FUN-ology! Seasons Make the World Go 'Round: A Three Lesson Unit – 3-5 Earth and Space Science

Lesson Two: How do seasonal rounds record weather data?

This is the second of three lessons, and it explores seasonal rounds from the Salish, Shoshone Bannock, and Nez Perce tribal perspectives. The students apply average temperature data to these seasonal rounds to help them understand how the rounds work and how western science and traditional knowledge both help people to understand more about the world around them.

In this three-lesson unit students will analyze and interpret data using western models of data tables and traditional seasonal rounds of Montana Indian tribes. Students will synthesize their experiences from previous lessons to build their own seasonal round using a combination of the models they have studied. Students will explore life cycles and how biotic (living) and abiotic (non-living) factors influence each other throughout the unit using multiple ways of knowing.

The first lesson introduced students to the Salish moons and the seasonal delights each moon brings with it. The students explored air temperature data and analyzed it for trends (i.e., does it seem to get warmer or colder throughout the month?) and created a line graph of their data.

In the third lesson students will synthesize western scientific knowledge and tribal seasonal round information. The students will create a list of organisms they interact with and identify the stages in their life cycles. Finally, students will share information regarding unique life cycles of organisms via their personal seasonal rounds.

Phenological (or "fun-ological") data has been collected by human beings for millennia. Phenology is the study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life. To survive, subsist, and thrive in a harsh environment such as Montana, tribes had to observe, track, interpret, analyze, predict, and transfer phenological knowledge. This knowledge was shared from generation to generation and helped families know where the best winter, spring, summer, and fall campsites were as well as what plants and animals that could be found during each season; plants and animals that would provide food, shelter, clothing, and tools.

When one observes the landscape, weather, seasons, animal behaviors, plant availability, water availability, and uses this information to maximize their natural resources, this is called a seasonal round. Seasonal rounds can be movement within a landscape for subsistence or a round can also be based upon events that help us acknowledge those seasonal changes that happen yearly, such as birthdays or annual hunting trips or summer family camping trips to a special place. More than just annual events, seasonal rounds include those indicators such as trees getting their leaves again after winter, leaves turning orange and yellow and brown in the fall, and the longer, warmer, sunnier days of summer. Seasonal rounds remind us we are passengers on a sphere that has an annual journey around our star, the sun. This journey around our star, the tilt of the Earth on its axis, and the Earth's daily rotation create the seasons no matter where we live on Earth. Where we live, north of the equator, south of the equator, east of a major mountain range, or west of an ocean, determines our weather and climate.

This lesson is a special collaborative endeavor between the Montana Office of Public Instruction Indian Education for All Unit and the Montana Natural History Center and is made possible through Indian Education for All grant funding.

Montana State Science Standards

3-ESS2-Earth's Systems

<table>
<tr><td colspan="3">Systems</td></tr>
<tr><td colspan="3">Students who demonstrate understanding can:
Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. [Clarification Statement: Examples of data at this grade level could include average temperature, precipitation, and wind direction.] [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.]</td></tr>
<tr><td colspan="3">The performance expectations above were developed using the following elements from the NRC document A Framework for K–12 Science Education:</td></tr>
<tr><td>Science and Engineering Practices
<u>Analyzing and Interpreting Data</u>
Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.
Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.</td><td>Disciplinary Core Ideas
<u>ESS2.D: Weather and Climate</u>
Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.</td><td>Crosscutting Concepts
<u>Cause and Effect</u>
Cause and effect relationships are routinely identified and used to explain change.</td></tr>
<tr><td colspan="3">San Diego County Office of Education Science Resource Center Educator tools to support the implementation of NGSS
Articulation of DCIs across grade-bands: K.ESS2.D; 4.ESS2.A; 5.ESS2.A; MS.ESS2.C; MS.ESS2.D</td></tr>
<tr><td colspan="3">Montana State Standards Connections:
Mathematics
3.MP.2 Reason abstractly and quantitatively.
3.MP.4 Model with mathematics.
3.MP.5 Use appropriate tools strategically.
3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.
3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs.</td></tr>
</table>

IEFA Essential Understandings

<u>Essential Understanding 1: Tribal Diversity</u>

There is great diversity among the twelve sovereign tribes of Montana in their languages, cultures, histories, and governments. Each tribe has a distinct and unique cultural heritage that contributes to modern Montana.

Key Concepts of Essential Understanding 1

- The twelve sovereign tribes, located in what is now the state of Montana, are distinct from one another in their history, culture, and language.
- Tribal sovereignty is the inherent right of tribes to independent self-governance.

- Tribal governments are fully functioning governments that provide an array of services similar to those of federal, state, and local governments.
- The political, demographic, and cultural landscape of Montana has rapidly changed in the last two hundred years.
- American Indian individuals and tribes are still here with distinct and intact governments, languages, and cultures that contribute to modern Montana.

Essential Understanding 3: Oral Histories as Valid as Written Histories

The ideologies of Native traditional beliefs and spirituality persist into modern day life as tribal cultures, traditions, and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs.

Additionally, each tribe has its own oral histories, which are as valid as written histories. These histories predate the "discovery" of North America.

Key Concepts of Essential Understanding 3

- The term spirituality within a cultural context can be limiting and misconstrued. Spirituality to Indigenous peoples generally refers to one aspect of their worldview in which all things are connected. Spirituality in this context does not necessarily equate to nor denote religion.
- A complex history of pre-Columbian tribal migrations and intertribal interactions, European colonization and Christianization efforts, and federal assimilation policies have contributed to the broad range of spiritual beliefs held by American Indians today.
- Despite this history, Native people have retained their spiritual beliefs and traditions – tribal languages are still spoken, sacred songs are still sung, and rituals and ceremonies are still performed.
- It is not important for educators to understand all the complexities of modern day American Indian cultures; however, they should be aware of their existence and the fact they can influence much of the thinking and practice of American Indians today.
- Humor plays an important role in American Indian cultures, there was no "stoic" Indian.
- Tribal oral traditions, ideologies, worldviews, and the principles and values associated with them, are as valid as other such traditions from around the world and should be accorded the same respect and standing.
- Educators should be aware that portions of these principles and values are private and are to be used and understood by certain individuals, groups, or the entire tribe. Tribal culture bearers, experts, and others can assist educators in navigating these situations.

Learning Objectives

Students will:

- utilize seasonal weather data using tables and graphical displays;
- add scientifically obtained average monthly temperatures to their own seasonal round; compare and contrast the three methods of communicating seasonal temperature data.

Background Information

The Salish Seasonal Round by Julie Cajune

Salish, Pend d'Oreille, Blackfeet, and Kootenai background knowledge building on seasons from Glacier National Park's Workhouse Curriculum

The Story of the Bitterroot video (Part 1 of 7)

Blackfeet Seasonal Round

Blackfeet Seasonal Round Teacher Toolkit

Nez Perce Seasonal Round

Excellent NGSS-aligned lesson: Differences between Climate and Weather and NSTA review of lesson

Make your own phenology wheel from Montana Natural History Center

Materials

- *Huckleberries, Buttercups, and Celebrations*, by Jennifer K. Greene (also used in Lesson One)

  (**this book has been purchased and sent to all public Montana elementary school libraries by the Office of Public Instruction Indian Education for All Unit*)
- One of the high temperature data sets that was assigned (from Lesson One).
- Student created line graphs of data analyzed (from Lesson One).
- Examples of Nez Perce, Shoshone Bannock, and Salish seasonal rounds provided at the end of this lesson.
- Compare and contrast graphic organizer provided at the end of this lesson.
- Blank seasonal round provided at the end of this lesson.

Procedure

Class Discussion

Begin with a think-pair-share of what students recall from Lesson One. Ask students how they would record temperature data if thermometers had never been invented. Review each month from *Huckleberries, Buttercups, and Celebrations* and ask how that data was recorded and remembered. Remind students these oral and pictorial traditions were practiced thousands of years before thermometers were invented and ask what knowledge the Salish people might need to know about when to hunt and gather. How do these two ways of observing and recording information benefit one another?

Introduce students to the practice of creating seasonal rounds. In small groups pass out seasonal round examples provided at the end of this lesson. Or, print out and set the examples of seasonal rounds provided around the room and have students rotate to observe them. Instruct students to discuss what they notice, similarities, and differences. Ask them to discuss in pairs or small groups why they look so different and have them bring those thoughts back to a large group discussion. (*e.g., Do all of the seasonal rounds list the months? Do they all have the same plants? The same animals? The same organization? Do all the rounds represent the same geographic region?*)

Teacher tip – Excellent culturally responsive instruction would include weaving the following into the class discussion:

- *Tribal knowledge of all plants, animals, weather patterns, ways the climate has changed over time, geologic features, etc. on both aboriginal territories and treaty lands has existed for thousands of years and has been shared throughout the generations. This knowledge continues to grow and be shared among tribal members and contributes to the way tribes manage natural resources on their lands.*
- *Tribal worldviews (epistemologies) include a belief that all things are connected and related. Therefore, every tree, every bird, every insect, every human is part of an interconnected web. If one is to respect oneself, one must respect all other beings. The values of respect, reciprocity, redistribution, and responsibility guide how knowledge of the natural world is gained, used, and shared.*
- *Both Western science and traditional knowledges are valid ways of knowing and understanding the world around us. They were both developed by vastly different cultures for different purposes. Traditional ecological knowledge evolved to support subsistence and survival. Western science was developed to*

measure and prove ideas about how the universe works. Both help us make sense of the many mysteries about life, the planet we live on, and our place in the universe.

- *Seasonal rounds vary with each tribe and are dependent on where they live and the climate of that location.*

Lead students to the knowledge of unique tribal regions and practices through a discussion of the features, similarities, and differences observed in the seasonal rounds. Ask students to develop a list of all categories of information they can discern from the seasonal rounds with examples from the specific tribes (*e.g., month names, animals available during those months, plants available during those months, tools associated with the season, moon phases, traditional month names, activities, locations of tribal movements, etc.*). Using these categories, have students identify which categories indicate weather patterns.

Introduce students to the word phenology, the study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life. The study of phenology has been used across the globe for millennia by all cultures for survival. Phenological data is currently being used by climate scientists to understand the impacts of a changing climate on plants and the organisms that depend on them for survival.

Small Group Work

Divide students into small groups or pairs. Have students ready with their temperature data sets and graphs from Lesson One and one of the three seasonal rounds provided in this lesson.

Ask students to look at their seasonal rounds they have been assigned and discern what information might indicate the average temperature for a season. Ask students to identify the tribe and the tribe's location of the seasonal round they used and what information on the seasonal round indicates monthly temperatures. After the students have compiled their information they report back to the whole class and groups can compare the different rounds.

Lead students in a discussion about the unique seasonal rounds for each tribe, the diversity in information they present, and the relevance to our modern lives.

Individual Work

Give students the blank seasonal round worksheet and have them write the months of the year and the average temperature for each month.

Resource 1 (from Lesson One)

Monthly High Temperature Averages for Helena, MT

This data of monthly high average temperatures in Fahrenheit was collected from daily temperature readings in Helena, Montana from 1981-2010.

January:	33°F
February:	39°F
March:	48°F
April:	58°F
May:	67°F
June:	76°F
July:	86°F
August:	85°F
September:	73°F
October:	59°F

November: 43°F

December: 32°F

Let students know they will be adding to this seasonal round in the next lesson and to be thinking about how they might depict the unique characteristics of each month.

Ask students to write a paragraph to compare and contrast the three methods (data in a table, data represented in a graph, and seasonal rounds) of communicating temperature data they have studied so far. Use the template framework graphic organizer included with this lesson if your students need more structure when writing their responses.

Assessment

Students will fill out the average monthly temperatures on their own seasonal round. This will be measured by the presence of the average monthly temperatures on their seasonal rounds.

Students will be able to compare and contrast the three methods of communicating seasonal temperature data in writing. This will be measured by their ability to complete the compare/contrast paragraph or the template framework graphic organizer.

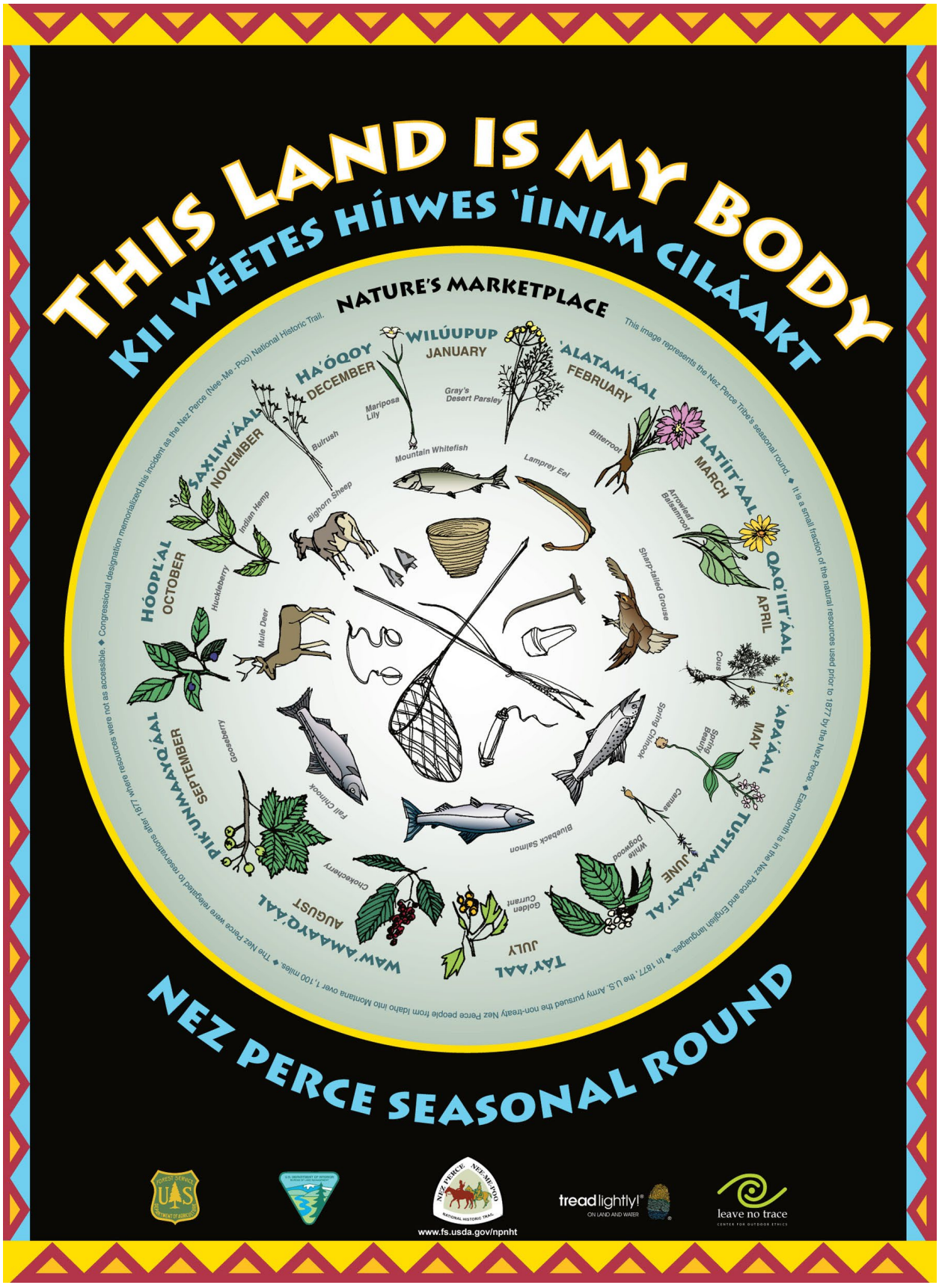
Resources

Abrams, Harry N., Inc, "Great Circle." TrailTribes.org.

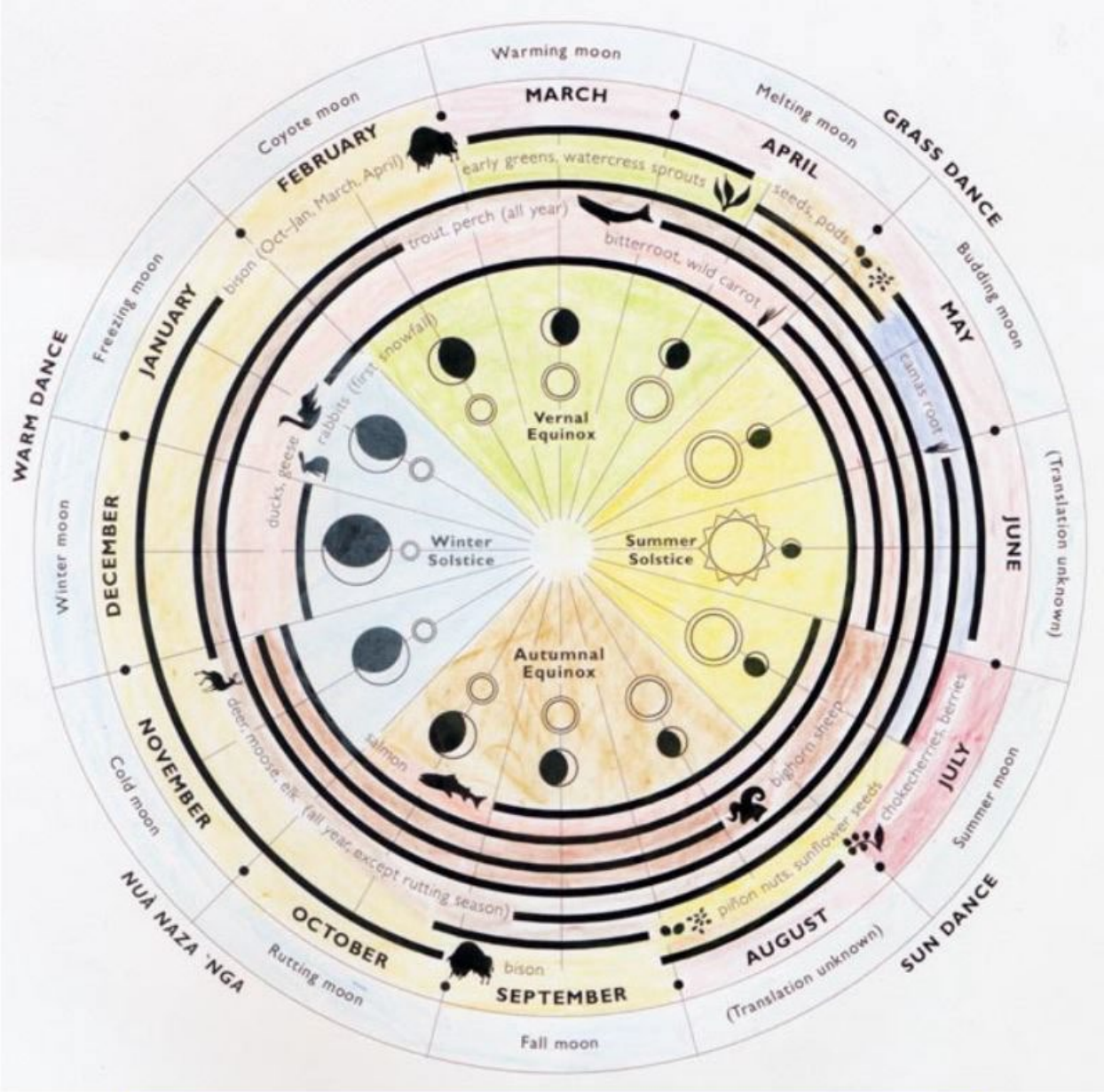
Forest Service, United States Department of Agriculture. "This Land is My Body."

Ryan, Tim, Salish Seasonal Round. Used with permission through the Montana Office of Public Instruction.

US Climate Data Website

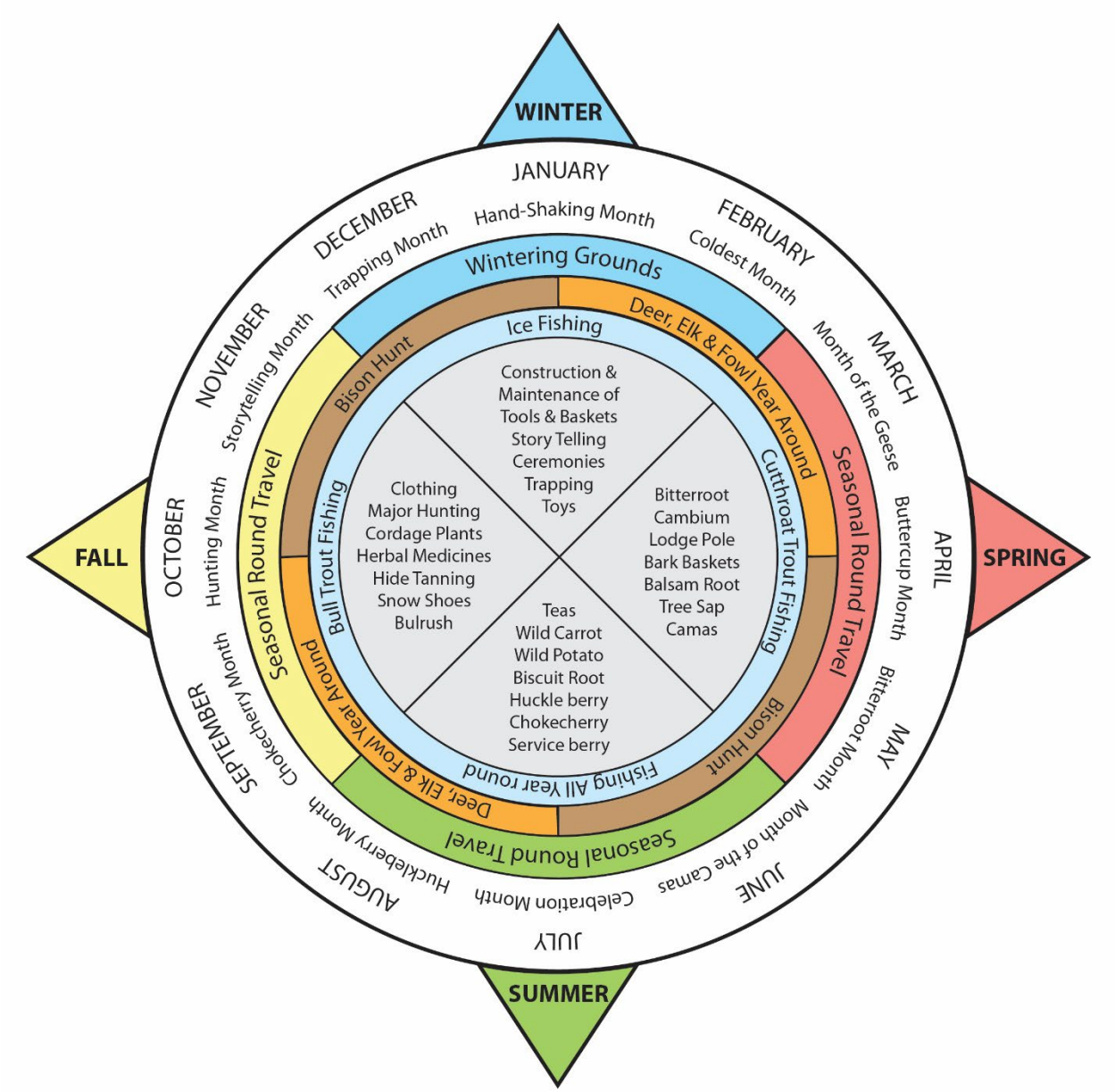

THIS LAND IS MY BODY
KII WÉETES HÍIWES 'ÍINIM CILÁAKT
NATURE'S MARKETPLACE
This image represents the Nez Perce Tribe's seasonal round. • It is a small fraction of the natural resources used prior to 1877 by the Nez Perce. • Each month is in the Nez Perce and English languages. • In 1877, the U.S. Army pursued the non-treaty Nez Perce people from Idaho into Montana over 1,100 miles. • The Nez Perce were relegated to reservations after 1877 where resources were not as accessible. • Congressional designation memorialized this incident as the Nez Perce (Nee-Me-Poo) National Historic Trail.
WILÚUPUP JANUARY
'ALATAM'ÁAL FEBRUARY
LATÍIT'ÁAL MARCH
QAQ'IIT'ÁAL APRIL
'APA'ÁAL MAY
TUSTIMASÁAT'AL JUNE
TÁY'AAL JULY
WAW'AMAAYQ'ÁAL AUGUST
PIK'UNMAAYQ'ÁAL SEPTEMBER
HÓOPL'AL OCTOBER
SAXLIW'ÁAL NOVEMBER
HA'ÓQQOY DECEMBER
Mariposa Lily
Gray's Desert Parsley
Bitterroot
Mountain Whitefish
Lamprey Eel
Bighorn Sheep
Bulrush
Indian Hemp
Arrowleaf Balsamroot
Sharp-tailed Grouse
Cous
Spring Chinook
Spring Beauty
Camas
White Dogwood
Bluebuck Salmon
Golden Currant
Chokecherry
Fall Chinook
Gooseberry
Mule Deer
Huckleberry
NEZ PERCE SEASONAL ROUND
www.fs.usda.gov/npnht
tread lightly! ON LAND AND WATER
leave no trace

Shoshone Bannock Great Circle (Seasonal Round)

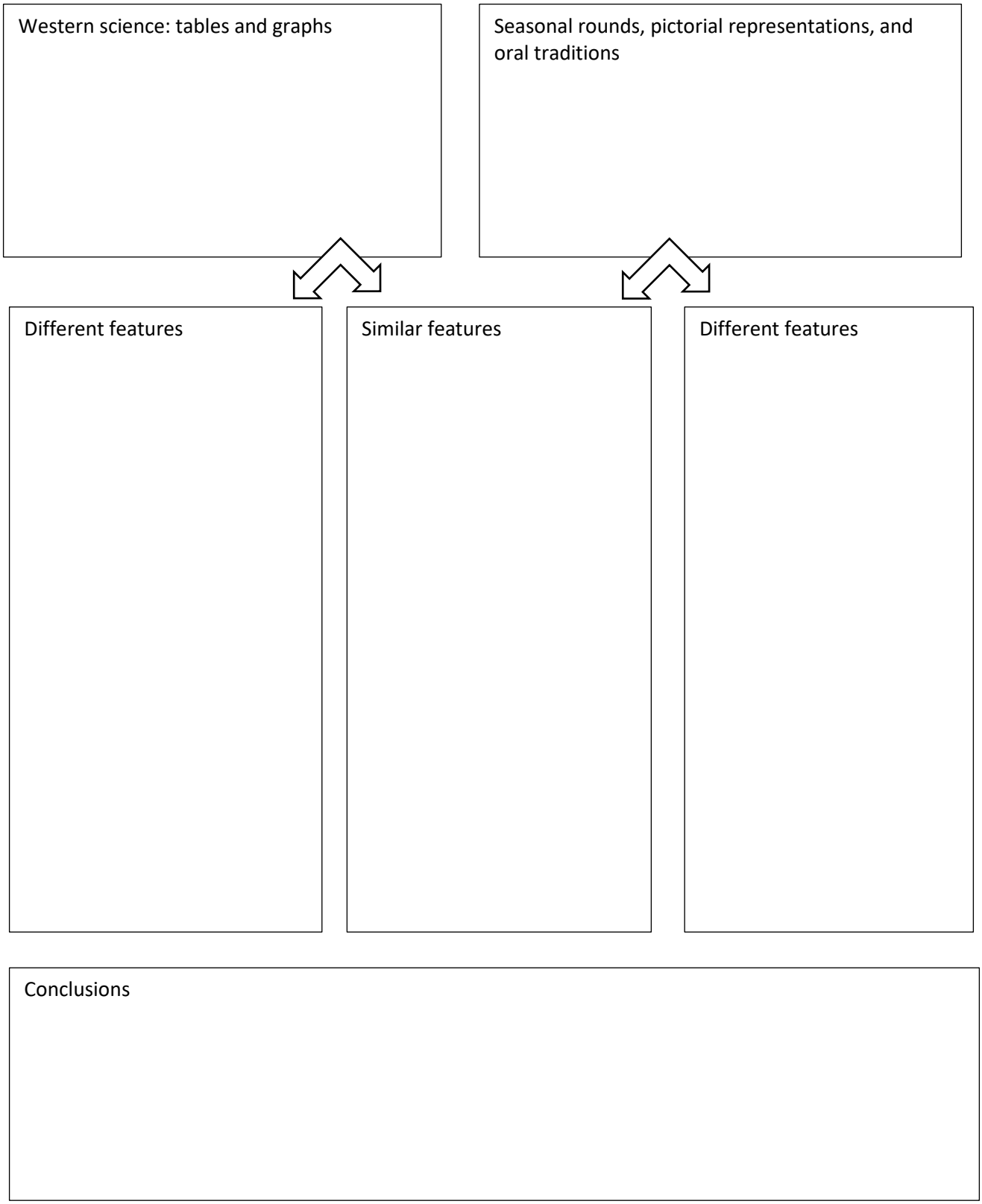


Seasonal Round of the Northern Shoshone Bannock
Adapted from image appearing in North American Indian Jewelry and Adornment
by Lois Sherr Dubin. © Harry N. Abrams, Inc.

Salish Seasonal Round



Compare and Contrast Graphic Organizer



My Personal Seasonal Round