Exploring the Great Bear Sea

Environmental Science Grades 11 &12

Acknowledgements

Film – Green Fire Productions

Karen Anspacher-Meyer	Executive Director
Ralf Meyer	Creative Director

Curriculum Authors

Sarah Lockman	B.Kin, B.Ed, Masters in Cultural Studies and Critical Theory
Jennifer Buffett	B.A., B.Ed, Masters of Science Communications

Resource Reviewers

Karen Anspacher-Meyer	Executive Director, Green Fire Productions
Molly Clarkson	Marine Communications and Technical Support Officer, Council of the Haida Nation
James Zlatanov	Helping Teacher Aboriginal Education, Middle/High School Support, School District #52, Prince Rupert

Graphic Design

Monika Sosnowska	MSE Marketing (www.msemarketing.net)

Green Fire Productions
www.greenfireproductions.org
www.greatbearsea.net

Table of Contents

Introduction

The **Exploring the Great Bear Sea Elementary and Secondary Curriculum Resources** are based on the film *The Great Bear Sea: Reflecting on the Past, Planning for the Future*, by Green Fire Productions, and can be used to engage students on an inquiry-based, educational journey through the Great Bear Sea. The Great Bear Sea is a new name given to the North Coast of British Columbia (BC), an area that extends from Campbell River on Vancouver Island to the border of BC and Alaska. This region of British Columbia's coast is one of the richest marine ecosystems in the world, has enormous cultural significance to the people who live here, and contains important resources for BC's economy. It covers a large area – 103,000 square kilometers in total – and extends from the high tide line to the edge of the continental shelf. In an effort to manage existing uses and plan for the future, coastal communities, local government, and more than 10 marine sectors participated in a planning process with 18 First Nations and the Province of British Columbia, a government-to-government partnership to create marine plans and ensure this region is sustained for future generations.

These resources include an elementary cross-curricular unit for Grades 4-7 and secondary units for Social Studies Grades 11 & 12 and Environmental Science Grades 11 & 12. Using film segments, research data, local knowledge and place-based stories, the Great Bear Sea curriculum explores themes such as traditional and local knowledge, collaborative science, marine planning, biodiversity, sustainable resource management and marine stewardship. All resources are connected to the revised BC curriculum and include lesson plans, supplementary resources and film clips to support classroom learning.

The Great Bear Sea Film

The film, *The Great Bear Sea: Reflecting on the Past, Planning for the Future*, by Green Fire Productions, is a journey through the Great Bear Sea region, home to First Nations for thousands of years. The film explores this unique area – a wild expanse of ocean where whales, wolves, bears, fish, seabirds, other marine life and humans thrive in rich coastal ecosystems. The Great Bear Sea is also a place where worlds collide – a place full of historic conflicts and looming battles over ocean resources. Now 18 First Nations and the Province of British Columbia have crafted marine plans for the Great Bear Sea to both protect their home and to build sustainable coastal economies through the Marine Planning Partnership (MaPP). Through the film, we meet people and communities along the coast of BC who are working to implement BC's marine plans.

Green Fire Productions, a non-governmental organization, specializes in producing documentaries on sustainability and conservation of natural resources. *The Great Bear Sea* is part of the Ocean Frontiers film series on ocean stewardship in North America. www.ocean-frontiers.org Founded in 1989 by Karen Anspacher-Meyer and Ralf Meyer, Green Fire films are used in classrooms worldwide and screened in community events, for decision-makers and on public television.
www.greenfireproductions.org

Marine Planning Partnership (MaPP)

The Marine Planning Partnership for the North Pacific Coast (MaPP) www.mappocean.org represents an innovative response and approach to the challenge of ensuring sustainable use of the MaPP study area, or the Great Bear Sea, for generations to come. The MaPP is a co-led process between 18 First Nations and the Province of British Columbia to establish four area-specific marine plans and a regional planning framework. Over the course of four years, the planning teams created new marine plans in consultation with marine stakeholders from the fishing, tourism, recreation, academia, local government, renewable energy, and other sectors.

The plans include special management zones for tourism, aquaculture, and First Nations culture and protection management zones for marine life and habitat. The plans address a variety of marine uses, activities and values and contain hundreds of strategies that will lead to solutions and revitalise the North Coast. The year 2015 marked an important milestone for shaping the future of Canada's North Pacific Coast and the Great Bear Sea. On April 27, 2015, after four years of planning, marine plans for four sub-regions (North Coast, Central Coast, Haida Gwaii, North Vancouver Island) were released and made public on the MaPP website. According to the BC and First Nations' governments, these plans: "when implemented, will help to create opportunities for sustainable economic development, support the well-being of coastal communities and protect the marine environment."

This collaborative government-to-government planning process is innovative and globally significant; there is no other country where a marine plan has been developed by Indigenous and provincial governments. Worldwide, there is great interest in MaPP and learning more about how the planning was done, and what was achieved. The MaPP website is a very useful resource to learn more about the process, watch a video on "10 Things You Need to Know About MaPP", read stories from the First Nations and the MaPP stakeholder members, as well as a research tool for students.

The Great Bear Sea: Reflecting on the Past, Planning for the Future explores the marine planning process from the perspective of the four sub-regions. The 18 First Nations* working on the MaPP plans include:

Central Coast

Nuxalk Nation, Heiltsuk Nation, Kitasoo/Xai'xais First Nation, Wuikinuxv Nation

Haida Gwaii

Council of the Haida Nation, Old Massett Village Council, Skidegate Band Council

North Coast

Gitga'at First Nation, Gitxaała First Nation, Haisla First Nation, Kitselas First Nation, Kitsumkalum First Nation, Metlakatla First Nation

North Vancouver Island

Mamalilikulla Qwe'Qwa'Sot'Em First Nation, Tlowitsis Nation, Da'naxda'xw Awaetlatla First Nation, Gwa'sala-'Nakwaxda'xw First Nations, We Wai Kum First Nation, Kwiakah First Nation, K'ómoks First Nation

** This list contains over 18 First Nations. Some Nations and territories had been amalgamated post-contact and have very recently been re-defining traditional territories and spaces.*

First Peoples' Perspectives & Indigenous Knowledge

The Great Bear region is the traditional, ancestral and unceded territory for many First Nations that have called this area home and have co-existed with the resources of the land and sea for thousands of years. First Peoples in this region have developed a vast body of knowledge over time – and they continue to develop this knowledge – around the land, sea, resources and how humans both impact and are connected to nature.

The film presents the perspectives of some of the diverse First Peoples of this region, and particularly their connection with place – with the land and sea – and their unique knowledge connected to their environment and territories. All perspectives shared were granted with permission, and in collaboration with individuals interviewed in the film. There are also a number of supplementary materials included in the Exploring the Great Bear Sea Curriculum Resources that were provided with permission from various First Nations. Throughout the resource, you will see these cited appropriately.

This Indigenous Knowledge forms the basis of the film and the Exploring the Great Bear Sea Curriculum Resources. Before beginning this unit, it is important to review the following:

- **Appendix A: Interview with Doug Neasloss** (Chief Councillor, Kitasoo/Xai'xais Band Council & Resource Stewardship Director, Kitasoo/Xai'xais Integrated Resource Stewardship Authority) sharing some of the history of the First Nations in the Central Coast region of BC.
- **Appendix B: Indigenous Knowledge** (Source: Science First Peoples Teacher Resource Guide © 2016, First Nations Education Steering Committee and First Nations Schools Association. Used with permission from the First Nations Education Steering Committee Society).
- The full-length version of ***The Great Bear Sea: Reflecting on the Past, Planning for the Future*** film (75 minutes), so you have an understanding of the context and geography of the perspectives shared in individual film clips. The full-length film is available at www.greatbearsea.net or on the Great Bear Sea USB Drive.

Individual lessons will also provide contextual and background information to support the teaching of this material.

Curriculum Development & Contributors

Curriculum developers, Sarah Lockman (B.Kin, B.Ed., Masters in Cultural Studies and Critical Theory) and Jennifer Buffett (B.A., B.Ed, Masters of Science Communications), have worked in formal and informal educational settings, including elementary, secondary and post-secondary classrooms, non-profit organizations, municipal and provincial educational organizations in BC and Ontario. Together, they bring over 30 years of curriculum development and teaching experience to projects, and work together to create innovative approaches to meeting outcomes and deliverables. They specialize in innovative approaches to hands-on, inquiry and place-based learning, and work with students, teachers and organizations to develop relevant, engaging learning resources and environments. Contact them at: learninginplace@gmail.com.

There are a number of resources included in this curriculum that were provided by individuals or organizations for use in this resource. Please note these resources are not available for use or publication outside of the classroom. Thank you to the following contributors for sharing these resources:

Bear Data and Bear Identification Information
Spirit Bear Research Foundation

***Bear Witness* (film clip)**
Bears Forever - a project of Coastal First Nations and the Central Coast First Nations Bear Working Group

Biographies

- Karen Anspacher-Meyer - *Executive Director, Green Fire Productions*
- Vernon Brown - Data & Referrals Coordinator Kitasoo/Xai'xais Integrated Resource Stewardship Authority
- Jenn Burt - Doctorate in Resource Management – Marine Ecology Simon Fraser University
- Rosie Child - Operations Manager and a Research Technician for the Spirit Bear Research Foundation
- Molly Clarkson - Marine Communication and Technical Support Officer
- Alejandro Frid - Science Coordinator/Ecologist Central Coast Indigenous Resource Alliance
- Kira Krumhansl - Postdoctoral Researcher at Simon Fraser University and Hakai Institue
- Doug Neasloss - Chief Councillor, Kitasoo/Xai'xais Band Council & Resource Stewardship Director, Kitasoo/Xai'xais Integrated Resource Stewardship Authority
- Dan Okamoto - Postdoctoral Researcher, Simon Fraser University
- Chantal Pronteau - Guardian Watchman & Researcher

- Trevor Russ - Vice President, Council of the Haida Nation
- Markus Thompson - Masters of Resource in Environment Management Simon Fraser University

Coastal Guardian Watchmen - *Eyes and Ears on the Land and Sea* (film clip)
Coastal Guardian Watchmen Network

Collaborative Research
Alejandro Frid, PhD, Science Coordinator, Central Coast Indigenous Resource Alliance

Cover photo (bear) by Doug Neasloss

***Eelgrass* (film clip)**
Florian Graner, Sealife Productions

***Gwaii Haanas Legacy Pole* (film clip)**
Parks Canada and filmmaker, Nate Jolley

Haida Marine Seasonal Round and Ocean & Way of Life brochure
Council of the Haida Nation – Marine Planning Program

Ha-ma-yas Marine Plan (excerpt)
Member Nations of the Nanwakolas Council

Indigenous Knowledge (Appendix B)
Source: Science First Peoples Teacher Resource Guide © 2016, First Nations Education Steering Committee and First Nations Schools Association. Used with permission from the First Nations Education Steering Committee Society

Interview with Doug Neasloss (Appendix A)
Doug Neasloss, Chief Councillor- Kitasoo/Xai'xais Band Council and Resource Stewardship Director- Kitasoo/Xai'xais Integrated Resource Stewardship Authority

Kelp Data and Background
Hakai Institute

***Otter Kelp Research* (film clip)**
Jenn Burt

***Ratfish* (film clip)**
Florian Graner, Sealife Productions

Seasonal Use Cycles of the Kwakwaka'wakw
Emily Aitken, Tlowitsis Nation

Supporting Emerging Aboriginal Stewards – *SEAS* (film clip)
Philip Charles

Resource Overview

Elementary Resource

The Elementary resource has been designed for Grades 4-7, using a hands-on, inquiry-based approach exploring themes of Indigenous Knowledge, collaborative research, marine planning, collaborative decision-making, careers and stewardship. It focuses specifically on Science and Social Studies but can be used cross-curricular as certain activities are Mathematics, English Language Arts, Career Education and Arts Education based. The key subjects have been identified at the beginning of each lesson plan. Educators are encouraged to consider using science journals or duotangs for the students to keep track of their individual learning.

Secondary Resources

The Secondary resources have been designed to align with the updated Social Studies Grades 11 & 12 and the Environmental Science Grades 11 & 12 BC curriculum. Both units provide an inquiry-based approach to exploring themes of collaborative planning and research, Indigenous Knowledge, marine planning, and stewardship.

From an Environmental Science perspective, the Great Bear Sea serves as a useful BC case study to consider how development and management of resources in the area can be planned and implemented as a means of moving toward sustainability for generations to come. The unit provides an indepth exploration of sustainable resource management and planning through the lens of the Great Bear Sea.

From a Social Studies perspective, the innovative approach to marine planning, as presented through the Marine Planning Partnership (MaPP), provides a new lens for considering issues of governance and collaboration. By exploring this key region of BC through the multiple lens of ecological, economic, geographic and social/cultural perspectives, students have the opportunity to consider both the benefits and challenges associated with collaborative decision making, and how this could be considered at local, national and international levels.

Both units provide an opportunity for educators to specifically look at First Peoples' perspectives and worldviews, and embed these perspectives into all aspects of student learning.

Tips for Educators

The lesson plans, film clips and resources provide a framework for educators to facilitate a unit of study. The lessons have learning outcomes and concepts that build upon each other; however activities have been designed to allow for customization or differentiation as you move through the unit to suit the needs of your environment or learners. All units are inquiry-based and can be tailored to suit students' interests and curiosity. At points in the units, it may be helpful to pre-teach concepts or learning strategies. These have been noted in lessons where appropriate.

These resources incorporate opportunities to engage in place-based learning by moving outside of your classroom and into your own place, as well as thinking critically about the importance of place and culture. We encourage teachers to incorporate the suggested ideas when possible to make connections to your own place as well as to the Great Bear Sea.

The resources also make suggestions for incorporating technology into the activities. Particularly at the upper elementary and secondary levels, one could take a technology-focused approach to the units by linking to the film clips via your own website or mediated online learning environments (such as Edmodo, Google classroom, Moodle, etc.) and encourage student engagement with the resources in this space. Questions for further exploration or inquiry could be mediated in an online environment, capturing evidence of student learning. Many online learning tools can also be incorporated into lessons, such as movie-making, pre/post surveys, blogs, personal websites, research tools, digital storytelling, etc.

How to Use and Access Materials

The resources have been divided into sections to guide the classroom teacher. For each lesson teachers will find required materials, lesson context and learning outcomes, step-by-step instructions for suggested activities, extensions and assessment ideas as well as black line masters. A Teacher Background section is also included for each lesson, highlighting additional background content for educators.

Throughout this resource, several images and colour resources are noted with a * in the materials list. These resources are available on the Great Bear Sea USB Drive, or at www.greatbearsea.net.

The full Exploring the Great Bear Sea Elementary and Secondary Curriculum Resources are available for download and viewing through the website: www.greatbearsea.net, including complete lesson plans as well as all supplementary materials for each lesson (film clips, images, etc.). Film clip transcripts have also been provided as a tool for educators.

We recognize that schools in rural or remote areas may have limited or inconsistent access to the internet and may not be able to download or view the resources. Please contact us through the website (**www.greatbearsea.net**) for alternate arrangements, or email at **greatbearsea@gmail.com**.

Curriculum Connections

All units were designed with the framework of the Core Competencies in mind, as outlined in the revised BC curriculum. Educators will see strong links to these competencies through the learning activities. These include:

- communication
- creative and critical thinking
- positive personal and cultural identity
- personal awareness and responsibility
- social responsibility

The resources also provide a framework for embedding First Peoples' worldviews, and engaging with Traditional Knowledge, throughout the units. It is suggested that educators refer to the First Peoples' Principles of Learning and other resources for more suggestions on embedding a First Peoples' worldview into your teaching practice: www.fnesc.ca/learningfirstpeoples.

Elementary

The Elementary Unit for Grades 4 – 7 addresses a variety of Science and Social Studies Big Ideas, content and curricular competencies. This cross-curricular unit also offers activities that target Mathematics, English Language Arts, Career Education and Arts Education.

Secondary

The Environmental Science Unit for Grades 11 & 12 addresses a variety of Big Ideas, content and curricular competencies associated with this area of learning. This unit also offers activities that target Science for Citizens 11.

The Social Studies Unit for Grades 11 & 12 specifically addresses a variety of Big Ideas, content and curricular competencies associated with BC First Peoples 11, Human Geography 11 and Contemporary Indigenous Studies 12. This unit also offers activities that target Social Studies 10, Comparative Cultures 11, Physcial Geography 11, Political Science 11, and Social Justice 12.

Curriculum Charts

See the following pages for BC curriculum connected charts.

Curriculum Connections Grade 11

Area of Learning: Environmental Science

Big Ideas:

Diversity in Local Ecosystems
- Local environments contain diverse ecosystems with many roles and relationships.

Processes and Changes in Local Ecosystems
- Interconnected systems sustain healthy ecosystems.
- Ecosystem stability is an important result of sustainability

Sustainability in Local Ecosystems
- Human practices affect the sustainability of ecosystem

Conservation and Restoration of Ecosystems
- Humans can play a role in conservation and restoration of ecosystems.

Content	Curricular Competencies
Diversity in Local Ecosystems • biodiversity: - species and their **ecological roles** - **relationships and interactions** in ecosystems **Processes and Changes in Local Ecosystems** • **matter cycles** • **change and stability** in ecosystems	Questioning and predicting • Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest • Make observations aimed at identifying their own questions, including • increasingly abstract ones, about the natural world • Formulate multiple hypotheses and predict multiple outcomes Planning and conducting • Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative) • Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods Processing and analyzing data and information • Experience and interpret the local environment • Apply First Peoples perspectives and knowledge, other ways of knowing, and local knowledge as sources of information • Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies • Construct, analyze, and interpret graphs, models, and/or diagrams • Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Analyze cause-and-effect relationships

Curriculum Connections Grade 11 (Environmental Science, continued)

Content	Curricular Competencies
Sustainability in Local Ecosystems • **benefits** of healthy ecosystems • humans as agents of change: - First Peoples and other **traditional ecological knowledge** - **unsustainable and sustainable** ecosystem practices **Conservation and Restoration of Ecosystems** • **environmental stressors** challenge ecosystem integrity, health, and sustainability • ecological **restoration principles** and **practices** • First Peoples concept of interconnectedness as related to conservation and restoration • **engagement** in ongoing and potential stewardship projects	Evaluating • Describe specific ways to improve their investigation methods and the quality of the data • Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and in primary and secondary sources • Exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations to evaluate claims in primary and secondary sources • Consider social, ethical, and environmental implications of the findings from their own and others' investigations • Critically analyze the validity of information in primary and secondary sources and evaluate the approaches used to solve problems Applying and innovating • Contribute to care for self, others, community, and world through individual or collaborative approaches • Co-operatively design projects with local and/or global connections and applications • Contribute to finding solutions to problems at a local and/or global level through inquiry • Implement multiple strategies to solve problems in real-life, applied, and conceptual situations • Consider the role of scientists in innovation Communicating • Communicate scientific ideas, information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations • Express and reflect on a variety of experiences, perspectives, and worldviews through place

Curriculum Connections Grade 12

Area of Learning: Environmental Science

Big Ideas:

Global Water Systems
- Human actions affect the quality of water and its ability to sustain life.

Global Environmental Changes
- Living sustainably supports the well-being of self, community, and Earth.

Content	Curricular Competencies
Global Water Systems • water quality: - chemical and physical **parameters** - **bio-indicators and indices** • **availability** and **water use** • **conservation** and **personal choices** **Land Use and Sustainability** • global **food security** and **technologies** **Global Environmental Changes** • **environmental ethics** • **First Peoples perspectives, philosophies, and responsibilities**	Questioning and predicting • • Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest • • Make observations aimed at identifying their own questions, including • increasingly abstract ones, about the natural world • • Formulate multiple hypotheses and predict multiple outcomes Planning and conducting • Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative) • Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods Processing and analyzing data and information • Experience and interpret the local environment • Apply First Peoples perspectives and knowledge, other ways of knowing, and local knowledge as sources of information • Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies • Construct, analyze, and interpret graphs, models, and/or diagrams • Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Analyze cause-and-effect relationships

Curriculum Connections Grade 12 (Environmental Science, continued)

Content	Curricular Competencies
Sustainability in Local Ecosystems • **benefits** of healthy ecosystems • humans as agents of change: - First Peoples and other **traditional ecological knowledge** - **unsustainable and sustainable** ecosystem practices **Conservation and Restoration of Ecosystems** • **environmental stressors** challenge ecosystem integrity, health, and sustainability • ecological **restoration principles** and **practices** • First Peoples concept of interconnectedness as related to conservation and restoration • **engagement** in ongoing and potential stewardship projects	Evaluating • Describe specific ways to improve their investigation methods and the quality of the data • Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and in primary and secondary sources • Exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations to evaluate claims in primary and secondary sources • Consider social, ethical, and environmental implications of the findings from their own and others' investigations • Critically analyze the validity of information in primary and secondary sources and evaluate the approaches used to • solve problems Applying and innovating • Contribute to care for self, others, community, and world through individual or collaborative approaches • Co-operatively design projects with local and/or global connections and applications • Contribute to finding solutions to problems at a local and/or global level through inquiry • Implement multiple strategies to solve problems in real-life, applied, and conceptual situations • Consider the role of scientists in innovation Communicating • Communicate scientific ideas, information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations • Express and reflect on a variety of experiences, perspectives, and worldviews through place

Lesson 1: Introduction to the Great Bear Sea

Overview: Students will be introduced to the marine area in BC known as the Great Bear Sea, including the corresponding local land-based communities that call this region home, through an introduction to the film *The Great Bear Sea: Reflecting on the Past, Planning for the Future*. Students will identify several key species that make this area one of the most biodiverse in the province and the world, and start to consider the ecological, social, cultural and economic significance of future development in the area.

Suggested Time: 2 class sessions (75 minutes each)

*** Teacher Note:** Throughout this resource, additional materials, several images and colour resources are noted with a ***** in the materials list. These resources are available on the Great Bear Sea USB, or at www.greatbearsea.net.

Materials and Resources:

- Computer, projector, and screen
- Chart paper and markers
- Lesson 1 Film Clips:
  - Introduction (6 mins)
  - Respect (10 mins)
  - First Nations History Overview - video and audio files (14 mins)
  - Ratfish (4 mins) - *optional*
- Teacher Background – Lesson 1
- 1.1 Interview with Doug Neasloss
- Great Bear Sea MaPP Study Area Map *****
- Great Bear Sea MaPP Study Area With Sub-Regions Map *****

Learning Objectives:

Students will:

1. Identify the location of the Great Bear Sea and some of the species and resources of the area.
2. Explore the interconnectedness of systems (land and water), and interdependence and interactions between systems.
3. Pose questions about the ecological, social, cultural and economic impacts associated with sustainable resource development.
4. Explore the ideas of stewardship and leadership in planning for the future of marine resources and ecosystems.

Lesson Context

This unit focuses mostly on humans as agents of change on systems. Before starting this unit, it would be helpful to review key concepts like biodiversity, the interdependence of all living things, systems and sustainable ecosystems, as well as the complexity of such systems. Students will then be prepared to look more closely at sustainable resource management and planning through the lens of the Great Bear Sea.

This lesson introduces students to the area known as the Great Bear Sea – an ecologically biodiverse and important marine area for British Columbia. They will be introduced to the four sub-regions of the area (Central Coast, Haida Gwaii, North Coast, and North Vancouver Island) and consider the communities and species that call this diverse ecosystem home.

Students will access prior knowledge through developing species food webs and considering how all living and non-living things are interconnected – marine and land-based. They will also listen to a First Nations story about the need to respect all things as a means of working toward sustainability. They then pose questions about the ecological, social, cultural and economic impacts of future development in the region, and how this development might be planned to support sustainability in a more broad sense.

Learning Activities

Part A

Activity 1: The Region Known as the Great Bear Sea (40 minutes)

1. Project the **Great Bear Sea MaPP Study Area Map*** on the screen and ask students if they can identify the area. Explain to students that this region is known as the Great Bear Sea and point out the demarcation line on the map, with the region spanning from the Alaska boarder to Campbell River on Vancouver Island. Engage students in a discussion about the region with some of the following questions:
    - Have you ever lived, visited or travelled through any of the areas in the region? Name some of the places that you are familiar with in the region.
    - What do you think may be the driving industries in the region?
    - Students may be familiar with the Great Bear Rainforest, including the recent steps to protect the area. What have they heard about the recent agreements to protect the area known as the Great Bear Rainforest?
    - Why do you think this region may be important to BC and Canada?
    - Do you think you are impacted by what happens in the Great Bear Sea? (Depending on your geographic location, this may be more or less overt. Encourage students to consider that coastal waters of BC have impacts for areas all over the province and beyond.)

2. Share the following quote with students, explaining that this is a comment made by a person living and working in the Great Bear Sea region, specifically the Heiltsuk Nation, which is in the region of Bella Bella (you may want to point to this area on the map).
    - *Everything we eat, whether it's inter-tidal, whether it's bottom fish, whether it's herring, whether it's herring spawn, whether it's salmon – everything comes out of that ocean. It's a lifeline. It's a lifeline for our people.* - William Housty, Chair, Heiltsuk Integrated Resource Management Department
3. In pairs, have students brainstorm a list of species they think are present in the Great Bear Sea region (both marine and land). Have them then star the species they think might have the biggest impact on the "lifeline" that is referred to in the quote. Discuss as a class.

Activity 2: Introduction to the Film (35 minutes)

1. Let students know that over the coming days, the class will be exploring more about this region, and its importance to BC, through film exploration. Introduce the film *The Great Bear Sea: Reflecting on the Past, Planning for the Future*, explaining that it is a film focusing on this particular region in BC and how people are coming together, amid growing demands on BC coastal waters, to plan for the future of the region. First Nations and the Province of BC have come together to work on regional marine plans to govern the area.
2. Project the **Great Bear Sea MaPP Study Area With Sub-Regions Map*** and as a class discuss the four sub-regions (Central Coast, Haida Gwaii, North Coast, and North Vancouver Island).
3. As a class, watch the **Introduction** film clip and have students add to their species lists. You may want to show the clip a second time.
4. After viewing, discuss the new species that were mentioned in the clip (species noted in the film include: salmon, dolphins, porpoises, humpback whales, orcas, wolves, spirit bears, sea prunes, cucumbers, red urchins).
5. In preparation for the next class, divide students in 6 small groups and explain that next class, groups will draft a food web for a particular species in the Great Bear Sea. Provide six options: salmon, grizzly bear, orca, wolf, herring, red urchin. You may wish to have students research their species independently to be prepared to share learning with their group.

Part B

Activity 1: Food Web Exploration (45 minutes)

1. Have the students form their species groups and provide each group with chart paper and markers. (Note: this activity could also be done digitally, using a program such as Padlet or Stormboard.) Explain to students that they should work together to build a food web including their chosen species. The webs do not need to be perfect – they should include best guesses when they are not sure. Provide the following instructions:
    - Food webs show the transfer of energy from organism to organism. Draw arrows pointing from the producer (prey) to the consumer (predator). Try to come up with as many relationships as possible, using the chosen species as a starting point. Use words and/or drawings.
    - As another layer of the food web, consider the following questions as a group:
        i. What are some of the external forces impacting the species? (habitat destruction, fishing, etc.).
        ii. If the species were to become extinct, what might be the impact to other species?
2. Time permitting, have one group join with another, and compare and contrast food webs. Have the groups consider how, if at all, their species impact one another.
3. Post the webs around the room and reserve time for groups to share their work.
4. Engage in a large group discussion, having students share their observations. Some possible prompting questions may include:
    - What is one new thing you learned as a result of working in groups or reviewing all the food webs?
    - How is life in the Great Bear Sea connected? Provide some examples.
    - Do you think resource management in this area would be important? Why?
    - If it hasn't come up already, stress the biodiversity – the variety of life in this region – and that the survival of all living things on Earth depend on this biodiversity. If one species is in threat, this impacts a series of other species (and so on). All life is interconnected.

Activity 2: Underwater Big House, Story of the Gitnuganaks (30 minutes)

1. Explain to students that the Great Bear Sea is home to many different First Nations who have lived in their territories for thousands of years, having close relationships with the land and sea (see the **Teacher Background – Lesson 1**).

2. Introduce the **Respect** film clip, Underwater Big House, Story of Gitnuganaks told by Vernon Brown, Kitasoo/Xai'xais Nation. Watch/listen to the story as a class.

3. After viewing, have students work in pairs to discuss the story and the moral, and then discuss as a class, reiterating the following:
   - We depend on marine and land based resources for survival. Management of these resources is important for our future health as a planet.
   - Healthy and sustainable systems support biodiversity. Planning for sustainability is key to a healthy and prosperous future.
   - In planning for resource management, there are ecological, social, cultural and economic implications to consider.

4. Have students develop 3 – 5 questions that they now have in thinking about healthy and sustainable resource planning and management, considering the ecological, social, cultural and economic impacts of such planning. These questions may help guide students to an area of research for further study in later lessons.

Extension Ideas

- Provide students with **1.1 Interview with Doug Neasloss** (or use the film clip or audio files with **First Nations History Overview**) describing the history of the First Nations in the Central Coast region of BC as told by Doug. Have students write a reflective response addressing one of the comments/issues that Doug raises.
- If students are interested in the ratfish, show the **Ratfish** film clip for further discussion.
- Have students research a cultural element of one of the species of the Great Bear Sea, showing the relevance to a particular group or area, particularly with regard to First Peoples culture.

Assessment Ideas

- Formatively assess students' engagement in group work and large group discussion.
- Use the food webs and associated questions as formative assessment of students understanding of biodiversity and interconnectedness.
- Assess the reflective responses.

Teacher Background – Lesson 1

The Great Bear region of British Columbia's north coast is one of Canada's unique ecological treasures. It is home to islands, wild rivers, cold-water seas, a rich marine ecosystem, and one of the world's last intact temperate rainforests. The Great Bear region is interconnected between the land and the sea and truly is an ecosystem that is unlike anything else in the world.

The Great Bear Sea covers a large area from the northern tip of Vancouver Island to the Alaska border. It can be divided into four sub-regions: North Coast, Haidi Gwaii, Central Coast, and North Vancouver Island, as described in the film. The Great Bear Sea is home to many species of living organisms and many different kinds of habitat. For example, 20% of the world's remaining Pacific salmon are in this area, moving from the rivers to the sea and returning to spawn in their life cycle. It is home to two species of bears including a special type, or sub-species, of black bear called the spirit bear that lives nowhere else on Earth. Many types of marine mammals such as sea otters, dolphins, porpoises, humpbacks and killer whales call this area home or migrate through the waters. The area contains globally significant populations of breeding seabirds as well as important foraging habitat for trans-equatorial migrants that spend the summer in BC when it is winter in Australia and New Zealand. The area also is part of the Pacific Flyway and each fall and spring, hundreds of thousands of shorebirds, ducks, geese and other birds fly between the breeding grounds in the Arctic and their wintering areas in Mexico and South America, stopping at the nutrient-rich estuaries and mud flats to refuel and regain body fat for the long journey. The Great Bear Sea contains important habitats for threatened and endangered species, and supports a rich, complex food web ranging from tiny pteropods to the giant whales – this is one of the most biodiverse temperate regions of the world.

The Great Bear region is the traditional, ancestral and unceded territory for many First Nations groups which have depended on the resources of the land and sea for thousands of years. This area is also very rich in culture, with various species, artefacts and landscapes holding great significance to the communities that call this area home. The Great Bear Sea provides employment for many in the region in a variety of industries such as fishing and tourism. At the same time, there are many threats to this region including overfishing, increased marine traffic, oil spills and development. The biodiversity of the region, the fact that so many communities depend on this area for sustenance, and the increasing global competition for natural resources and waterways, provides a good framework for understanding the importance of ecosystem protection and planning for the future.

The year 2015 marked an important milestone for shaping the future of Canada's North Pacific Coast and the Great Bear Sea. A co-led partnership between the Government of British Columbia and 18 First Nations – called the Marine Planning Partnership (MaPP) – developed marine plans for the purpose of guiding marine management and the future

of the Great Bear Sea region. On April 27, 2015 the marine plans for the four sub-regions were publicly announced. This collaborative planning process is extremely innovative, and can be used as a model for considering community engagement around planning for a sustainable future.

The Great Bear Sea: Reflecting on the Past, Planning for the Future explores the marine planning process from the perspective of the four sub-regions (North Coast, Haida Gwaii, Central Coast, and North Vancouver Island). The following First Nations* in each sub-region were involved in the MaPP:

Central Coast

- Nuxalk Nation, Heiltsuk Nation, Kitasoo/Xai'xais First Nation, Wuikinuxv Nation

Haida Gwaii

- Council of the Haida Nation, Old Massett Village Council, Skidegate Band Council

North Coast

- Gitga'at First Nation, Gitxaała First Nation, Haisla First Nation, Kitselas First Nation, Kitsumkalum First Nation, Metlakatla First Nation

North Vancouver Island

- Mamalilikulla Qwe'Qwa'Sot'Em First Nation, Tlowitsis Nation, Da'naxda'xw Awaetlatla First Nation, Gwa'sala-'Nakwaxda'xw First Nations, We Wai Kum First Nation, Kwiakah First Nation, K'ómoks First Nation

** This list contains over 18 First Nations. Some Nations and territories had been amalgamated post-contact and have very recently been re-defining traditional territories and spaces.*

1.1 Interview with Doug Neasloss

The following is an excerpt from an interview with Doug Neasloss, Chief Councillor, Kitasoo/Xai'xais Band Council & Resource Stewardship Director, Kitasoo/Xai'xais Integrated Resource Stewardship Authority. Doug shares some of the history of the First Nations in the Central Coast region of BC.

Doug: My name is Doug Neasloss. I am from a small community called Klemtu, which is right on the central coast of British Columbia, and it is home to the Kitasoo/Xai'xais Nation. I have a few different titles. I work as a Marine Planning Coordinator. I work as a Resource Stewardship Director, with land and marine stewardship and a whole bunch of other things that come out of that as well. I also work as the elected Chief of the community, and my background's mostly been in tourism for the last 14 years.

To me, I think, this is one of the most special areas in all of the coast. I think the Great Bear Rainforest is definitely a very special and unique area. A place that still has intact old growth forests. We live in the largest intact temperate rainforest on the planet. It's one of the last strongholds you'll get for bears and other wildlife that are in the region. And it's just full of life. And I think that's something that's really neat. It still has the aquatic resources. It still has a lot of the land animals and I think there's not too many places on the planet that have what we have here and that's what keeps me here.

Karen Meyer (Great Bear Sea film maker): Taking a look back, talk about things that had a really significant impact on First Nations.

Doug: I think there's been a bit of a rough past when it comes to First Nations, I mean, I think just not long ago, whether it's 150 years to 200 years there was nobody else here, it was just First Nations communities, you know, in my area here we have two different nations from Klemtu. We have the Kitasoo, who are Tsimshian and they're the southernmost Tsimshian group and lived on the islands and then we have the Xai'xais people who lived on the mainland and in both Nations moved in the Klemtu in the 1850's, but prior to that, people lived, you know, quite nomadic lifestyles, and they followed the food resources in all of these different areas. At the time our cultures were very complex. It wasn't just as simple as following food. People had very complex governance structures, they had very complex relationships with different families. We had clan systems that distinguished different family groups and who had access to different areas based on different seasons. So it was a really complex relationship.

Around 1884 the government at the time decided to ban the Potlatch, which was the Potlatch in our community, our culture was the glue that held everything together. The singing, the dancing, the storytelling, the governance, coming-of-age ceremonies, passing of chieftainship, passing of copper shields. All those things were really important in our culture and in our community. And people used to prepare years in advance for Potlatch. So if I was going to host a Potlatch, some people would prepare 4 or 5 years in advance. But the Canadian government wanted to assimilate First Nations people into

the mainstream society so at the time they banned the Potlatch in 1884 to 1951. And the same thing happened in other regions. In the U.S. it happened in 1884 to 1936. But 1884-1951 during the banning of the Potlatch, it was illegal to Potlatch. And if you were caught potlatching, you were arrested for doing that.

So at the time the government sent what they called the "Indian Agent," and it was a person up here to monitor the activities of the local communities. And so everyone was paranoid about potlatching. People didn't want to Potlatch. But it was such an integral part of our culture and our community, people decided to take it underground in a way and Potlatch in secret. So what people used to do is they used to take the regalia and put it in the cedar bentwood boxes to make it look like it was a burial box, but it was actually their storage area for all of their regalia. And they used to paddle out to this one place we call it Dis'Ju, and it's a gathering place for people. And this Big House is hidden in the forest, you can't tell it's there going by in the boat, and people used to paddle out there in the roughest times of the year to go and Potlatch, so the Indian Agent wouldn't follow them out there.

Unfortunately around the early 1900s, there were so many families that did not make it back. A lot of families died trying to go out and Potlatch in secret. So by the early 1900s Klemtu stopped potlatching altogether. And that was a huge loss for the culture. Again, because that was the glue that held everything together. And that was just, you know, one of the reasons why we, during that time, we lost a lot.

Karen: What are some of the key things that your Elders tell you about what life was like here pre-contact?

Doug: Yeah, I've sat down and had a lot of discussion with our Elders about life, and even, you know, we live in a pretty isolated area, so we didn't have actually a lot of contact until quite late. The first contact we had was actually Captain Vancouver. I believe that was in 1793, when he came up and it was what people, the Elders always talk about how nomadic the lifestyles were. They talked about the seasonal camps, and the permanent camps. They said the food harvest would start in the wintertime. It would start with the clams and cockles in the winter. And then early spring, around March, the halibut would start to come in and they would start harvesting halibut. And then once the halibut was finished, they would start to move over to the herring and the herring eggs. And that was huge. That was probably one of the most important foods in our community, because it wasn't just used for food consumption, but it was also used for trade. And there was a huge trade routes along the Coast amongst different families up and down the coast. So Klemtu used to harvest the herring eggs and trade it with the Bella Coola people [Nuxalk] and also the Kitamaat people [Haisla], and they used to trade for eulachon grease, and that was huge because we didn't have eulachons in Klemtu area, and then once that was finished, we'd move over to seaweed in May, and right after seaweed was finished then you would go on to salmon, in particular sockeye salmon, and then later on in the summer, late summer, you would start to get all the salmon, so the coho, pink, and chum would start to come in.

So people were very dependent on all of these resources, and especially because it was such an isolated community, those aquatic resources are extremely important because food costs here in the community are so expensive. People, you know, depended on those, and we had different camps based on different things. Like Marvin Island is a herring camp. People just went there to go and harvest herring eggs. And while they were there, they would dry the herring eggs, they would dry the halibut, because a long time ago there were no refrigerators or freezers, so they would dry everything. Everything was sun dried. Or they would smoke it. And that's how they'd preserve things.

We've watched a lot of those resources dwindle over the last number of years. Partly because of mismanagement, and people coming in and harvesting too much. And, you know, in my lifetime, we've witnessed huge declines. Everything from abalone. Abalone used to be a once abundant shellfish in our territories. And the Elders talk about it … that in some areas they said you couldn't even touch the ground there was so many abalone. They were all over the place. Today, you probably will never see an abalone. In my lifetime I've never actually tried an abalone in the last probably 20-something years now because they've all just been wiped out. You know, the commercial fishery came in and harvested way too many and they just haven't been able to come back in numbers. With things like abalone you need large numbers because they're broadcast spawners and so the population just hasn't been able to come back and do that.

Same thing with salmon. I listen to the historical numbers of salmon. Some of the Elders will say some of the rivers and the estuaries would be full of salmon. They said some rivers were just plugged wall to wall with salmon. And I looked at the historical numbers of them, and there were about 80,000 fish in some of those systems. Today, we are down to about 5 or 6 thousand in some of those same rivers.

So, you know, I think there's been way too much over harvesting. I think with things like global warming, there's a number of different impacts that are effecting salmon. So, I think we have a long way to go.

Karen: What happened as a result of banning of Potlatches and other events, post-contact?

Doug: Well, I think the loss of culture during the ban of the Potlatch, I mean that was huge. I mean we had, you know, very strict ceremonies for different seasons. The return of salmon. The return of eulachons. The return of herring. The return of all these separate things were celebrated in a way, but also it was a ceremony to let the community know what time of the year it was, and food harvesting, I think there was traditional stories that were lost during that time and traditional stories that taught lessons of respect for certain resources and you know I think the governance structure, I think there was a lot that was lost, you know, songs and dances, and songs in our culture was a way of documenting an event, you know, that was going on so it wasn't just a simple song it had some meaning to it, and it came from a certain area, and it belonged to a certain family.

The passing of chieftainship. You know we have a very complex hereditary chief system in our community. So hereditary chiefs, you weren't just born a hereditary chief, you were groomed to be a chief, and you know the rule of the hereditary chief is you're there to steward, you had a responsibility to take care of a certain area, and so if you were a chief you would carry title to a certain inlet, or a certain estuary, and it was your responsibility to make sure that what was going on there was sustainable and "chief" in our language means "to serve." It means that you're there to maintain order of a house. So we had chiefs that had … they're responsible for a Raven House. And that house, they had to make sure people were keeping the songs alive, keeping the stories alive. You know, harvesting the different berries, or harvesting deer, and salmon, and things that hunters and gatherers harvested.

But they would also grant permissions to certain people to access certain areas, and that was all based on sustainability. So you had to make sure that the stocks were there, and if they weren't there, they would deny access to certain areas.

And we also had very complex arranged marriages as well, so if you wanted to access an area, today people just go on there and fish in an area. A long time ago it wasn't like that. You had to get very strict permission or it was often done through arranged marriage. So, if I was a chief and I wanted to access some else's area, you'd do an arranged marriage, and I would have access to their salmon, they would have access to my berries. So it wasn't just anybody that could go in. And that could get you in big trouble, I think, a long time ago if you just waltzed in there today and go and access certain areas. So I think that system, the hereditary system they used, a lot of that was lost during that time. Luckily we do have some Elders that still have some of that knowledge.

You know, I think the appetite of the time was really to assimilate First Nations people to mainstream society. And it started off with the governments and the church at the time banning things like the Potlatch and I guess just before the Potlatch, disease ran fairly rampant in our communities in around the 1860s.

I think at the time there was this huge movement to assimilate First Nations people into the mainstream society, so banning the Potlatch was a huge step in terms of trying to assimilate and get First Nations people to forget their culture, but prior to the banning of the Potlatch came disease. So disease ran rampant in all of our communities and we estimated we had a population of about 3,500 to 4,000 people out in Kitasoo Bay alone and disease swept through there around the 1860s and there was a smallpox epidemic that killed off quite a bit of the communities. In some cases it was like 99% of the communities. So we have some stories where one or two people survived the smallpox epidemic. Also around 1913, there was also the flu epidemic as well, and that decimated, again, quite large populations. I heard stories from our Elders where so many people died that they didn't really have time to give them a proper burial. It was just dig a big hole, put them in the ground, and hopefully you don't get sick. So I think those introduction of diseases played a huge role and a lot was lost.

So not just did we have to deal with smallpox and the flu epidemic, and the banning of the

Potlatch. Communities were still around in the early 1900s so the government started to introduce Reserve systems. They started to take First Nations nomadic people and started to push them all to these small parcels of Reserve and basically said "You're not going to live in these areas anymore." And they sort of pushed these people into small little blocks. So, my community was settled here in Klemtu and this is about 100 acres here in the community. It's not very big, but our community, our territory is massive because we followed all the foods and that's what our territory is based on today.

You know, unfortunately, now if you look at our system now, we only have about, we have less that 1% of our land base, if you were to go by their reserve system today. Although my people have always said they never signed a treaty. They've never surrendered rights and titles, so they've always said "this is theirs" and it's based on the chieftainship that's there.

So, it wasn't just all of those things – disease, the banning of the Potlatch. Another major event was residential schools. In the 1930s the government created these residential schools and basically, you know, we have some of the literature from the churches that said the banning of the Potlatch wasn't working – people were still speaking the language, people were still practicing their culture, whether that was being done in secret. So they needed some ways to really try and get people to forget their culture, forget their language, and become, to be assimilated into mainstream society, so the idea of residential schools was created.

There were boats that came into the community in the early 1930s and basically scooped up all the kids in the community and people had no choice, and they had to go and they were taken on the boats and they were taken out to schools, and they were spread out all over. A lot of people from Klemtu went down to Vancouver Island. And around Alert Bay area. Some people went down to Port Alberni. Some people from Klemtu went as far over as Edmonton in the 1930s. Some people went to Vancouver, to the mission school that was there. And the idea was to separate young people from their parents so that oral tradition wasn't passed on. And people, if you listen to the Elders who have gone through these residential schools, they were strapped for speaking their language. They had to cut their hair a certain way. The food quality wasn't good and there was a lot of other things that went on in the background that were not the best things to happen to young kids. And that really changed a whole generation of kids, because now you take a bunch of kids, you put them in these residential schools so that that love you get from your parents was not passed on throughout families and that had a trickle down generation, we still feel the effects today of that generation because some parents grew up without the parenting skills that you would learn from your parents.

Some people grew up with no love and that really affected households, families and communities, and so I think it's my generation, kind of the first generation, that are fortunate and hasn't had to deal with all of that stuff now, and I think things are a bit different today than they were back then. So I think you're going to start to see a bit of a resurgence of stewardship and I think you're going to get this new generation that's

going to come up and start to reassert their stewardship responsibilities, reassert their authority as hereditary chiefs, as owners, or stewards of the land. And I think that's something that we want to be able to work with provincial and federal governments. And we want to stop the mismanagement of these resources and we want to work together and somehow come out with some sort of strategy to best take care of these areas.

Lesson 2: Traditional Knowledge and Collaborative Research

Overview: Students will explore some examples of Traditional Knowledge pertaining to resource management from the Great Bear Sea region. They will be introduced to the concept of collaborative research and how this relates to sustainable planning, including types of knowledge that contribute to marine planning, such as traditional and local knowledge, and academic research.

Suggested Time: 2 sessions (75 minutes each)

*** Teacher Note:** Materials with a ***** are available on the Great Bear Sea USB, or at www.greatbearsea.net. Other seasonal rounds that may be available from your local community could also be incorporated into this lesson.

Materials and Resources:

- Computer, projector and screen
- Lesson 2 Film Clips:
  - Cultural Traditions (6 mins)
  - Collaborative Science (8 mins)
  - Traditional Knowledge (8 mins)
  - Intertidal Walk (10 mins) - *optional*
  - Chiefs Robe (2 mins) - *optional*
- Teacher Background – Lesson 2
- 2.1 Seasonal Harvest
- 2.2 Collaborative Research
- Haida Marine Seasonal Round *****
- Kwakwaka'wakw Seasonal Use Cycle *****
- Haida Ocean and Way of Life Brochure (*optional*) *****

Learning Objectives:

Students will:

1. Identify different types of knowledge, particularly Traditional Knowledge, and how these contribute to scientific research.
2. Explore specific examples of Traditional Ecological Knowledge from the Great Bear Sea region and identify seasonal harvest cycles.
3. Understand how research and information gathering can help inform decision making at the local and provincial levels.

Lesson Context

This lesson has students looking at some examples of Traditional Knowledge from the region of the Great Bear Sea, particularly around resource management and planning through seasonal rounds from the Haida and Kwakwaka'wakw Nations. Seasonal rounds or seasonal use cycles map the traditional knowledge of an area, displaying the when and what of harvesting around the seasons for a specific place.

The concept of collaborative research is also explored, specifically as it relates to the decision-making process around the future of the Great Bear Sea through the Marine Planning Partnership (MaPP). In this lesson, students watch a film clip that describes some of the innovative research taking place in the region, with partnerships between local communities, First Nations, and academic researchers. This research takes into consideration traditional and local knowledge, as well as academic research to help inform the decision-making process.

The **Teacher Background – Lesson 2** provides an overview of Traditional Knowledge (or Indigenous Knowledge), as well as the concepts of Traditional Ecological Knowledge (TEK) and collaborative research. Whereas TEK continues to be a fundamental aspect of Indigenous culture as it has been for thousands of years, it is only recently being recognized as integral to furthering the knowledge base of the scientific community and general public. The collaborative research modelled through the Marine Planning Partnership is an innovative approach to resource management in BC.

Learning Activities

Part A

Activity 1: Seasonal Rounds – Two Examples of Traditional Ecological Knowledge (45 minutes)

1. Project one of the **Seasonal Rounds*** (Haida or Kwakwaka'wakw) on the screen and have students share what they think it is:
    - First Nations depend on the oceans for sustenance.
    - Over thousands of years, communities have gathered knowledge around seasons and life cycles of species to better understand harvesting cycles. In the past (and still today), this knowledge and the passing of this knowledge from generation to generation was key to survival (for example, knowing when to collect food, how to preserve for months with little harvest potential, etc.).
    - Share the following quote with students, explaining that this is a common concept shared by many First Nations in BC: *When the tide is out, the table is set.*

- Seasonal rounds or seasonal use cycles map the Traditional Knowledge of an area, displaying the when and what of harvesting around the seasons for a specific place.

2. Divide students into small groups and provide half the groups with the **Haida Marine Seasonal Round*** and the other half with the **Kwakwaka'wakw Seasonal Use Cycle***. Provide each group with **2.1 Seasonal Harvest**. Tell the groups to imagine they are working at a restaurant in the region of the seasonal round, and they have been tasked with coming up with four "featured dishes" – one for each season. The dishes must consider the harvest available.

3. Have the groups share a dish with the rest of the class, explaining their selections (you may want to select a group to present, and ask them to share their dish from a particular season). As a group, discuss some other observations from the seasonal rounds. Some discussion questions may include:

   - What months seem to be most abundant in each region?
   - What months have sparse harvest opportunities? Can you think of some ways that communities could plan for this time?
   - Do you think that these seasonal rounds are static, or do they change? (Here is where you can present the idea that knowledge is cumulative – it grows over time).
   - Reiterate the importance of harvesting at certain times of the year and how managing resources is a critical step to ensure those resources are available for the future. When one thing changes in an ecosystem, other things (including humans) are impacted. Everything is interconnected.

Activity 2: Traditional Knowledge (30 minutes)

1. If it has not come up already, introduce the term Traditional Knowledge (see **Teacher Background – Lesson 2**), and ask students to explain what they think this means. It is important to recognize that Traditional Knowledge encompasses a vast and sophisticated system of knowledge, including stories (such as Underwater Bighouse, Story of Gitnuganaks from Lesson 1), values (such as, harvesting only what one can eat, process or distribute), governance systems (such as, where specific families or groups hold rights to marine harvests).

2. Explain to students that one particular type of Traditional Knowledge – the local knowledge First Peoples have about the natural world in their traditional environment – is sometimes referred to as Traditional Ecological Knowledge (TEK). Facilitate a discussion about TEK, and have students provide examples from their own local communities or what they have seen so far in the film clips (the seasonal rounds are one example). Some important points to reiterate:

   - TEK is local knowledge pertaining to the particular territories in which people

live, which has been (and continues to be) passed down from generation to generation. While First Peoples share some common values and worldviews, local knowledge captures the nuances and specifics of place, about local ecosystems, sustainable use of resources and the interconnectedness of all living and non-living things.

- TEK is knowledge about how to live and thrive in a particular place. For Indigenous peoples around the world (and First Peoples here in BC), TEK has allowed communities to flourish for thousands of years, with knowledge passed on from one generation to the next.

3. In their notebooks, have students note some examples of TEK as they watch the **Cultural Traditions** and **Traditional Knowledge** film clips, and discuss as a class.

4. Have students submit a reflective response to the following question: Describe one of the examples of Tradtional Knowledge or TEK explored today and explain how this knowledge could contribute to planning for the future.

Part B

Activity 1: Collaborative Research (75 minutes)

1. Share the following scenario with students:

   - It's time for you to buy a new cell phone. You need to use your cell phone for communicating via phone and social media platforms, making high resolution video for your part-time marketing job, and storing files for school that you can work on while on the go. You have a strict budget and the phone needs to last for a long time. What kind of information or research or people would you need to access to inform your thinking so you can make a decision about what type of phone to purchase?

2. In pairs, have students brainstorm all the information/research/people they would need to access and make a list. Share as a class and make a list on the board of student responses.

3. As a class, try to sort and classify the shared list. Consider the following points of discussion:

   - Simple data information, like costs, storage capacity, etc.
   - Statistical data information, like professional consumer guides showing trends over time, battery performance over time, etc.
   - Personalized information, like anecdotal evidence by friends or on the internet.

4. Reinforce that the more information you have, the easier it is to make an informed decision. You may also value information in different ways, in different situations.

5. Now have students work with a partner to discuss what different types of knowledge may be helpful in something related to the marine environment, such as where to plan a new ferry route, protecting salmon spawning habitats, etc. Again, have them create a list and then discuss as a class.

6. Write the term "collaborative research" on the board and have students brainstorm what they think this means (see **Teacher Background – Lesson 2** for more information). As a class, come up with a working definition of "collaborative research."

7. Provide each student with a copy of **2.3 Collaborative Research**. As they watch the **Collaborative Science** film clip, students should note some examples of the different types of knowledge being used to inform decision-making, as well as how the different aspects connect or collaborate.

8. After the clip, provide a few minutes for students to make notes. Have students discuss their answers with a partner, then share as a class.

9. Together as a class, return to your working definition for collaborative research and refine the definition as needed.

10. Have students submit a reflective response to the following question:
    - Think of another example where collaborative research may be used for planning or decision-making. How might it be used and how would it be helpful?

Extension Ideas

- During Part A of the lesson, show the additional footage **Intertidal Walk** and **Chiefs Robe**.
- If possible, provide the opportunity for students to make 1 or 2 of the featured dishes and share them with others in the school.
- Have students research and develop a seasonal round from your own region (or a region of their choosing).
- Provide students with a copy of the **Haida Ocean and Way of Life Brochure*** by the Council of the Haida Nation – Marine Planning Program, and have them research one or more of the species. Research how these organisms are connected to the Haida way of life.

Assessment Ideas

- Formatively assess students' engagement in group work and large group discussion.
- Collect **2.1 Seasonal Harvest, 2.3 Collaborative Research** and reflective responses.

Teacher Background – Lesson 2

Indigenous and Traditional Ecological Knowledge (TEK)

Thinking generally about these concepts, Indigenous or Traditional Knowledge refers to the vast, diverse and sophisticated body of knowledge of a group of peoples that has been generated over thousands of years, is passed down from one generation to another, and continues to evolve over time. It is knowledge that pertains not only to cultures and beliefs, but also physical space, environments and place. As noted by the Assembly of First Nations:

> "Although there is no universally accepted definition of "traditional knowledge", the term is commonly understood to refer to collective knowledge of traditions used by Indigenous groups to sustain and adapt themselves to their environment over time. This information is passed on from one generation to the next within the Indigenous group. Such Traditional Knowledge is unique to Indigenous communities and is rooted in the rich culture of its peoples. The knowledge may be passed down in many ways, including: storytelling; ceremonies; dances; traditions; arts and crafts; ideologies; hunting and trapping; food gathering; food preparation and storage; spirituality; beliefs; teachings; innovations; medicines."

The term Traditional Ecological Knowledge (TEK) is perhaps the most popular term used to refer more directly to the knowledge that First Peoples' have in relation to the natural world, and specifically the distinct ecosystems and landscapes in their traditional environments. Again, there is not a universally recognized definition of TEK, but in helping students understand this concept, the following points may be useful:

- TEK is local knowledge pertaining to the particular territories in which people live, which has been (and continues to be) passed down from generation to generation. While First Peoples share some common values and worldviews, local knowledge captures the nuances and specifics of place, about local ecosystems, sustainable use of resources and the interconnectedness of all living and non-living things.
- TEK is knowledge about how to live and thrive in a particular place. For Indigenous peoples around the world (and First Peoples here in BC), TEK has allowed communities to flourish for thousands of years, with knowledge passed on from one generation to the next.
- The environmental knowledge of generations about a specific local place is very important in the study of science, and thus TEK is used widely in various fields of science, such as resource management, climate change and sustainability.

It is important to recognize that Indigenous Knowledge or Traditional Knowledge does not just encompass ecological knowledge (TEK), but also a variety of other systems

of knowledge including (but not limited to) cultural, historical, economic, political and societal information belonging to a group of peoples. Consider some of these additional resources to learn more:

Appendix A: Interview with Doug Neasloss

Appendix B: Indigenous Knowledge

Assembly of First Nations Environmental Stewardship – Traditional Knowledge
www.afn.ca/uploads/files/env/ns_-_traditional_knowledge.pdf

First Nations Education Steering Committee Science First Peoples Resource
www.fnesc.ca/science-first-peoples

Traditional Ecological Knowledge Prior Art Database
http://ip.aaas.org/tekindex.nsf/TEKPAD?OpenFrameSet

World Intellectual Property Organization
www.wipo.int/freepublications/en/tk/920/wipo_pub_920.pdf

Collaborative Research

Contributed by Alejandro Frid - Science Coordinator/Ecologist Central Coast Indigenous Resource Alliance (27 April 2016). Do not duplicate without permission from the author.
www.alejandrofridecology.weebly.com/marine-resources-and-first-nations.html

Modern Indigenous people embrace new technologies and do not isolate themselves from contemporary culture and economy, yet maintain a tradition of deep interconnection with our non-human kin. Their gathering of edible and medicinal plants, their hunting and fishing, bring nourishment that not only is physical but also essential to sustaining worldviews that have been rooted in place for many generations. The implication is that habitat destruction and biodiversity loss are inseparable from the demise of cultural diversity, and therefore the rights of many human beings. Not surprisingly, Indigenous people have become conservation leaders in many parts of the world. Their efforts to conserve the ecosystems that sustain their traditional foods — mainly through protected areas that exclude large-scale exploitation — could make ecosystems more resilient to climate change and other stressors.

In the Central Coast of British Columbia, the Heiltsuk, Kitasoo/Xai'xais, Nuxalk, and Wuikinuxv First Nations have joined forces to proactively manage their resource, fostering collaborative research between scientists and holders of traditional knowledge. The elements of this collaboration are complementary.

On the one hand, science tests for explicit mechanisms that might affect ecological communities — such as fisheries and climate change — and uses empirical findings to

predict future conditions. Yet science often occurs in short spurts and in few places, suffering from short-term, narrow perspectives that limit understanding.

In contrast, Indigenous Knowledge derives from cumulative and collective observations made by many generations of people who are connected to the resources of vast ecosystems. Oral traditions preserve this knowledge as Indigenous laws and stories that transcend many limitations of science.

In concert, science and traditional knowledge can merge the holistic and long-term perspectives of Indigenous people and the predictive abilities of science. The potential result is a stronger foundation for conservation and resource management policies.

Name:_____

2.1: Seasonal Harvest

Record your "featured dishes" for each season below. Dishes can be breakfast, lunch or dinner. Be creative and ensure dishes use the harvest of the season (or explain if you are using food from other seasons and how it would be available).

Region of Seasonal Round: _____

Summer
Autumn
Winter
Spring

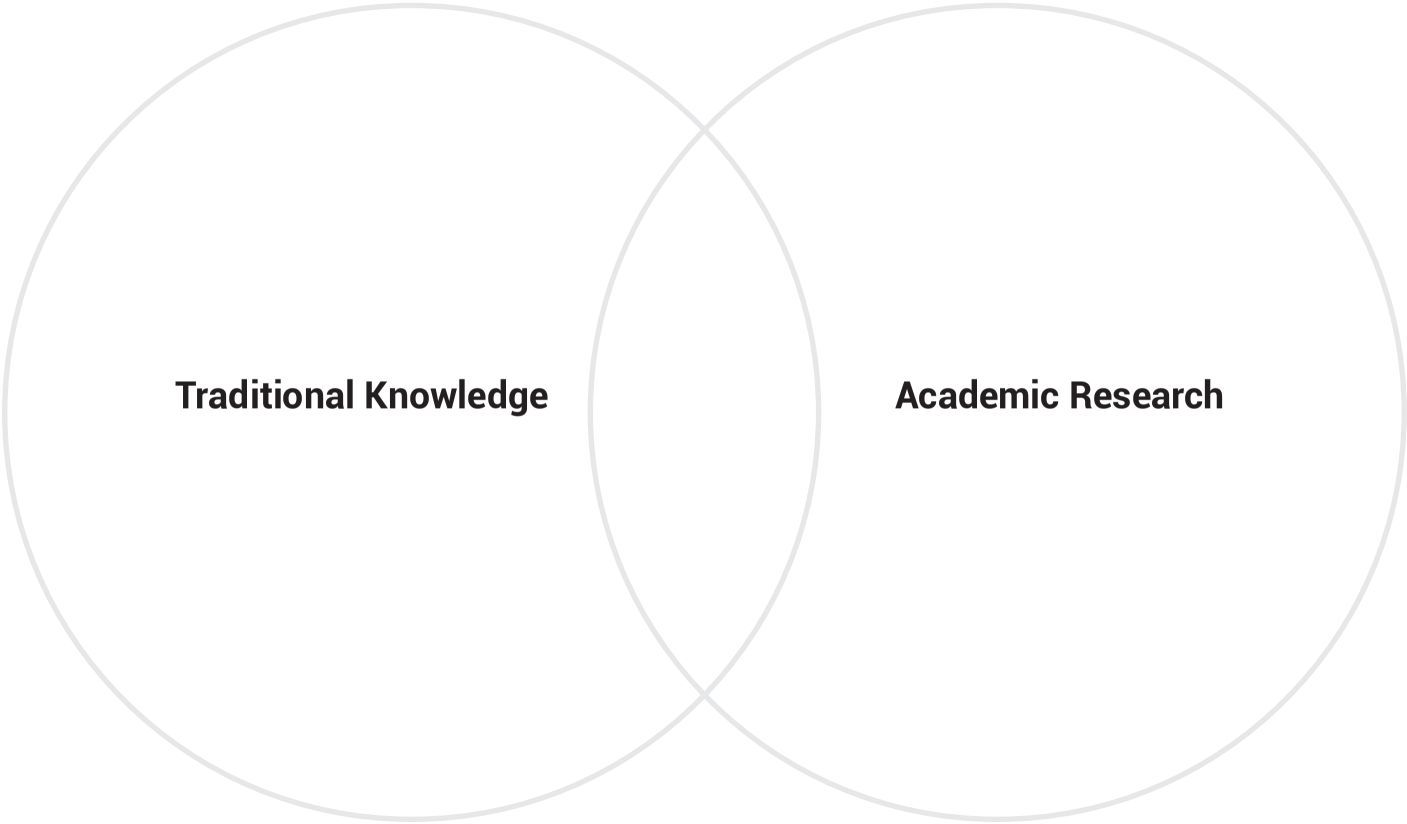
What is the easiest season to plan for? The hardest?

Describe 3 interesting observations from the seasonal round:

List 3 questions you have after looking at the seasonal round:

Name:_____

2.2: Collaborative Research



Lesson 3: Great Bear Sea Case Studies

Overview: In small groups, students will explore case studies of current activities and research going on in the Great Bear Sea region. Students report out the case study findings to their peers using a jigsaw strategy.

Suggested Time: 2 classes (75 minutes each)

*** Teacher Note:** Materials with a ***** are available on the Great Bear Sea USB, or at www.greatbearsea.net.

Materials and Resources:

- Personal viewing devices (tablets, computer lab access, etc.)
- Teacher Background – Lesson 3
- Great Bear Sea Case Studies
  - ¤ Case Study 1: Kelp Forest
    - Otter Kelp Research (8 mins)
    - Case Study 1: Kelp Harvest Data
    - Kelp Research Images *****
  - ¤ Case Study 2: Bears
    - Bear Research (5 mins)
    - Case Study 2: Bear Data
    - Bear Images *****
    - Bear Identification *****
  - ¤ Case Study 3: Pacific Herring
    - Herring Research (21 mins)
    - Case Study 3: Pacific Herring Research
  - ¤ Case Study 4: Cumulative Effects – North Coast
    - Cumulative Effects (20 mins)
    - Eelgrass (8 mins)
    - Case Study 4: Cumulative Effects – North Coast
  - ¤ Case Study 5: Clam Gardens
    - Clam Gardens (2 mins)
    - Case Study 5: Clam Gardens
    - Kwakwaka'wakw Seasonal Use Cycle *****

- 3.1 Great Bear Sea Case Studies
- 3.2 Self-Assessment Checklist
- 3.3 Group Assessment Checklist

Learning Objectives:

Students will:

1. Explore and identify local place-based examples of research, resource management and resource planning.
2. Explore different examples of collaborative research and identify use of different knowledges in marine-planning.
3. Interpret the local environment through analyzing information and data.
4. Use scientific and inquiry processing skills to analyze information, critique environmental questions, and draw conclusions.
5. Develop processes for working together and communicating findings with others.

Lesson Context

Part A of this lesson introduces students to some of the collaborative science that is taking place in various areas of the Great Bear Sea region. In small groups, students will work with a particular case study (combination of film clips, background information and research data) showcasing scenarios that are currently underway in the Great Bear Sea. In their groups, students will provide a synopsis of the case study and answer some guiding questions. **Part B** has students forming new groups and sharing their learning with others. Using a jigsaw approach, students get exposure to multiple examples of collaborative research methodologies focusing on sustainable resource management and marine planning.

This structure assumes that student groups have access to technology to view the film portion of their case studies as a small group (on devices in the classroom or in a computer lab). Depending on your circumstances, students could watch the film clips at home or the class could watch all the film clips together and then break off into groups thereafter to explore the additional materials and plan their presentations. For watching at home, the clips are available on the website: www.greatbearsea.net. Clips on the website are Youtube links, so these can be embedded into your own class website and/or online learning space, with additional instructions for students, opportunities for sharing comments between students and groups, etc.

The **Teacher Background – Lesson 3** provides an overview of the 5 case studies.

Learning Activities

Part A (1 class session + individual viewing time, where needed)

Activity 1: Exploring Great Bear Sea Case Studies (75 minutes)

1. Review some key aspects of "collaborative research."
2. Divide the class into 5 groups and provide each student with a copy of **3.1 Great Bear Sea Resource Management Case Studies** and review as a class.
3. Provide each group with one of the case studies and explain that as a group they should work through the questions, but each student should prepare a written version of **3.1 Great Bear Sea Resource Management Case Studies** in order to share their learning with other students the following day.
4. The **Teacher Background – Lesson 3** includes answers to the data research questions for Case Studies 1 and 2.
5. Ensure students have completed their own version of **3.1 Great Bear Sea Resource**

Management Case Studies in preparation for the next class.

6. Provide each student with a copy of **3.2 Self-Assessment Checklist** and each group with a copy of **3.3 Group Assessment Checklist** and have students/groups complete them now or later in the lesson.

Part B

Activity 1: Sharing Great Bear Sea Case Studies (60 - 75 minutes)

1. Using a jigsaw pattern, have students form new groups so that there are representatives from each of the 5 case study groups. Have each student (or multiple students) from the particular case study groups share their learning with others, using their completed **3.1 Great Bear Sea Resource Management Case Studies** as a guide.
2. Student groups may wish to keep an eye on the presentation time for each case study representative(s) to allow for ample time for all to share.
3. Those listening should prepare 1 question and 1 comment for the presenter to address after they share. You may wish to structure this in a different way to ensure active, respectful listening and engagement by all group members.

Activity 2: Class Discussion – Collaborative Research in the Great Bear Sea (20 minutes)

1. Facilitate a class discussion to address any questions that arose in small groups that may not have been answered. Have others contribute to responses.
2. Have students note 2 - 3 questions about an area of interest after hearing about all of the case studies.
3. Have each case study group make a recommendation for further research about the featured resource in their particular case study. You may wish to collect these as exit slips at the end of the class.

Extension Ideas

- Use student questions and areas of interest to fuel personal inquiry studies at the end of this unit.
- Provide students with access to watch the other case study clips based on personal interests. The film clips can be accessed through the website at www.greatbearsea.net; as the clips are accessible via YouTube, you may also wish to embed them on your own website, along with discussion questions, etc.

Assessment Ideas

- Formatively assess students' engagement in group work and large group discussion. You may wish to develop a class rubric for active and respectful listening.
- Collect **3.1 Great Bear Sea Resource Management Case Studies** and **3.2 Self-Assessment Checklist** for each student, and **3.3 Group Assessment Checklist** for each group.

Teacher Background – Lesson 3

There are 5 case studies presented in this lesson, each looking at different species and/or approaches to resource management and planning in the Great Bear Sea. The case studies have been prepared so that students can review the materials for information and summarize the findings using **3.1 Great Bear Sea Resource Management Case Studies**. Some case studies also include data and research questions so that groups can analyze the data and attempt to answer the questions.

Brief summaries of each case study are provided below. It is also recommended that you review the case study materials and film clips.

Case Study 1: Kelp Forests

This case study includes a film clip about kelp forests, as well as background information and research data from Kira Krumhansl, Postdoctoral Researcher at Simon Fraser University and Hakai Institute. The film clip explores the delicate relationship between kelp and sea urchins, with urchins having the capability to control the diversity, distribution and productivity of entire kelp forest ecosystems. Any force acting on these kelp forests can tip the balance of this delicate ecosystem. The research data looks specifically at the impacts of harvesting kelp.

This research data includes some questions for students to analyze. Questions and answers are provided here:

> **Question One:** Did kelps grow back at the same rate at each site? Find the average growth rate at each site. What is the range of the average kelp growth rate for each site?
>
> **Answer:** No, kelps grew back at different rates across sites. The average growth rates are: Golden 0.053; Meay 0.53; Simonds 0.62; Strykeer 0.045; Triquet 0.009 m per day (i.e. surface canopy growth per day). The range of growth rates was 0.009 (Triquet)-0.062 (Simonds) m per day.
>
> **Question Two:** Is the water temperature the same at each site? What is the range of average water temperatures? What is the average water temperature?
>
> **Answer:** No, the average water temperature varied among the fives sites. The average temperatures ranged from 11.96 (Simonds)-12.70 (Triquet)°C. The average temperature among the five sites was 12.32°C.
>
> **Question Three:** Is the kelp density the same at each site? What is the average kelp density?
>
> **Answer:** No, the average kelp density ranged from 0.15 (Meay)-0.49 (Triquet) kelps m^{-2} (i.e. how many kelps there are per meter of ocean bottom). The average kelp density (rounding to the nearest ten thousandths) among the five sites was 0.4005 m^{-2} (per meter of ocean bottom).

Question Four: Does the water temperature influence how quickly kelps regrow?

Answer: Yes, kelp re-growth rate decreased at higher average water temperature.

Question Five: Which factor out of those you considered do you think was most important in determining kelp recovery rates? What implications does this have for harvest?

Answer: Temperature was the most important variable determining kelp regrowth rates. Climate change is expected to cause increases in water temperature, which may impact the ability of kelps to recover from harvest in the future. Harvest managers should consider monitoring water temperatures in association with harvest so that they can reduce or avoid harvesting during years with warm water.

NOTE: Permission was granted to use the data in the context of this lesson. The data are not available for publication or use outside of the classroom.

Case Study 2: Bears

This case study includes a film clip from *Bear Witness*, as well as background information and data supplied by researchers with the Spirit Bear Research Foundation. The Spirit Bear Research Foundation is a collaboration between the Kitasoo/Xai'xais First Nation and conservation scientists conducting locally relevant, ecosystem-based wildlife research to address pressing conservation concerns in BC's Great Bear Rainforest.

The research data includes questions for students to analyze about the monitoring and movement of bears using non-invasive methods to see which bears are around, how they are moving across the territory and how much salmon they have been eating.

Questions and answers are provided here:

Question 1: What do you notice about the diet of these bears? What species eats the most salmon? What bear eats the least salmon?

Answer 1: There is individual variation. Least is a female black bear that eats 3% salmon. Most is a male grizzly that eats 88% salmon.

Question 2: Which species eats more salmon? Calculate the averages, for example, on average how much salmon to grizzly bears eat vs black bears. Why?

Answer 2: Grizzly bears (average 72) eat more salmon than black bears (average 23).

Question 3: Does the gender of the bear make a difference to salmon consumption? Why or why not?

Answer 3: Males eat more salmon (52 average) than females (35 average). Also, the group can talk about the difference between proportion and amount. Why do you think males eat more salmon?

NOTE: Permission was granted to use the data in the context of this lesson. The data are not available for publication or use outside of the classroom.

Case Study 3: Pacific Herring

This case study includes a film clip and background information about collaborative research looking at the Pacific herring from the Herring Research Team in Klemtu, BC. The research is a partnership between the Central Coast Indigenous Resource Alliance, Simon Fraser University, and the people living in this region.

The Pacific herring is an extremely important species in the ecosystem. It is a food source for a wide variety of other species in the ecosystem, including whales and salmon, as well as land-based species like wolves and bears that come to the shoreline to feed when herring are spawning. It also is very important from a cultural perspective for many First Nations.

Changes in herring spawning behaviours and populations is a very important issue for First Nations communities. If herring change spawning behaviour this can have drastic consequences on the ecology of the area and the livelihood of those in the region.

Case Study 4: Cumulative Effects – North Coast

This case study includes two film clips and background information highlighting a groundbreaking new approach to how to look at the impacts of development in a region. This approach is being used on the North Coast, specifically in the region of the Skeena River and estuary, and it looks at the "cumulative effects" of ongoing development in the region. This means that rather than looking at one project at a time, the proposed development projects are being looked at together to see what cumulative effects the projects may have on both ecosystem and the people who live in the region. Some of these projects include forestry, fisheries, pipelines to feed liquefied natural gas (LNG) plants, LNG refineries and wind power mega-projects. Cumulative effects are basically the combined effects of past, present and future activities on a region and the things that people care about for ongoing sustenance and survival in a region.

The Cumulative Effects Monitoring Initiative is led by Environment Canada and Climate Change, and includes input from various stakeholders, including the First Nations along this coast: Gitga'at First Nation, Gitxaała First Nation, Haisla First Nation, Kitselas First Nation, Kitsumkalum First Nation, Metlakatla First Nation.

The first film clip provides an overview of multiple cumulative effects initiatives underway in the region, including the Cumulative Effects Monitoring Initiative, while the second clip looks specifically at eelgrass ecosystems. The clips provide information for students to analyze.

Case Study 5: Clam Gardens

This case study includes a film clip provided by Dr. Anne Salomon, and shared with

permission here. The film clip details some of the research occurring on North Vancouver Island just off the coast of Quadra Island, in the Great Bear Sea. This research is led by Dr. Salomon at Simon Fraser University.

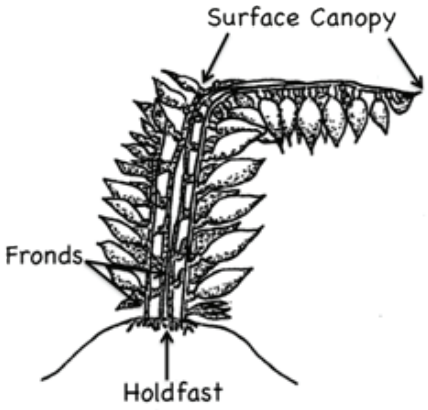
The case study also provides Traditional Ecologicial Knowledge, provided by the Member Nations of the Nanwakolas Council (North Vancouver Island) through an excerpt from the Ha-ma-yas Marine Plan, about the Nations in this region and the significance of the clam gardens. Clams were and are a vital food source of many First Nations in BC. Clam gardens are prehistoric rock walls that were made thousands of years ago. Elders share that rocks were rolled down to the shoreline at low tide and placed to form walls in the hopes of increasing the productivity of clams.

Case Study 1: Kelp Harvest Data

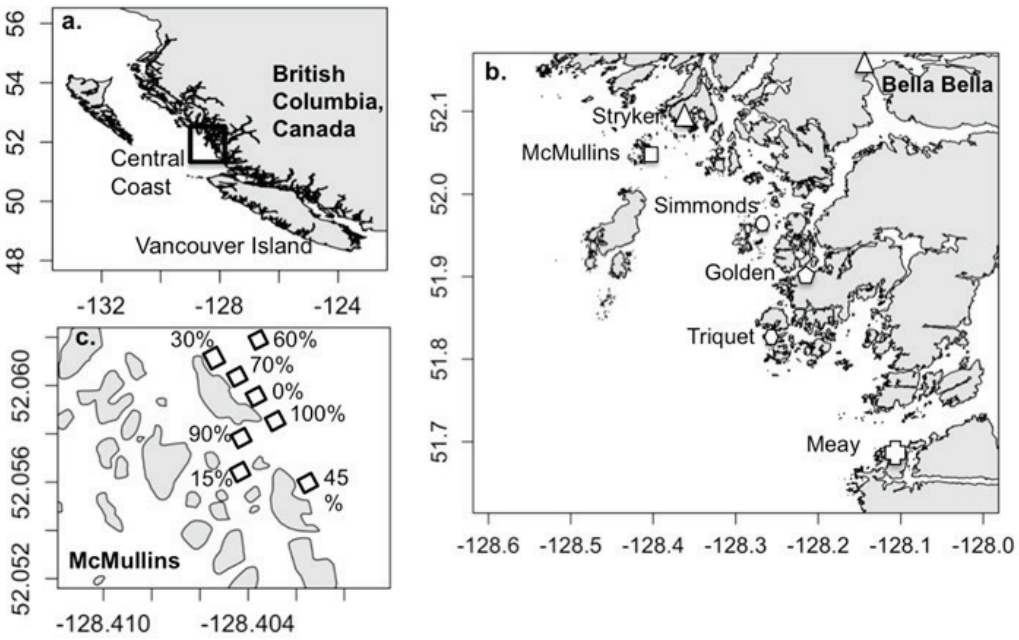
This information and data was submitted by Kira Krumhansl, Postdoctoral Researcher at Simon Fraser University and Hakai Institute. In collaboration with the Heiltsuk First Nation, researchers at Hakai Institute and Simon Fraser University conducted a kelp research project, looking closely at kelp harvesting, to see if kelp can be taken from the ecosystems without having a negative impact on other species in the ecosystem or on the carbon storage abilities of the kelp.

Background: Giant kelp (Macrocystis pyrifera) is the fastest growing primary producer on the planet. This species has been harvested by First Nations on the coast of British Columbia for millennia, and is still being used to collect herring eggs in the spring for subsistence and commercial fisheries (i.e. spawn on kelp fishery). Giant kelp is also being considered for other commercial uses, such as the production of fertilizers, food additives, and cosmetics. Before commercial harvests begin for these purposes, the Heiltsuk First Nation worked in collaboration with researchers at the Hakai Institute and Simon Fraser University to investigate how quickly the kelp recovers from harvest, and what factors influence how quickly kelp recovers. This information helps Heiltsuk Research Managers to determine whether commercial kelp harvesting is a sustainable activity, and if so, how best to manage it.

The basic anatomy of giant kelp is shown in the diagram below. Giant kelps are anchored to the substrate via a root-like structure known as a **holdfast**. Each holdfast has multiple stems or **frond** that grow up through the water column towards the surface of the water. Once the frond reaches the surface, it grows along the surface to form a **surface canopy**. This surface canopy is where most of the kelp's photosynthesis occurs, and is visible from a boat (maybe you've seen one!). Harvesting involves cutting the surface canopy portion of the kelp.



We harvested kelps at 5 sites on the Central Coast of BC near Bella Bella in 2014, where plots that measure 30 by 30 meters were set up as the study area (see the site maps below). We harvested kelp (involves cutting the surface canopy portion of the kelp) and measured how quickly the kelp regrew (meters of canopy growth per day). We were interested in understanding what factors influence how quickly the kelps regrow following harvest such as water temperature and the density of the kelp.



Some of the questions we were interested in were:

Would larger kelp individuals regrow more quickly (compared to smaller kelps)? Would kelps grow back more quickly when they are in sparse kelp beds or dense kelp beds? Does the water temperature influence how quickly kelps regrow?

To answer these questions, we measured the water temperature at each site (°C), the initial size of each harvested kelp before harvest (surface canopy length in meters), and the density of kelps at each site (kelps m^{-2}, i.e. how many kelps there are per meter of ocean bottom). We did an analysis of the data to investigate which factor was most important. What can you see in the data provided? Try to answer these questions for yourself:

Question 1: Did kelps grow back at the same rate at each site? Find the average growth rate at each site. What is the range of average growth rate for each site?

Question 2: Is the water temperature the same at each site? What is the range of average water temperatures? What is the average water temperature at each site?

Question 3: Is the kelp density the same at each site? What is the average kelp density?

Question 4: Does the water temperature influence how quickly kelps regrow?

Question 5: Which factor out of those you considered do you think was most important in determining kelp recovery rates? What implications does this have for harvest?

Table: Kelp Harvest Data

Site	Average Water Temperature (^{0}C)	Kelp Density at Site (m^{-2})	Initial Kelp Size (m)	Kelp Growth Rate (m per day)
Golden	12.4	0.336111111	10.9	0.066666667
Golden	12.4	0.336111111	6.4	0.050520833
Golden	12.4	0.336111111	10.9	0.067708333
Golden	12.4	0.336111111	6.4	0.028125
Golden	12.4	0.336111111	3.8	0.049479167
Meay	12.12	0.147222222	9	0.065306122
Meay	12.12	0.147222222	5.4	0.041836735
Meay	12.12	0.147222222	7	0.051020408
Simonds	11.96	0.233333333	7.6	0.067368421
Simonds	11.96	0.233333333	2.15	0.052631579
Simonds	11.96	0.233333333	4.4	0.043157895
Simonds	11.96	0.233333333	2.05	0.046315789
Simonds	11.96	0.233333333	7.3	0.101052632
Stryker	12.425	0.463888889	4.85	0.012121212
Stryker	12.425	0.463888889	7	0.046969697
Stryker	12.425	0.463888889	3	0.055050505
Stryker	12.425	0.463888889	2.8	0.074242424
Stryker	12.425	0.463888889	2.5	0.034343434
Triquet	12.702	0.486111111	4	0.007368421
Triquet	12.702	0.486111111	4.7	0.004210526
Triquet	12.702	0.486111111	6.05	0.011578947
Triquet	12.702	0.486111111	5.95	0.013684211

NOTE: Permission was granted to use the data in the context of this lesson. The data are not available for publication or use outside of the classroom.

Case Study 2: Bear Data

This information and data was submitted by Rosie Child – Field Technician, University of Victoria and Spirit Bear Research Foundation. See more information at www.spiritbearfoundation.com. Spirit Bear Research Foundation is a collaboration between the Kitasoo/Xai'xais First Nation and conservation scientists conducting locally relevant, ecosystem-based wildlife research to address pressing conservation concerns in British Columbia's Great Bear Rainforest.

We monitor bear populations and movement using non-invasive methods to see which bears are around, how they are moving across the territory and how much salmon they have been eating. We monitor the bears through remote cameras that show us when bears are around and how they are moving through the territory. We collect hair samples by using either a snag station (a corral built out of barbed wire) or use a rub tree (an existing rub tree that we wrap with barbed wire). The spring is the best time to collect samples as the bears are just waking up and are shedding hair from last fall. We track the bear movement and we use stable isotope analysis to tell us the proportion of the bear's diet that is salmon, marine mammal or plant based.

When identifying bears from the remote camera footage, it is best to use multiple characteristics such as colour, size, shoulder hump, face shape, and ear size. People often assume that black bears are black and that grizzly bears are brown. Grizzly bears are usually brown but can be very light to very dark in colouring. Black bears are usually black but can also be white, blue, cinnamon, or brown.

Colour

- Grizzly bears are usually brown and black bears are usually black, but there is lots of variation so colour is not the best way to identify bears.

Size

- Adult grizzly bears are usually larger than adult black bears but females and young bears are smaller and make size unreliable.

Shoulder Hump

- Grizzly bears have a prominent shoulder hump that is a mass of muscle that helps them dig.

Face Shape

- Black bears have a straight face profile, while grizzly bears have a more dished face profile.

Ear Size

- Black bears have taller ears in proportion to their head than grizzly bears shorter rounded ears.

Claws

- Grizzly bears have longer front claws that are usually lighter than black bear claws.

Table: Bear Data

The data below was collected during 2012, 2013, and 2015 during the spring and fall. What can you see in the data provided below? Try to answer these questions for yourself:

Question One: What do you notice about the diet of these bears? What species eats the most salmon? What bear eats the least salmon?

Question Two: Which species eats more salmon? Calculate the averages, for example, on average how much salmon do grizzly bears eat vs black bears. Why?

Question Three: Does the gender of the bear make a difference to salmon consumption? Why or why not?

Season	Year	Bear	Species	Sex	Salmon
spring	2014	25721	grizzly	female	0.634
spring	2014	23534	grizzly	female	0.594
spring	2014	14642	grizzly	female	0.617
Spring	2014	28132	grizzly	female	0.632
Spring	2014	10911	grizzly	female	0.637
Spring	2014	25852	grizzly	female	0.658
Spring	2014	10466	grizzly	female	0.671
Spring	2013	10680	grizzly	female	0.704
Spring	2013	10466	grizzly	female	0.705
Spring	2012	10911	grizzly	female	0.738
Spring	2014	23860	grizzly	female	0.746
Spring	2012	10667	grizzly	female	0.757
Spring	2012	10992	grizzly	male	0.827
Spring	2012	10567	grizzly	male	0.88
Spring	2012	10663	grizzly	male	0.636
Spring	2012	139903	grizzly	male	0.718
Spring	2012	10853	grizzly	male	0.736
Spring	2012	10981	grizzly	male	0.744
Spring	2012	10640	grizzly	male	0.744
Spring	2012	10303	grizzly	male	0.758
Spring	2012	10665	grizzly	male	0.809
Spring	2012	149691	grizzly	male	0.81
Spring	2012	10786	grizzly	male	0.812
Spring	2013	14256	black	female	0.035
Spring	2012	10936	black	female	0.037
Fall	2014	25723	black	female	0.052

Season	Year	Bear	Species	Sex	Salmon
Spring	2014	10646	black	female	0.07
Spring	2013	13723	black	female	0.071
Spring	2013	11706	black	female	0.074
Spring	2013	23452	black	female	0.084
Spring	2012	10646	black	female	0.103
Fall	2014	14837	black	female	0.254
Spring	2014	28476	black	female	0.449
Spring	2012	10635	black	female	0.032
Spring	2012	10602	black	female	0.036
Spring	2014	28080	black	female	0.039
Spring	2012	10585	black	female	0.046
Spring	2014	26964	black	female	0.167
Spring	2014	26396	black	female	0.172
Spring	2013	11497	black	female	0.309
Spring	2014	26999	black	female	0.471
Spring	2012	10598	black	male	0.195
Spring	2012	10320	black	male	0.225
Spring	2012	10592	black	male	0.342
Spring	2012	10820	black	male	0.344
Spring	2012	10429	black	male	0.406
Spring	2012	10622	black	male	0.422
Spring	2012	10607	black	male	0.043
Spring	2012	10603	black	male	0.079
Spring	2012	10714	black	male	0.266
Spring	2012	10484	black	male	0.351
Spring	2012	10533	black	male	0.517
Spring	2012	10526	black	male	0.586

NOTE: Permission was granted to use the data in the context of this lesson. The data are not available for publication or use outside of the classroom.

Case Study 3: Pacific Herring

This information was contributed by Kitasoo/Xai'xais First Nations, Alejandro Frid (Science Coordinator with the Central Coast Indigenous Resource Alliance) and several researchers from Simon Fraser University including Markus Thompson (Masters of Resource in Environmental Management) and Dan Okamoto (Postdoctoral Researcher) about the collaborative research happening in the Great Bear Sea region looking at the Pacific herring from the Herring Research Team in Klemtu, BC. The research is a partnership between the Central Coast Indigenous Resource Alliance, Simon Fraser University, and the people living in this region.

The Pacific herring is an extremely important species in the ecosystem. It is a food source for a wide variety of other species in the ecosystem, including whales and salmon, as well as land-based species like wolves and bears that come to the shoreline to feed when herring are spawning. It also has a very important from a cultural perspective for many First Nations on the coast.

Markus Thompson and his team are collaborating with Central Coast First Nations to look at recent changes in the behavior of herring. Pacific herring typically spawn in the shallow, the intertidal, where they can often be seen on the shoreline at low tide. But recently, spawn kelp fishers have been noticing that the herring have been spawning in deeper waters, at depths as deep as 30 or 40 meters below the surface, which is really uncharacteristic. It's not something that researchers or local fishers have seen before. There are a number of reasons and hypotheses around why this might be happening. And there are a number of consequences that could result in deeper spawning herring, so this is an important phenomenon and behaviour change to be researching given how important the Pacific herring are to the region and the whole ecosystem.

Some of the hypotheses about why the spawn is deeper include:

- The deeper spawning may be temperature induced due to increased temperatures with climate change or El Niño. The herring may be diving deeper to find colder water that they are more accustomed to.
- The deeper spawning may be an attempt to get away from predators that are in the area, or to move away from marine vessel traffic.

Some of the consequences of deeper spawning may include:

- In shallow waters there is a surface current to help with movement needed to fertilize the eggs. At deeper water levels, there is less current. Could that mean less eggs are being fertilized and thus less herring with be produced?
- Because not a lot is known about Pacific herring (how they move, behave, etc.), more has to be learned about the change in behaviour to understand how much can be safely harvested given the potential for less fertilization.

Collaborative research is very important in a situation like this, where local knowledge is very important to understanding behaviour change and the key places to collect data.

The First Nations in the region can share their observations from fishing the areas

their entire lives, including the changes they have observed over time. Local fishermen lead the researchers to the key areas in the region where spawning is taking place, and particularly where the deep spawning is happening and when it is safe and productive to travel to these regions to collect data. For example, when the wind is blowing too hard, it would be impossible to collect reliable data.

As Markus Thompson describes in the film:

> *"Tomorrow we're going to head out into Kitasoo Bay, and we're going to set up an experiment to test how depth affects herring eggs. And to do this we're going to place eggs that we harvest from the natural spawn to three different depths in the bay. So we're going to put them at 30 meters, at 15 meters, and at 3 meters. To do this we going to have to have two dive crews out there. One dive crew is going to be harvesting while the other dive crew is collecting the stuff from harvesters and putting it into these pre-constructed frames, and those frames will be lowered from the surface to the bottom, and we will collect those eggs at different intervals. So, I collect them just before they hatch, and then I preserve them, bring them back to the lab and I can examine them with a microscope and see how well they survived, or if a lot of them have died. And we'll also have temperature, salinity and dissolved oxygen loggers on those systems."*

As Alejandro Frid describes in the film:

> *"What's rather exciting about all this work that I'm involved in is that it's not someone with an academic background like me coming into a place and bringing my own ideas, and just making my own moves, and making decisions as if I knew any better. It's about listening to people who have been living in place for many generations, have a very long-term perspective, who have an intimate relationship with their resources that nourished them culturally and as well economically, nutritionally, and saying: "Hey! We're noticing these changes. We understand a lot of this from our own perspective, but what can you as a scientist bring to round out our understanding better?" And that's a very enriching experience because it is the synergy of the old traditions and all of their wisdom. And new tools that science can contribute. It just complements our understanding as well. And it's very gratifying when requests for scientific research comes from the First Nations themselves."*

And as Clark Robinson Sr, Hereditary Chief, Kitasoo/Xai'xais Nation describes in the film:

> *"We need to make sure to respect the area, not to ruin it for the future. Make sure that we have enough going around there, for all of them. Not to overtake. Not to waste. Not to be disrespectful to any of the animals. They're all there to feed as well as we're going to feed ourselves. Make sure that we're looked after well with whatever we have left there for the herring."*

This research builds on First Nations Traditional Knowledge and the tools science can provide to better inform planning for years to come.

Case Study 4: Cumulative Effects – North Coast

The "cumulative effects" approach being used on the North Coast, specifically in the region of the Skeena River and estuary, is a groundbreaking new way of looking cumulatively at all of the impacts of development on a region. This means that rather than looking at one project at a time, the proposed development projects are being looked at together to see what cumulative (added all together) effects the projects may have on both ecosystem and the people who live in the region. Some of these projects include forestry, fisheries, pipelines to feed liquefied natural gas (LNG) plants, LNG refineries and wind power mega-projects. Cumulative effects are basically the combined effects of past, present and future activities on a region and the things that people care about for ongoing sustenance and survival in a region.

There are several cumulative effects initiatives happening in the region, including the Cumulative Effects Monitoring Initiative, led by Environment Canada and Climate Change, and includes input from various stakeholders, including the First Nations along this coast: Gitga'at First Nation, Gitxaała First Nation, Haisla First Nation, Kitselas First Nation, Kitsumkalum First Nation, Metlakatla First Nation.

In the Cumulative Effects film clip, **Rina Gemeinhardt (Environment, Lands and Referrals, Kitsumkalum First Nation)** and **Nicole Wallace (Consulting Biologist, Kitsumkalum First Nation),** explain how the North Coast region, and particularly the area along the Skeena River and the Skeena River estuary, is going through a period of very intense development. Many outside groups are wishing to move forward with development plans in the region, including projects such as natural gas pipelines, refineries, wind power plants and all the increased marine traffic (tankers and vessels) that accompany this development. Rina and Nicole stress the need to look at all the projects together, and to think about the impact that a lot of development happening at the same time will have on the area and ecosystem as a whole.

As **Bruce Watkinson (Marine Program Coordinator, Gitxaala Environmental Monitoring)** describes it in the film:

> *"Well, when they start having two, or three, or four, or five of these projects, the additive effect, the cumulative effect, of those projects, it needs to be examined. Both in a short-term perspective and, more importantly, I think, in a long-term perspective. What effects are these projects, as a group as a whole, what effect are they having on our environment and our resources? And our culture."*

From the Metlakatla First Nation perspective, **Taylor Zeeg (Advisor, Cumulative Effects Management Initiative, Metlakatla Stewardship Society)** shares this observation:

> *"Basically, cumulative effects are the combined effects of past, present, and future activities on the things that people care about. In our case it's what the Metlakatla membership cares about. So the starting point for us was going through a process to understand the priorities of the membership given the development context within the territory.*

One of the Metlakatla priorities is, we called it "food, social, and ceremonial activity." We loosely define that as hunting, fishing, gathering, social events, cooking, eating. So it's a broad spectrum of things. And trying to understand to what degree people are participating in these activities. And is that level of participation being negatively or positively affected by the development activity that we're seeing in the area.

So, that would have been something that sort of fits in the cultural category, but in the case of at least Metlakatla First Nations it has implications for health, economy, and social well-being as well.

Metlakatlas have always taken economic development very seriously, but it's always been said "never at the expense of stewardship." So there's all this stuff happening and the environmental assessment process tends to be focused on a single project. The process wasn't well suited to address the relationship amongst different projects and the effects that can result. That's where Cumulative Effects steps in."

From the Gitxaala First Nation perspective, **Caroline Butler (Heritage Research Coordinator, Gitxaala Environmental Monitoring)** shares this observation:

"So working with community members and working in collaboration with other nations, we have identified a long list of values. Gitxaala people harvest probably close to 100 different species from the territory. So, we've identified species of concern. We've identified critical habitats. We've identified cultural values. And, it's a case now of creating the indicators for being able to monitor those values and the impacts on them.

So, wake, for example. The community members have a lot of concern about the impacts of a wake from tanker traffic. So, for harvesters out in a small speedboat, what that means to their safety, what that means to their gear, what it means to the species on the beach, the clam beds, what it means to boats on the beach, and people on the beach. What it means to the marine archeological sites, the coastal archeological sites. So looking at the speed of the vessels and the size of the wake, the consistency of those impacts over time as the traffic increases, and how that can be managed, or mitigated, or stopped.

This is a really important time. And it's an important time for everyone to be really diligent about what happens here. There's been a lot of change here, and a lot of impacts over the last 150 years, but people have been able to maintain their way of life, and protect their territory, and protect their culture, but this is a different level of threat. So, it's really important to plan it well, and trace out all the potential impacts, and some of them are clearer. Like clear out the eelgrass. There are very clear, ecological impacts to that loss of habitat. But, what's more difficult to trace out, but equally important, is to understand how the population increase, the rise in the price of housing, the increased traffic, the size of the wake down Principe Channel, what that means to how people feel about their territory. How they are able to manage the resources."

Case Study 5: Clam Gardens

Clams were and are a vital food source of many First Nations in BC. The film clip details some research occurring in the Great Bear Sea. This research is led by Dr. Anne Salomon at Simon Fraser University. The information below is shared with permission by the Member Nations of the Nanwakolas Council – North Vancouver Island, and provides some background about the Nations and clam gardens.

First Nations' Culture, Communities & Governance

The Kwak'wala, Lik'wala and K'omoks speaking peoples were a highly stratified bilineal culture of the Pacific Northwest. Today, fifteen remaining Nations comprise the grouping known as the Kwakwaka'wakw . Each Kwakwaka'wakw Nation has its own history, culture, and governance, but remains collectively similar. Seven of these fifteen First Nations are represented through this Ha-ma-yas Marine Plan: the Mamalilikulla Qwe'Qwa'Sot'Em, Tlowitsis, Da'naxda'xw Awaetlatla, Gwa'sala-'Nakwaxda'xw, Wei Wai Kum, Kwiakah and K'omoks.

Each of the member First Nations has its own stories, songs, dances, and masks that tell of who they are and their origins. The Nations have extremely strong ties to their territories, dating back to the beginning. For example, each Nation has its own version of the great flood and how some members survived. The K'omoks First Nation tells the story through the **Legend of Queneesh (Figure 1)**:

> *"Long ago there were big cedar planked houses, totem poles and canoes in the K'omoks Valley. The nights were very quiet, except for the sounds of the water, sea birds and of hooting owls. One night an old man, Quoi Qwa Lak, had a dream. In that dream a voice told him that he must tell the chief and the K'omoks people to prepare for a great flood. Quoi Qwa Lak passed this message on and the K'omoks built canoes and packed them full of food and clothes. The young men made a strong cedar rope and took it to the top of the glacier and fastened it tightly. The people tied their canoes to the rope. Not long after, it began to rain; it rained and rained for many days. Soon there was only a little of the glacier showing. The K'omoks people were afraid. Then all of a sudden the glacier began to move. The people began to cry "White Whale, White Whale! Queneesh, Queneesh." The glacier had taken the form of a whale and saved our people. The rain stopped, and Queneesh still stands guard over the K'omoks people to this very day."*

Figure 1. K'omoks Legend of Queneesh

Similarly, each Nation has its own territory, traditions, crests, privileges, and names for its important members. Potlatches and winter ceremonial feasts are still used to conduct social, cultural, economic and political business. The Kwakwaka'wakw still have ties to their winter villages, and the clan/family seasonal camping sites, fishing places, hunting and gathering areas.

Marine resources were, and are still today, traditionally utilized through time and space cycles, reflecting Kwakwaka'wakw socio-political structures and former settlement patterns. The Kwakwaka'wakw economic life was and is (where still possible) characterized by a regular series of seasonal occupations during which marine resources are gathered and processed. The **Seasonal Use Cycle of the Kwakwaka'wakw*** illustrates the seasonal cycle and the types of resources harvested and processed at the various time of the year. Although specific activities and movements vary from one First Nation to another, in general the cycle involves a sequence of three key movements: a) from winter villages to the eulachon fisheries in the spring; b) the use of 'other' resource procurement sites during the summer and fall; and c) the return to the winter villages (now modern, permanent settlements in the case of most member Nations).

Following the two month eulachon season, people disperse to a variety of resource procurement sites. The most important are salmon fisheries sites, occupied (according to site and species) until late fall. During this period, people also harvest a range of resources from both land and sea. Some, such as berries, ground fish, rock fish and shellfish, are widely distributed and often can be gathered near the fishing stations. Occasional visits to the principle village would occur during this period of gathering, but the onset of winter completes the cycle. About the end of November, the village would be re-occupied on a full-time basis and clams and other shellfish become key sources of fresh protein. The removal of member Nations from village sites, and the effects of modern technology have altered many components of this traditional cycle. **Table 1** provides a example of resources used by Kwakwaka'wakw and Nanwakolas Member First Nations.

Table 1: Partial List of Resources Used by Kwakwaka'wakw and Nanwakolas Member First Nations

Fish Species	Shellfish and Invertebrates	Marine Mammals, Plants and Birds
Salmon (all species)	Dungeness Crab	Harbour Seal/Hair Seal
Steelhead	Snow Crab	Northern Fur Seal
Cutthroat Trout	Pacific Crab	Sea Otter
Eulachon	Clams	Dall's Porpoise
Halibut/Pacific Halibut	Horse Clam/Geoduck/Gaper/ Pacific Coast Gaper	Humpback Whale
Cod	Butter Clam/Smooth Washington Clam	Minke Whale/Pike Whale/Little Piked Whale
Ling Cod	Mussels (California/Sea Mussel/Blue Mussel)	Edible Seaweed
Red Cod	Barnacle/Giant Acorn Barnacle	Kelp/Sea Wrack
Red Snapper	Basket Cockle/Heart Cockle	Bull Kelp/Bottle kelp
Black Rockfish	Abalone (Northern/Japanese)	Common Eelgrass
Yelloweye Rockfish	Prawns	Rockweed/Bladderwrack
Shiner Perch	Shrimp	
Starry Flounder	Sea Urchins	
Black Cod/Sablefish	Chitons (Black Katy/Black Leather/ Giant Pacific Chiton/ Gum Boot Chiton)	
Tuna	Octopus	
Dogfish	Sea Cucumber	
Great Sculpin/ Bullhead		
Herring/Herring Roe		
Sardines		
Eels		
Keip Greenling/ Tommy Cod		
Spotted Ratfish		

Clam Gardens

Loxiwe, or clam gardens, are a unique feature found throughout the Kwakwaka'wakw territory. Loxiwe means "place of rolling rocks together" to create a terrace or clam garden. These places of rolling rocks together create incredibly productive shellfish growing sites. The concentration of Loxiwe found in the area now called the Broughton, allows for a reliable source of protein during the difficult winter months.

Loxiwe were first created by the Elders, women and young children who would roll boulders and rocks to the edge of the lowest tide mark. Sand and silt would fill up behind the terracing toward the beach and create perfect clam habitat. This allowed clams to be easily harvested with a digging stick and the areas tended to by the owners of that specific beach.

This form of clam aquaculture began producing abundant quantities of clams as seen through shell middens along the coast. Those families who did not have rights on streams would have to rely more heavily on clams and share, trade or barter for salmon. Although salmon are critical to First Nations life, clams are a staple and the part of everyday life. There is little mention of their importance compared to salmon, but the Elders have informed us that clams have always been critical in sustaining the Kwakwaka'wakw .

> *"Productivity of clam gardens was carefully monitored and managed. To maintain the clam gardens, the sand was turned over every year or the clams at the bottom would die. The smell of a clam garden is an indicator of its health. In the past, there were guardians for each First Nation and one of their duties was to ensure the health of their First Nation's Loxiwe. If a shellfish bed was severely depleted or not suitable for harvest the guardian would speak to the chief and a ceremonial copper would be posted to warn others not to harvest from this Loxiwe."*

Name:_____

3.1: Great Bear Sea Case Studies

Group Members:

Case Study Topic:

1. **Provide a brief synopsis (4 – 5 sentences) of the case study:**

2. **What regions are involved?**

3. **Who (researchers, First Nations, etc.) are involved and how?**

4. **What is being researched or studied and why? Include the names of species, problems, issues, etc., as well as any specific research question(s).**

5. **Briefly share any hypotheses or research results. If these were not shared in your case study, create your own hypothesis or predictions about the what is being researched.**

6. **How does the case study draw on local or Traditional Knowledge?**

7. **How does the case study connect to biodiversity or conservation in the Great Bear Sea region?**

8. **How will this information help planning for the future?**

Name:_____

3.2: Self-Assessment Checklist

For each statement, please rate **your** participation and contribution to the group activity. For each question, include an example of your contribution or what you wish to work on for next time.

1 = I need to work on this area.
2 = I did ok in this area.
3 = I excelled in this area.

	1	2	3	Example or wish for next time:
I was ready to work and remained focused on the task.				
I shared my ideas and opinions.				
I listened attentively and respectfully to others' ideas and opinions.				
I accepted constructive feedback and provided the same to others when possible.				
When faced with challenges, I contributed to problem solving in order to complete tasks.				
I did my fair share of the work during the activity.				

Other comments or suggestions for future learning:

Name:_____

3.3: Group Assessment Checklist

Group Members' Names:

As a team, please rate the way **the group** worked together, and then complete the questions.

1 = We need to work on this area.
2 = We did ok in this area.
3 = We excelled in this area.

	1	2	3
We were ready to work and remained focused on the task.			
We encouraged each other to share ideas and opinions.			
We listened attentively and respectfully when individuals were sharing.			
All members were involved in decision-making.			
When faced with challenges, we worked as a team to find strategies to complete the tasks.			

Describe one thing your group did really well:

Describe one thing your group could improve for next time, and the strategy you might use:

Lesson 4: Sustainable Resource Planning for the Future

Overview: In thinking about sustainable resource planning, students will explore the concept of collaborative decision-making and consider some of the processes and challenges that may be encountered when gathering input and making decisions about important issues. Through a variety of film clips, students will look specifically at how partners and stakeholders are planning for the future of the Great Bear Sea through the Marine Planning Partnership, the development of Marine Protected Areas, and monitoring/stewardship activities.

Suggested Time: 2 sessions of 75 minutes each

Materials and Resources:

- Computer, projector and screen
- Chart paper and markers
- Teacher Background – Lesson 4
- Lesson 4 Film Clips:
  - Planning Part2 (13 mins)
  - Collaborative Decision-making (10 mins)
  - Protected Areas Overview (2 mins)
  - SEAS1 (3 mins)
  - SEAS2 (3 mins)
  - Coastal Guardian Watchmen (12 mins)
- 4.1 Great Bear Sea Guided Viewing Questions

Learning Objectives:

Students will:

1. Examine how diverse worldviews influence individual and societal interactions with the environment and decision-making.
2. Explore a model of collaborative planning and governance with the Marine Planning Partnership for the Great Bear Sea.
3. Explore local marine models of monitoring, conservation and stewardship.
4. Explore how marine planning may contribute to a sustainable future.

Lesson Context

Students will engage with the broad concept of collaborative decision-making, including partner and stakeholder engagement, working with different perspectives, and the challenging process of making evidence-informed decisions around issues with wide impact. Students will begin to see that collaborative decision-making in general can involve drawing on background knowledge and experience, voicing opinions and rationales for those opinions, thinking about personal and collective consequences, listening carefully and respectfully to others, and sometimes, being willing to compromise for the sake of group and/or identified needs.

While it may have come up in discussion in prior lessons, students are also introduced formally to the Marine Planning Partnership (MaPP), and how 18 First Nations and the Province of British Columbia have partnered as part of an innovative process to plan for sustainable management of the Great Bear Sea through the establishment of four area-specific marine plans and a regional planning framework. Students consider some of the various perspectives involved in both marine and land-based decision-making in BC. Additional film clips are also provided which give an overview of Marine Protected Areas (MPAs) and examples of monitoring/stewardship practices currently underway in the region.

Learning Activities

Part A

Activity 1: Collaboration and Collective Decision-Making (25 minutes)

1. Share the following scenario with students:
    - You are preparing an emergency pack for the classroom. But there's a catch – only 4 items can be packed. What 4 items do you choose?
2. In small groups, have students discuss the scenario and decide on 4 items as a group. You have to come to a decision and form one list to be presented to the Emergency Preparedness School Committee.
3. Have groups share their lists and reasons for selecting the items.
4. Facilitate a class discussion about how groups formed their lists. Consider the following questions:
    - Describe the process you used to come to a decision on the 4 items. For example, did you start with a big list and then work down to only 4 items?
    - What was informing your decision-making? How did you know what should be on the list and what was ok to let go?

- Where some voices in the group 'stronger' than others? How did you deal with this?
- What were the benefits and consequences to having to come to a shared decision?

Activity 2: Great Bear Sea Stakeholders (20 minutes)

1. Explain that in the example in Activity 1, we all had a vested interest in the outcome – survival. Coming to a shared decision on other issues – especially those with competing ecological, social, cultural and economic impacts – can be more challenging.
2. Have students think about this in relation to the Great Bear Sea and decision-making for the regions. As a class, brainstorm a list of stakeholders (a person with an interest or concern in something) in marine planning for the Great Bear Sea. Record the list on the board.
3. As a group, discuss how different stakeholders may have different perspectives (for example, commercial interests vs personal interests). Consider some different processes for making final decisions (for example, in Activity 1, how might the Emergency Preparedness School Committee go about looking at all the recommendations and making a final decision).

Activity 3: Great Bear Sea Collaborative Decision-Making (30 minutes)

1. Explain that as a class, students will view a portion of the film that shows the ways that groups in BC are coming together to collaborate around the future of the Great Bear Sea (see **Teacher Background – Lesson 4**).
    - The Marine Planning Partnership (MaPP) is a co-led partnership between First Nations and the Province of British Columbia. These partners in turn then engaged stakeholders in each region to gain their input (perspectives/opinions) in informing the development of regional plans.
    - Whereas marine planning is taking place all over the world, the manner in which the Great Bear Sea marine plans are being developed – through the MaPP process – is very unique. This collaborative government-to-government planning process is innovative and globally significant; there is currently no other country where a marine plan has been developed by Indigenous and provincial governments.
    - Provide students with some context around the difference in regulation in Canada for marine/oceans and land.

2. Provide each student with a copy of **4.1 Great Bear Sea Guided Viewing Questions** and review it together as class.

3. Watch the film clip **Planning Part2**. If time permits, suggest that students watch closely the first time, and then again a second time to make notes.

4. Provide students with some time to complete the questions on their own. These notes will be helpful for students when building their projects in Lesson 5.

5. Before moving onto Part B, you may want to provide students will time to review the MaPP website (www.mappocean.org) and have them watch the *10 Things You Need to Know About MaPP* video. Have them submit a reflective response, noting why they think the MaPP is unique.

Part B

Activity 1: Marine Protected Areas and Marine Reserves (35 minutes)

1. Recall the clip from last class regarding the MaPP. As a large group, discuss what makes the MaPP so unique:
    - Co-led partnership between the Province of British Columbia and 18 First Nations.
    - Informed by scientific, traditional and local knowledge.
    - Gathers input and advice from stakeholders, scientists and the general public.
    - First Nations and the Province of BC are being pro-active in planning local needs, and considering different types of needs (human well-being, ecological integrity and governance). Considering multiple perspectives.
    - Recognizing the Great Bear Sea as a unique BC natural resource – coming together with sustainability in mind.

2. Explain to students that the next film clip, **Collaborative Decision-making**, will both review some things about the MaPP as well as introduce some new concepts about marine planning. Have them watch for the new concepts and be prepared to discuss them as a class following the viewing. Play the film clip and then consider the following:
    - With so much potential development in the area, marine planning is key.
    - Protection Management Zones were noted – areas that allocate space primarily for conservation purposes – and will eventually become part of a network of Marine Protected Areas (MPAs) in the Great Bear Sea.
    - Other layers of zoning were mentioned:
        i. *General Management Zones* are areas that allocate space for public, private and community marine uses and are managed using ecosystem management approach.

ii. *Special Management Zones* are areas that allocate space for high priority or high potential marine uses.

3. Watch the next film clip, **Protected Areas Overview**, and have students record any questions they have about the two. As a class, discuss the distinction:
    - MPAs may be less restrictive than Marine Reserves by allowing for extractive activities like sport fishing, salmon trolling, etc.

Activity 2: Monitoring and Stewardship (40 minutes)

1. Read out this quote to students, from the end of the **Collaborative Decision-making** film clip:
    - *Rolling out a plan like this is not the end of something, it's pretty much the beginning of it* – Dan Edwards, BC Commercial Fishing Caucus
2. Discuss this as a class. What does he mean by this? What comes next? Note some suggestions on the board.
3. Have students brainstorm what may have to be monitored and enforced in implementing the Great Bear Sea marine plans and in promoting sustainability and stewardship in the area. How do we ensure implementation for generations to come?
4. As a class, watch all or some of the remaining film clips (**SEAS1**, **SEAS2** and **Coastal Guardian Watchmen**) and discuss how formal and informal means of leadership might contribute to sustainability and stewardship. For instance:
    - In what ways are the participants of the Supporting Emerging Aboriginal Stewards (SEAS) program contributing to furthering the marine plans? How does learning about language, culture and tradition contribute to sustainability?
    - Why is it important for the people monitoring the area – like the Coastal Guardian Watchmen – to live in the communities they monitor?
5. In preparation for Lesson 5, have students submit their top 3 questions and/or topics for inquiring more into sustainable development and/or resource management in the Great Bear Sea.

Extension Ideas

- Have students submit a reflective response to one of the monitoring and stewardship film clips addressing the following question:
  - What is a pressing environmental concern in our local region? How do you think it should be addressed through monitoring and stewardship?
- Engage in a class stewardship activity at a local water source and discuss how stewardship at the local level has impacts at the global level.
- Explore a local example of the development of a marine protected area by researching the Northern Shelf Bioregion MPA Network. See **Teacher Background – Lesson 4**.

Assessment Ideas

- Formatively assess students' engagement in group work and large group discussion.
- Collect **4.1 Great Bear Sea Guided Viewing Questions** for each student.

Teacher Background – Lesson 4

In Canada, regulation in relation to environmental issues generally falls within three categories: federal jurisdiction, provincial jurisdiction or a combination of both. Particular scenarios can be quite complicated, but for the purpose of this lesson, it will be helpful for students to make the general distinction that most land issues (as well as land-locked lakes/rivers) are under provincial jurisdiction, while marine and ocean related issues like fisheries, shipping and navigation are generally under federal jurisdiction. You can find more information on the Parliament of Canada website by searching "Federal and Provincial Jurisdiction to Regulate Environmental Issues" (www.parl.gc.ca).

The Great Bear Sea represents an interesting area where both provincial and federal jurisdiction comes into play. Traditionally, the federal government has taken a sector-by-sector approach to management, rather than looking at the space in an integrated way. This approach has been challenged by groups calling for the need to look at economic, social, ecological and cultural factors across sectors when making decisions that will impact the area. As a means of addressing this, the Government of Canada established the Pacific North Coast Integrated Management Area (PNCIMA), in 2010, with the goal of collaboratively developing an integrated marine plan. However, the federal government withdrew from the agreement in 2011.

Marine Planning Partnership

The Marine Planning Partnership (MaPP) www.mappocean.org represents an innovative response and approach to the challenge of sustainable planning for the Great Bear Sea for generations to come. The MaPP is a co-led process between 18 First Nations and the Province of British Columbia to establish four area-specific marine plans and a regional planning framework. Over the course of four years, the planning teams created new marine plans in consultation with marine stakeholders from the fishing, tourism, recreation, academia, local government, renewable energy, and other sectors. The plans include special management zones for tourism, aquaculture, and First Nations culture and protection management zones for marine life and habitat. The plans address a variety of marine uses, activities and values and contain hundreds of strategies that will lead to solutions and revitalise the North Coast. The year 2015 marked an important milestone for shaping the future of Canada's North Pacific Coast and the Great Bear Sea. On April 27, 2015, after four years of planning, marine plans for four sub-regions (North Coast, Central Coast, Haida Gwaii, North Vancouver Island) were revealed and made public on the MaPP website. According to the BC and First Nations' governments, these plans… "when implemented, will help to create opportunities for sustainable economic development, support the well-being of coastal communities and protect the marine environment." Ecosystem based management integrates human well-being, ecological integrity and governance as well as considers the effects of ocean use and activity on marine life and coastal communities.

The MaPP plans outline activities and uses for which the province has jurisdiction. For the federal government, which manages shipping and commercial fishing in the Great

Bear Sea, these plans may be tools for establishing a more integrated approach to marine management.

Whereas marine planning is taking place all over the world, the manner in which the Great Bear Sea marine plans are being developed – through the MaPP process – is very unique. This collaborative government-to-government planning process is innovative and globally significant; there is no other country where a marine plan has been developed by Indigenous and provincial governments. Worldwide, there is great interest in MaPP and learning more about how the planning was done, and what was achieved. The MaPP website is a very useful resource to learn more about the process, watch a video on "10 Things You Need to Know About MaPP", read stories from the First Nations and the MaPP stakeholder members, as well as a research tool for students. The 18 First Nations* working on the MaPP include:

Central Coast

- Nuxalk Nation, Heiltsuk Nation, Kitasoo/Xai'xais First Nation, Wuikinuxv Nation

Haida Gwaii

- Council of the Haida Nation, Old Massett Village Council, Skidegate Band Council

North Coast

- Gitga'at First Nation, Gitxaała First Nation, Haisla First Nation, Kitselas First Nation, Kitsumkalum First Nation, Metlakatla First Nation

North Vancouver Island

- Mamalilikulla Qwe'Qwa'Sot'Em First Nation, Tlowitsis Nation, Da'naxda'xw Awaetlatla First Nation, Gwa'sala-'Nakwaxda'xw First Nations, We Wai Kum First Nation, Kwiakah First Nation, K'ómoks First Nation

** This list contains over 18 First Nations. Some Nations and territories had been amalgamated post-contact and have very recently been re-defining traditional territories and spaces.*

Marine Protected Areas

Marine Protected Areas (MPAs) are an important tool for protecting ecosystems from overuse and exploitation. MPAs restrict human activity in a protected area of seas, oceans or large lakes for a conservation purpose, typically to protect natural, historic or cultural resources. MPAs allow for fish and marine life restoration, increasing both size and number of species, and protect species in critical stages of the life cycle. MPAs also act as a baseline for research purposes, to judge management processes in nearby areas. To date, Canada has just over 60,000 km^2 of protected oceans and lakes. In June 2010, Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site (3500 km^2) in British Columbia (in the Great Bear Sea region) was established under the Canada National Marine Conservation Areas Act.

Northern Shelf Bioregion MPA Network

The Government of Canada, Province of British Columbia and 17 First Nations are working together to develop a marine protected area network in the Northern Shelf Bioregion (NSB), which extends from the top of Vancouver Island (Quadra Island/ Bute Inlet) and reaches north to the Canada – Alaska border, in the region of the Great Bear Sea. The Northern Shelf Bioregion Marine Protected Area Network planning process aims to build a network of MPAs that will help to ensure that future generations will inherit the beauty and productivity of our Pacific Ocean. For more information on the Northern Shelf Bioregion MPA Network visit: www.mpanetwork.ca/bcnorthernshelf.

Coastal Guardian Watchmen

First Nations Guardian Watchmen have safeguarded the health of their territorial lands and waters on BC's coast since time immemorial. Today local Guardian Watchmen monitor the health of the plants and animals that have ecological and cultural importance to their communities. They also monitor the impacts of activities such as commercial and sport fishing, logging, and tourism.

Local Guardian Watchmen programs play a critical role in successful resource management by helping to implement land and marine use agreements and ensuring rules and regulations are followed in their territories.

The Coast Guardian Watchmen Network is an initiative of the Coastal First Nations Great Bear Initiative. Their video – *Eyes and Ears on the Land and Sea* – is provided in this lesson with permission. See their website for more information:
www.coastalguardianwatchmen.ca.

Supporting Emerging Aboriginal Stewards (SEAS)

Supporting Emerging Aboriginal Stewards (SEAS) Community Initiative is a youth program initiated by First Nation community partners together with TNC Canada. As noted on their website at www.emergingstewards.org:

Local programs are designed to engage, develop, prepare and empower Indigenous youth to become the next generation of stewards in their communities and territories. First started in 2009, the SEAS Initiative has supported youth in four communities in the Great Bear Rainforest of British Columbia as well as the Lutsel K'e Dene community in the Northwest Territories. Working collaboratively with TNC Canada, each community partner develops and designs a program uniquely suited to the community's priorities, needs and opportunities for engaging youth in stewardship learning and activities. Programs integrate traditional and cultural knowledge with western science approaches, and typically have both a school component and a summer internship component.

Name:_____

4.1: Great Bear Sea Guided Viewing Questions

1. Douglas Neasloss (Chief Councillor, Kitasoo/Xai'xais Band Council & Resource Stewardship Director, Kitasoo/Xai'xais Integrated Resource Stewardship Authority) comments “We started working on the marine use planning shortly after [land-based planning]. That's really important, especially for the community because we are such an aquatic based people." Why would marine planning be so important for the Kitasoo and other coastal First Nations communities?

2. The clip introduces the Marine Planning Partnership (MaPP). Describe this partnership in your own words, including what you think “collaborative planning" means.

3. List some of the partners and stakeholders involved with the Great Bear Sea (marine-based) decision-making. Include those not mentioned in the film if you can think of others.

4. Several people in the film clip provide reasons for why the MaPP is important for the Great Bear Sea region. What are some of those reasons? Can you think of other reasons why marine planning is important for BC?

Lesson 5: Inquiring into the Great Bear Sea

Overview: As a culminating activity for the unit, students work in small groups to design a funding proposal for a sustainable development/resource management project in the Great Bear Sea, and then present that proposal to the class. With a set of criteria, students will vote on the proposals and select one to be awarded the funding.

Suggested Time: 2 – 3 classes, (~75 minutes each)

*** Teacher Note:** Materials with a ***** are available on the Great Bear Sea USB, or at www.greatbearsea.net.

Materials and Resources:

- Computer, projector and screen
- Chart paper and markers
- Lesson 5 Film Clip:
  - Sustainable Development (10 mins)
- Teacher Background – Lesson 5
- 5.1 Great Bear Sea Funding Proposal Plan
- 5.2 Funding Proposal Voting Forms (or online voting tools)
- Featured Career Biographies* - *optional*
- Supplementary material for student research
  - Additional video footage/ research materials at www.greatbearsea.net
  - Marine Planning Partnership Website: www.mappocean.org

Learning Objectives:

Students will:

1. Apply prior learning about sustainable development and resource management in a new context and communicate that learning to others.
2. Consider how research topics have ecological, economic, and cultural/ social and importance and impact, particularly with regard to sustainability.
3. Understand the value of traditional knowledge and how it contributes to sustainability and planning for the future.
4. Use collaborative science approaches and concepts to build and critique arguments, including learning about how to collaborating with First Nations and local communities.
5. Develop processes for working together and collaborative decision making.

Lesson Context

By now, students have explored many examples of research and projects aimed at sustainable development and resource management in the Great Bear Sea region. This culminating activity has them selecting an area of interest to explore in more depth and developing a mock "Proposal for Funding" to attempt to secure 'funds' to carry out their research.

Their Proposal for Funding must engage in collaborative research, stressing the importance of collaborating with First Nations around issues of environmental sustainability and advocacy. Part of the proposal has students identifying who they might work with (the First Nations and/or communities in their chosen area) and how they might go about building a meaningful partnership.

The **5.2 Funding Proposal Voting Forms** provides a framework for students to both build their projects and vote on the ideas presented. Students will need to address all of the items in the voting criteria in order to achieve the highest score possible from their peers, and thus win the funding. This provides the opportunity to be creative and also demonstrate their learning around sustainable development through modelling a real-life situation. Rather than paper-based voting forms, consider using an online tool such as Survey Monkey or Doodle Poll to capture and tally the votes.

Learning Activities

Part A

Activity 1: Sustainable Development (40 minutes)

1. Return to the quote that was first referenced in Lesson 1 and discuss as a class. What new meaning does this carry after exploring more about the Great Bear Sea:
   - *Everything we eat, whether it's inter-tidal, whether it's bottom fish, whether it's herring, whether it's herring spawn, whether it's salmon – everything comes out of that ocean. It's a lifeline. It's a lifeline for our people.* - William Housty, Chair, Heiltsuk Integrated Resource Management Department
2. Share the following quote and have students respond:
   - *The sea, the great unifier, is man's only hope. Now, as never before, the old phrase has a literal meaning: we are all in the same boat.* - Jacques Yves Cousteau, Oceanographer
3. Write the term "sustainability" on the board and have students share a working definition with a partner. Do the same with the word "development."
4. As a class, come up with a working definition for sustainable development.

5. Watch the **Sustainable Development** film clip.

6. Discuss some of the examples of development happening or proposed for the Great Bear Sea from the clip, and then consider some of the potential impacts.

7. Return to the working definition of sustainable development and add/change to the definition as need be.

Activity 2: Topics of Interest – Sustainable Development/Resource Management (30 minutes)

1. In order to group students by interest, have each student share a topic for inquiry that they would now be interested in exploring with regard to sustainable development or resource management in the Great Bear Sea (for example, a specific species, a type of activity like fishing, sustainable shellfish harvesting, etc.).

2. Record student interests beside their names on the board and create small groups accordingly.

3. Have students form their groups and provide each group with **5.1 Great Bear Sea Funding Proposal Plan** and each student with **5.2 Funding Proposal Voting Forms**.

4. Review **Teacher Background – Lesson 5** and explain the activity:
    - Groups will develop a funding proposal around their area of interest, with a plan to work in collaboration with First Nations in their selected region.
    - Groups should address all areas of **5.1 Great Bear Sea Funding Proposal Plan**, with the first goal of developing an inquiry/research question.
    - The funding proposals will be judged based on the criteria in **5.2 Funding Proposal Voting Forms**. The winning proposal will be awarded funding to carry out their research proposal!
    - Groups will plan a presentation, no more than 7 – 10 minutes, to explain their proposal in an engaging manner, including how much money they are seeking for their project.
    - All students will judge the proposals using the criteria provided. You will not judge your own group.
    - The results will be tallied and the winner announced!

5. Provide groups with time to start brainstorming their inquiry/research question.

Part B

Activity 1: Research Time

1. Provide groups with time to research their topic and plan their proposal. The supplementary material may be helpful, as well as student access to library/other resources.

Part C

Activity 1: Funding Proposal Presentations (75 minutes)

1. Have each group present their funding proposals, with peers completing **5.2 Funding Proposal Voting Forms**.
2. Tally the results at the end of the presentations and announce the winning proposal!
3. Have students reflect on the unit and what was discovered about the Great Bear Sea. Have them write a reflective response, blog post, etc., with this guiding question:
    - Reflect on everything you have discovered about the Great Bear Sea. Why is planning for sustainability in this region so important? Respond from both an environmental perspective and a cultural perspective.

Extension Ideas

- The **Teacher Background – Lesson 5** presents some other ideas for grouping or individual work. If students work individually, consider extending the activity to have them more fully research their inquiry question.
- Have students develop a sustainable development framework and apply the framework to new contexts (locally, nationally and globally). Can it work in different contexts? What are some examples?
- Have students explore some of the careers associated with the Great Bear Sea. See **Featured Career Biographies***.

Assessment Ideas

- Formatively assess students' engagement in group work and large group discussion.
- Collect **5.1 Great Bear Sea Funding Proposal Plan** for each group and assess group presentations based on co-developed assessment rubrics. You may wish to use the voting criteria as a guide for assessment rubrics.

Teacher Background – Lesson 5

Tips for Facilitating the Request for Funding Activity

Structuring the Activity

This lesson has students forming small groups around shared areas of interest. You could also have students work individually. This could also be the starting point of a larger inquiry project. If structuring as individual presentations, some ideas include:

- Have students set up presentations in a 'science fair' format, with half the class showcasing their work while the other half goes on a 'gallery walk' of the presentations. Structure this online, with presentations posted on a blog, etc.
- Have students vote according to criteria and then determine the top 3 successful funding applications.
- Consider having 'judges' from the community come to take part in the day. These could be scientists, Elders, university students, etc.
- Include students in roles such as review panel, facilitation, topic specialists, etc.

Providing Time for Research and Preparation

There are a number of supplementary materials provided in addition to the film. All of these materials are provided in this resource or on the website at www.greatbearsea.net. Transcripts of the film clips are also provided on the website. These are helpful tools for accessing information quickly and in quoting information.

A key part of the proposal is for students to learn about the particular First Nations in the region they hope to work, and at the very least, create a plan for how they would go about collaborating with these First Nation partners. Students should be encouraged to research the particular First Nations and any protocol that may be in place for establishing communication and building relationships with key partners around marine planning. If your school is in the region of the Great Bear Sea, you may want to go further to have students consider planning across various First Nations and specific community groups or organizations that may need to consulted in the process.

Criteria for Proposals

Consider revising the criteria to fit a specific class need or area of interest. For instance:

- Sustainable development or resource management in your local neighbourhood/ traditional territories, local watershed, etc.
- Pick one criteria and go deeper (e.g. biodiversity, Traditional Knowledge).Think locally/nationally/globally and develop criteria around a research question.

Student Presentations

- Specify a time frame for presentations to encourage concise explanations.
- Encourage different styles of presentation (digital story, blog, skit, etc.).
- Co-develop a presentation rubric with students to help facilitate group collaboration.

Name:_____

5.1: Great Bear Sea Funding Proposal Plan

Instructions: Your team is applying for funding to support a research project that will address resource management or sustainable development in the region of the Great Bear Sea, working in collaboration with the First Nations in the region. Record your answers to all of the questions below in developing your proposal, and then plan your presentation to the Funding Board.

Team Members:

Research Project Title:

Funding Required:

Inquiry/Research Question:

Provide a brief synopsis of your proposed research project (3 – 4 lines):

1. **Describe how your research project will address biodiversity or conservation in the region.**

2. **Describe how you will go about building collaboration with First Nations (and other community organizations, if applicable) in the region you hope to work. Specifically, address the following:**

   - What are the First Nations in the region you hope to work with?
   - How will you go about building relationships to engage in collaboriative research? Each First Nation may have specific protocol regarding how to approach collaboration respectfully, which should be researched and identified here.
   - Describe how your project will be informed by Traditional Knowledge.

3. **How will your research project impact the people and communities in the region?**

4. **How does your research project promote sustainability and help to plan for the future?**

5. **Why is this research project important?**

5.2: Funding Proposal Voting Form

Use the form below to rate the Funding Proposals, where 1 = low and 5 = high. The research project with the highest score will be awarded the funding.

Research Project Title: _____

1. The research project will address a practical need of the ecosystem and communities of the region.

1 2 3 4 5

2. The research project will respectfully draw on Traditional Knowledge.

1 2 3 4 5

3. The research project addresses biodiversity or conservation in a relevant, meaningful way.

1 2 3 4 5

4. The research project will contribute to sustainability and help communities plan for the future.

1 2 3 4 5

5. The requested funding is realistic to carry out the plan.

1 2 3 4 5

Research Project Title: _____

1. The research project will address a practical need of the ecosystem and communities of the region.

1 2 3 4 5

2. The research project will respectfully draw on Traditional Knowledge.

1 2 3 4 5

3. The research project addresses biodiversity or conservation in a relevant, meaningful way.

1 2 3 4 5

4. The research project will contribute to sustainability and help communities plan for the future.

1 2 3 4 5

5. The requested funding is realistic to carry out the plan.

1 2 3 4 5

Appendix A: Interview with Doug Neasloss

The following is an excerpt from an interview with Doug Neasloss, Chief Councillor, Kitasoo/Xai'xais Band Council & Resource Stewardship Director, Kitasoo/Xai'xais Integrated Resource Stewardship Authority. Doug shares some of the history of the First Nations in the Central Coast region of BC.

Doug: My name is Doug Neasloss. I am from a small community called Klemtu, which is right on the central coast of British Columbia, and it is home to the Kitasoo/Xai'xais Nation. I have a few different titles. I work as a Marine Planning Coordinator. I work as a Resource Stewardship Director, with land and marine stewardship and a whole bunch of other things that come out of that as well. I also work as the elected Chief of the community, and my background's mostly been in tourism for the last 14 years.

To me, I think, this is one of the most special areas in all of the coast. I think the Great Bear Rainforest is definitely a very special and unique area. A place that still has intact old growth forests. We live in the largest intact temperate rainforest on the planet. It's one of the last strongholds you'll get for bears and other wildlife that are in the region. And it's just full of life. And I think that's something that's really neat. It still has the aquatic resources. It still has a lot of the land animals and I think there's not too many places on the planet that have what we have here and that's what keeps me here.

Karen Meyer (Great Bear Sea film maker): Taking a look back, talk about things that had a really significant impact on First Nations.

Doug: I think there's been a bit of a rough past when it comes to First Nations, I mean, I think just not long ago, whether it's 150 years to 200 years there was nobody else here, it was just First Nations communities, you know, in my area here we have two different nations from Klemtu. We have the Kitasoo, who are Tsimshian and they're the southernmost Tsimshian group and lived on the islands and then we have the Xai'xais people who lived on the mainland and in both Nations moved in the Klemtu in the 1850's, but prior to that, people lived, you know, quite nomadic lifestyles, and they followed the food resources in all of these different areas. At the time our cultures were very complex. It wasn't just as simple as following food. People had very complex governance structures, they had very complex relationships with different families. We had clan systems that distinguished different family groups and who had access to different areas based on different seasons. So it was a really complex relationship.

Around 1884 the government at the time decided to ban the Potlatch, which was the Potlatch in our community, our culture was the glue that held everything together. The singing, the dancing, the storytelling, the governance, coming-of-age ceremonies, passing of chieftainship, passing of copper shields. All those things were really important in our culture and in our community. And people used to prepare years in advance for Potlatch. So if I was going to host a Potlatch, some people would prepare 4 or 5 years in advance. But the Canadian government wanted to assimilate First Nations people into

the mainstream society so at the time they banned the Potlatch in 1884 to 1951. And the same thing happened in other regions. In the U.S. it happened in 1884 to 1936. But 1884-1951 during the banning of the Potlatch, it was illegal to Potlatch. And if you were caught potlatching, you were arrested for doing that.

So at the time the government sent what they called the "Indian Agent," and it was a person up here to monitor the activities of the local communities. And so everyone was paranoid about potlatching. People didn't want to Potlatch. But it was such an integral part of our culture and our community, people decided to take it underground in a way and Potlatch in secret. So what people used to do is they used to take the regalia and put it in the cedar bentwood boxes to make it look like it was a burial box, but it was actually their storage area for all of their regalia. And they used to paddle out to this one place we call it Dis'Ju, and it's a gathering place for people. And this Big House is hidden in the forest, you can't tell it's there going by in the boat, and people used to paddle out there in the roughest times of the year to go and Potlatch, so the Indian Agent wouldn't follow them out there.

Unfortunately around the early 1900s, there were so many families that did not make it back. A lot of families died trying to go out and Potlatch in secret. So by the early 1900s Klemtu stopped potlatching altogether. And that was a huge loss for the culture. Again, because that was the glue that held everything together. And that was just, you know, one of the reasons why we, during that time, we lost a lot.

Karen: What are some of the key things that your Elders tell you about what life was like here pre-contact?

Doug: Yeah, I've sat down and had a lot of discussion with our Elders about life, and even, you know, we live in a pretty isolated area, so we didn't have actually a lot of contact until quite late. The first contact we had was actually Captain Vancouver. I believe that was in 1793, when he came up and it was what people, the Elders always talk about how nomadic the lifestyles were. They talked about the seasonal camps, and the permanent camps. They said the food harvest would start in the wintertime. It would start with the clams and cockles in the winter. And then early spring, around March, the halibut would start to come in and they would start harvesting halibut. And then once the halibut was finished, they would start to move over to the herring and the herring eggs. And that was huge. That was probably one of the most important foods in our community, because it wasn't just used for food consumption, but it was also used for trade. And there was a huge trade routes along the Coast amongst different families up and down the coast. So Klemtu used to harvest the herring eggs and trade it with the Bella Coola people [Nuxalk] and also the Kitamaat people [Haisla], and they used to trade for eulachon grease, and that was huge because we didn't have eulachons in Klemtu area, and then once that was finished, we'd move over to seaweed in May, and right after seaweed was finished then you would go on to salmon, in particular sockeye salmon, and then later on in the summer, late summer, you would start to get all the salmon, so the coho, pink, and chum would start to come in.

So people were very dependent on all of these resources, and especially because it was such an isolated community, those aquatic resources are extremely important because food costs here in the community are so expensive. People, you know, depended on those, and we had different camps based on different things. Like Marvin Island is a herring camp. People just went there to go and harvest herring eggs. And while they were there, they would dry the herring eggs, they would dry the halibut, because a long time ago there were no refrigerators or freezers, so they would dry everything. Everything was sun dried. Or they would smoke it. And that's how they'd preserve things.

We've watched a lot of those resources dwindle over the last number of years. Partly because of mismanagement, and people coming in and harvesting too much. And, you know, in my lifetime, we've witnessed huge declines. Everything from abalone. Abalone used to be a once abundant shellfish in our territories. And the Elders talk about it … that in some areas they said you couldn't even touch the ground there was so many abalone. They were all over the place. Today, you probably will never see an abalone. In my lifetime I've never actually tried an abalone in the last probably 20-something years now because they've all just been wiped out. You know, the commercial fishery came in and harvested way too many and they just haven't been able to come back in numbers. With things like abalone you need large numbers because they're broadcast spawners and so the population just hasn't been able to come back and do that.

Same thing with salmon. I listen to the historical numbers of salmon. Some of the Elders will say some of the rivers and the estuaries would be full of salmon. They said some rivers were just plugged wall to wall with salmon. And I looked at the historical numbers of them, and there were about 80,000 fish in some of those systems. Today, we are down to about 5 or 6 thousand in some of those same rivers.

So, you know, I think there's been way too much over harvesting. I think with things like global warming, there's a number of different impacts that are effecting salmon. So, I think we have a long way to go.

Karen: What happened as a result of banning of Potlatches and other events, post-contact?

Doug: Well, I think the loss of culture during the ban of the Potlatch, I mean that was huge. I mean we had, you know, very strict ceremonies for different seasons. The return of salmon. The return of eulachons. The return of herring. The return of all these separate things were celebrated in a way, but also it was a ceremony to let the community know what time of the year it was, and food harvesting, I think there was traditional stories that were lost during that time and traditional stories that taught lessons of respect for certain resources and you know I think the governance structure, I think there was a lot that was lost, you know, songs and dances, and songs in our culture was a way of documenting an event, you know, that was going on so it wasn't just a simple song it had some meaning to it, and it came from a certain area, and it belonged to a certain family.

The passing of chieftainship. You know we have a very complex hereditary chief system in our community. So hereditary chiefs, you weren't just born a hereditary chief, you were groomed to be a chief, and you know the rule of the hereditary chief is you're there to steward, you had a responsibility to take care of a certain area, and so if you were a chief you would carry title to a certain inlet, or a certain estuary, and it was your responsibility to make sure that what was going on there was sustainable and "chief" in our language means "to serve." It means that you're there to maintain order of a house. So we had chiefs that had … they're responsible for a Raven House. And that house, they had to make sure people were keeping the songs alive, keeping the stories alive. You know, harvesting the different berries, or harvesting deer, and salmon, and things that hunters and gatherers harvested.

But they would also grant permissions to certain people to access certain areas, and that was all based on sustainability. So you had to make sure that the stocks were there, and if they weren't there, they would deny access to certain areas.

And we also had very complex arranged marriages as well, so if you wanted to access an area, today people just go on there and fish in an area. A long time ago it wasn't like that. You had to get very strict permission or it was often done through arranged marriage. So, if I was a chief and I wanted to access some else's area, you'd do an arranged marriage, and I would have access to their salmon, they would have access to my berries. So it wasn't just anybody that could go in. And that could get you in big trouble, I think, a long time ago if you just waltzed in there today and go and access certain areas. So I think that system, the hereditary system they used, a lot of that was lost during that time. Luckily we do have some Elders that still have some of that knowledge.

You know, I think the appetite of the time was really to assimilate First Nations people to mainstream society. And it started off with the governments and the church at the time banning things like the Potlatch and I guess just before the Potlatch, disease ran fairly rampant in our communities in around the 1860s.

I think at the time there was this huge movement to assimilate First Nations people into the mainstream society, so banning the Potlatch was a huge step in terms of trying to assimilate and get First Nations people to forget their culture, but prior to the banning of the Potlatch came disease. So disease ran rampant in all of our communities and we estimated we had a population of about 3,500 to 4,000 people out in Kitasoo Bay alone and disease swept through there around the 1860s and there was a smallpox epidemic that killed off quite a bit of the communities. In some cases it was like 99% of the communities. So we have some stories where one or two people survived the smallpox epidemic. Also around 1913, there was also the flu epidemic as well, and that decimated, again, quite large populations. I heard stories from our Elders where so many people died that they didn't really have time to give them a proper burial. It was just dig a big hole, put them in the ground, and hopefully you don't get sick. So I think those introduction of diseases played a huge role and a lot was lost.

So not just did we have to deal with smallpox and the flu epidemic, and the banning of the

Potlatch. Communities were still around in the early 1900s so the government started to introduce Reserve systems. They started to take First Nations nomadic people and started to push them all to these small parcels of Reserve and basically said "You're not going to live in these areas anymore." And they sort of pushed these people into small little blocks. So, my community was settled here in Klemtu and this is about 100 acres here in the community. It's not very big, but our community, our territory is massive because we followed all the foods and that's what our territory is based on today.

You know, unfortunately, now if you look at our system now, we only have about, we have less that 1% of our land base, if you were to go by their reserve system today. Although my people have always said they never signed a treaty. They've never surrendered rights and titles, so they've always said "this is theirs" and it's based on the chieftainship that's there.

So, it wasn't just all of those things – disease, the banning of the Potlatch. Another major event was residential schools. In the 1930s the government created these residential schools and basically, you know, we have some of the literature from the churches that said the banning of the Potlatch wasn't working – people were still speaking the language, people were still practicing their culture, whether that was being done in secret. So they needed some ways to really try and get people to forget their culture, forget their language, and become, to be assimilated into mainstream society, so the idea of residential schools was created.

There were boats that came into the community in the early 1930s and basically scooped up all the kids in the community and people had no choice, and they had to go and they were taken on the boats and they were taken out to schools, and they were spread out all over. A lot of people from Klemtu went down to Vancouver Island. And around Alert Bay area. Some people went down to Port Alberni. Some people from Klemtu went as far over as Edmonton in the 1930s. Some people went to Vancouver, to the mission school that was there. And the idea was to separate young people from their parents so that oral tradition wasn't passed on. And people, if you listen to the Elders who have gone through these residential schools, they were strapped for speaking their language. They had to cut their hair a certain way. The food quality wasn't good and there was a lot of other things that went on in the background that were not the best things to happen to young kids. And that really changed a whole generation of kids, because now you take a bunch of kids, you put them in these residential schools so that that love you get from your parents was not passed on throughout families and that had a trickle down generation, we still feel the effects today of that generation because some parents grew up without the parenting skills that you would learn from your parents.

Some people grew up with no love and that really affected households, families and communities, and so I think it's my generation, kind of the first generation, that are fortunate and hasn't had to deal with all of that stuff now, and I think things are a bit different today than they were back then. So I think you're going to start to see a bit of a resurgence of stewardship and I think you're going to get this new generation that's

going to come up and start to reassert their stewardship responsibilities, reassert their authority as hereditary chiefs, as owners, or stewards of the land. And I think that's something that we want to be able to work with provincial and federal governments. And we want to stop the mismanagement of these resources and we want to work together and somehow come out with some sort of strategy to best take care of these areas.

Appendix B: Indigenous Knowledge

The following is an excerpt from:

Source: Science First Peoples Teacher Resource Guide © 2016, First Nations Education Steering Committee and First Nations Schools Association. Used with permission from the First Nations Education Steering Committee Society.

The full resource can be found at www.fnesc.ca.

Indigenous Knowledge

What is Indigenous knowledge, and how can it be brought into science classes? This section looks at important concepts in understanding Indigenous knowledge, the importance of Interconnectedness, Sense of Place, Language, Place Names, Story and Traditional Ecological Knowledge.

Interconnectedness

First Peoples are diverse, and the unique knowledge each group holds is part of their individual worldviews. However, they share a common belief that we are all connected to nature and to each other. This notion that we are all connected with everything in the world is expressed by many First Peoples in the phrase "All my relations."

Inherent in this view of the world is the understanding that everything in the universe has a place there and deserves respect. From this vantage point, people view their relations with others as well as the natural world differently than someone who only sees it through a microscope or telescope.

Sense of Place

Connection with place, with the land, is the foundation of Indigenous Knowledge. This means that each Indigenous group holds unique world views, technologies and pedagogies according to their environment and territories. Indigenous knowledge, passed on through the generations, was essential for survival. Survival for First Peoples depended on and depends on their particular knowledge of the land, their unique relationship with the environment, and their shared values and practices through which they made sense of the world.

The concept of Place goes far beyond the physical space. It includes a crucial Sense of Place, the memories, emotions, histories, spiritualities that bind the people to the land.

Five concepts of place have been identified, common to most First Peoples[1]:

- Place is multidimensional. More than the geographical space, it also holds cultural, emotional and spiritual spaces which cannot be divided into parts.
- Place is a relationship. All life is interrelated.

1 Adapted from Michell et al., *Learning Indigenous Science From Place*, p. 27-28.

- Place is experiential. Experiences a person has on the land give it meaning.
- Place is local. While there are commonalities, each First Nation has a unique, local understanding of Place.
- Place is land-based. Land is interconnected and essential to all aspects of culture.

Making connections with place in science curricula is an integral part of bringing Indigenous science into the classroom. That means including experiential learning in local natural and cultural situations.

Language

Language is the vessel that contains Indigenous knowledge. Understanding is embedded in language, and knowledge is structured and transmitted through language. Learning through oral language is part of its experiential nature.

Through the processes of colonization, First Nations languages have undergone attack. Most communities suffered significant language loss, and one of the results of the loss of language is the loss of knowledge. As well, learning has moved from the oral to the written.

Some languages face extinction, but others are experiencing renewal. People are working to revitalize languages which in turn will serve to keep traditional knowledge alive.

Like most languages, strong Indigenous languages continue to grow and sometimes new words have been added to the language for contemporary objects. For example, in the Ts'msyen language Sm'algyax, the word flashlight is *laawksm ts'amti* (light lightning or lightning from a light). In Tsilhqot'in, the word for helicopter is *betŝit'ay naghedalt'ex* (Something that has something spinning on top of it.)

Incorporating traditional languages into experiential science activities wherever possible is an important part of bringing Indigenous Science into the classroom. There may be local community language resources in the school or community to support this. An online source that students can access is firstvoices.com which gives students searchable vocabularies in many of BC's diverse First Nations languages.

Place Names

Traditional place names provide information about First Peoples and their relationship with the land. Traditional knowledge is often embedded in place names. Paying attention to the name of places in traditional territories can lead to a wealth of information about local ecosystems, land use or plant and animal behaviour.

Many First Nations communities have documented the traditional place names of their traditional territories and they may be available as a classroom resource. However, some place names may be considered private and to be used only by community members.

Story

Story is one of the main methods of traditional Indigenous learning and teaching. Combining story and experience is a powerful strategy that has always been used by First Peoples, and its power can also be brought to the science classroom.

Stories enable holistic learning. They meld values, concepts, protocol, practices and facts into a narrative. They also develop important skills of listening and thinking.

Story can be an important part of the science curriculum. Oral storytelling can be incorporated by inviting First Nations storytellers into the class, or the teacher can read a written version of a traditional story where appropriate. Reading published stories that are relevant to the science class can integrate with English Language Arts, or where First Nations languages are taught.

Traditional Ecological Knowledge

Traditional Ecological Knowledge, or TEK, is the most popular term to denote the vast local knowledge First Peoples have about the natural world found in their traditional environment. As with the definition of science, there are differing meanings of TEK. Sometimes the term is expanded as Traditional Ecological Knowledge and Wisdom. Other terms used are Aboriginal Traditional Knowledge, Naturalized Knowledge Systems, local knowledge, and Indigenous Knowledge. Some view TEK as a construct of other contemporary sciences. Others fear the word "traditional" suggests the knowledge is stuck in the past, where in fact it is dynamic and continually being renewed.

TEK is widely used in biological and environmental sciences, and is largely considered to be complimentary to, and equivalent with, Western scientific knowledge. The environmental knowledge of generations is important to fields such as resource management, climate change and sustainability. For example, at the federal level, an ATK subcommittee reports to the Committee on the Status of Endangered Wildlife in Canada which make recommendations to the Minister based on TEK in their own local regions on species that may need to be listed.

TEK is, above all, local knowledge based in people's relationship to place. It is also holistic, not subject to the segmentation of contemporary science. Knowledge about a specific plant may include understanding its life cycle, its spiritual connections, its relationship to the seasons and with other plants and animals in its ecosystem, as well as its uses and its stories.

It is important to recognize that TEK is the intellectual property of the First Nations who hold it. Many people share much of their knowledge with others, but there is other knowledge and wisdom that is considered private and is not shared.