk in BC. A significant portion of these species are legally listed as "at risk" and are therefore protected from further decline by federal and/or provincial legislation.

☐ **True**

☑ **False**

As of 2014, only four endangered species are legally listed as "at risk" under the *British Columbia Wildlife Act.*

Under the federal *Species at Risk Act* (SARA), just over two hundred species are listed as extirpated, endangered, threatened or of special concern as of February 2015.

*Species at Risk Act* (federal):

- Endangered species – a wildlife species that is facing imminent extirpation or extinction
- Threatened species – a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction
- Special concern species – a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats

BC Conservation Data Centre (provincial):

- Red list – any ecological community, and indigenous species and subspecies that is extirpated, endangered, or threatened in British Columbia
- Blue List – includes any ecological community, and indigenous species and subspecies considered to be of special concern (formerly vulnerable) in British Columbia

---

**10)** Throughout BC, people are engaged in recovery activities to benefit numerous species, but more needs to be done.

☑ **True**

☐ **False**

---

**11)** All British Columbians can take simple actions every day to help species at risk.

☑ **True**

☐ **False**

There are many ways to get involved in efforts to protect species at risk in BC. Learn more from the resources identified in this curriculum.


*"Just Think" by Gabie, Grade 10, South Kamloops Secondary School*

# ACTIVITY 2:

## What Species are at Risk in Your Community?

**ACTIVITY SUMMARY:** This activity can be completed in two parts. Part 1 is classroom-based and includes an introduction to species at risk field investigations. Part 2 is a field trip to a local ecosystem, which introduces students to species at risk, their habitat and the historical geography of the area.

**GRADE LEVEL:** 8-12

**SUBJECT AREA:** Science, Social Studies

**LEARNING OUTCOMES:**

It is expected students will...

- Generate questions about local plant and wildlife populations, including species at risk
- Generate questions about why local species are at risk
- Understand and practice species and habitat monitoring skills, data collection, compilation and analysis

**TIME REQUIRED:** Part 1 - one period (approx. 1.5 hours). Part 2 - field trip location will determine the time required.

**KEY WORDS:** Ecosystem monitoring, populations, field investigations, scientific processes, habitat, ecosystem, resiliency, animals, plants

**MATERIALS:**

- Birds of the Okanagan video
- *Primer for Teachers* (p. 7)
- *Student Fact Sheet* (p. 15)
- *Student Worksheet: Birds of the Okanagan* (p. 33)
- Hula hoops, pencil and paper, clipboard, field guides, binoculars, cameras
- *Field observation data sheets* (p. 34-35)

**SETTING:** Classroom and outdoors

**SKILLS:** Gathering information, analysis, monitoring

*Western painted turtle (Isabelle Groc)*

### Did You Know?

The **western painted turtle** (*Chrysemys picta*) is a member of the family Emydidae (pond or marsh turtles). Did you know that most painted turtles hibernate and have the ability to survive for several months in highly anoxic (low or no oxygen) environments?

In BC, western painted turtles occur as two populations (Pacific Coast and Intermountain-Rocky Mountain). They can be found in pockets throughout the southern interior, as far north as Golden. This includes the Okanagan Valley, Kamloops Lake, Shuswap Lake and the Creston-Nelson area. They are less common on the coast. Western painted turtles are found in low numbers in parts of the Fraser Valley from Vancouver to Hope, as well as southeast Vancouver Island and the Sechelt-Powell River area.

PROCEDURE/STEPS:

**Part 1 – Introduction to Species at Risk in a BC Community - Birds of the Okanagan**

This lesson begins with the Birds of the Okanagan video (6:49 min). http://bit.ly/1Ic31Wu

In this video we meet Dick Cannings, renowned biologist, birder and book author. Dick is concerned about the plight of species at risk, and we follow him in his search for birds in the Okanagan. Approximately 200 bird species nest in the Okanagan, which makes it the most diverse place for breeding birds in North America. The Okanagan is also a hotspot for many other species at risk in Canada.

**1)** Hand out copies of *Student Worksheet: Birds of the Okanagan* (p. 33).

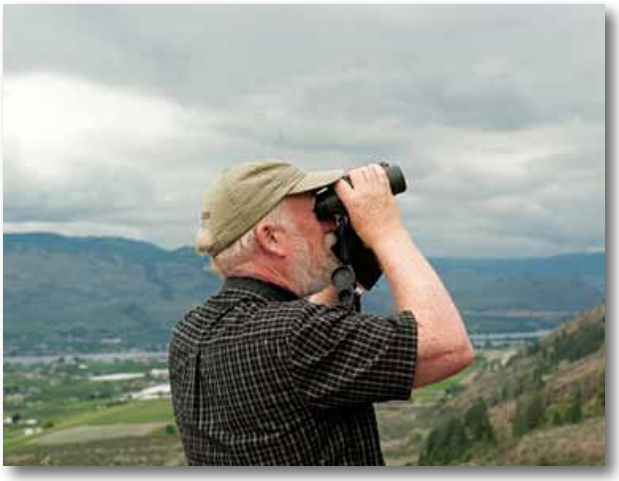
**2)** While they watch the video, encourage students to generate any questions they might have about species at risk.

**3)** Challenge students to note clues about how to gather field data (field investigative techniques) about species at risk. For example, Dick Cannings demonstrates a number of ways to gather data about species at risk while in the field – what are they? (e.g. use of camera, binoculars, field notebook, sound recording device, checking nest boxes, measuring, observing, etc.). Note that the students will be using some of these techniques during their field trip.

**4)** Challenge students to note what Dick Cannings mentions as possible reasons why some bird species are at risk.

What are the threats? What types of habitats does he identify as being degraded? (e.g. riparian, ponderosa pine). What actions does he suggest to help species at risk in the Okanagan? (e.g. awareness of threats to bird habitat that relate to human use)

**5)** Debrief the video. Wrap up by discussing any questions, misunderstandings or other issues that come up during the activity. Refer to the *Primer for Teachers* and *Student Fact Sheet* as needed.



*Biologist Dick Cannings searches the skies for birds. (Isabelle Groc)*

*Students are introduced to a local ecosystem during a field trip. (Isabelle Groc)*

## Part 2 – Introduction to Species at Risk Field Trip

**1)** Prior to the field trip, enlist a field biologist or naturalist to provide a field tour of a local natural area (ecosystem) where species at risk may be found (see resource list on p. 31 for more information). Field trip providers can find guidelines for working with students in the field – see *Connecting Students with their Watersheds*, particularly Modules 3 and 4, for field trip planning ideas. Many local groups offer field trips or nature talks. For example the South Coast Conservation Program does interpretative walks and talks with older youth and their parents.

**2)** Gather the required field equipment.

**3)** At the site, ask your field biologist or field trip provider to give an overview of the site, including the human history, how the site has been modified historically and which species might be found there currently. She/he can assist your class with plant and animal identification when students complete the *Field Observation Data Sheets* (p. 34-35). She/he can also identify the species' habitat needs and provide information on any impacts humans have had on the ecosystem and species found there (e.g. historical geography of the area).

**4)** Remember to review field procedures (safety, care for sensitive species, need for quiet at the site, etc.) with students and identify boundaries for student work. Remind students to do their best not to disturb animals. Make sure all safety protocols are followed; be especially aware of safety while working at field sites near water. Marking field investigation boundaries with flagging tape ahead of time can help establish the area where students will be working.

**5)** Have students complete the field observation activity using one or both of the provided *Field Observation Data Sheets* as a guide. A simple way to do an introductory field investigation is to use a sampling technique using hula hoops: have students spread out in groups in the investigation area, placing a hula hoop on the ground and recording what plants and animals (or evidence of animals) they observe. One way to focus students' observation skills is to have them record:

- I see...
- I hear...
- I smell...
- I touch...

Students can use field guides to identify plants and animals and/or draw what they observe (see resource list on p. 31 for field guide examples). If unsure of the species, students can photograph the species and identify them back in the classroom.

### Metro Vancouver Habitat Field Trip Case Study

Metro Vancouver Regional Parks offers a variety of educational field trips in parks throughout the region. Here are some sample field trip activities:

**Invasive Species Pull** – Students participate in habitat restoration by pulling invasive plants. Equipment is provided.

**Dune/Beach Study** – Learn about the creatures that live in this delicate yet harsh environment by studying specimens and searching for the unique animals that live in these rare ecosystems.

**Pond Dip** – Compare the Dune and Beach ecosystem to the Pond by collecting aquatic invertebrates from the pond. Discover the diversity that these different ecosystems offer.

Find out more about field trips through Metro Vancouver Regional Parks at: http://bit.ly/1EhzZyO

**6)** Students should also look for possible human impacts that may pose a threat to species or habitat, recording this in the comments section of the *Field Observation Data Sheet*.

**7)** Students can continue sampling by moving the hula hoop to new sites within the study area, recording data on the appropriate data observation sheet.

**8)** Back in the classroom, have students organize, analyze and report on their findings. For example, students can make charts, graphs and/or tables to communicate what they found (e.g. total number of a particular species, total number of species observed, percentages of particular species or taxon, numbers of different species versus number of species at risk, number and type of human impacts observed, etc.).

**9)** Ask students to complete a journal assignment, based on the following questions:

a. What do you remember about the field trip (highlights)?

b. What did you learn?

c. What were the challenges and successes in collecting data?

d. Were the results what you expected?

**10)** Make a summary table of all results and student learning. Discuss with the students. Did all students get the same results? Why or why not? What sources of error might influence the results?

## EVALUATION:

Have students…

- Develop questions about species at risk, and identify how field studies can help answer those questions
- Complete self-assessments of their field study based on the level of effort, degree of completeness, analysis and reporting

## COMMUNITY CONNECTIONS:

Connect with local naturalists, conservation organizations, and/or biologists in your community (e.g. student, teacher or parent associated with the school; individuals from a local naturalist organization or conservation group; conservation biology researcher at a local post-secondary institution, etc.) for assistance with leading a local field trip activity, identifying species and/or providing a list of species found in the area.

## EXTENSION:

Go on a second field trip to another nearby natural area or an area with high human impact, complete the same field inventory technique and compare results to the first site.

Using the list of the species observed at the field trip site, make a food chain/web of species. How might humans or other circumstances impact this web? What are ways to ensure the species found continue to thrive?

*Rubber boa (Isabelle Groc)*

## RESOURCES

The Wilderness Committee (WC) can assist you with field trip support to a local natural area. Contact WC's Species at Risk Project Coordinator for more information: species@wildernesscommittee.org

### Using the outdoor classroom:

Husby, Will and Ann Finlayson. *Connecting Students with their Watersheds: A Workbook for Community Leaders*. Bowen Island Conservancy, 2001. http://hctfeducation.ca/product-category/books-and-guides/

Ryken, Amy et. al. *Using Outdoor Environments to Foster Student Learning of Scientific Processes.* Pacific Education Institute, 2007. http://www.pacificeducationinstitute.org/workspace/resources/field-investigations.pdf

Staniforth, Sue. *Get Outdoors! An Educators's Guide to Outdoor Classrooms in Parks, Schoolgrounds and Other Special Places.* WildBC, BC Parks, BC Ministry of Education, Parks Canada and Metro Vancouver, 2009. http://hctfeducation.ca/product-category/books-and-guides/

### Guides to identification of plants and animals:

Cannings, Richard and Russell Cannings. *Birdfinding in British Columbia.* Vancouver: Greystone Books, 2013.

Cannings, Richard, Tom Aversa and Hal Opperman. *Birds of Southwestern British Columbia.* Victoria: Heritage House, 2005.

Peterson, Roger Tory. *A Field Guide to Western Birds*. Boston: Houghton Mifflin Company, 1999.

Pojar, Jim and Andy MacKinnon. *Plants of Coastal British Columbia.* Vancouver: Lone Pine Publishing, 1994.

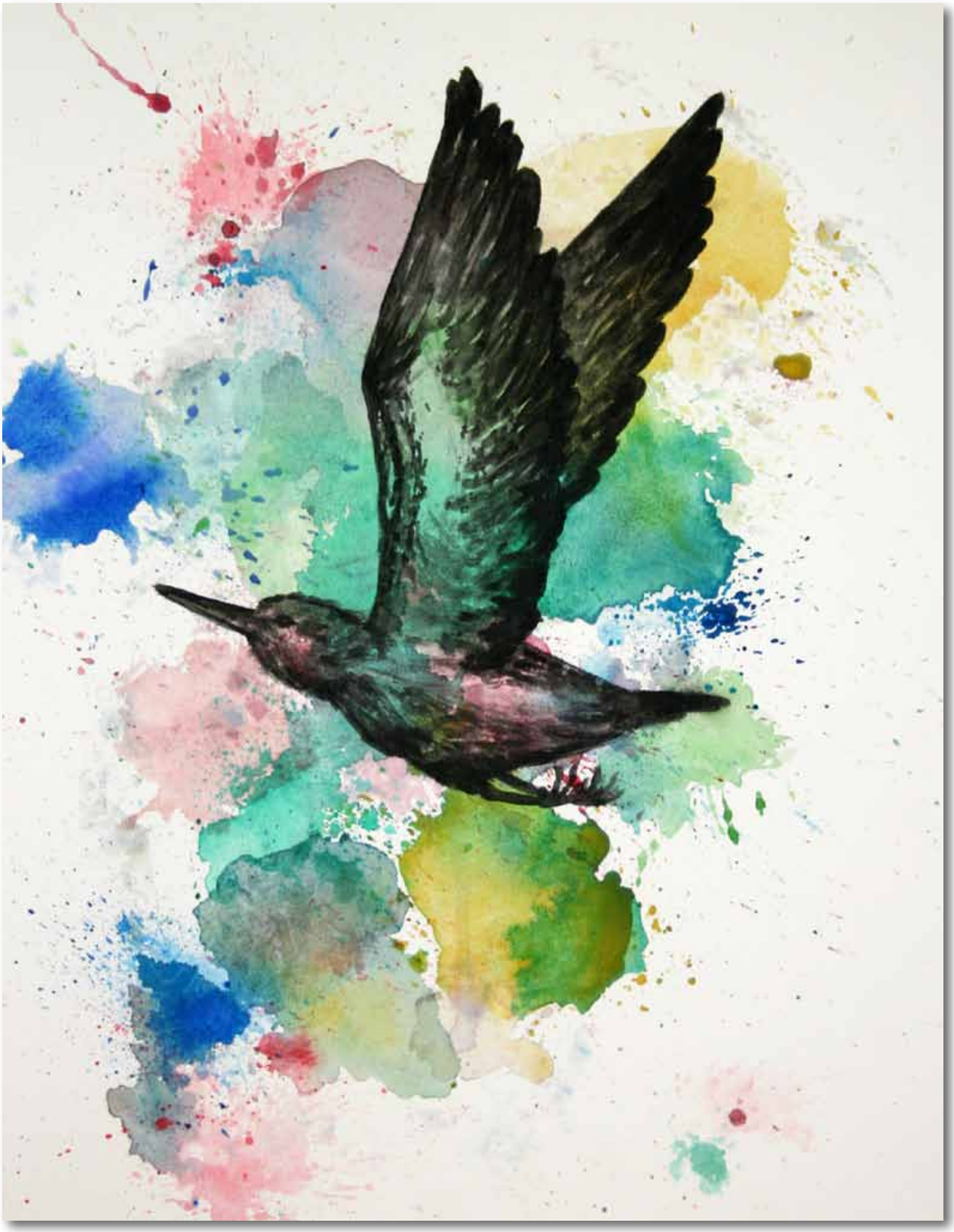
**Note: there are a number of apps for smart phones that assist in the identification of plants and animals*

### Species at risk profiles and videos:

Biodiversity of BC: E-fauna and E-flora Atlases. http://ibis.geog.ubc.ca/biodiversity/

South Coast Conservation Program Species and Ecological Communities of Conservation Concern. http://www.sccp.ca/species-and-habitat

Species at Risk Videos. http://www.protectbiodiversity.ca/resources/videos/



*"Surrounded" by Jillian, Grade 10, South Kamloops Secondary School*

## Student Worksheet – Birds of the Okanagan

Name: _____

Instructions: Use this worksheet as you watch the video to gather information about birds of the Okanagan and why they may be at risk.


1) Biologist Dick Cannings demonstrates a number of ways to gather data about species at risk while in the field. What are they?

_____

_____

2) What types of habitats does he identify as being degraded in the Okanagan?

_____

_____

3) What does Dick Cannings mention as possible reasons why some bird species are at risk in the Okanagan?

_____

_____

4) What actions does he suggest to help species at risk in the Okanagan?

_____

_____

_____

5) After watching the video, what are some things you wonder about species at risk?

_____

_____

_____

The video *Birds of the Okanagan: A Vanishing Legacy* may be found at: http://www.protectbiodiversity.ca/resources/videos/

ACTIVITY 2

# Field Observation Data Sheet - Natural Areas

**Name:** _____

**Date:** _____

Habitat/Ecosystem Description:

Location:

Weather:

| Plants/ Animals* Observed (see, hear, smell, touch) | How Many | Comments |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Print this page

**include evidence of animals observed*

## Field Observation Data Sheet - Human Geography

**Name:** _____

**Date:** _____

Description of area (e.g. park in rural community, surrounded by agricultural fields):

Location:

| Human Interaction with Natural Ecosystem Observed (see, hear, smell, touch) | How Many | Comments |
|---|---|---|
| | | |
| | | |
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*"The Amazing American Avocet" by Katrina, Grade 9, South Kamloops Secondary School*

# ACTIVITY 3:

## Species at Risk in the News

**ACTIVITY SUMMARY:** Working in small groups, students will complete a project-based learning activity to research and produce a student newspaper, magazine or other media to inform and take action on local species at risk.

**GRADE LEVEL:** 8-12

**SUBJECT AREA:** Science, Social Studies

**LEARNING OUTCOMES:**

It is expected students will...

- Study and describe a species at risk in their local ecosystem using online resources
- Become familiar with a range of threats (why species are at risk)
- Apply skills to research, write and present information on local species at risk
- Identify personal and collective actions students and local communities can take to gain better protection for species at risk

**TIME REQUIRED:** Two periods (approx. 3 hours) plus student research time

**KEY WORDS:** Species at risk, threats, recovery plans, species at risk stewardship

**MATERIALS:**

- Online resources (see step 3, p. 38)
- A variety of local and regional newspapers, magazines and other information sources

**SETTING:** Classroom

**SKILLS:** Gathering information, analysis, presenting information

*Streambank lupine (WC files)*

### Did You Know?

**Streambank lupine** (*Lupinus rivularis*) is a member of the pea family Fabaceae. This species is also known as "riverbank lupine." Lupines, like others in the pea family, are good at converting nitrogen from the atmosphere into ammonia via "rhizobium-root nodule symbiosis."

The nodules on their roots host nitrogen-fixing bacteria, which helps fertilize the soil for other plants. This adaptation allows lupines to grow in poor soils and to change soil quality to support other plant species in the area. Streambank lupine is found only on the west coast of North America. In Canada, it is currently known to be found in five locations (Sooke on southern Vancouver Island, Delta, Surrey and along the Coquitlam and Pitt Rivers).

These plants are quite rare, with small populations (only 1 to 100 plants) that presently consist mainly of seedlings and only a few mature plants. Scientists think this is the result of mowing and other habitat disturbances.

**PROCEDURE/STEPS:**

Species at risk are in the news on a regular basis, but often the stories are about issues far away – say, in Africa – rather than close to home. In this activity, students have the opportunity to find out about local species while working as a team to produce a student newspaper, magazine or other type of media about local species at risk.

**1)** Tell students that, working in small groups, they will be completing a project to develop a newspaper, magazine (or other format such as PowerPoint, visual collages, comic strips, posters, games, video) on species at risk in their community or region.

**2)** Ask students, "What needs to be included in a magazine or newspaper?"

Ideas include:

- Factual articles (e.g. news stories about biodiversity in BC, local species at risk, legislation for protection, groups involved, etc.)
- Classifieds (e.g. humorous ads "seeking mate", obituaries, looking for accommodation, etc.)
- Comics/puzzles

Discuss with students what makes an effective presentation of news.

**3)** Review all species observed during the field trip(s) from *Activity 2* (p. 27) and identify any local species that are at risk. Using online and other resources, find other species in your community/regional district that are at risk. Key searchable online resources include: www.speciesatrisk.bc.ca and www.env.gov.bc.ca/atrisk/toolintro.html (see resource list below for more info).

**4)** Select species for the "news" and divide students into groups, creating one group for each of the species selected. Each group should decide on the type of media (e.g. newspaper, magazine, video) and develop an outline of the research that needs to be completed. Key research areas should include: common and scientific name, description, habitat/ecosystem, ecological role (niche), where it is found (distribution), threats to the species, what we can do to help protect this species and other interesting facts. Graphics or photographs should be used in whichever type of media the students choose.

**5)** Publish the "Species at Risk News" and distribute in the school. Other distribution options include the school or class website and other community venues. Consider publishing all student media in an online format for sustainable production of the news.

**6)** Debrief with a class discussion about producing the "news" by asking the students what they felt were the challenges and successes.

*A student examines an insect found at a local park. (Isabelle Groc)*

**7)** Ask students what they learned about species at risk and the threats these species face. Generate a list of threats, elaborating as needed.

**8)** End with a discussion about how students can help with the conservation of the species they researched, especially in light of the fact that BC has no species at risk legislation. Facilitate a student brainstorm to come up with ideas about how they can take action as individuals and collectively, including:

- Reducing their personal impact on the local, regional or global environment
- Engaging in local monitoring and conservation efforts
- Speaking to family members, neighbours and friends about the importance of protecting species at risk and their habitat
- Being active citizens by learning more about local and provincial campaigns to protect species at risk, signing petitions and writing letters to appropriate government representatives to ask for stand-alone species at risk legislation in British Columbia

**9)** Students should identify one action that they would like to take to protect and reduce threats to species at risk in their community.


*A sample species at risk news project created by students at Burnaby South Secondary School.*

## EVALUATION:

Have students…

- List at least five local species at risk and the threats to these species
- Work collaboratively within their group to produce "news" on local species at risk
- Identify ways to help conserve local species at risk.

## COMMUNITY CONNECTIONS:

Check out your local media sources, search "species at risk" and see what comes up! For example, a search through local newspapers in the Lower Mainland revealed that back in 2009, a major dredging project was postponed in Burnaby Lake due to concerns about western painted turtle habitat.

### Which species are at risk in BC?

- Grizzly bear
- Northern spotted owl
- Killer whale
- Phantom orchid
- Yellow-breasted chat
- American badger
- Sea otter
- Sockeye salmon (some populations)
- Little brown bat
- Coastal Douglas-fir forest ecosystem
- **And many more...**

Find more BC endangered species using the **BC Species and Ecosystems Explorer:**
http://a100.gov.bc.ca/pub/eswp

## RESOURCES:

### Protect Biodiversity

This website is the endangered species campaign site developed by an alliance of groups including the Wilderness Committee, David Suzuki Foundation, Ecojustice, ForestEthics, Wildsight and Sierra Club BC, who have been actively campaigning for species at risk legislation in BC since 2008. The site features an interactive map of species at risk in BC, highlighting the conservation status, threats and habitat areas. It also features an online petition regarding species at risk legislation, as well as campaign news updates, videos and reports.

www.protectbiodiversity.ca

### Species @ Risk: A Primer for British Columbia

This database provides easy-to-understand information about the species considered at risk in BC, and provides quick access to lists of species searchable by municipality, regional district, habitat and forest district. It includes species life histories, population statistics, distribution maps and current threats to survival. There is also a section on stewardship practices for species at risk, including summaries for specific threats (see below). The database does not include offshore marine species.

http://www.speciesatrisk.bc.ca/

### Stewardship Practices for Species at Risk

A series of publications about species at risk, with descriptions of practices that can help protect, conserve and restore species at risk and their habitat.

http://www.speciesatrisk.bc.ca/guides

### BC Species and Ecosystems Explorer

This key database is produced by the provincial government and provides current status information for BC species, as well as species summaries. Information on fauna is focused on "at-risk" taxa only, while plant information covers all species.

http://a100.gov.bc.ca/pub/eswp/

### Species at Risk in the Classroom - A Resource for Educators (SARitc)

SARitc is the South Coast Conservation Program's unique curriculum resource made for formal and informal educators on BC's Lower Mainland. Grade focus is K-7.

http://www.sccp.ca/resources/species-risk-classroom-resource-educators

### E-Flora BC and E-Fauna BC

These biogeographic atlases of the wild species of the province are produced at the University of British Columbia. They include all species and provide species descriptions, illustrations and information on distribution, habitat and ecology. The atlases cover both marine and terrestrial/ freshwater species. At risk species (red- or blue-listed species in BC) may be called up separately.

http://www.geog.ubc.ca/biodiversity/eflora/

http://www.geog.ubc.ca/biodiversity/efauna/

### South Coast Conservation Program: Species and Ecological Communities of Conservation Concern

The SCCP's Species and Habitat (Ecological Community) profiles have been developed by the South Coast Conservation Program to provide easy-to-use, comprehensive information identifying endangered species that users may encounter in BC's Coast Region (South, Central and North Coast, Vancouver Island and Haida Gwaii), with a specific focus on the SCCP's backyard – the South Coast. Each profile includes up-to-date taxonomic information (species scientific name) and conservation status at the provincial, federal and international level, as well as a profile of the species biology and conservation issues.

http://www.sccp.ca/species-and-habitat

### NatureServe Explorer

NatureServe is a non-profit conservation organization that compiles and facilitates data collection on species to aid in conservation efforts. They coordinate collection protocols between conservation data centres in Canada, all 50 US states, Latin America and the Caribbean. This page lets you explore the data NatureServe has compiled on species and their habitats.

http://www.natureserve.org/explorer/

### Biodiversity BC

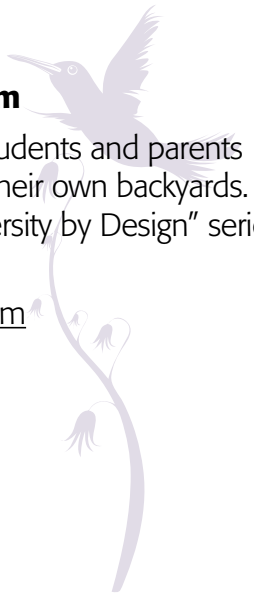
Biodiversity BC (BBC) is a partnership of conservation and government organizations that generates reports on biodiversity, species at risk and other environmental topics.

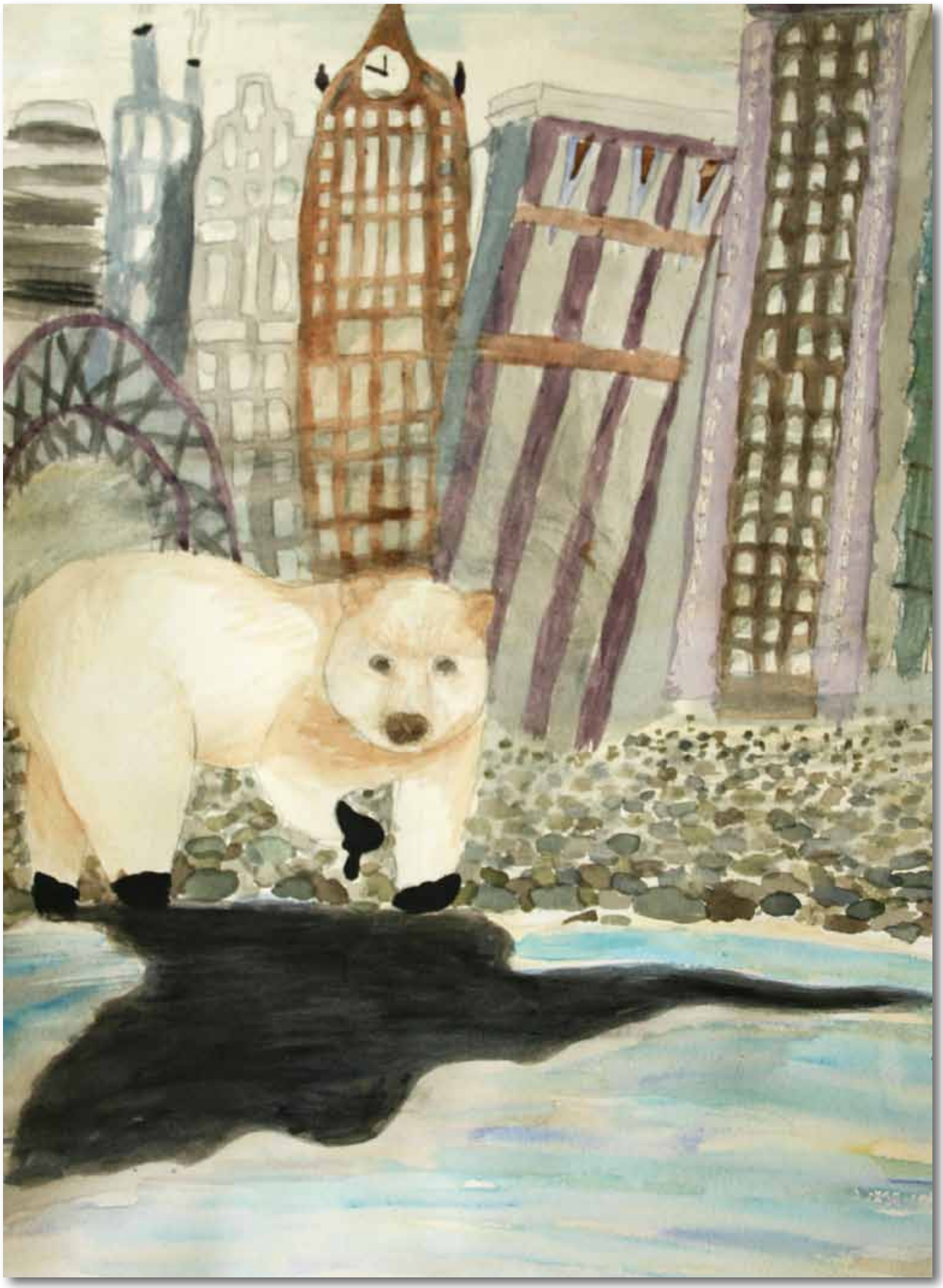
http://www.biodiversitybc.org/EN/index.html

### South Coast Conservation Program: Landowner Contact Program

The Landowner Contact Program is designed to engage and connect students and parents with opportunities for stewardship and restoration for species at risk in their own backyards. A number of relevant and useful resources is provided. See also the "Diversity by Design" series for restoring habitat for species at risk.

http://www.sccp.ca/projects/south-coast-landowner-stewardship-program





*"Spirit Bear Facing Extinction" by Heather, Grade 9, South Kamloops Secondary School*

# GLOSSARY

**Biodiversity:** The variety of life in a geographic region or ecosystem; the term can refer to genetic, species and/or ecosystem variability.

**Blue List:** A list including any species or ecosystem that is considered to be of special concern (formerly vulnerable) in British Columbia.

**Conservation Data Centre:** A body within the BC Ministry of Environment that compiles and disseminates data on species and ecosystems at risk. It is part of a larger international organization that shares data collected in each different country.

**Ecosystem:** A complex network of all living organisms interacting as a system in conjunction with the nonliving components of their environment.

**Endangered:** A species or ecosystem facing imminent extirpation or extinction.

**Extinct:** A species that no longer exists.

**Extirpated:** A species or ecosystem that no longer exists in a specified geographic area (for example, British Columbia), but occurs elsewhere.

**Red List:** A list including any indigenous species, subspecies or ecosystem that is a candidate for extirpated, endangered or threatened status.

**Special Concern:** A species particularly sensitive to human activities or natural events because of characteristics; formerly referred to as "Vulnerable."

**Species:** A group of living organisms consisting of individuals with shared characteristics or qualities, capable of interbreeding and producing viable offspring.

***Species at Risk Act* (SARA):** Legislation enacted in 2002 by the Federal Government of Canada that created a framework for identifying species that are at risk and a process for protecting them to ensure their long-term survival. Species listed under SARA are legally protected.

**Threatened:** A species or ecosystem that is likely to become endangered if limiting factors are not reversed.

***Wildlife Act*:** The Government of British Columbia's only legislation dealing specifically with species at risk; species designation is discretionary, not mandatory.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