

Two-Eyed Seeing: Ojibwe Astronomy & NASA Moon 2 Mars

with CARL GAWBOY, WILLIAM WILSON,
JEFF TIBBETTS, JIM KNUTSON-KOLODZNE,
& ANNETTE S. LEE

Join Us for
A LIVE
(ONLINE)
SHOW!

Painting by A. Lee, W. Wilson, C. Gawboy, 2012

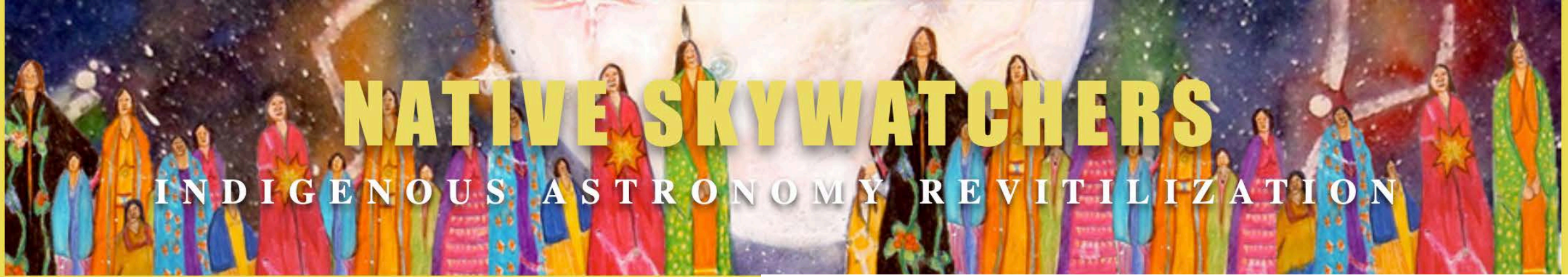
Image by NASA



**FRIDAY, OCT. 23
10-11 AM CDT**

Will feature topics like: the *Mooz*
constellation seen in the Fall night skies,





Two Eyed Seeing – NASA & Indigenous

As described by Mi'kmaw elders: *Etuaptmumk*

Two-Eyed Seeing is learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and to use both the strengths of Western knowledges and ways of knowing, and to use both the

Join us!...For this eight month project that weaves together Indigenous Astronomy and NASA Moon 2 Mars. Participants will participate in science and culture. Seven seasonal live (virtual) events will be held. Focus: NASA - Next Gen STEM, focus: Moon to Mars & STEM on Station.

Schedule of Upcoming Live Shows for this Project:



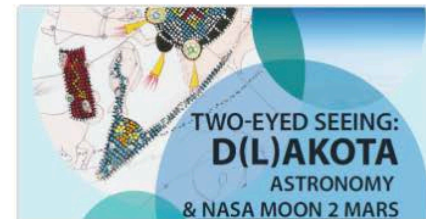
Two-Eyed Seeing:
Ojibwe Astronomy
& NASA Moon 2 Mars

Two Eyed Seeing:
OJIBWE Astronomy & NASA Moon 2 Mars

Friday, October 23, 2020

from 10-11 am cdt

[More Info](#) [Register](#)



TWO-EYED SEEING:
D(L)AKOTA
ASTRONOMY
& NASA MOON 2 MARS

Two Eyed Seeing:
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Friday, November 13, 2020

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[More Info](#) [Register](#)



esta de noche me
do las estrellas
cielo en ver la luna
que es

Two Eyed Seeing:
Maya/Mesoamerican Astronomy & NASA Moon 2 Mars

December 2020

TBA

[Coming soon...](#)



Two Eyed Seeing:
NAVAJO-DINE Astronomy & NASA Moon 2 Mars

January 2021

TBA

[Coming soon...](#)



Two Eyed Seeing:
AFRICAN Indigenous Astronomy & NASA Moon 2 Mars

February 2021

TBA

[Coming soon...](#)

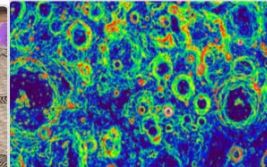


Two Eyed Seeing:
HAWAIIAN Indigenous Astronomy & NASA Moon 2 Mars

March 2021

TBA

[Coming soon...](#)



Two Eyed Seeing:
STEAM, Indigenous Astronomy & NASA Moon 2 Mars

April 2021

TBA

[Coming soon...](#)



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Small Steps to Giant Leaps

Explore Moon to Mars

STEM on Station

NASA STEM Engagement

Related Topics

All Topics A-Z



What is Next Gen STEM?

NASA's Office of STEM Engagement executed a series of efforts to develop STEM products and opportunities that provide a platform for students to contribute to NASA's endeavors in exploration and discovery. These mission-driven activities include over 20 evidence-based products and opportunities to engage students in authentic STEM experiences. NASA is working to provide mission driven opportunities that enhance STEM literacy and help build a vibrant and diverse next generation STEM workforce.



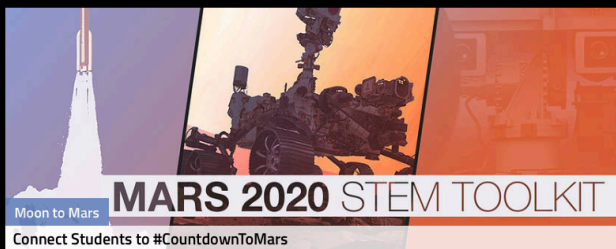
Commercial Crew Program



Small Steps to Giant Leaps



Moon to Mars



Moon to Mars

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Connect Students to #CountdownToMars



Earn Educator Badges



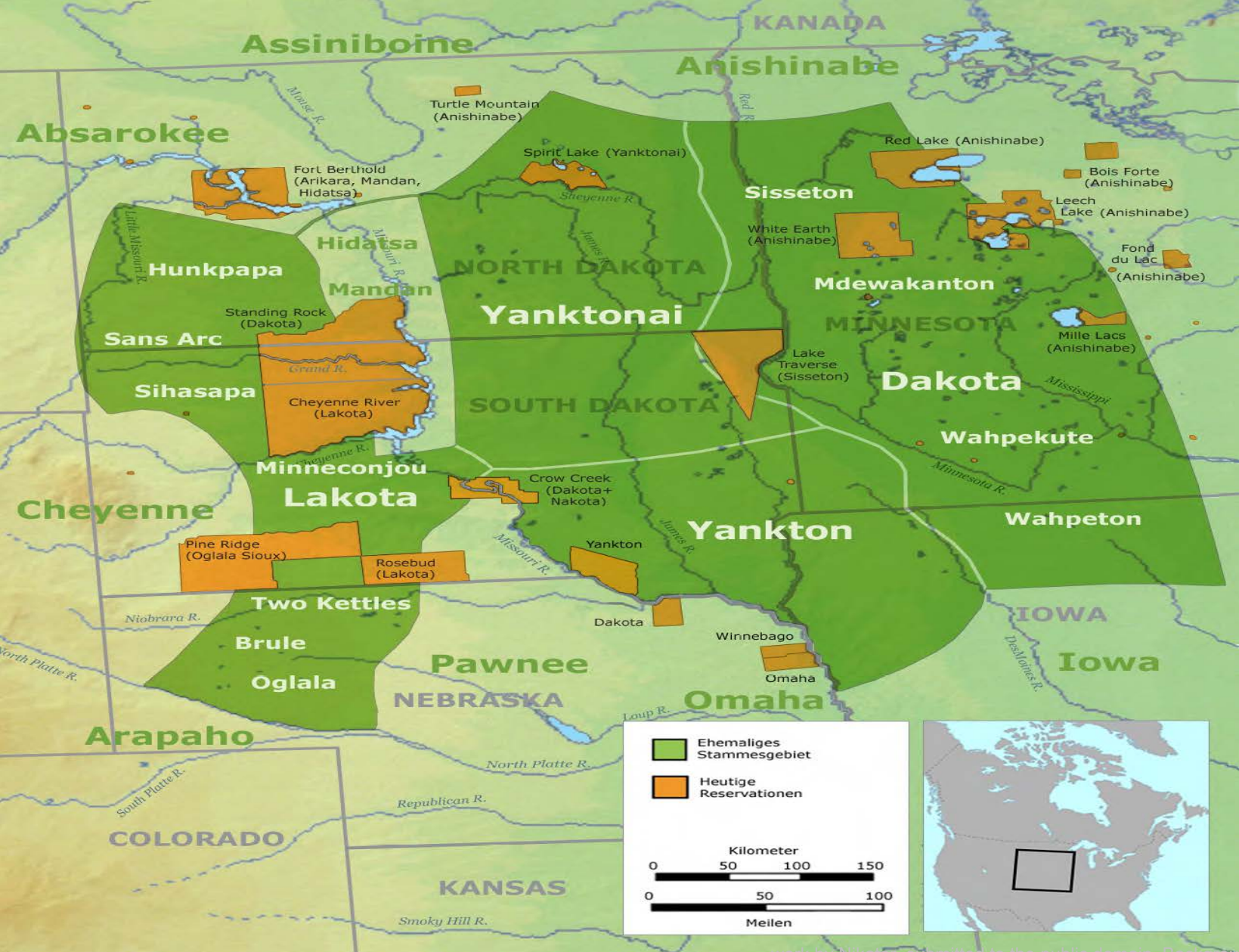
NASA
STEM
FORWARD TO THE MOON

EXPLORE
HUMANS in SPACE
STEM on Station

Funded by: NASA Next GEN STEM

with focus on Moon to
Mars & STEM on Station

Land Acknowledgement – *Mni Sota Makoce*



work by Nikater, submitted to the public domain. Background map courtesy of Demis, www.demis.nl.

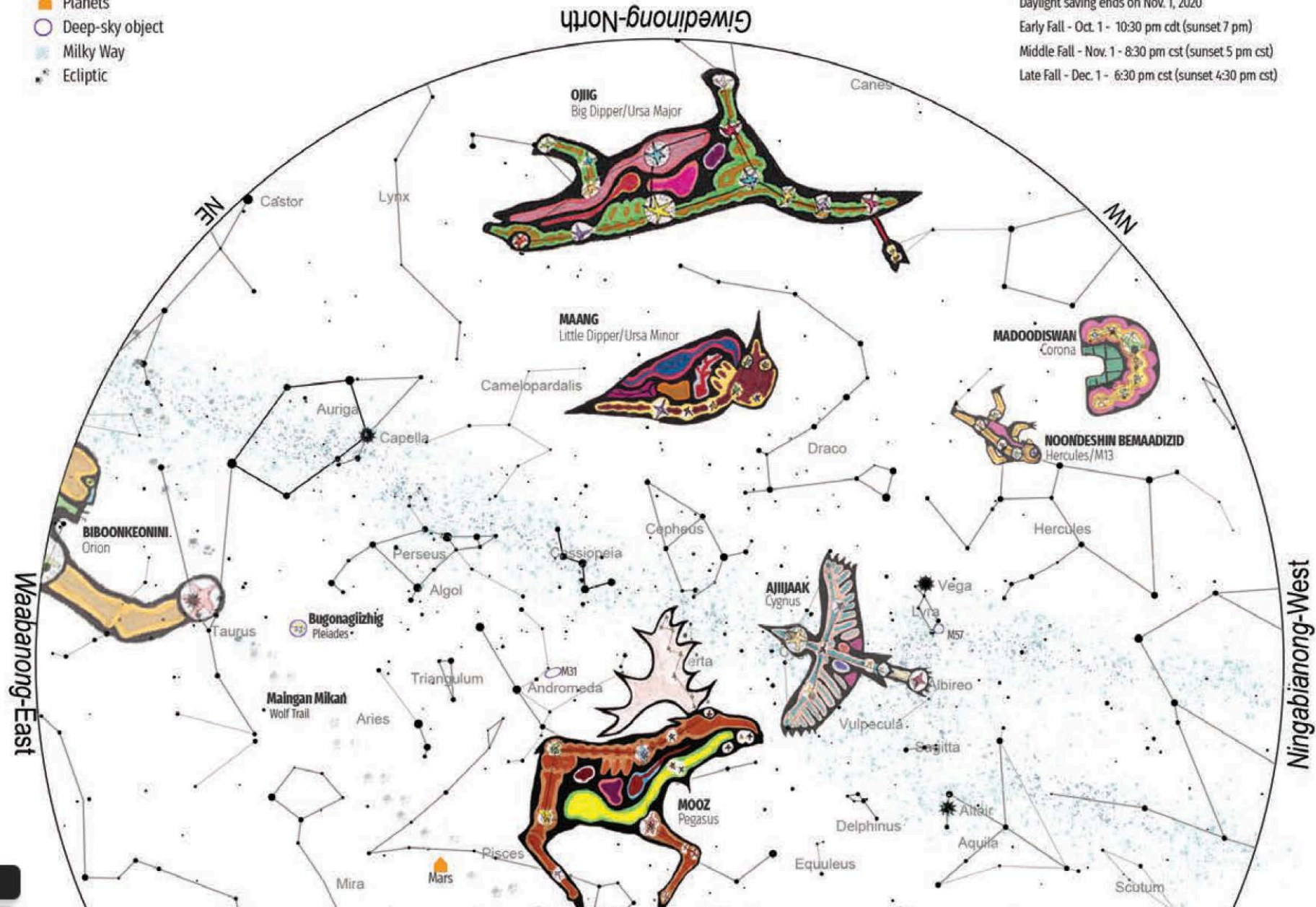
DAGWAAGIN - FALL NIGHT SKY

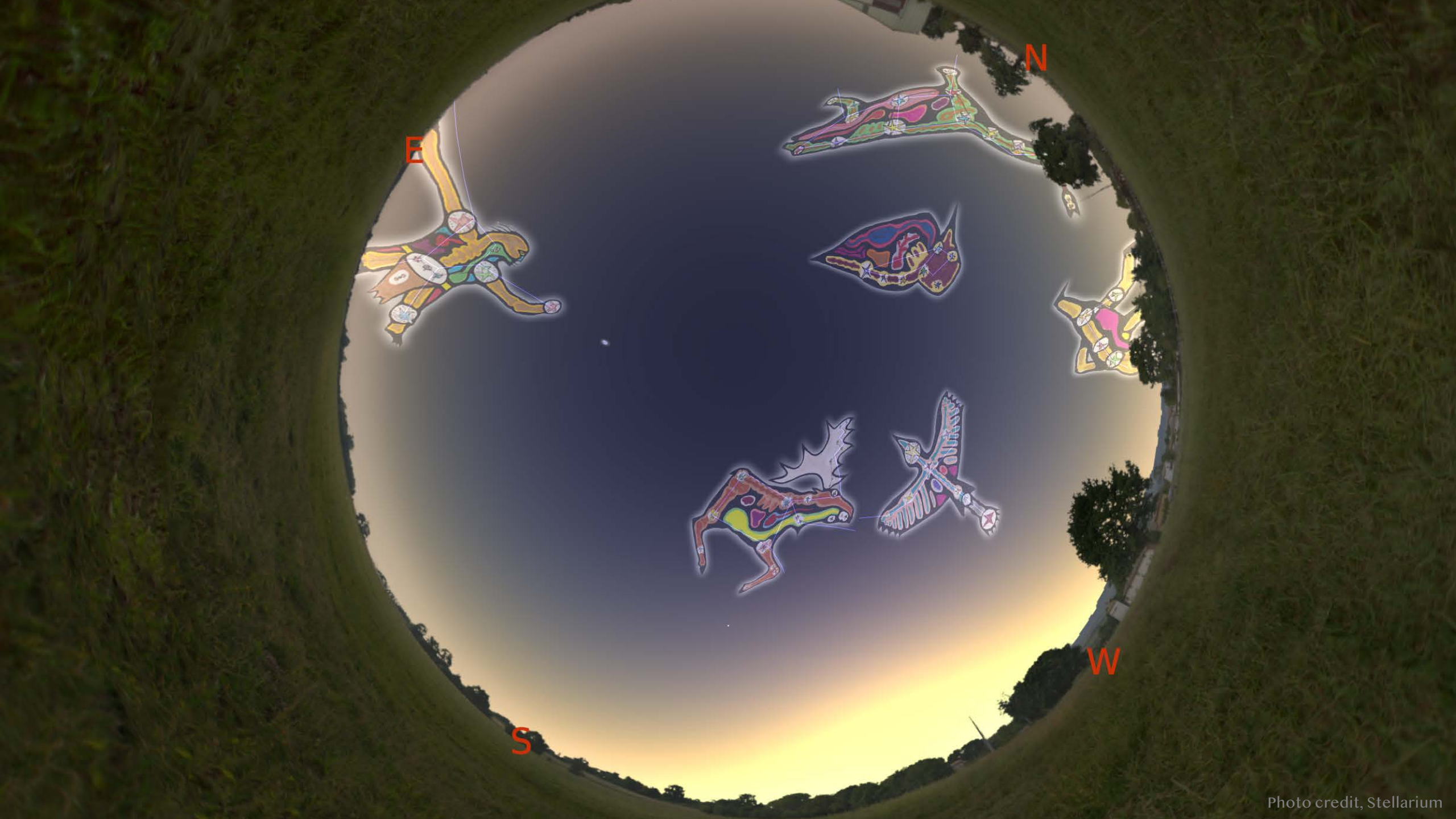
Legend

- ★ Bright stars
- 🟠 Planets
- 🌌 Deep-sky object
- ☁ Milky Way
- 🌌 Ecliptic

Best Time to Use this map

Sunset times in fall are getting earlier and earlier.
 Daylight saving ends on Nov. 1, 2020
 Early Fall - Oct. 1 - 10:30 pm cdt (sunset 7 pm)
 Middle Fall - Nov. 1 - 8:30 pm cst (sunset 5 pm cst)
 Late Fall - Dec. 1 - 6:30 pm cst (sunset 4:30 pm cst)





Dagwaagin - Fall Constellations

Mooz in the Sky

During the Fall night skies, the Mooz constellation is shining down on us full strength, highest and brightest in the sky at this time. On a clear fall night look south and nearly overhead for four bright stars that make a square (Pegasus). The square forms the body of the Mooz. Fainter stars below the square form the legs. Stars on the upper-right of the square make up the Mooz's head. Above the head a zigzag of fainter stars (Lacerta) mark the Mooz's antlers. After you have located the Ojibwe Mooz constellation, try to find the Mooz's bell (flap of skin under the chin) and the heart stars.

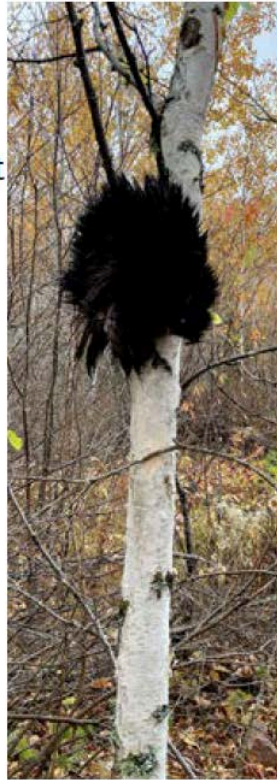


Photo by J. Tibbetts, Oct. 2020

Mooz on the Land

Moose hunting happens on the land in fall when the herd is at their fattest and strongest. Bull moose are in rut and are out looking/listening for a mate. Traditionally, when a moose is taken, tobacco is offered. In addition to using every part of the animal from the meat to the bones, to the nose and toes, the moose's beard or 'bell' is hung from a tree. This shows respect for the animal's spirit and mirrors the Mooz constellation, land and sky. "The reason they hang it is because all the stars are hanging" (W. Wilson).



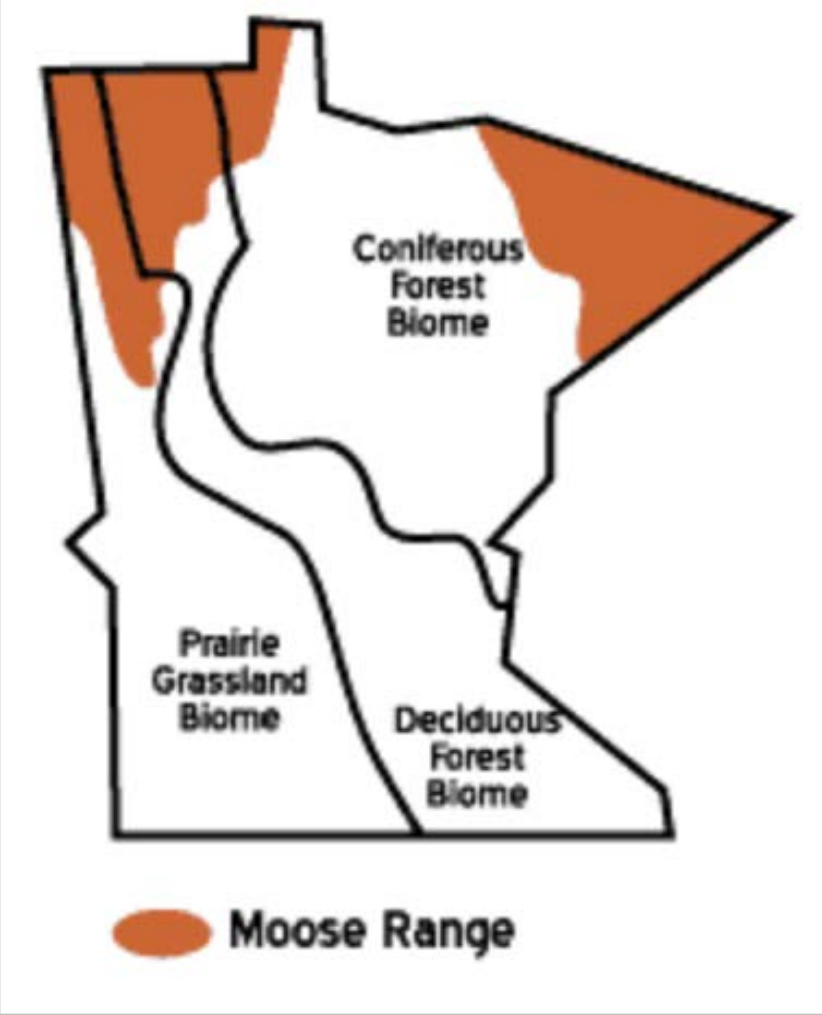
Photo by MN DNR



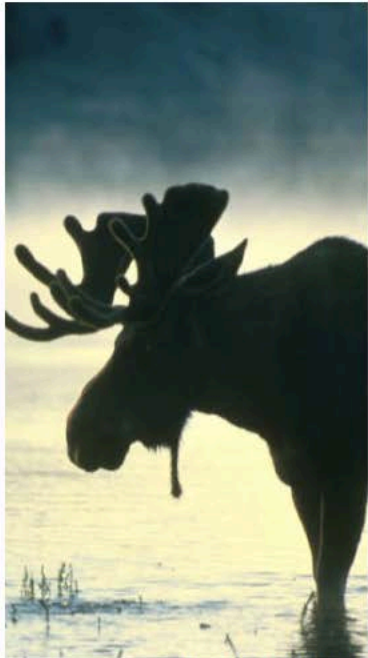
Photo by J. Tibbetts, 2020

Lake Hegman Pictographs

Some of the Ojibwe constellations can be seen in the pictographs at the Boundary Waters Canoe Area in northern Minnesota and Ontario, Canada. For example, high up on the cliffs at North Lake Hegman, the Mooz constellation is painted on the rock face, complete with a heart line of stars indicated. To the left of Mooz is the Ojibwe Wintermaker constellation and followed by *Gaadidnaway* - Curly Tail or *Mishi Bizhiw* - Mountain Lion constellation. Carl Gawboy was the first person to understand that some of the rock paintings in the Boundary Waters Canoe Area are actually Ojibwe constellations.



Map by MN DNR



Page 6

Photo by MN DNR

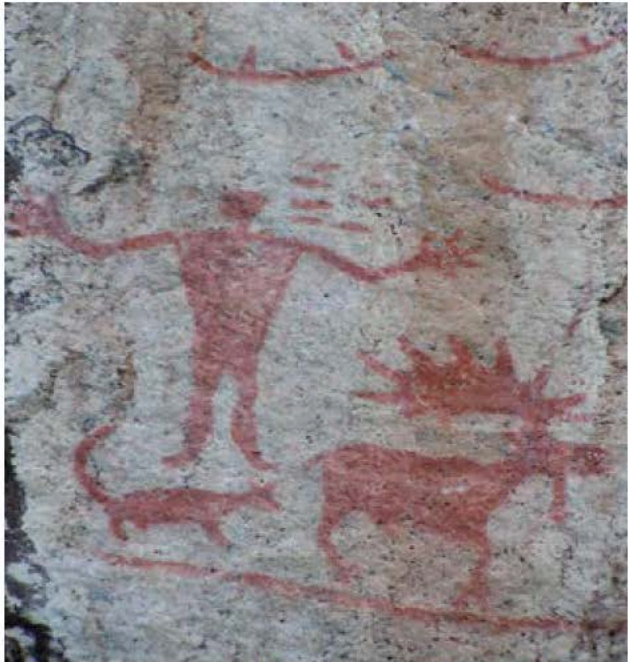


Photo by A. Lee, Lake Hegman, MN, 2013.

Q& A: 1-2 student questions-

Mikinaak - Snapping Turtle - Earth Sky

The word 'mikinaak' is translated 'snapping turtle', but it means 'Making a Roadway' or rather 'Making a Spirit Roadway'. Snapping turtles call lakes, rivers, and wetlands their home but they lay their eggs on land buried in a nest. *Mikinaak* is associated with the *Jiisakaan*, Shaking Tent ceremony "That's the messenger... When you pray that's the road you follow." (W. Wilson).



Photo by A. Lee, Fall 2020



Original Painting by W. Wilson, 2014, used with permission

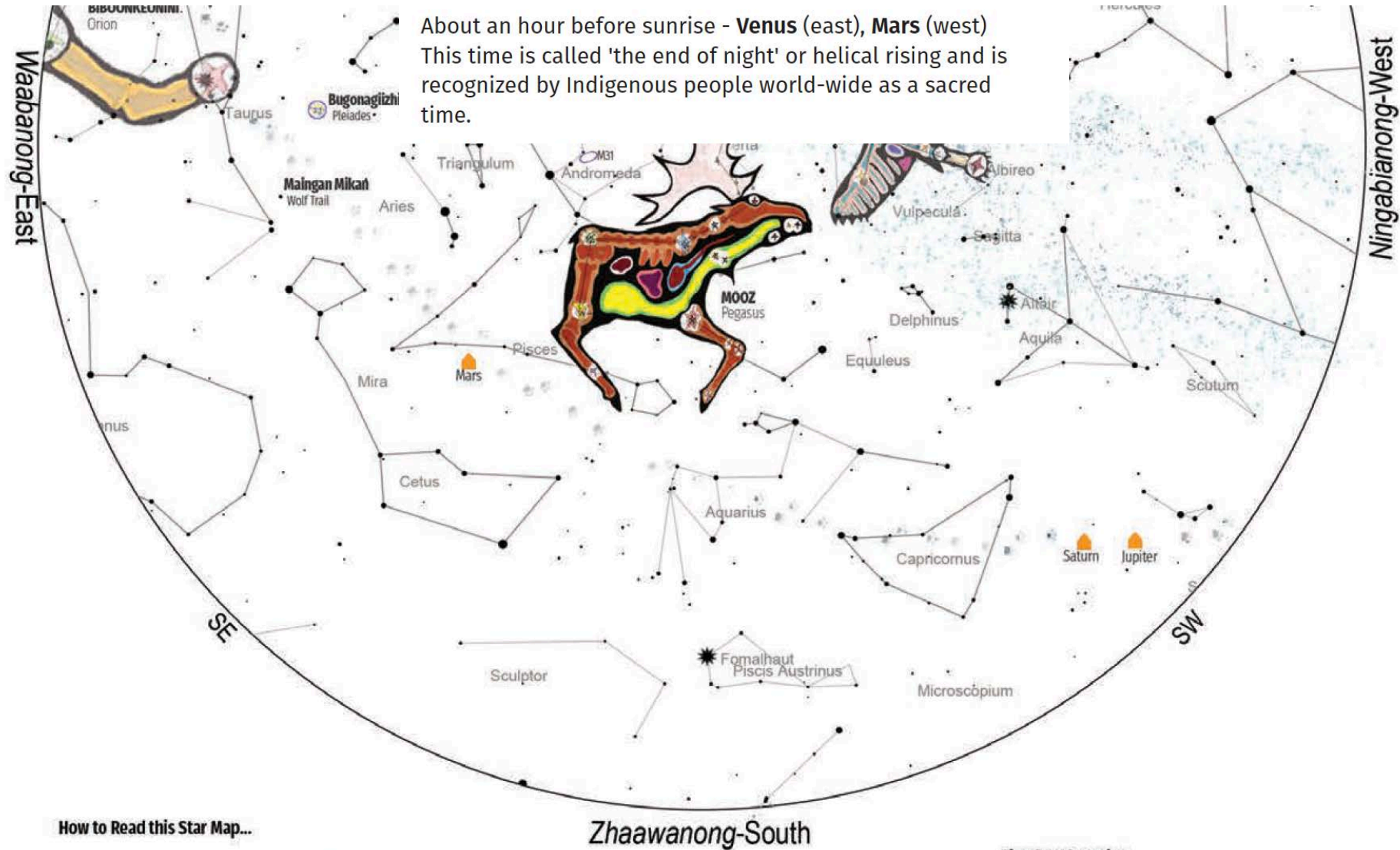


Original Painting by W. Wilson, 2014

Planets to See this Fall

About an hour after sunset - **Mars** (east), **Jupiter** & **Saturn** (south/southwest)

About an hour before sunrise - **Venus** (east), **Mars** (west)
This time is called 'the end of night' or helical rising and is recognized by Indigenous people world-wide as a sacred time.



How to Read this Star Map...

This map is a snapshot of the entire night sky as seen in the Fall from mid-latitudes in North America. Imagine the page is a flat version of the sky above you, a dome shape. Standing outside, face

Tips for Observing...

Enjoy! Dress warm. Get to the darkest sky possible. Allow ~10 minutes for eyes to adjust to the darkness. Amazingly more stars will 'appear' as your eyes



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Maingan Mikan - Wolf's Trail



Photo credit USFWS

Anyone who looks at the sky long enough will notice patterns. Planets we can see will move from east to west, passing through south, along the same path through the sky. In Ojibwe this special 'path of the planets' is called the '*Maingan Mikan*, Wolf's Trail' (the ecliptic).

So why a *wolf's* trail and not a deer trail or rabbit trail? The answer lies in the keen observation of the pattern of animal behavior unique to the wolf that mirrors the motion of the planets (retrograde motion). Most of the time the wolf will travel with the pack, but every once in while the lone wolf will rebel and travel off in a different direction before looping back. This rebellious movement of the planets is wolf-like.



NASA Moon to Mars

Would you consider going to the Moon someday? ...or to Mars?

NASA has a plan, the Artemis Program, to send humans back to the Moon by 2024 and then keep going so that by 2030 humans will land on the Red Planet Mars. Right now there is a lot of research happening to prepare. Did you know that the astronauts' toilets were just updated to accommodate women astronauts better and capture more waste? Until recently it was mostly men going to space and cleaning up escaped waste is messy, everything floats!

Another messy problem NASA is trying to solve is Lunar Dust. Small sticky particles are everywhere on the Moon. It can cause everything from equipment failure to damaging spacesuits. A plan for mitigating Lunar dust is a must for the future of space exploration.

Even more important than the dust problem is the problem of human health in space. High energy radiation can cause serious damage to our DNA and even cancer. Microgravity causes the heart to get smaller, more fluid in the head, and muscles get seriously weak. Travel to the Moon might be a 3-day trip, but to Mars would be a 7-9 month trip (one way). Lots to learn here....



Moon to Mars, Photo credit NASA.gov



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Moon to Mars

- In Lunar Orbit
- Humans on the Moon
- Commercial Lunar Payload Services
- Preparing People to Go
- Getting There: SLS and Orion
- Mars Today

Artemis News and Features

Related Topics

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- Solar System and Beyond
- Space Tech
- All Topics A-Z



Artemis

Mobile Launcher at Launch Pad 39B for Tests, Preps for Artemis I

About Moon to Mars

NASA will lead an innovative and sustainable program of exploration with commercial and international partners to send humans farther into space and bring back to Earth new knowledge and opportunities.

MARS 2020 STEM TOOLKIT

Moon to Mars

Connect Students to #CountdownToMars

Space Tech

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Space Tech

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Mars Perseverance Rover

NASA's Perseverance Rover Bringing 3D-Printed Metal Parts to Mars

Image of the Day

Orion's Recently Installed Solar Array Wings

Artemis I

Space Launch System "Green Run" Test: By the Numbers

Space Tech

NASA Selects Partner to Land Water-Measuring Payload on the Moon



NASA STEM on Station



Northern Lights Over Canada, sighted from the International Space Station. The station's main solar arrays are seen in the left foreground. Expedition 53 crew, Sept. 15, 2017. Photo credit NASA.gov

Circling the Earth once every 93 minutes about 250 miles above the ground in low Earth orbit (LEO) is a space station as long as ten buses launched nearly 22 years ago and inhabited continuously since November of 2000. The International Space Station (ISS) has been visited by 240 astronauts (including space tourists) from 19



STEMonstrations: Exercise

Q& A: 1-2 student questions-

Indigenous Contributions to Science

History at the K-12 level has generally followed 'great man' narratives as a pedagogical tool to draw students into complex historical events through individuals who have directly impacted them. Histories of science have relied even more heavily on these tropes, as readily called to mind by Galileo Galilei, Isaac Newton and Albert Einstein. In virtually all cases for U.S. K-12 curricula, these approaches center the agency of European or European-diaspora men. In 2014, however, for the first time, the majority of America's public schools were non-white. In 2040 the U.S. will be a 'majority minority.' This project creates Indigenous astronomy content by Indigenous people for our communities and everyone. (Gerardo Aldana)

Indigenous Engineering

- Building a canoe entirely out of a birch bark treewith some help from the spruce and cedar tree
- Surviving in winter camp where the temperature is 40 below zero (F or C)! Moving camp, not always in the same spot because there is a layer of frozen ground (thick ice)



Ojibwe family in canoe on Lake Vermillion, ca. 1905 Photo credit - MN Historical Society

Food Sovereignty

- Ojibwe were/are future oriented, preserving for future needs, not just surviving pre-colonization times but thriving (Carl Gawboy)
- Every part of the animal was used.
- Gathering traditional foods, like all the berries, strawberries, blueberries, cranberries .. drying them in the summer
- Preserving of traditional foods: Example: in summer smoke all meat; in winter leave it hanging someplace where there's no wind
- Example: preserve the Mooz (cut into tiny shreds, dry it, mix with tallow and berries)



Photo credit, MN Historical Society



Indigenous Housing

- Sustainability of a Wigwam, non-toxic, renewal materials, hole on top for light



Ojibwe people standing by a bull rush wigwam, c1910. Photo credit - MN Historical Society



Plant Medicine

- Sumac used for pipe stems, already a hole
- High bush cranberries bladder infection medicine... (Lindsey) or women's non-stop bleeding a root tea was used (William)
- Fall time to harvest...sage, tobacco, sweet grass, etc.
- Question: Is it ok to harvest flat cedar from a landscape bush? Depends on the situation, always better to use wild plants, but sometimes we have to make-do.



Photo credit, MN Historical Society

Two Eyed Seeing:
D(L)AKOTA Astronomy & NASA
Moon 2 Mars

Friday, November 13, 2020

Lee, Annette S., Carl Gawboy, Jim Rock, Jeff Tibbetts, William Wilson, and Charlene O'Rourke. "Native Skywatchers-Revitalization of Ojibwe & D (L) akota Star Knowledge-Collaborative Work with Educators", IAU General Assembly 22 (2015).

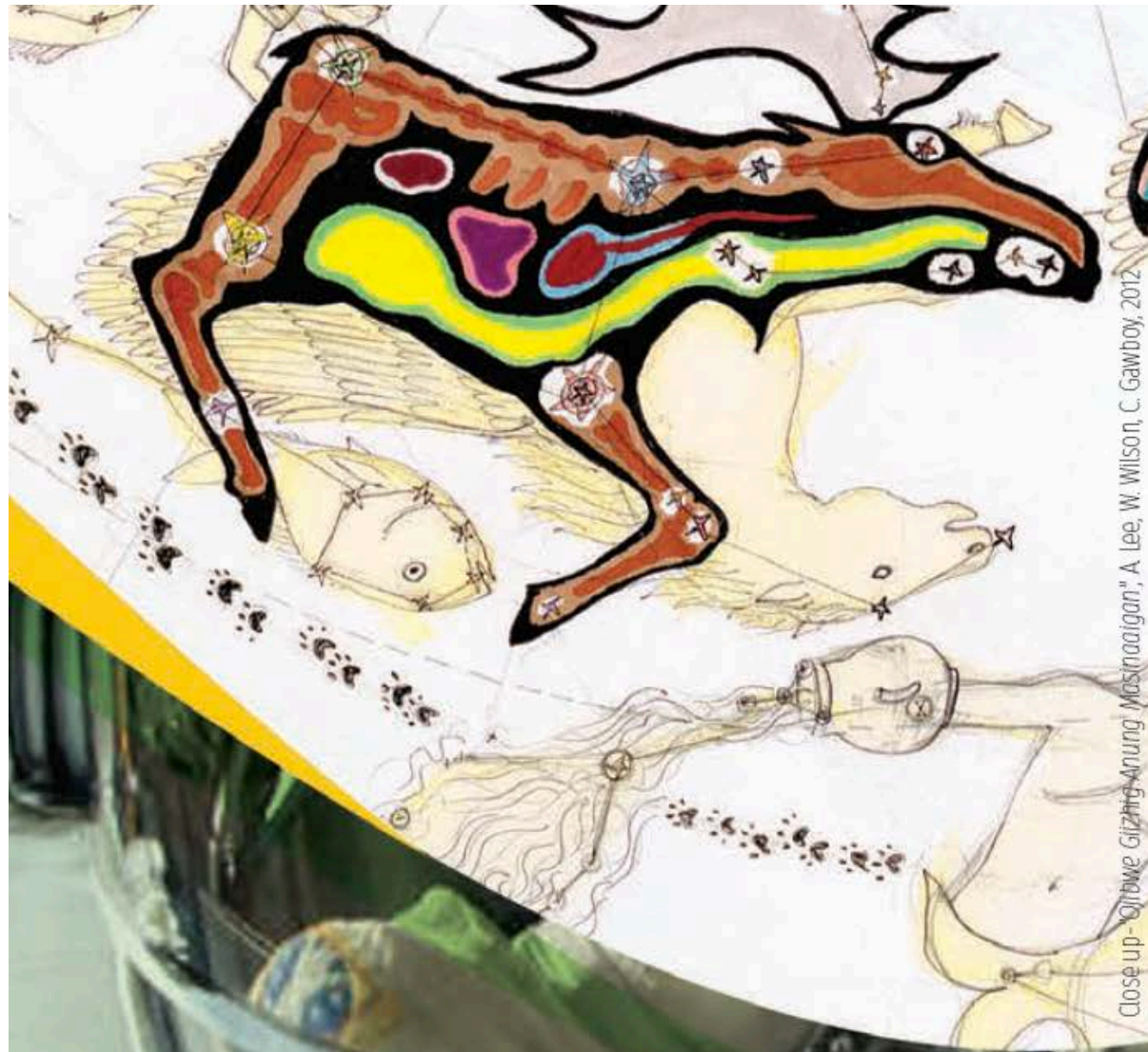
Lee, Annette S., William Wilson, Jeffrey Tibbetts, and Carl Gawboy. "Ojibwe Star Map Constellation Guidebook: An Introduction to Ojibwe Star Knowledge", Minneapolis, Minnesota: Native Skywatchers Press, 2014.

Morton, Ron, and Carl Gawboy. "Talking Sky: Ojibwe Constellations as a Reflection of Life on the Land", Rockflower Press, LLC., 2014.

Funded by
NASA-Next Gen STEM



MIIGWECH!



Thanks!