

Unit 4

Shaping the Land

Overview

Traditional Ecological Knowledge incorporates many ways of taking care of the land to ensure that resources are sustainable and provide food security for the present and the future. Today we may use terms such as land management, stewardship, and conservation, but for First Peoples the application of traditional knowledge was and is a way of life.

First Peoples applied knowledge to take care of the land and resources in diverse ways. For example, they used selective harvesting to ensure plants and animals were only harvested at appropriate times, taking into account the time of year, the age or point in the organism's life cycle. People rotated their harvest sites so that the plants and animals were not depleted in one area. In order to regulate the management of the resources, First Peoples had systems in place to control and regulate who could use what territories.

Another way that First Peoples managed the land in the past was to actively shape the land. They used a diversity of practices that maintained, enhanced and intensified the resources. These include terracing the ground to produce clam gardens and root gardens, building structures to direct the movement of fish and animals, and using controlled burning to maintain ecosystems.

In this unit students will have an opportunity to learn about a variety of ways that First Peoples shaped the land in the past, and infer the Traditional Ecological Knowledge and understanding of scientific principles that were used in these techniques. They also can engage in activities that look at ways that these ancient practices can be applied today.

Guiding Questions

- How have First Peoples practices affected the sustainability of ecosystems?
- How have First Peoples applied their knowledge of the land to alter landscapes in ways that ensure a sustainable lifestyle?
- How do traditional practices for shaping the land encourage growth and sustainability of the local culture?
- In what ways can traditional First Nations strategies and practices be applied today?

Relevant BC Learning Standards for Senior Secondary Science

Course	Key Content Standards	Key Curricular Competencies
Environmental Science 11	<ul style="list-style-type: none"> • Ecosystem complexity: roles; relationships; population dynamics • Energy flow through ecosystems • Matter cycles through and between living systems • Succession • First Peoples knowledge and other traditional ecological knowledge in sustaining biodiversity • Benefits of ecosystem services • Human actions and their impact on ecosystem integrity • First Peoples ways of knowing and doing • Resource stewardship • Restoration practices 	<p>Questioning and predicting</p> <ul style="list-style-type: none"> • Make observation aimed at identifying their own questions, including increasingly abstract ones, about the natural world. <p>Planning and conducting</p> <ul style="list-style-type: none"> • Collaboratively and individually plan, select and use appropriate investigation methods, including field work and lab experiments, to collect reliable data. <p>Processing and analyzing data and information</p> <ul style="list-style-type: none"> • Experience and interpret the local environment • Apply First Peoples perspectives and knowledge, other ways of knowing and local knowledge as sources of information
Environmental Science 12	<ul style="list-style-type: none"> • Soil characteristics and ecosystem services • Land use and degradation • Land management • Personal choices and sustainable living • Global environmental ethics, policies and law [<i>including First Peoples perspectives, philosophies and responsibilities</i>] 	<p>Evaluating</p> <ul style="list-style-type: none"> • Consider social, ethical, and environmental implications of the findings from their own and others' investigations <p>Applying and innovating</p> <ul style="list-style-type: none"> • Contribute to finding solutions to problems at a local and/or global level through inquiry <p>Communicating</p> <ul style="list-style-type: none"> • Express and reflect on a variety of experiences, perspectives, and worldviews thorough place.

Cross-curricular Connections

BC First Peoples 12

- Traditional Territories of the BC First Nations and relationships with the land

Contemporary Indigenous Studies 12

- Varied identities and worldviews of indigenous peoples, and the importance of the interconnection of family, relationships, language, culture, and the land

Resources

For further information on these resources, see the annotations in the Bibliography, beginning on page 273.

Suggested Resources

- Ethnobiology books and articles, particularly those relating to the local area
- Access to a field site (see Activity 4.6)
- Snively, Gloria and Wanosts'a7 Lorna Williams, eds. *Knowing Home: Braiding Indigenous Science with Western Science, Book 1*. Download at <https://pressbooks.bccampus.ca/knowinghome>

Resources for studying Clam Gardens

- "Ancient Clam Gardens Increased Shellfish Production: Adaptive Strategies from the Past Can Inform Food Security Today." Amy S. Groesbeck, Kirsten Rowell and Dana Lepofsky, Anne K. Salomon. *PLoS ONE* 9(3), 2014. Linked at <http://ow.ly/NJ1L303qvDU>
- The Clam Garden Network. Website at <https://clamgarden.com/>.
- *Clam garden time lapse*. <https://youtu.be/hqWC5CeVQy8>
- *Mysteries of Ancient Clam Gardens*. Andrew Elizaga, 2013. 6:43 min. https://youtu.be/DIGn4yd15_I
- *A Wall Worth Building*. 3:55. Hakai Magazine, 2017. <https://youtu.be/22Nytmxw2Z8>
- Williams, Judith. *Clam Gardens*. New Star Books, Vancouver, 2006.

Resources for studying Shell Middens

- Shell Middens. (1 page summary) Royal BC Museum website: <https://tinyurl.com/fnesc22>
- Ancient First Nations Archaeology Midden Site. (2.10 min video) https://youtu.be/yDAL2fo_AjA
- Shell Midden. (2.14 min. video) History channel. <https://youtu.be/Z7mOuWnzk1o>
- Shell Middens. (article) The Canadian Encyclopedia. <https://tinyurl.com/fnesc23>.
- Gamble, Jessa. "How British Columbia's Coastal People Fertilized the Forest." *hakaimagazine.com*, linked at <https://tinyurl.com/fnesc24>.
- Trant, Andrew J. *et al.* "Intertidal Resource Use Over Millennia Enhances Forest Productivity. *Nature Communications* 7, 2016. Linked at <https://tinyurl.com/fnesc25>.

Resources for studying Landscape Burning.

- CBC. *Imagine the Fire*. *The National*. 2013. 14:24 min. <https://bit.ly/2UC2u87>.

UNIT 4 • SHAPING THE LAND

- CBC “B.C. First Nation sets fires to save bison,” <https://tinyurl.com/fnesc26>.
- Indigenous Corporate Training Inc. “Indigenous Fire Management and Traditional Knowledge.” 2019. <https://bit.ly/2UTXhgU>.
- Johnson, Leslie Main. “Aboriginal Burning for Vegetation Management in Northwest British Columbia.” In *Indians, Fire and the Land in the Pacific Northwest*. Robert Boyd, ed. Oregon State University Press, 1999. Linked at <https://tinyurl.com/fnesc27>.
- Simmons, Ellen. “British Columbia’s Indigenous People: The Burning Issue.” *Journal of Ecosystems & Management* 13 (2). <https://bit.ly/2L1aBLT>

Additional Resources

- Deur, Douglas and Nancy Turner, eds. *Keeping It Living: Traditions of Plant Use and Cultivation on Northwest Coast of North America*. University of Washington Press, 2006.
- Turner, Nancy and Fikret Berkes. *Coming to Understanding: Developing Conservation through Incremental Learning in the Pacific Northwest*, 2006. *Human Ecology* v. 34. Online at <https://bit.ly/2H9U9FD>.
- FNESEC. *Science First Peoples Teacher Resource Guide Grades 5 to 9*. FNESEC/FNSA, 2016.

Blackline Masters

- 4-1 Shaping the Land
- 4-2 Clam Gardens
- 4-3 Stone Fish Traps

Outline of Activities

- 4-1. First Peoples Relationships with the Land
- 4-2. How Did First Peoples Shape the Land in the Past?
- 4-3. Clam Gardens; Shaping the Intertidal Zone
- 4.4 Indigenous Landscape Burning
- 4.5 Modifying Waterways
- 4.6 Can Ancient Methods Work Today?

Suggested Activities

Note: There are more activities here than most teachers will incorporate into their units. It is not expected that you will use all of the activities, or follow the sequence as it is described. These activities are intended to be adapted to fit the needs of your students and classroom, as well as inspire ways that you can respectfully include relevant Indigenous knowledge and perspectives in your course.

Activity 4.1

First Peoples Relationships with the Land

Build on students' understanding of First Peoples' reciprocal relationships with the land.

- Ask students to reflect on the question, "Why is the Land important to First Peoples?"
 - Students can record their own thoughts, then share with a partner or the class.
 - Alternatively, students could work in groups to brainstorm a number of reasons why the land is important.
- If you have not done so, use activities from Unit 1, 1-2, Reciprocal Relationships With the Land on page 40. If you have, review why a reciprocal relationship is important for First Peoples' relationships with the land.
- To build students' understanding of the traditional territories of the local First Nations, see *Science First Peoples 5-9*, for the activity "Traditional Territories," page 34.



Formative Assessment Strategy

Use student responses to this question to assess their understanding of First Peoples' relationships with the land.

Science First Peoples 5-9
Traditional Territories, page 34

Activity 4.2

How Did First Peoples Shape the Land in the Past?

- Discuss with students different ways that people modify the land today. (For example, we clear it to build houses and roads, we cut down trees for wood, we build dams to produce electricity.) Ask, which of these examples demonstrate a reciprocal relationship with the land?
 - Landscape Walk. Students can explore their neighbourhood or community to observe how the landscape has changed over time. Ask them to picture how it might have looked fifty years ago or 200 years ago.
 - Students can take pictures that show how the local landscape has been changed over time.




Land-Based Activity

Landscape Walk

UNIT 4 • SHAPING THE LAND

- Later they can share their images with the class and discuss why they chose to photograph the subjects they did.
 - Alternatively, they can find pictures in publications or online that show how people have altered the landscape in striking or significant ways around the world.
 - Discuss the question, Is there a reciprocal relationship shown in the photographs, and if so, what are the consequences?
- b. Ask students if they know of any ways that First Peoples modified or shaped the land in the past. Write their suggestions on the board. If students can't think of any ways, ask them to predict how First Peoples might have shaped the land in the past.
- Discuss how these methods might be different or similar to the modern ways people alter landscapes today.
 - Discuss how the examples or predictions could demonstrate reciprocal relationships. For example, some techniques enhance the productivity of the land, giving back – it needs to be sustained.
- c. To spark interest, present an example of one of the examples of land modified by First Peoples in the past. If possible, illustrate a local example.
- It could be an example that:
 - will be of special interest to your students
 - is relevant to the local First Nations
 - is relevant to current events, such as landscape burning in relation to wildfires
 - Use one of the examples discussed in the activities below. Some suggestions are:
 - landscape burning
 - wapato garden
 - clam garden
 - reef net fishery
 - stone or wooden fish traps
- d. Students can use Blackline Master 4-1, page 130, *Shaping the Land*, to learn about some of the ways that people modified or shaped the land in the past. Students are asked to suggest what they think the purpose of shaping the landscape might have been for each example.
- e. Students choose one of the methods to investigate further. This could be done as an inquiry, or as research project.
- Inquiry: Students could create an inquiry question about one of the methods that interests them. They would then research the topic to find answers to their question.
 - Alternately, students could research one of the techniques and present their findings as a project.


 Blackline Master 4-1,
page 130, *Shaping the
Land*,

Formative Assessment Strategies


As students work on their projects, assess the connections they are making between skills and processes involved with the technique, and the big ideas of survival, sustainability and reciprocity.

UNIT 4 • SHAPING THE LAND

- Discuss different aspects of the techniques that can be investigated, including:
 - underlying traditional scientific knowledge required
 - technologies required
 - skills required
 - purpose or goals of the technique
 - connections with other cultural aspects
 - the reciprocal nature of the technique
 - ways that the practice or strategy aided sustainability or survival
 - real-life examples of where this technique was or is used.
 - Refer to the activities below for suggestions for resources.
 - Students can use the 7 Es to guide the research. Students can use Blackline Master 5-4, page 158 (Unit 5) Inquiry Using the 7 Es. For background see 7 E Model in Foundations, page 31.
- f. Have students decide how they will present their findings. For example, they could create a written report with illustrations, a model with explanatory notes, a digital slide show or video, or an oral talk.
- g. After students have completed their inquiries and projects, they can present them to the class or to another audience such as an Elders or Seniors group in the community.

 Blackline Master 5-4, page 158 (Unit 5) Inquiry Using the 7 Es.

 **Foundations**
7 Es Model, page 31

 **Self-Assessment Strategy**
Have students assess their final product using criteria established by the class.

Activity 4.3

Clam Gardens: Shaping the Intertidal Zone

Students can take a closer look at one way that First Peoples on the coast altered the land to enhance the yield of resources. Clam gardens were used on the coast for millennia to enhance clam growing ecosystems. After colonization they fell into disuse, and only around 2006 were they widely noticed and studied by the outside world.

- a. Introduce the topic of clam gardens using the video *A Wall Worth Building*, produced by Hakai Magazine, found online at <https://youtu.be/22Nytmxw2Z8>
- Student could view other videos to get different perspectives on clam gardens. For example:
 - Mysteries of Ancient Clam Gardens. This can be found on Youtube at https://youtu.be/DIGn4yd15_I.
 - For a short view of a clam garden through the changing tides, view the time lapse video found at <https://youtu.be/hqWC5CeVQy8>
- c. Students can research more about clam gardens to investigate the Indigenous scientific understandings inherent in their structure. They can find out how the clam gardens require a knowledge of habitat interconnectedness.

UNIT 4 • SHAPING THE LAND



Clam Garden Model

- Explore the structure of the clam garden and suggest the benefit they served for both the natural environment and for the First Nations that used them. Ask, how does the clam garden structure change to suit the needs of the local environment?
- Research sources include:
 - Blackline Master 4-5, Clam Gardens, page 132.
 - *Clam Gardens*, by Judith Williams.
 - The Clam Garden Network. Website available at clamgarden.com
 - A report on a scientific study is available online: Ancient Clam Gardens Increased Shellfish Production: Adaptive Strategies from the Past Can Inform Food Security Today. Linked at <http://ow.ly/NJ1L303qvDU>.
- d. Students can illustrate a clam garden, or build a model or diorama of a beach with a clam garden.
 - Students can work in groups to create dioramas of a clam bed. They could use clay, sticks, sand, grass and clam shells to put together a representation of aquaculture structures built by indigenous peoples.
- e. Explain that the technology of clam gardens wasn't widely known outside of First Nations communities until 2006. Discuss why such a significant resource management technology was virtually unknown by science for so long.
- f. Coastal Shell Middens. The large quantities of shellfish harvested in the past resulted in the alteration of the land in a different way. People deposited the shells around their houses, and eventually the shells formed huge piles around the habitation site. People used the shells to level out the ground, or build up the terrain. Today the middens are important archeological sites, and are evidence of the presence of First Nations living there for thousands of years.
 - Students can find out what a shell midden is, and how their composition largely of shells has enabled them to last for thousands of years.
 - Suggested resources include:
 - Shell Middens. (1 page summary) Royal BC Museum website: <https://tinyurl.com/fnesc22>
 - Ancient First Nations Archaeology Midden Site. (2.10 min video) https://youtu.be/yDAL2fo_AjA
 - Shell Midden.(2.14 min. video) History channel. <https://youtu.be/Z7mOuWnzk1o>
 - Shell Middens. (article) The Canadian Encyclopedia. <https://tinyurl.com/fnesc23>.
 - Student can investigate a feature of shell middens only recently recognized by scientists. Researchers have found that trees, particularly western red cedar, grow better in the presence of shell middens.
 - Students can learn more by reading the article “How British Columbia’s Coastal People Fertilized the Forest,” at the website hakaimagazine.com, linked at <https://tinyurl.com/fnesc24>.

UNIT 4 • SHAPING THE LAND

- The study this article is based on is “Intertidal Resource Use Over Millennia Enhances Forest Productivity: Trant *et al.*, at the website nature.com, linked at <https://tinyurl.com/fnesc25>.
- g. Students can conduct soil tests to measure the calcium content.
 - Students can use a simple test with vinegar. For a suggested procedure to follow, see the activity Determination of Carbonate Concentrations in Calcareous Soils with Common Vinegar Test, online at <https://bit.ly/2VnI2sz>.
 - Students can using chemical indicators to conduct further soil tests.
 - Have students design an experiment that studies the effects of adding shells to soil. If possible, have them carry out their experiment.
 - Students could possibly investigate areas where Indigenous clam gardens may have been cultivated to see if the concentration of calcium is higher than other areas. This confirmation can lead to conversations and discussion about the benefits of previous land shaping by Indigenous peoples.
- h. Have students summarize what they have learned about clam gardens.
 - Students can label or be able to explain orally ways that the clam garden illustrates Traditional Ecological Knowledge.



Lab Activity

Soil tests for Calcium



Formative Assessment Strategy

Students should label or be able to explain orally ways that the clam garden illustrates Traditional Ecological Knowledge.

Activity 4.4 Indigenous Landscape Burning

In this activity, students will better understand how fire was used for thousands of years as a practice by First Peoples in stewardship of the land (for restoration, community protection and food security).

- a. Introduce the technique of controlled landscape burning by having students view the CBC video *Imagine the Fire*. It reports on how the Dene of the Fort Liard First Nations in north-eastern BC use traditional burning practices to manage its traditional territories.
 - CBC. *Imagine the Fire*. *The National*. 2013. 14.24 min. <https://bit.ly/2UC2u87>. CBC news video
 - Students can also read the accompanying news article “B.C. First Nation sets fires to save bison” linked at <https://tinyurl.com/fnesc26>.
 - For further background, students can read the article “British Columbia’s Indigenous People: The Burning Issue.” by Ellen Simmons. *Journal of Ecosystems & Management* 13 (2). <https://bit.ly/2L1aBLT>

UNIT 4 • SHAPING THE LAND

- b. Ask students to think about why First Peoples used fire to manage the land in the past.
- First ask students to predict why First Peoples might want to use controlled burning on their territories. Ask them to think of a variety of ways it might be used.
 - To see a summary of ways that fire was used in the past, students can read the article “Indigenous Fire Management and Traditional Knowledge.” (Indigenous Corporate Training Inc. 2019) <https://bit.ly/2UTXhgU>.
 - The uses of controlled or prescribed burning given in the article are to:
 - Manage the buildup of combustible materials
 - Manage regeneration
 - Manage pests
 - Open and maintain trails and paths
 - Create grazing lands for prey species (and later for horses)
 - Rejuvenate quality and quantity of forage (new growth being higher in protein and minerals)
 - Clear land for agriculture
 - Stimulate productivity of berry patches
 - Stimulate growth of medicinal plants
 - Produce materials for basketry
 - Create fuel breaks around camps and villages
 - Have students think more about the ways that First Peoples used fire to manage the land.
 - Students can work in groups to consider one of the uses, distributed so all the uses are covered. They can explain what the given use means, and suggest what the expected results of the burning would look like. When completed they can share their findings with the rest of the class.
 - Students can illustrate one of the uses of fire. The illustrations can be displayed in a gallery.
 - Charades. To engage students actively, have them select one of the uses and act it out for group members or the whole class, who will try to determine which use it is. The selection could be their own choice, or you could write the items on slips of paper which students select at random.
- c. Students can dig deeper into the use of Indigenous fire management by reading an ethnobotany study about landscape burning in one region of BC.
- "Aboriginal Burning for Vegetation Management in Northwest British Columbia," by Leslie Main Johnson. (1999) Available for download at <https://tinyurl.com/fnesc27>.
 - Note that, consistent with the time this was written, the term "Indian" is used in the document.
 - This study explores the use of landscape burning by the Gitksan and We'suwe'ten people of the upper Skeena River region.

UNIT 4 • SHAPING THE LAND

- Have students read to find out how the Gitksan and We'suwe'ten used fire to manage the landscape. Ask questions such as:
 - Where did they burn?
 - When did the burn?
 - Why did they burn?
 - Who was responsible for the burning?
 - What effect did the appropriate burning have on the vegetation?
 - What skill and knowledge did people use to burn successfully?
 - Ask students to read the section Suppression of Berry Patch Burning, pages 244-245. Discuss why the provincial government suppressed the traditional burning practices.
- d. Have students suggest the skills, understanding of scientific principles and traditional ecological knowledge First People needed for landscape burning.
- Responses could include:
 - knowledge of the weather; understanding the right wind and precipitation conditions to start burning
 - understanding fuel loads; the amount of vegetation that there is to burn
 - how to control the burning so it doesn't run away
 - understanding how plants and soil will respond to the burning
 - knowledge of plant cycles and how they will regenerate
 - how frequently burning should take place (e.g. every two years, ten years?)
- e. Landscape Burning Lab Demonstration. As a class project, have students compare the growth potential of burned sod and unburned sod.
- Necessary items are:
 - 2 metal pie pans
 - 2 “pie pan sized” pieces of sod (maybe from a corner of your sports field).
 - Let both pieces of sod dry out for 10 days.
 - In either a fume hood or outdoors in a location such as the school parking lot, burn the dried grass on one of the pieces of sod in its pie pan.
 - After the piece of sod has cooled, plant seeds from another type of plant not growing in the sample. Apply an appropriate amount of water in both the burned and the unburned soil samples.
 - Allow the plants to grow. Compare the subsequent growth of the secondary growth plants in both of the samples.
- f. Wildfires. Effects of climate change can be witnessed in the increasing number of wildfires we experience in BC and elsewhere. Some people believe if traditional landscape burning practices were followed, there would less threat of such large forest fires. Students can investigate the issue to decide if they agree or disagree.
- Students can work in pairs or small groups to examine the issue. Groups can create their own questions to investigate, or the class could decide on a question. For example, they could ask, “How would traditional landscape burning practices affect the forest fire situation today?”



Lab Activity

Landscape Burning
This lab activity has been tested and works successfully and safely.

Activity 4.5

Modifying Waterways

Many Indigenous techniques for shaping the land involve terrestrial ecosystems. However, they also used sophisticated technologies to enhance aquatic ecosystems. These include wetlands, estuaries and marine environments. Clam gardens are one example, and a number of other examples are given here.

Students can explore one or more of these technologies on their own or in groups. They could conduct a research project or an inquiry-based study. This should include an analysis of the Indigenous knowledge and understanding of scientific principles (e.g. biological, physical) that were (and are) applied to use the technology successfully.

The topics below give a brief overview and a number of resources that students can begin with.

a. Wapato Gardens

Wapato is an aquatic plant that grows in wetlands. In the past they were a significant source of carbohydrates for some First Nations communities, including the Katzie First Nation in the Pitt River area. Recent road construction in the area revealed a complex management system that shows people enhanced the wetland habitat to increase the sustainability of the plant.

Students can investigate how First Nations modified the wetlands thousands of years ago, and how the Katzie First Nation is working to restore their habitat today.

- This is an online news article summarizing the finding of the wapato gardens. "Hunting the Elusive Wapato," Joanne Will, 14 Jan 2010, The Tyee, linked at <https://tinyurl.com/fnesc62>.
- "Engineered feature used to enhance gardening at a 3800-year-old site on the Pacific Northwest Coast." Tanja Hoffmann et al. *Science Advances*, 2016. Linked at <https://tinyurl.com/fnesc61>.
- Katzie & the Wapato: An Archaeological Love Story. Natasha Lyons, et al. *Archaeologies: Journal of the World Archaeological Congress*, 2018. Download at <https://tinyurl.com/fnesc59>.
 - This article is notable because it presents a scientific study as a narrative.
- *This is an Eco-Cultural Restoration in Katzie Traditional Territory*. Katzie First Nation, linked at <https://tinyurl.com/fnesc60>.

b. Reef Net Fisheries

This unique technology was used by Straits Salish communities around southern Vancouver Island and the Gulf Islands. It involves using stationary nets to mimic the ocean floor and make the fish think they are heading for deeper water.

UNIT 4 • SHAPING THE LAND

- Video: *To Fish As Formerly: WSÁNEĆ Nation Brings Reef Net Fishing Back After 100 Years* (5.35 min.) <https://youtu.be/vTQk1IR9ibc>
- Ahearne, Suzanne. "Reclaiming a Banned Saanich Fishery." UVic News, 2016. <https://tinyurl.com/fnesc29>.
- Claxton, Earl and John Elliot Sr. *Reef Net Technology of the Saltwater People*. Saanich Indian School Board, 1994.
- Reef net fishing is used as a case study in the article "Coming to Understanding: Developing Conservation through Incremental Learning in the Pacific Northwest" by Turner and Berkes See pages 506 (last paragraph) to page 510 of Turner and Berkes. <https://bit.ly/2H9U9FD>
- *Knowing Home*, pages 122-123 discuss this fishery, with an illustration.

c. Estuary Gardens


In a similar fashion to clam gardens, First Peoples built terraces along estuaries to increase the critical habitat for some important food plants that grow in particular zones of estuaries. These are sometimes called root gardens, or estuarine root gardens.

- See pages 125-127 of *Knowing Home*, Book 1. This includes pictures of some of the plants grown in estuary gardens, and diagrams of a cross-section of a salt marsh.
- Students can investigate an ethnobotanical project conducted in Squamish territory, led by Indigenous ethnobotanist Leigh Joseph.
 - Students can read the online article "Getting Back to Her Roots (Nicole Trigg, *The Squamish Chief* June 24, 2011) <https://bit.ly/2UACM4w>. This article explains how Leigh Joseph studied the rice root plant for her Master's thesis, and involved the Squamish community to restore the estuary gardening of rice root.
- Students can go deeper into the research by studying Leigh Joseph's Master's thesis, *Finding Our Roots: Ethnoecological Restoration of lhásem (Fritillaria camschatcensis (L.) Ker-Gawl), an Iconic Plant Food in the Squamish River Estuary, British Columbia*. <https://bit.ly/2TL9z9V>.

d. Stone Fish Traps

These large traps were used at the mouths of estuaries where salmon moved from the salt water to the rivers and streams where they would spawn.

- Blackline Master 4-3, page 134 *Stone Fish Traps*
- Gitxaala (Kitkatla) fish traps. Naomi Smethurst. *Inscribed on the Landscape: Stories Of Stone Traps And Fishing in Laxyuup Gitxaala*. Masters thesis, UBC, 2014. <https://tinyurl.com/fnesc30>.
- Heiltsuk fish traps:
 - Heiltsuk Stone Fish Traps. An overview of two sites near Bella Bella with Heiltsuk archaeologist Xanius, Elroy White. theyee, 2012, 2:45 min. <https://youtu.be/jQIQO11cT-8>.
 - Xanius, Elroy White. *Heiltsuk stone fish traps: Products of my ancestors' labour*. SFU M.A. thesis. 2006. <http://summit.sfu.ca/item/4240> (Note: This document can only be read online, not printed.)

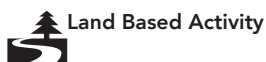
 Blackline Master 4-3,
page 134, Stone Fish
Traps

UNIT 4 • SHAPING THE LAND

- J. A. Pomeroy. Stone Fish Traps of the Bella Bella Region. 1976. <https://tinyurl.com/fnesc31>.
 - Tseshaht, Broken Group.
 - Video: Stone Fish Traps. James Thompson Photography. 2014. 0.49 min. <https://youtu.be/rbUPmay2fOI>.
 - Tseshaht Oral History and Ethnography. Ts'ishaa: Archaeology and Ethnography of a Nuu-chah-nulth Origin Site in Barkley Sound, by A. D. McMillan and D. E. St. Claire, Archaeology Press, Simon Fraser University, Burnaby See pages 28 to 30. <https://tinyurl.com/fnesc32>
 - Deep Bay, Vancouver Island.
 - Gregory G. Monks. *An examination of relationships between artifact classes and food resource remains at Deep Bay, DiSe7*. Doctoral Thesis, UBC. Pages 166-169; 303 (pdf pages 179-182; 316). Linked at <https://tinyurl.com/fnesc78>.
- e. Herring
- Coastal First Nations use a number of techniques to encourage herring to spawn on kelp or hemlock branches, making the nutritious eggs easier to harvest. They replicated the natural behaviour of herring spawning along the shoreline.
- Pages 125-127 of *Knowing Home*, Book 1. This includes a diagram of one way of anchoring branches on a log frame.

Activity 4.6

Can Ancient Methods Work Today?



Students will develop a land and resource management plan for a nearby piece of land by adapting traditional First Peoples land and resource management practices.

Some schools are developing or maintaining local or native gardens. This activity could be coordinated with a school garden.

- a. Locate a piece of land that is easily and permissibly accessible by students. Almost any piece of land could work, as long as it has some soil and plants. The more diverse and natural the setting, the better.
 - If circumstances allow, you may be able to find an area where students are able to actually carry out some of their plans, such as a corner of the school grounds or the edge of a woodland area in the community given appropriate permission.
- b. Preparation for site visit
 - Explain the purpose of the field trip. State that they will be going to a project study site for a class project, and their first job is to observe the site

UNIT 4 • SHAPING THE LAND

to become aware of relationships between the different elements found there.

- Go over expectations for behaviour and safety considerations, and any other protocols that may pertain to the field trip.
- c. Survey the site
- You may want students to begin by developing a sense of place about the site. Use some of the suggestions found in Foundations, Connecting With the Land: Including Land-Based Activities in Your Units, page 21.
 - Have students conduct an initial survey of the land. Activities could include:
 - describing the topography and geological features
 - describing the amount and diversity of plant life
 - photographing major plant species
 - identifying any evidence of animal activity, including mammals, birds, insects, fishes etc.
 - assessing the ecological state of the site; i.e. is it in a natural state? how heavily is it impacted by human activity?
- d. Profile the site
- In the class, students develop a profile of the site. This could include: a map, description of habitat of the site, soil condition, list of plants growing there, possible uses of plants.
- e. Discuss with students how the land on this site could be modified. Ask, What might be the purpose of shaping the land in some way?
- Explain to students that they are going to investigate ways that traditional First Peoples land shaping practices could be applied to this piece of land.
 - Students can work in groups to identify one or more traditional practices that could enhance, improve or make more sustainable the piece of land they studied. (For example, a weed infested yard full of invasive plants could be improved by controlled burning or transplanting roots; a sloping piece of land with high runoff could be levelled by terracing.)
 - Have the groups design a plan that could feasibly be put into practice, deciding on features such as goals and purpose for using the strategy; expected outcomes, resources needed, and time frame.
- f. Groups can present their plans to the class. Discuss ways that these plans could enhance the ecosystem of the site.



Formative Assessment Strategy

Observe students' work for evidence that they are able to apply First Peoples perspectives to the activity.



Formative Assessment Strategy

Informally assess students' abilities to apply what they learned about traditional land shaping methods in Activity 2 to this activity.

Blackline Master 4-1

Shaping the Land

Here are some of the ways that First Peoples shaped the landscapes of their territories in the past. Many of these methods are still followed today. For each method, tell what you think the purpose of shaping the landscape might have been.

Activity	Purpose
1. Pruning or cutting down plants, such as berries or plants that provide materials for basketry.	
2. Burning individual or small groups of plants	
3. Landscape burning	
4. Digging and tilling the soil before, during and after harvest	
5. Transplanting bulbs or reproductive parts of plants.	
6. Creating terraced gardens	
a. Tidal estuaries	
b. Berry gardens	
c. Clam gardens	
7. Weeding and clearing out competing plants and rocks such as in a blue camas meadow	
8. Adding natural fertilizers such as ashes clamshells, animal or fish remains	
9. Building stone fish traps	
10. Imitating nature	
a. Putting hemlock branches in the sea when herring are spawning	
b. Imitating underwater features with reef nets for salmon fishing	

Blackline Master 4-1 Sample Responses

Shaping the Land

Here are some of the ways that First Peoples shaped the landscapes of their territories in the past. Many of these methods are still followed today. For each method, tell what you think the purpose of shaping the landscape might have been.

Activity	Purpose
1. Pruning or cutting down plants, such as berries or plants used to make baskets.	stimulate new growth, stronger plants, more and better quality berries
2. Burning individual or small groups of plants	cleans out the patch of land, encourages new growth, stronger plants,
3. Landscape burning	remove underbrush, improve growth of berry or root plants, create forage for animals like deer
4. Digging and tilling the soil before, during and after harvest	aerates the soil, decompresses soil, plants are more productive, weeds reduced
5. Transplanting bulbs or reproductive parts of plants.	controls the types of plants growing in a plot, sustains the important food plants; spreads plants to new fertile ground
6. Creating terraced gardens	
a. Tidal estuaries	rock or log walls trapped nutrients brought in by the tides and down the river; attracted birds which could be hunted
b. Berry gardens	created prime conditions to grow a variety of species of plants
c. Clam gardens	created the prime habitat for clams, resulting in a higher yield than many regular beaches
7. Weeding and clearing out competing plants and rocks such as in a blue camas meadow	encourages more productive growth, more vigorous plants
8. Adding natural fertilizers such as ashes clamshells, animal or fish remains	additional nutrients improve quality and yield of plants
9. Building stone fish traps	enabled a group effort to harvest fish efficiently, sustainably and selectively
10. Imitating nature	
a. Putting hemlock branches in the sea when herring are spawning	provides an accessible and productive way of harvesting nutritious herring eggs
b. Imitating underwater features with reef nets for salmon fishing	guides or corrals fish to make the harvest more productive

Clam Gardens

One of the food sources that helped coastal First Nations survive in the past was the clam. If you go to an ancient village site along the British Columbia coast, you will find it is built on deep layers of white shells from clams and other shellfish, like cockles and mussels.

Clams are very nutritious. They are rich in protein, and also nutrients such as iron, Vitamin C and Vitamin D.

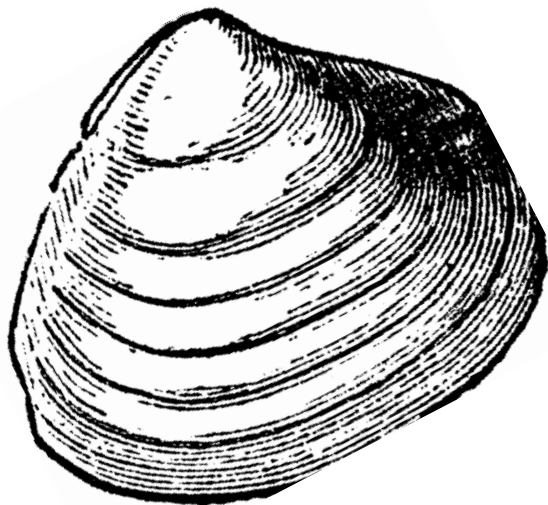
There are four main species of clams along the BC coast: butter clam, littleneck, horse clam, and cockles.

Harvesting clams

Clams and cockles are easy to harvest by all members of the family. They live below the surface of beaches in the intertidal zone. They sometimes give themselves away by squirting water through holes.

In the past, clams and cockles were a dependable food source. People could almost always find a good feed of shellfish, summer or winter.

The best time of year to gather clams is in the winter. In warmer months people knew that they might not be safe to eat. They could be polluted by what we call “red tide.”



As well as observing the water to see a change in colour, people would watch the animals like seagulls and otters. If they were eating the clams, then people knew they were safe to dig.

Preserving clams

First Nations families harvested large amounts of clams in the past. Some were eaten fresh, but most were preserved to be eaten later.

The shellfish were steamed open and the meat was threaded onto sticks to be roasted or smoked over a fire. Some people put them between mats and stomped on them to make them more tender.

The dried clams could be stored for a long time, or they could be traded with other First Nations.

The clams made a good snack. Sometimes people strung them on strings which they wore around their neck. If they got hungry while going about their work, they could pull off a clam to eat.

Clam gardens

We know clams were an important food source in the past because First Peoples built large clam gardens to improve the quality and quantity of the clams.

To do this, people long ago built walls along a sloping beach, and filled it in with sand to make level ground.

All along the Pacific coast, First Nations people built thousands of these beach terraces. In one bay alone on Quadra Island there are at least 49 separate gardens.

It took a great deal of knowledge to build and maintain these gardens. First, the builders had to understand the currents and tides to know the best places to build them.

The clam gardeners must have had a detailed understanding of the intertidal ecosystem to create such successful technology to manage their shellfish harvest.

The walls were as much as two meters high. They were created by rolling boulders down to the lowest of the low tide levels.

The rock walls were built at just the right height so the sandy terrace behind it would create the best growing habitat for the clams.

The waves washing over it would bring in nutrients. As people harvested the clams and cockles, using their digging sticks, they kept the sand loose enough for the shellfish to move about.

Certain people in the community were stewards of the clam gardens. They would observe the condition of the gardens. They would make sure there was no overharvesting. If the quality or number of clams got too low, they would leave the area untouched for a period of time.

Sometimes they would take small clams from another clam beach and “plant” them on a struggling beach.

Scientists have done some tests in clam gardens and found that more clams grow on beaches with walls than regular beaches. As well, clams grow faster and are more likely to survive in clam gardens.

The vast system of clam gardens wasn’t built quickly. They were built over many generations. Families passed on the knowledge and skills involved so that the gardens could be continue to be cared for.

The use of the clam gardens was part of First Nations political and social organization. In some communities certain families or hereditary groups had the use of certain gardens, which were passed down. As well as the rights to use the gardens went the responsibility to care for them.

Sea Garden

The rock walls did more than hold back the sand for the clam gardens. They also created a reef ecosystem where other sea creatures could live, such as octopus, sea cucumbers and chitons. These are all seafood delicacies, and no doubt were an added benefit to the clam gardeners.

Blackline Master 4-3

Stone Fish Traps

Stone fish traps were one of a number of fishing technologies used by coastal First Nations to harvest fish. They were an efficient form of **selective** harvesting of a large quantity of fish, but they required a relatively large labour force to build, maintain and operate.

Stone fish traps used the energy from two main sources: the ebb and flow of the tide, and the outward flow of a stream or river into the ocean. They used the falling tide to trap fish behind a rock wall or the stream flow to direct fish into a pond or pool.

Building a stone fish trap

The basic structure of trap is a wall of boulders and stones built in a semi-circular formation along the shore. It required considerable skill and knowledge to select the stones and place them correctly to build a strong wall. It needed to withstand constant tidal action and rough waves.

Salmon traps

Many stone tidal fish traps found along the coast were used to harvest various species of salmon as the migrating fish returned to their birth rivers and streams to spawn.

Small fish traps

In some areas traps were used to catch large quantities of small fish such as herring or perch. These were not near streams, but protected waterways where schools of fish gathered.

Working the traps

Using the stone tidal traps was an active job. People didn't just wait for the tide to trap the fish. They might guide the fish into the trap by splashing with branches or paddles. They may also stand along the wall while the water is high to make sure they fish don't escape.

Once the tide went out the fish could be harvested. Some traps were designed to drain completely, and the fish could be scooped or raked up. Others were designed to hold some water until the fish to be harvested were selected, and the rest released.

Social Organization

Usually it was a hereditary right held by lineage or house chiefs to build a stone fish trap in certain locations. It required the effort of all members of the lineage or house group to build, maintain and operate it.