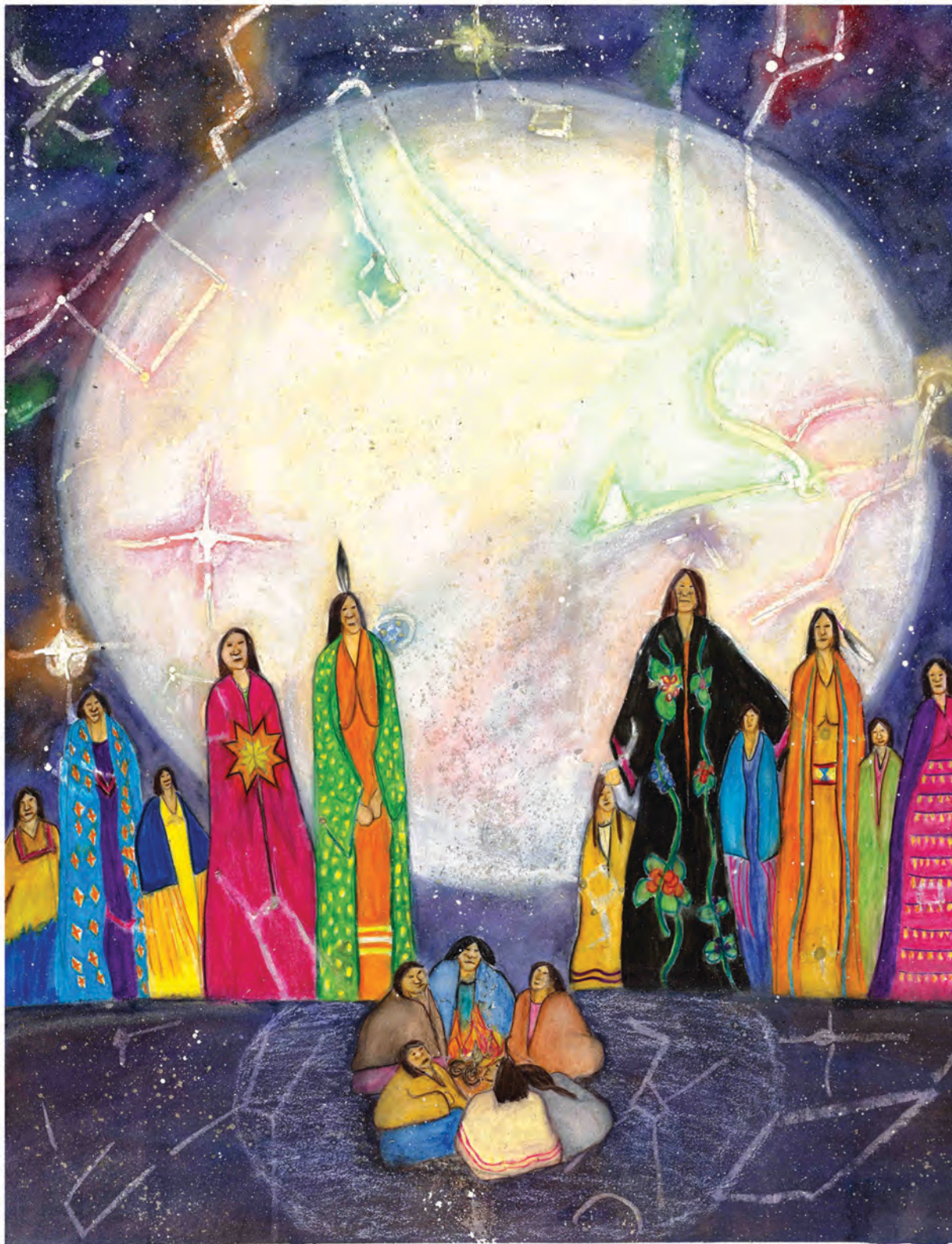


Native Skywatchers – Curriculum Workbook



Spring 2012

Building Community Around Star Knowledge

Annette S. Lee

Part 1 – Four Directions Stargazing

Written by Annette S. Lee

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Curriculum Workbook
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Introduction

In Ojibwe the Big Dipper is known as *Ojiiig* – the Fisher and in D(L)akota star knowledge the same group of stars is seen as *To Win/Tuŋ Wiŋ*—Blue Woman/Birth Woman. In each there are stories and teachings that help guide, teach and inspire native peoples. *Native Skywatchers* research and programming focuses on understanding the Ojibwe and D(L)akota importance of these and other celestial connections. We seek to address the crisis of the loss of the indigenous star knowledge, specifically the native peoples of Minnesota, Dakota and Ojibwe. The purpose of this programming is to remember, rebuild and revitalize the native star knowledge.

There is urgency to this project for two reasons: the native star knowledge is disappearing as elders pass away and state standards. One Ojibwe elder spoke of his vision of ‘the star medicine returning through the native youth.’ He specifically called them ‘star readers’. In 2011 he passed away suddenly. At the same time, the new MN State Science Standards K-12 requires “Understanding that men and women throughout the history of all cultures, including Minnesota American Indian tribes and communities, have been involved in engineering design and scientific inquiry....For example Ojibwe and Dakota knowledge and use of patterns in the stars to predict and plan”. And yet there was a complete lack of materials.

This research and programming, *Native Skywatchers*, seeks out elders, culture teachers, language experts, and community members to discuss the Ojibwe and D(L)akota star knowledge. Together, we have created two astronomically accurate, culturally important star maps, *Ojibwe Giizhig Anung Masinaaigan* – Ojibwe Sky Star Map and *Makoče Wičañhpi Wowapi* – D(L)akota Sky Star Map. These native star maps were disseminated to regional educators at the first *Native Skywatchers* Middle School Teacher workshop in 2012. In addition, hands-on curriculum that combines astronomy, culture, language and art has been developed. As with many North American tribes much cultural knowledge, especially cultural astronomy, has been lost. The goal of the *Native Skywatchers* programming is to build community around the native star knowledge.

The *Native Skywatchers* research and programming initiative was founded in 2007 by Annette S. Lee.

Ojibwe Giizhig Anung Masinaaigan - Ojibwe Sky Star Map

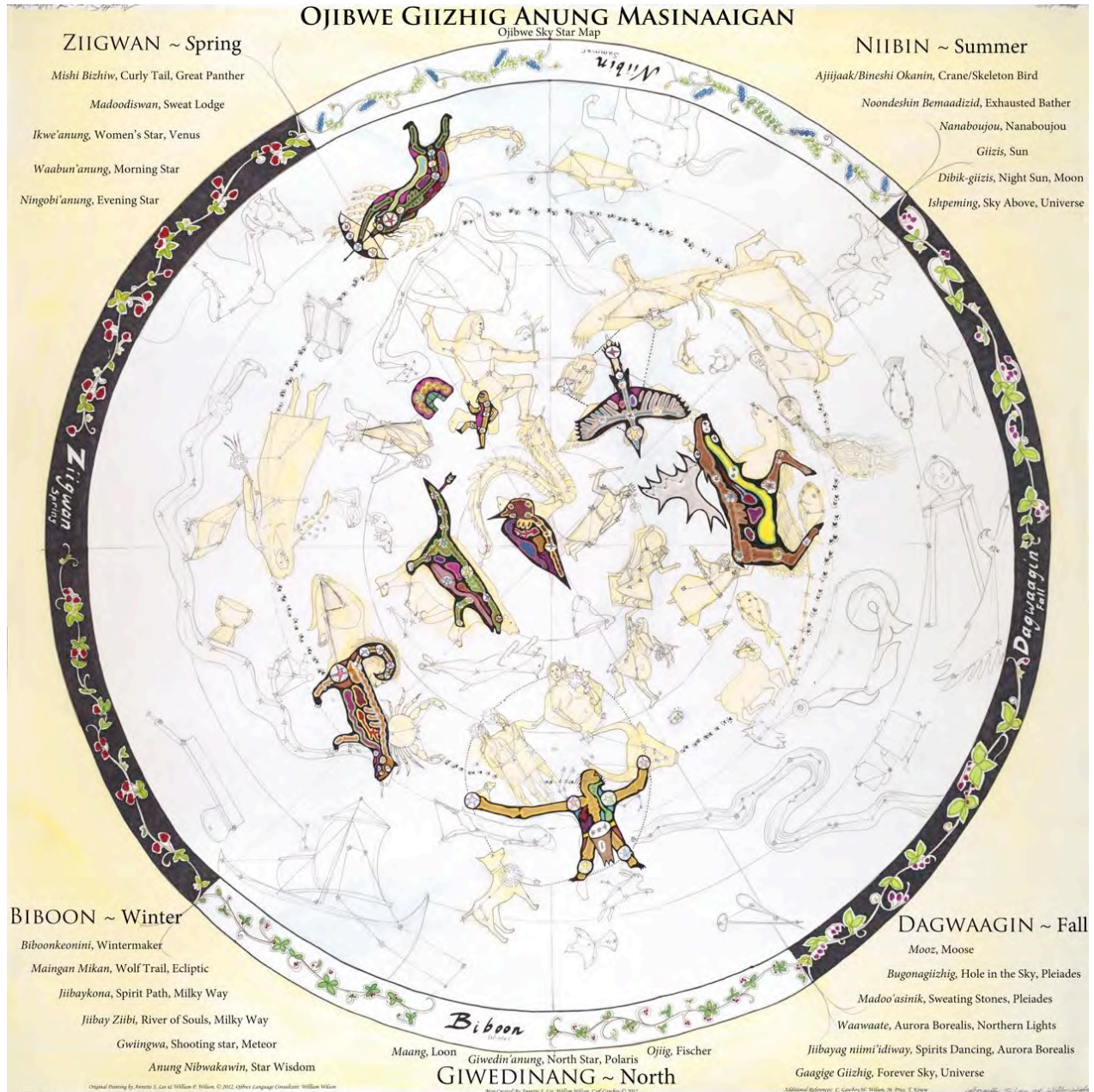


Figure 6 - Ojibwe Giizhig Anung Masinaaigan, Created by A. Lee, W. Wilson, C. Gawboy, 2012

“Ojibwe Giizhig Anung Masinaaigan - Ojibwe Sky Star Map”, was created by A. Lee, W. Wilson, C. Gawboy, ©2012. The map was designed so that the *Giwed'in'ung*, North Star, Polaris, is at the center of the map. This reflects the motion in the night sky – the North Star-Polaris appears to be a ‘motionless point’ about which all other stars in the sky appear to rotate around counter-clockwise (CCW) as viewed from the Northern Hemisphere.

Moving outwards from center, Ojibwe constellations of each of the four seasons are painted in woodlands x-ray style by W. Wilson. Brighter Greek constellations are shown in whispers of light yellow. Dimmer Greek constellations are visible in pen or simply pencil. Seasonal medicinal plants are displayed on the border in a floral Ojibwe style beadwork pattern.

Lesson One – Which Way is North?

Part 1. - Introductory Discussion. Ask the group “*Which way is North?*” have students/participants point to the direction in the room that is north.

- ***Which way is North?***
- How do you know?
- Why is it important?
- How do we say ‘North’ in Ojibwe?

- ***What are the Ojibwe constellations in the Northern night sky?***

On Earth:

Place a large letter ‘N’ in this direction and/or the Ojibwe word ‘*Giiwedini/ Giiwediniang/ Giiwedinihong*’.

Using place specific landmarks, like the Mississippi River flows north to south or the direction of sunset/sunrise east-west or using a smart phone compass app are some of the ways of knowing north... Note: Often people will point in many different directions.

In the Sky:

In the Northern sky is where we find the North Star, Polaris. This star is special because it is directly above the Earth’s North Pole. As the Earth rotates each day on its axis, the North Star – Polaris appears motionless¹. The exact point above the Earth’s North Pole is called the “North Celestial Pole (NCP).

Imagine you are the Earth. As you rotate around your (vertical) rotation axis, there is a point on the ceiling directly above your head that appears not to move!

The North Star – *Giiwedini’angun* is also special because it reflects (like a mirror) our position on Earth. (up-down, or equivalently north-south from the equator of Earth)

For example, at latitude +45°, the North Star-Polaris is 45° above the horizon. If we travel further north and look at the stars, then the North Star will be seen higher in the north sky! If we travel further south, towards the equator, then the North Star-Polaris will be seen closer to the horizon (or 0°). The North Star is a compass in the sky! It has been used for thousands of years for navigation, this is called “celestial navigation”.

Summary Points:

- The North Star, Polaris is found in the north direction². It is a compass.
- The height of the North Star, Polaris above the horizon is the same as how far you are above the Equator. It is a reflection of where you are.
- The North Star is located directly above the Earth’s rotation axis and so appears motionless.
- All other stars in the night sky appear to move in a counter-clockwise (CCW) direction around the North Star. In some cultures, the North Star is considered a ‘leader’ because literally all other visible stars in the night sky will appear to circle around it.
- *Giiwedini/ Giiwediniang/ Giiwedinihong* is North in Ojibwe.
- *Giiwedini’angun* is the “The North Star”, Polaris, in Ojibwe.
- The orientation of the Big Dipper with respect to the North Star as viewed a few hours after sunset can be used like a calendar because it changes with the season.
 - Winter – vertically upside down to the right of the North Star – like an icicle
 - Spring – horizontally upside down, above the North Star – like a bucket pouring water ‘Spring showers’
 - Summer – vertically right side up, to the left of the North Star – like a blade of grass or shovel
 - Fall – low on the horizon – like a basket, ‘we fill our baskets’ in the fall.

¹ There is a very small wobble of 0.75° about the North Celestial Pole (NCP).

² For approximately 1000 years Polaris will be the North Star. The minimum angular separation will occur ~2100 AD.

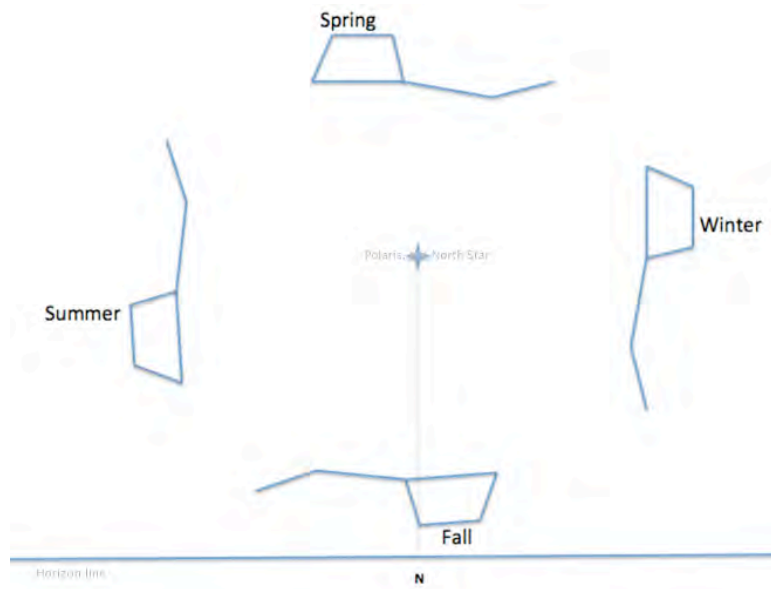


Figure 7 - Big Dipper as a seasonal calendar, as viewed a few hours after sunset



Figure 8 – Long exposure photo centered on the North Star, Polaris shows the circumpolar motion, Photo by I. Bernick 2014

OJIBWE CONSTELLATIONS found in the NORTHERN NIGHT SKY:

***Ojiig* – Fisher** (corresponds with the Big Dipper/Plough and Ursa Major)



This constellation relates to the story of when the birds and Spring were held prisoner by the ogres. Of all the animals it was only *Ojiig* - Fisher that was able to trick the ogres and free the birds. He saved everyone with his courage and wit.

The fisher is the only animal that can kill and eat porcupines. Also it is not diurnal or nocturnal, but prefers to always be on the move, sleeping and eating night and day. It does not build a home in one place and return as most animals do, but rather makes its home in different places. The fisher is constantly on the move.

- Find *Ojiig*-Fisher in tonight's sky.
- Earth-Sky Connection - Notice how *Ojiig*'s behavior on Earth is a perfect mirroring of the *Ojiig*-Fisher constellation in the night sky. The animal fisher is constantly on the move. The constellation *Ojiig*-Fisher is constantly moving around the North Celestial Pole (NCP). The motion of the physical animal matches the motion of the constellation in the night sky. This framework of a reflection of the relationship between earth and sky is repeated throughout the Ojibwe star knowledge.



Figure 9 - Photo by <http://www.ForestWander.com>, CC BY-SA 3.0 us, <https://commons.wikimedia.org/w/index.php?curid=21460755>



Figure 10 - *Ojiig*, by W. Wilson 2012

- ⇒ Video Connection - Listen to the Story of *Ojiig* Rescuing the Birds by Carl Gawboy.
- ⇒ Art Connection - paintings: *Ojiig*, by W. Wilson 2012

- **Maang – Loon** (corresponds with the Little Dipper and Ursa Minor)



The North Star and other stars in the Little Dipper/Ursa Minor make up the Ojibwe loon constellation. The loon is one of the Ojibwe clans and is seen as a very important messenger. Loon and crane are both leaders in the clan system, they work together. The loon stands at the doorway between the water and the land or the material and the spirit world. The loon avoids leaving the water, it must have water to land and take off. Only to make a nest to lay eggs it goes on land. They prefer larger lakes. The loons' legs and feet are positioned way back and they can't walk well on land

- **Giwedin'anung** - (corresponds with the North Star/Polaris)



The night sky appears to rotate around this star in a counter-clockwise motion. This star is at the 'center' of all stars as seen from the northern hemisphere and because of this it is considered to be very important.

- Find **Maang-Loon** and **Giwedin'anung** -in tonight's sky.
- Earth-Sky Connection - The place of the Maang-Loon as Ojibwe Clan Leader mirrors the place of Polaris-the North Star (which is where the Maang-Loon constellation is found) in the night sky. They are both leaders. Everyone circles around them.

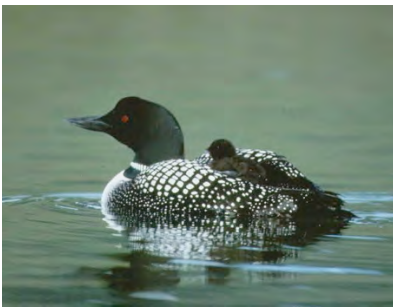


Fig. 11 - <https://commons.wikimedia.org/w/index.php?curid=17426>



Fig. 12- Art Weber/U.S. Fish and Wildlife Service



Figure 13 – *Doorkeeper of the North*, A. Lee, 2014



Figures 14a & 14b- *Ishpiming Maang* (Loon in the Sky), W. Wilson, 2012

- ⇒ Literature Connection - Read the story about *Maang*, Loon in Carl Gawboy's book "*Talking Sky*", pg.76
- ⇒ Literature Connection - Read more about Ojibwe clans in E. Benton's book "*The Mishomis Book*",
- ⇒ Art Connection - painting of *Doorkeeper of the North (Maang)*, A. Lee and painting "*Ishpiming in the Sky*", W. Wilson, 2012
- ⇒ Video Connection - Watch elder William Wilson share Ojibwe teachings about *Maang* like why the Earth is inside the belly of *Maang* in the painting *Ishpiming Maang* (Fig. 14a)



Figures 15a & 15b - Screen shot from Ojibwe skyculture on Stellarium, Carl Gawboy's video storytelling of *Ojig*

Notes:

- **Protocol.** This material is rooted in Ojibwe culture. All efforts should be made to present the material with the cultural authenticity. The ideal way to accomplish this is to have a native person (Ojibwe) to present in collaboration. Seek out those elders or cultural teachers in your area. These teachings come from a different system of knowing and there is always some risk when non-native persons attempt to deliver it. For example, there are some star stories that are only told when ‘there is snow on the ground’. Be respectful and careful.

MN K-12 Science Standards:

✓	3.1.3.2.1	Understand that everybody can use evidence to learn about the natural world, identify patterns in nature, and develop tools. <i>For example:</i> Ojibwe and Dakota knowledge and use of patterns in the stars to predict and plan.
✓	3.1.3.2.2	Recognize that the practice of science and/or engineering involves many different kinds of work and engages men and women of all ages and backgrounds.
✓	0.1.1.2.1	Use observations to develop an accurate description of a natural phenomenon and compare one’s observations and descriptions with those of others.
✓	0.4.1.1.1	Understand that living things are diverse with many different observable characteristics.... Observe and compare plants and animals.
✓	1.1.1.1.1	Understand that scientists work as individuals and in groups to investigate the natural world, emphasizing evidence and communicating with others. ...When asked "How do you know?," students support their answer with observations.
✓	1.1.1.1.2	Recognize that describing things as accurately as possible is important in science because it enables people to compare their observations with those of others.
✓	5.1.3.2.1	Describe how science and engineering influence and are influenced by local traditions and beliefs. <i>For example:</i> Sustainable agriculture practices used by many cultures.
✓	5.1.1.1.4	Understand that different models can be used to represent natural phenomena and these models have limitations about what they can explain. For example: Different kinds of maps of a region provide different information about the land surface.

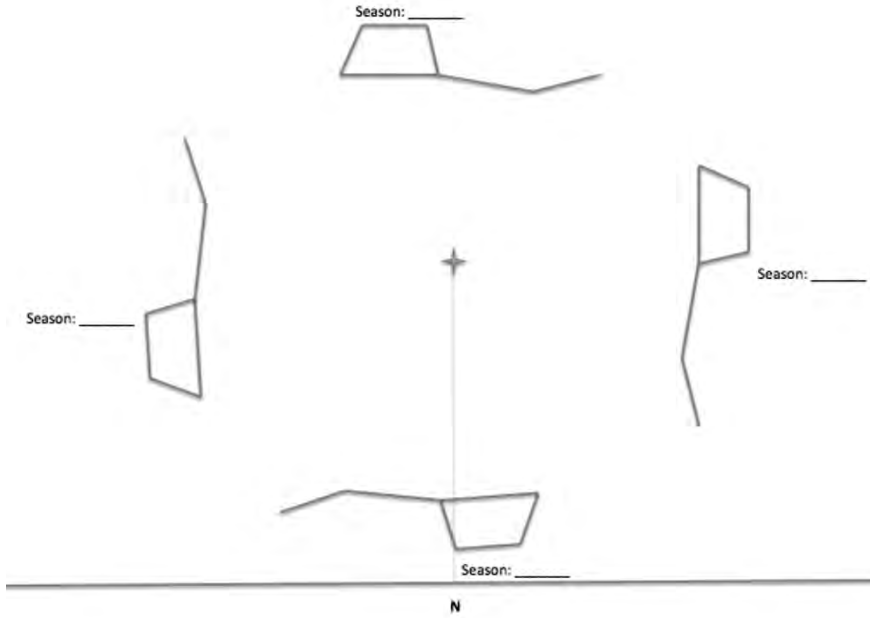
Can be extended to include:

✓	5.1.3.4.2	Create and analyze different kinds of maps of the student's community and of Minnesota. <i>For example:</i> Weather maps, city maps, aerial photos, regional maps, or online map resources.
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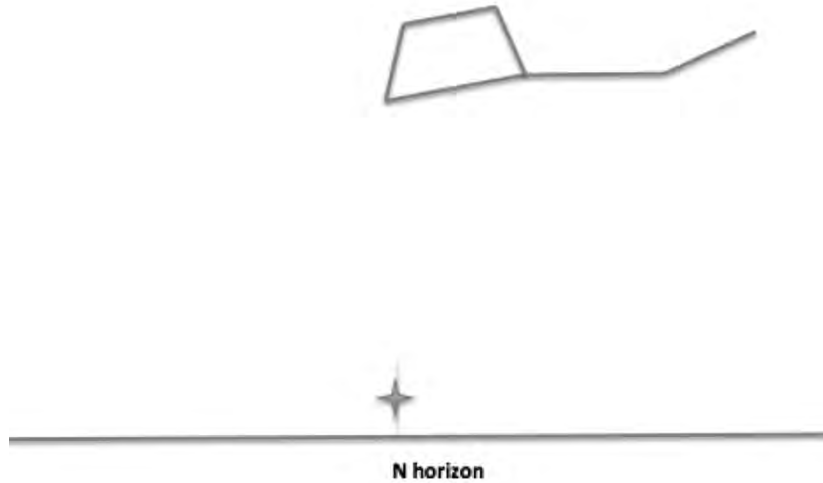
Additional Resources and Suggestions

- Read the *Ojibwe Constellation Guidebook* that accompanies this map.
- Go outside and find the constellation in the night sky.
- Tell a friend about one of the constellations you learned.
- Invite an Ojibwe elder/language expert into the classroom.
- Attend a Planetarium show.
- Read Carl Gawboy’s book on Ojibwe Star Knowledge, *Talking Sky*.
- Visit recommended websites:
 - <http://web.stcloudstate.edu/aslee/OJIBWEMAP/home.html>
 - http://web.stcloudstate.edu/planetarium/native_skywatchers.html
 - <http://web.stcloudstate.edu/aslee/>
 - <http://www.nativeskywatchers.com/>
 - <http://ojibwe.lib.umn.edu/main-entry/giiwedini>
- Video Connection -> “Star Trail Time Lapse”, 1:25, <https://www.youtube.com/watch?v=3V3rmDG5J8A>

1. Fill in the season for each snapshot of the Big Dipper. Assume a few hours after sunset, viewed from MN.



2. Where would I have to be in order to see the North Star in this position?



3. What is the Ojibwe word for 'North'?

4. What is astronomical name for the 'North Star'? the Ojibwe name for the 'North Star'?
_____ and _____
5. What is the name of the Ojibwe constellation using the same stars as the Big Dipper?
6. What is the name of the Ojibwe constellation using the same stars as the Little Dipper?
7. What is the Ojibwe word for 'star'?
8. What do the white dots on the back of the loon symbolize in Ojibwe star knowledge?
9. What is the scientific name for the motionless point above the Earth's North Pole?
10. If I am looking at the North Star and walk to the North Pole, how would the location of the North Star change? (Assuming I start in MN and have superhero-walking abilities.)
 - a. It would be seen at a higher latitude above the north horizon
 - b. It would be seen at a lower latitude above the north horizon
 - c. No change.
 - d. It depends on the time of year
 - e. It would be seen more toward the south.
11. If I am looking at the North Star and walk to the North Pole, how would the number of stars that do not go below the horizon change (called 'circumpolar stars')? (Assuming I start in MN and have superhero-walking abilities.)
 - a. There would be an increase in circumpolar stars
 - b. There would be an decrease in circumpolar stars
 - c. No change.
 - d. It depends on the time of year
 - e. It depends on the time of day.
12. Challenge Question: What does the North Star look like as viewed from the Southern Hemisphere?

