

**Keweenaw
Mountain Lodge**
Copper Harbor, MI



Application for Dark Sky Park Designation

Keweenaw Dark Sky Park

Picture taken by KML staff member, Nick Niffin, on April 4, 2021, on the 9th hole of the Keweenaw Mountain Lodge golf course

Table of Contents

Acknowledgments and Contributors	8
Mission of the Dark Sky Park	8
Nomination Letter, Support Letter, and Corporate Resolution	9
Nomination Letter	9
General Manager / Owner Support Letter	11
Corporate Resolution	13
Executive Summary	15
About the Keweenaw Mountain Lodge and Surrounding Areas	17
Location	17
History of the Keweenaw Mountain Lodge	20
Historic Preservation Easement	22
Stargazing at the Lodge	22
Viewing Areas in the Surrounding Area	24
Park Resources	31
Natural Resources	31
Historic Resources	31
Weather and Climate	31
Artificial Light and Light Pollution	34
Potential Threats to the Dark Skies at the Top of the Keweenaw	35
Example Lighting Project: Street Lights	36
Lighting Management Plan and Lighting Inventory	43
Lighting Management Plan	44
Visitor Lighting	44
Temporary Lighting	45
Illuminated Signs	45
Warranting of Outdoor Lighting Installations	45
Property Map, with Lighting Locations	46
Lighting Inventory	47
Lighting Ordinances for Keweenaw County	54
Night Sky Measurements	55
On Lodge Property, Sky Quality Measurements	55
Surrounding Areas, Sky Quality Measurements	59
Documenting the Nighttime Horizons	60

Night Sky Educational Programs and Outreach Initiatives	61
Night Sky Interpretive Talks	61
Stargazer Telescope Program	61
Educational Workshops	63
Stargazing Calendar of Events	67
Astronomy Clubs & Observatories	69
Outreach Commitment	70
International Dark Sky Park Support Letters	71
Letter from Keweenaw Convention & Visitors Bureau, Brad Barnett	72
Letter from Keweenaw Economic Development Alliance, Jeff Ratcliffe	73
Letter from Keweenaw Adventure Company, Sam Raymond	74
Letter from Copper Harbor Trails Club, Nathan Miller	75
Letter from Mariner North, Don and Peg Kauppi	76
Letter from Fort Wilkins State Park, Bob Wild	77
Letter from Grant Township, Scott Wendt	78
Letter from Michigan Nature Association, Julie Stoneman	79
Letter from Keweenaw Community Forest Company (dba, KORC), Gina Nicholas	80
Letter from Charlie Eschbach, Estivant Pines	81
Letter from Keweenaw County, Don Piche	82
Letter from Kall Morris Inc, Troy Morris	83
Letter from Pure Michigan, Dave Lorenz	84
Letter from Mt. Bohemia, Lonie Glieberman	85
Letter from Eagle Harbor Township, Rich Probst	86
Letter from Roger B. Chaffee Planetarium, David L. DeBruyn	87
Appendix	88
Appendix A: KML Historic Preservation Easement	89
Appendix B: Lighting Management Plan - Signed	96
Appendix C: Sky Quality Measurement Raw Data	100
Appendix D: Sampling of Dark-Sky-Related Workshop / Activities Blog Posts, Signs, and Social Media Posts	108
Energy Efficient and Dark Sky Compliant Street Lighting, February 22, 2021	109
Stargazing: Night Sky Photography Workshop, June 10, 2021	114
Stargazing: Night Sky Photography Workshop, July 9, 2021	116
Stargazing: Night Sky Photography Workshop, August 8, 2021	120
Stargazing: Dark Sky Light Management Workshop, November 3, 2021	126
Stargazing: Northern Lights Photography Workshop, November 6, 2021	128
Stargazing: Northern Lights Photography Workshop, December 4, 2021	132
Stargazing: Moonlit Snowshoe Hike, January 15, 2022	135

Snowshoe Hare Event, with a Moonlit Snowshoe Hike, February 12, 2022	140
Stargazing: Moonlit Snowshoe Hike, March 19, 2022	146
Stargazing: Northern Lights Photography Workshop, April 2, 2022	149
An Example of a Sign on Property	151
Sample of Social Media Posts	152
Appendix E: Email: Keweenaw County - Zoning Ordinance - Comments	158

Application Log*April 22, 2021*

Initial submission, version 1.0, emailed to IDA program manager, John Barentine

May 29, 2021

Received review comments from IDA program manager, John Barentine

June 10, 2021

Received additional review comments, focused on statistical analysis of the sky quality measurement data, from IDA program manager, John Barentine

October 1, 2021

Updated application, emailed ver 2.0 to IDA program manager, Ashley Wilson¹

October 9, 2021

Updated application, emailed version 2.1 to IDA program manager, Ashley Wilson, with change log between versions 1.0 and 2.1

November 8, 2021

Received review comments from IDA program manager, Ashley Wilson

December 15, 2021

Updated application, emailed version 3.0 to IDA program manager, Ashley Wilson, with change log between versions 2.1 and 3.0

January 20, 2022

The Dark Sky Places Committee reviewed our application

February 15, 2022

Received initial draft of feedback from Ashley Wilson with initial responses from the Dark Sky Places Committee's review of our application

March 22, 2022

Received finalized feedback response from Ashley Wilson (she was working on the ownership structure solution)

March 23, 2022

Meeting with Ashley Wilson and Amber Harrison to discuss the final review and address questions in order to have a clear direction to address the committee's concerns with version 4.0 of the application

¹ Ashley Wilson has become our assigned program manager at IDA, as John Barentine is no longer with IDA as of August 2021.

April 22, 2022

Updated application, emailed version 4.0 to IDA program manager, Ashley Wilson, with change log between versions 3.0 and 4.0

May 19, 2022

Received response from Ashley Wilson regarding version 4.0 application

May 20, 2022

Updated application, emailed version 4.1 (*this version*) to IDA program manager, Ashley Wilson, with change log between versions 4.0 and 4.1



The intent of this application is for the Keweenaw Mountain Lodge to extend its commitment to the International Dark-Sky Association to combat light pollution through public outreach and education, and become a designated Dark Sky Park in the northwoods of Michigan.

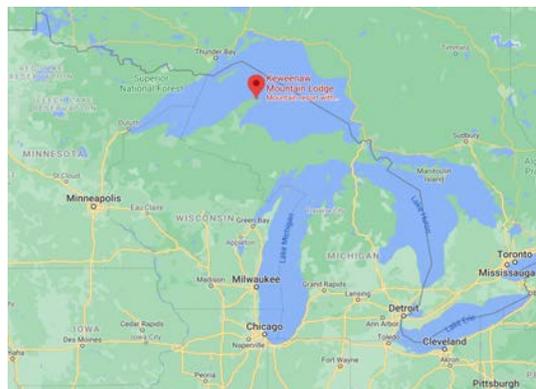
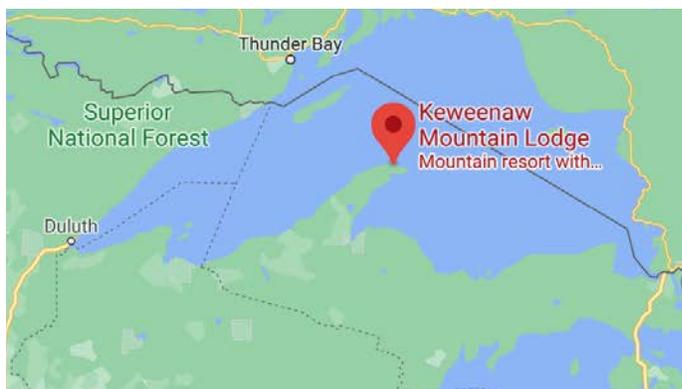
Name: Keweenaw Dark Sky Park, 
headquartered at the Keweenaw Mountain Lodge

Applying for Category: Dark Sky Park

Address: 14252 US Hwy 41, Copper Harbor, Michigan 49918, USA

Main Contact: John Mueller
E: john@keweenawresort.com
P: 906-289-4403
W: <https://keweenawmountainlodge.com>

Land Area: 560 acres, plus surrounding areas



Acknowledgments and Contributors

We would like to thank the individuals and organizations who wrote letters of support for the application and who we will be working with going forward in protecting the dark skies in the Keweenaw and educating visitors and residents about the importance of the night skies (you can find those individuals and organizations in the support letter section of our application). Their support of this initiative is important to ensuring that dark skies and stargazing are valued in the Keweenaw. These individuals and organizations understand the asset they have in the dark skies, and thus are committed to ensuring that the park's mission is achieved. As well, we would like to thank the staff at the Keweenaw Mountain Lodge for assisting in writing this application and supporting the Dark Sky initiative at the top of the Keweenaw. Thank you.

Contributors to writing this application

Pam Dyl, Chris Guibert, Mike Miller, John Mueller,
Martin Mueller, Nick Niffin, Tom Oliver, Mariah Summers

Mission of the Dark Sky Park

To provide a “headquarters” at the top of the Keweenaw which fosters the ability of individuals to see the stars and educate the public about the benefits of dark skies in the Northwoods of Michigan.



Nomination Letter, Support Letter, and Corporate Resolution

Nomination Letter

Below is the nomination letter from Robert Parrish, an International Dark Sky Association Delegate and the main contact for the Dr. Lawless International Dark Sky Park in Jones, Michigan.

April 20, 2022

To the International Dark Sky Association,

It is my pleasure to nominate the Keweenaw Mountain Lodge (KML), near Copper Harbor, Michigan as an International Dark Sky Park. After reviewing their IDSP application and having personally experienced their pristine dark skies, it is my belief that Keweenaw Mountain Lodge will be an excellent addition to the growing list of IDA approved Dark Sky Places.

Located at the tip of the Keweenaw Peninsula, the northern land mass of Michigan's Upper Peninsula that extends into Lake Superior, the area that comprises KML is well-protected from intrusive light pollution. As this area enjoys the status of being a tourist destination, the establishment of a Dark Sky Park will not only add to that attraction but will also offer the opportunity to further spread education outreach about light pollution.

With a resolute support team and a desire to preserve the natural beauty of Michigan's dark skies, I have no reservations when nominating the Keweenaw Mountain Lodge to receive the high status of an International Dark Sky Park. They will make the organization proud.

With best regards,



Robert Parrish

International Dark Sky Association Delegate

Dr. Lawless International Dark Sky Park

General Manager / Owner Support Letter

Below is a letter of support from the General Manager and Owner of the Keweenaw Mountain Lodge, John Mueller. John is a member of the International Dark-Sky Association (Member #: 24895), and sole member of Keweenaw Resort, LLC, which owns the Keweenaw Mountain Lodge.

April 21, 2022



To the International Dark Sky Association:

As a Member of the International Dark Sky Association it is my pleasure to support the **Keweenaw Mountain Lodge's** application to be recognized as a **Dark Sky Park**.

The Keweenaw Mountain Lodge is located in Copper Harbor, MI. Copper Harbor is a small tourist town at the tip of the Keweenaw peninsula, with approximately 100 year-round residents. Its remote setting and separation from the city means that residual city light is all but nonexistent, and makes it a great candidate for Dark Sky recognition. During the summer and fall months, the grounds offer biking and hiking trails, disc golf, and 9-hole golf course. During the winter and spring months, the grounds offer cross-country skiing and snow-shoeing. As such, there is great potential for Dark Sky community outreach programs and events year-round at the Lodge. The natural beauty and opportunity for adventure draws outdoor enthusiasts from all over, to the tune of 8,000+ visitors in a season.

Through intentional self promotion and light pollution management, the Keweenaw Mountain Lodge hopes to become known for its views of the cosmos. The Lodge has a strong team in place, and all involved will be educated to become a positive force towards the Dark Sky goal. I have no doubt that this dedication will benefit the promotion of the Lodge's dark skies and light pollution education.

Receiving Dark Sky Park recognition would be an honor that comes with many benefits. Like all worthy goals, the path will be challenging. I believe the Lodge has the personnel and perseverance to be the first Dark Sky Park in the Upper Peninsula of Michigan.

Regards,

A handwritten signature in black ink that reads "John Mueller '22". The signature is written in a cursive style with a large, sweeping flourish over the first name.

John Mueller
Owner / Member
Keweenaw Resort, LLC

Keweenaw Mountain Lodge

14252 US Hwy 41, Copper Harbor, MI 49918

Phone: 906-289-4403 | Email: info@keweenawresort.com | Website: <http://keweenawmountainlodge.com>

Corporate Resolution

Below is a corporate resolution from Keweenaw Resort, LLC, owner of the Keweenaw Mountain Lodge. John Mueller, IDA member and sole member of Keweenaw Resort, LLC, signed the resolution on December 6th, 2021 to formally show current and future endeavors by the company to foster dark sky initiatives at the Keweenaw Mountain Lodge and in the Keweenaw. As approved and adopted by its sole member, this resolution has been formally recorded with the company's legal documents as of December 6, 2021.

**RESOLUTION No. 2021-001****A RESOLUTION SUPPORTING THE FOSTERING OF THE DARK SKY ACTIVITIES IN THE KEWEENAW**

WHEREAS, the Keweenaw Resort, LLC company, the owner of the Keweenaw Mountain Lodge, supports efforts to foster Dark Sky initiatives at the Keweenaw Mountain Lodge and in Keweenaw county; and

WHEREAS, the Keweenaw Mountain Lodge represents an outstanding opportunity to view the dark sky under a pristine and undiluted viewing environment; and

WHEREAS, the natural starry night as found at the Keweenaw Mountain Lodge represents an important and valuable asset to the County of Keweenaw that contributes to the quality of life for its residents, visitors, and wildlife in and around the resort; and

WHEREAS, the Keweenaw Mountain Lodge recognizes the pristine quality of dark skies at the top of the Keweenaw as an important natural, cultural, and environmental resource of significant value and believe it should be fostered; and

WHEREAS, the Keweenaw Mountain Lodge seeks to preserve the Dark Sky at the Keweenaw Mountain Lodge through responsible lighting; and

WHEREAS, the Keweenaw Mountain Lodge supports sponsored events that help educate the public on the sensible outdoor lighting practices that help preserve the Dark Sky asset in and around Keweenaw County; and

WHEREAS, the Keweenaw Mountain Lodge believes its Lighting Management Plan approved by top management at the Keweenaw Mountain Lodge in 2021 is more stringent than the current Keweenaw County Zoning Ordinance, and the Keweenaw Mountain Lodge supports it as a means to protect the pristine Dark Sky asset at the top of the Keweenaw; and

THEREFORE, BE IT RESOLVED, that the owner of the Keweenaw Mountain Lodge, the Keweenaw Resort, LLC company, pledge its support in the creation of a Dark Sky Park at the Keweenaw Mountain Lodge within Keweenaw County, Michigan.

APPROVED AND ADOPTED THIS 6th day of December, 2021.

Attest:

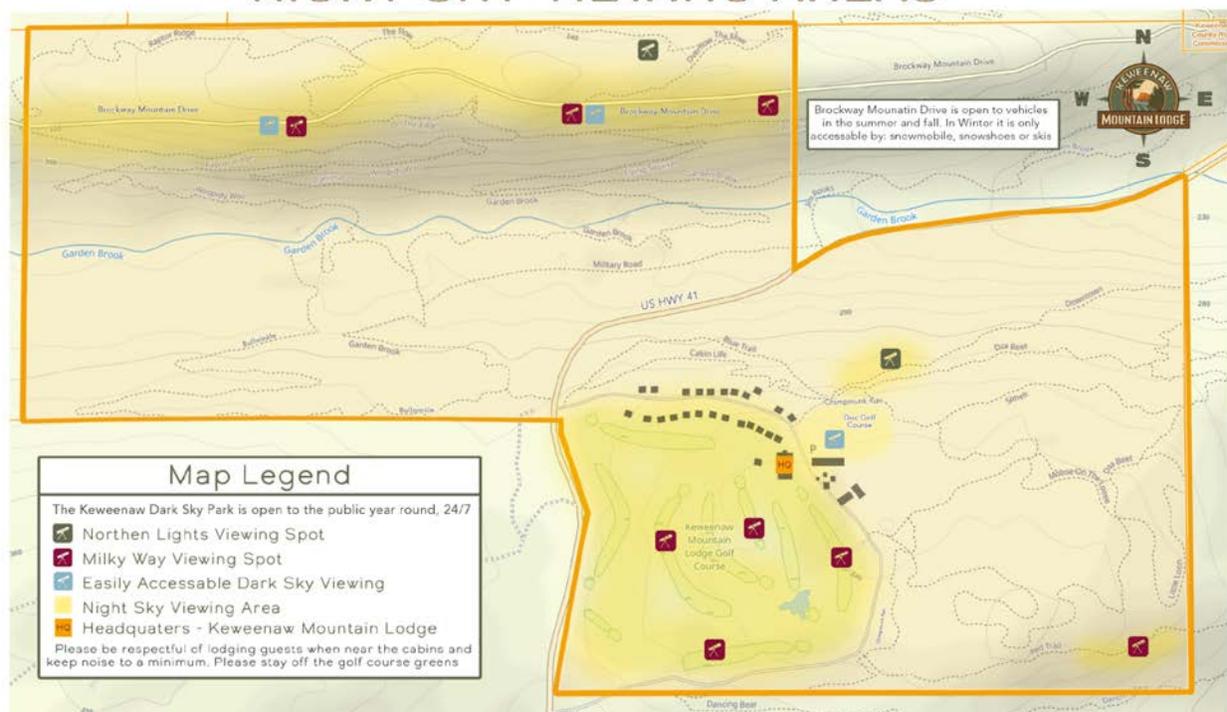
A handwritten signature in black ink that reads "John Mueller '21".

John Mueller, Member
Keweenaw Resort, LLC

Executive Summary

The Keweenaw Mountain Lodge (KML) is applying to be designated as an International Dark Sky Park, named “Keweenaw Dark Sky Park”. The Keweenaw Mountain Lodge is a mile from Copper Harbor, Michigan, the northernmost town in the state. Established in 1934, the Keweenaw Mountain Lodge is a WPA-era lodge that is on the National Registry of Historical Places, and consists of 560 acres. By establishing a designated dark sky park at the Lodge, we are looking to be the headquarters for night sky viewing and educational activities at the top of the Keweenaw, where the skies are dark (with an average sky quality measurement reading of $21.51 \text{ mag}_{\text{SQM}}/\text{arcsec}^2$ throughout the year).

KEWEENAW DARK SKY PARK NIGHT SKY VIEWING AREAS



In this application we have provided a history of the Lodge and the property, information about the surrounding areas and park resources, data on the level of light pollution and our data to show the quality level of our skies at the top of the Keweenaw in the northwoods of Michigan, and our educational and outreach initiatives. As well, you will see the support we have from the community, as exhibited in the support letters from individuals and organizations at the township, county, and state levels. As part of the deed restriction on the property, along with the Lodge being on the national register of historical places, the resort is accessible to the public for lodging, dining, and outdoor activities, including stargazing. Thus, public nighttime access to the

site is not preconditioned on visitors availing themselves of paid amenities, such as lodging stays.

As for the name of the dark sky park, we are using only “Keweenaw” as opposed to “Keweenaw Mountain Lodge”. We could have applied as a stand alone location. However, we felt that applying as a wilderness area, with the Keweenaw Mountain Lodge being the headquarters for the park and dark sky activities, helps ensure that a larger area enjoys the dark skies and more individuals are educated about dark skies since there is a clear leadership to champion the cause. The designated name of the park will be “Keweenaw Dark Sky Park”.

We are proud and excited to have organized a dark sky park initiative in the Keweenaw, where stargazing has been done for years (think Northern Lights / Aurora Borealis). This application is the result of this effort.

Notes:

Web page for this application: We have a web page on the Lodge’s primary website that is dedicated to this application. We set this page up earlier this year so we keep the general public abreast of our progress to become a designated International Dark Sky Park. This has been helpful in garnering community support for the dark sky park initiative. The web page can be accessed at:

- <https://keweenawmountainlodge.com/projects/international-dark-sky-park-application/>

Dedicated web domain: We have registered the domain keweenawdarkskypark.com. We look to build out the domain to be a separate website dedicated solely to the dark sky initiatives that are laid out in this application.

- <https://keweenawdarkskypark.com>

To help with the funding of the website, the Keweenaw Convention and Visitors Bureau has provided us with a \$1,500 grant.

Currently the domain redirects to our Outdoor Activities - Stargazing page on the Keweenaw Mountain Lodge website, keweenawmountainlodge.com.

About the Keweenaw Mountain Lodge and Surrounding Areas

The Keweenaw Peninsula, known as the Copper Country, is on Reader's Digest 2020 "The Most Gorgeous Peninsulas in the US" list. This area is home to some of the oldest exposed rock in the world, one of two National Historic Parks in the country, lighthouses, waterfalls, and more. Known as "The Gem of the Keweenaw", the Keweenaw Mountain Lodge is in the heart of it all. With the resort's outdoor recreation activities now year round, outdoor enthusiasts can enjoy hiking and biking trails, disc golf, traditional golf, cross country skiing, snowshoeing, and the charm of the historic rustic cabins with family and friends. For the naturalists and the environmentally inclined, the Lodge grounds offer a wide variety of flora and fauna. Bald eagles, owls, woodpeckers, whitetail deer, wolves, bears, and coyotes add to the wildlife population. Old growth pine forests, wildflowers, maples, birch, and much more take root for nature lovers to explore. The Keweenaw wilderness is full of edible foods that foragers flock to. Among them are thimbleberries and morel mushrooms, both popular treats in the Keweenaw.

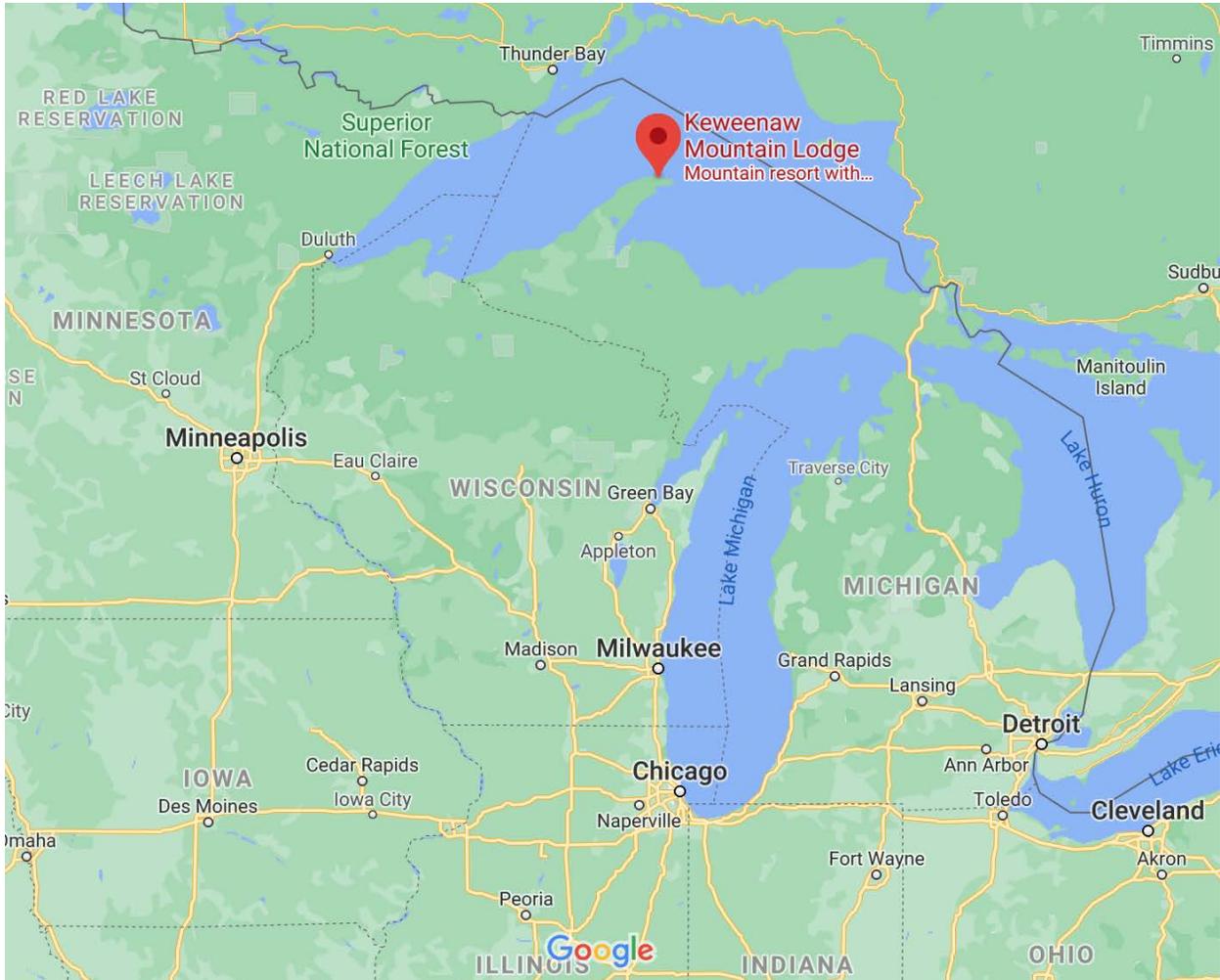
Now we hope another of our activities at the Lodge will take off: night sky viewing, stargazing. The realm of outdoor activities does not have to end when the sun drops below the horizon. Stargazing, meteor shower observations, and moon phases light up the night and are a unique way to bring together friends and family. With regular public night-time access, these activities will be prevalent in the unpolluted night sky of the Keweenaw Mountain Lodge. The Lodge will use this Dark Sky recognition to further educate, entertain, and bring the public together for the greater good of the night sky. This application reveals the Lodge's intent to continue the commitment to preserving the night sky and offering the distinguished opportunity to view the darkest skies possible.

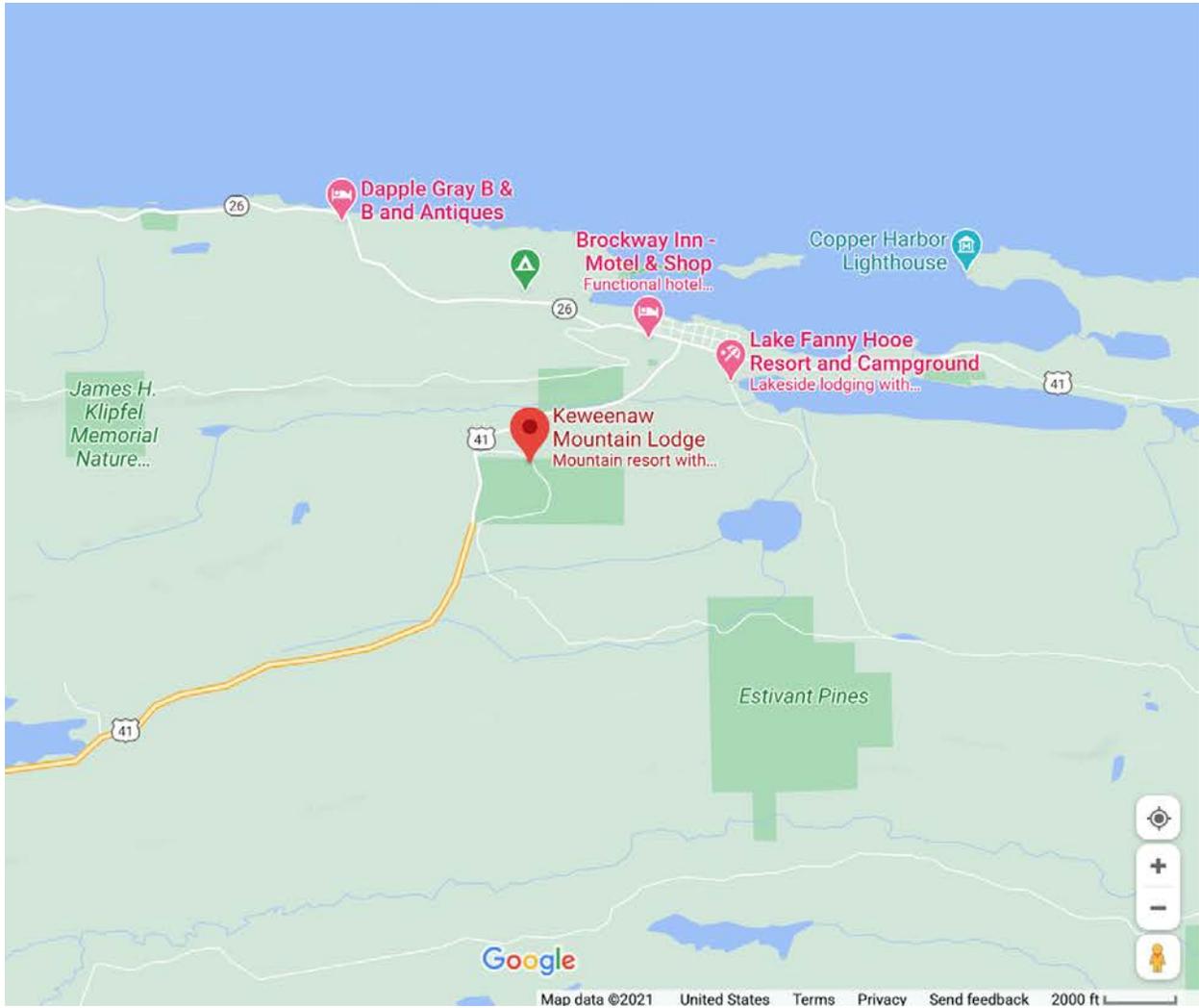
Location

The Keweenaw Mountain Lodge is located at the top of the Keweenaw peninsula in the northwoods of Michigan -- surrounded by Lake Superior on three sides. The resort sits on US Hwy 41, which stretches from Copper Harbor, Michigan to Miami, Florida (1,990 miles)². The closest town, Copper Harbor with less than 100 year-round residents, is 1 mile away from the property. Copper Harbor is known for being the furthest city away from a US Interstate: 237 miles away (US Interstate 39, Wausau, WI)³. This remoteness of the Lodge adds to the ability to offer dark skies to stargazers.

² Source: <https://k1025.com/copper-harbor-farthest-from-interstate/>

³ Source: <https://www.bloomberg.com/news/articles/2012-10-11/how-far-can-you-live-from-an-interstate-highway>





History of the Keweenaw Mountain Lodge

Located at the top of the Keweenaw Peninsula of Michigan, the Keweenaw Mountain Lodge is a historic wilderness resort built in 1934 as part of the Works Progress Administration (WPA) and Civilian Conservation Corps (CCC) initiatives. The architecture of the buildings is similar to the architecture seen in many of the US National Parks.



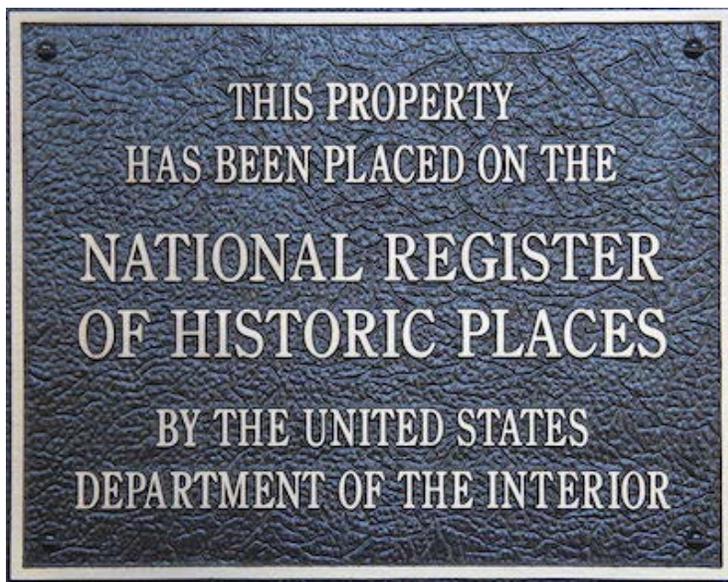
In October 1933, the Keweenaw County Road Commission reviewed several areas to build what was then known as the Keweenaw Park & Golf Course project. Initially, 167 acres was gifted by the Keweenaw Copper Company, formally known as Aetna Mining Company, to Keweenaw County. Keweenaw County owned and operated the resort from inception in 1934 until 2018 (for 84 years). In 2018 the resort was purchased by Keweenaw Resort, LLC, with a deed restriction that the resort be accessible to the public for a certain amount of days each year. Keweenaw Resort, LLC continues to be open to the public, offering cabins for rent, dining (food and beverage), events (e.g. wedding, corporate retreats), and outdoor activities (e.g. mountain biking, golf, hiking, trail running, cross-country skiing, snow shoeing, and more).



Construction started in 1933 under the guidance of architect Ocha Potter and a crew of 124 men. One team of horses was also used to assist with the hauling of trees while clearing what would become the golf course and using the logs for the construction of the Lodge and the cabins of what is now the present-day Keweenaw Mountain Lodge. Today it is under private ownership, and the outspoken character of the Lodge continues today stronger than ever.



The Keweenaw Mountain Lodge is on both the state (1976) and national (1980) registers of historic places.



PHS-4-100 (11-79)

United States Department of the Interior
Heritage Conservation and Recreation Service

**National Register of Historic Places
Inventory—Nomination Form**

See instructions in How to Complete National Register Forms
Type all entries—complete applicable sections

For NCRS use only
Issued 1/78 & 1980
Date entered 11/18/80

1. Name
Historic: Keweenaw Mountain Lodge and Golf Course Complex
and/or common:

2. Location *Sol of Ocha Potter Works on U.S. #*
street & number 51 of SW, Sec. 31, T59-R28 and N4, Sec. 6, not for publication
128-828
city, town Grant Township X vicinity of congressional district 11
state Michigan code 26 county Keweenaw code 085

3. Classification

Category	Ownership	Status	Present Use
<input checked="" type="checkbox"/> district	<input checked="" type="checkbox"/> public	<input checked="" type="checkbox"/> occupied	<input type="checkbox"/> agriculture
<input checked="" type="checkbox"/> building	<input type="checkbox"/> private	<input type="checkbox"/> unoccupied	<input type="checkbox"/> commercial
<input type="checkbox"/> structure	<input type="checkbox"/> both	<input type="checkbox"/> work in progress	<input type="checkbox"/> educational
<input checked="" type="checkbox"/> site	<input type="checkbox"/> Public Acquisition	<input type="checkbox"/> in process	<input checked="" type="checkbox"/> entertainment
<input type="checkbox"/> object	<input type="checkbox"/> in process	<input checked="" type="checkbox"/> yes; restricted	<input type="checkbox"/> government
	<input type="checkbox"/> being considered	<input type="checkbox"/> yes; unrestricted	<input type="checkbox"/> industrial
		<input type="checkbox"/> no	<input type="checkbox"/> military
			<input type="checkbox"/> other

4. Owner of Property
name Keweenaw County
street & number Keweenaw County Courthouse
city, town Eagle River vicinity of state Michigan

5. Location of Legal Description
courthouse, registry of deeds, etc. Keweenaw County Courthouse
street & number Eagle River Courthouse Square
city, town Eagle River state Michigan

6. Representation in Existing Surveys
site WUPDR Historic Preservation has this property been determined eligible? yes no
Plan, 1977
date Harrington HABS Study, 1975 federal state county local
depository for survey records Michigan State History Division
city, town Lansing state Michigan

The application, which was approved on June 18, 1980, can be found on our website at:

<https://keweenawmountainlodge.com/about/national-register-of-historical-places/>

with a link to our listing in the National Archives Catalog found here:

<https://catalog.archives.gov/id/25339759>

Historic Preservation Easement

When Keweenaw Resort, LLC purchased the Lodge in September 2018 from Keweenaw County, a historic preservation easement was placed on the property. The historic preservation easement ensures the property will be open to the general public, and that the property will continue to exhibit the characteristics that made the resort an historic property. The Michigan State Historic Preservation Office (SHPO) is the entity which lodge administration works with to ensure that the historic preservation easement is adhered to and the Lodge continues to be listed on the National Register of Historic Places. A copy of the historic preservation easement and its covenants can be found in the appendix.

Stargazing at the Lodge

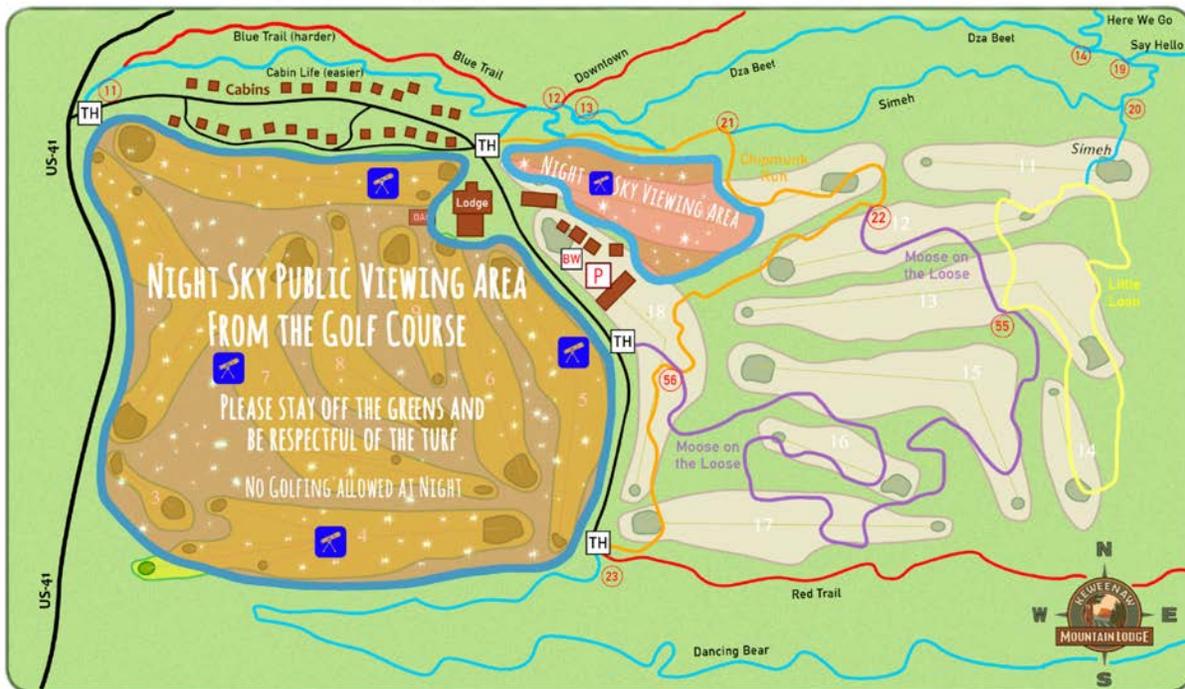
The Keweenaw Mountain Lodge is fortunate to have access to dark skies, where one can look up and easily see a multitude of bright stars in the sky. As is noted in this application, there is very little artificial light around the Lodge -- and thus multiple locations on the Lodge property where one can easily look up and see the stars.

Below is the Night Sky Viewing map at the Keweenaw Mountain Lodge, with the designated dark sky viewing areas and vantage points shown. The entire golf course is set up to allow individuals to view the stars. As well, the tennis courts, two small fields, and the disc golf course are also designated areas for stargazing.

 20180571	20180571 September 05, 2018 1:46 PM Fees: \$30.00
Julie A. Carlson Register of Deeds KEWEENAW COUNTY Pages: 6	
HISTORIC PRESERVATION EASEMENT KEWEENAW MOUNTAIN LODGE AND GOLF COURSE COMPLEX, TOWNSHIP OF GRANT, KEWEENAW COUNTY MICHIGAN	
<p>This historic preservation easement (the "Easement") is made the 5th day of September 2018 between KEWEENAW COUNTY as GRANTOR of a historic preservation easement (hereafter referred to as the "Grantor") whose address is 5095 4th Street, Eagle River, MI 49950, and the MICHIGAN STATE HOUSING DEVELOPMENT AUTHORITY, a principal state department acting through its STATE HISTORIC PRESERVATION OFFICE ("SHPO" or "Grantee"), whose address is 735 East Michigan Ave., Lansing, Michigan, 48912. The Grantor is the recipient of a 2007 Community Facility Grant Award from the United States Department of Agriculture, Rural Housing Service (USDA). The consideration for this Easement totals Ten thousand dollars (\$10,000) received from the USDA with the condition of granting this Easement to the Grantee.</p>	
<p>The property that is the subject to this Easement is the Keweenaw Mountain Lodge and Golf Course Complex, as described below (the "Property"), is listed in the National Register of Historic Places (the "National Register"). The Property is a parcel of land located in Grant Township, Keweenaw County, Michigan, and is more particularly described as:</p>	
<p>A parcel of land being a part of the South Half (S ½) of Section 31, T59N, R28W, Grant Township, Keweenaw County, Michigan AND the North Half of Section 6, T58N, R28W, Grant Township, Keweenaw County, Michigan described as: Beginning at the Southeast corner of said Section 31, T59N, R28W and the Northeast corner of said Section 6, T58N, R28W thence S. 00° 17' 27" E. 1766.33 feet along the East line of said Section 6; thence N. 89° 10' 31" W. 4220.22 feet to a point on the Easterly right of way line of Highway U.S. 41 (33 feet from center line); thence along the Easterly right of way line of said Highway the following eight courses N. 00° 49' 59" W. 33.95 feet to the point of curvature of a curve to the Right (Radius = 1041.27 feet, Delta = 15° 36' 17", Chord Bears N. 07° 53' 20" E. 282.72 feet); thence along the arc of said curve to the Right 283.59 feet; thence N. 15° 41' 29" E. 604.59 feet to the point of curvature of a curve to the Left (Radius = 620.65 feet, Delta = 35° 53' 27", Chord Bears N. 02° 15' 15" W. 382.46 feet); thence along the arc of said curve to the Left 388.78 feet; thence N. 20° 11' 58" W. 242.73 feet to the point of curvature of a curve to the Right (Radius = 724.21 feet, Delta = 19° 14' 13", Chord Bears N. 10° 34' 52" W. 242.01 feet); thence along the arc of said curve to the Right 243.15 feet to point on the North line of said Section 6; thence S. 89° 35' 55" E. 167.06 feet along the North line of said Section 6 to a point on the Southeasterly right of way line of said Highway (200 feet from the center line) and to</p>	

Night Sky Viewing at the Keweenaw Mountain Lodge

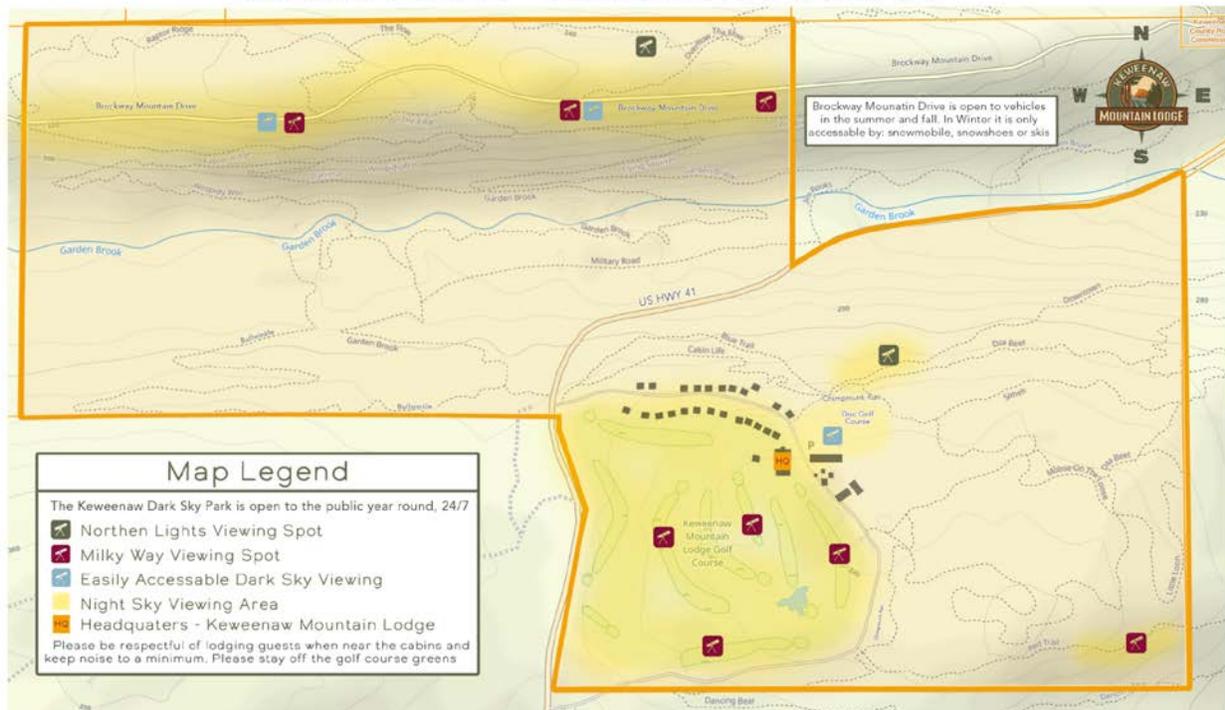
Please be respectful of lodging guests when near the cabins: Keep noise to a minimum



The night sky can be viewed from many spots on the property.
 The telescope symbol  shows some vantage points for best viewing the stars

An additional 383 acres adjacent to the lodge property were purchased in March 2022. This increases the Lodge property from 177 acres to 560 acres. On the property that was purchased there is ~310 acres of conservation easement, which will help protect the dark skies from light population. Any development in the 70 development envelope on that property will take in consideration the dark sky compliant lighting. Below is the map of the entire 560 acres with viewing areas identified.

KEWEENAW DARK SKY PARK NIGHT SKY VIEWING AREAS



The general public is able to access the property at night, and do not have to be lodging guests. Public nighttime access on the property is not preconditioned on visitors availing themselves of paid amenities of the Lodge. Individuals are able to enter the Lodge property via Golf Course Road, which is a road maintained by Keweenaw County year round. This includes snow plowing Golf Course Road during the winter to provide access to the property even when there is a large amount of snow on the ground. This is a benefit for both lodge guests and the general public.

With the recent addition of 383 acres to the park, a portion of Brockway Mountain Drive (which is also on the National Register of Historic Places) is now within the designated dark sky park. There are several prime dark-sky viewing areas along Brockway Mountain Drive. The road is maintained by the Keweenaw County Road Commission and is accessible at night to the general public.

The current size of the Lodge property is 560 acres.

Viewing Areas in the Surrounding Area

At the top of the Keweenaw, there are not very many areas that are developed. This offers stargazers multiple locations to look up and see the stars. This includes places along the Lake

Superior lake front (on M-26 and US Hwy 41), in multiple county and state parks, and up Brockway Mountain; all of which are just a short jaunt from the Lodge.

Lake Manganese (1) is due east of the Lodge. One can take a hiking trail from the Lodge to Lake Manganese or can drive down to the Lake.

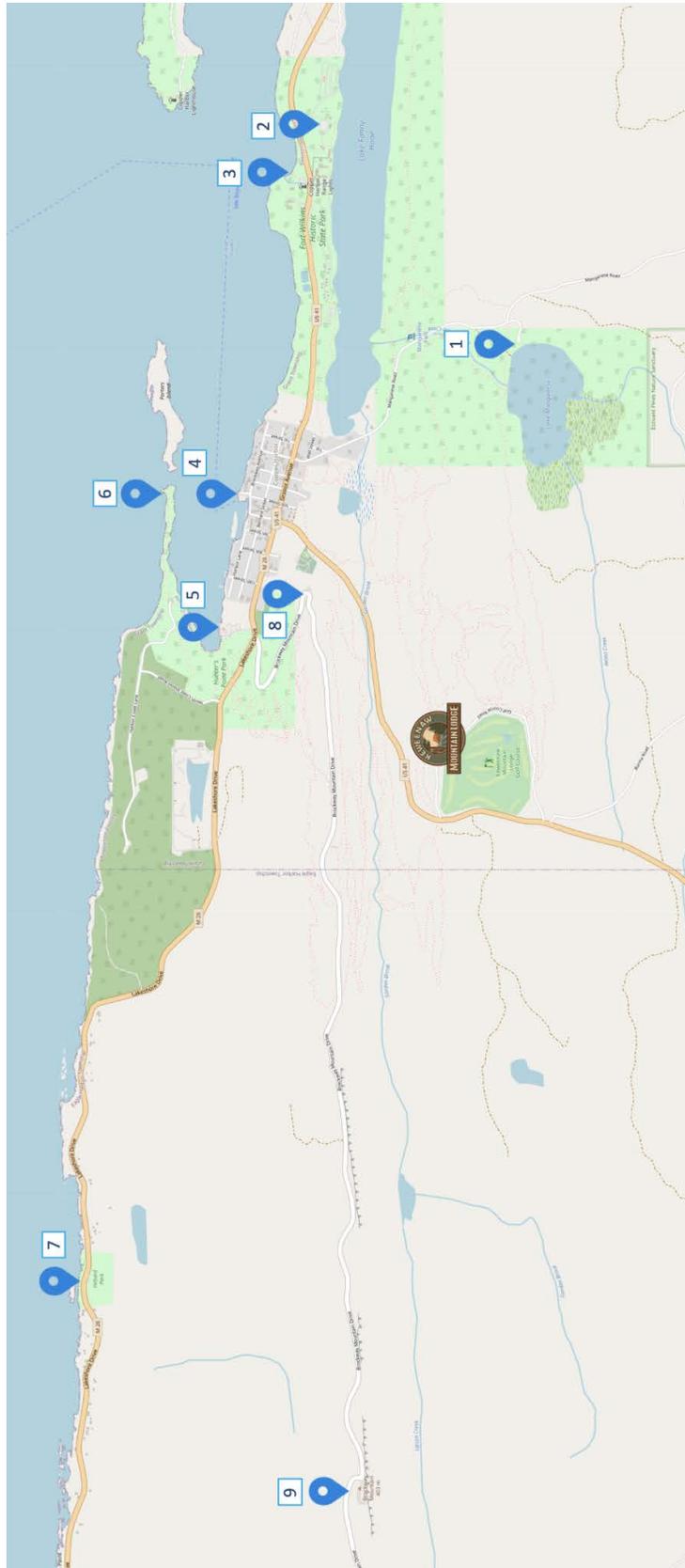
Fort Wilkins State Park (2) is located in Copper Harbor. It is a historical park operated by the Michigan Department of Natural Resources. The park preserves the restored 1844 army military outpost, Fort Wilkins, which was placed on the National Register of Historic Places in 1970.

Astor Shipwreck Park (3), which is across from Fort Wilkins, on Lake Superior. Walking a short distance from the parking lot, one is on the shores of Lake Superior looking out towards the North. Across the harbor, one will see the green light of the Lighthouse which adds a different vibe to looking up at the stars, but doesn't take away from the visibility and the atmosphere as the light is low to the ground.

In Copper Harbor, there is the **Jamsen's Bakery dock (4)** and the **boardwalk** along Lake Superior. On the west side of Copper Harbor, there is **Copper Harbor State Harbor (5)** and **Hunter's Point (6)**, which offer similar views of the lake and the stars. Venturing further west along the shoreline, there is **Hebard Park (7)**.

Elevation can be gained by going up **Brockway Mountain Drive**, which has a similar elevation as the Lodge (~1,100 feet above sea level). Along Brockway Mountain Drive, there are various pull-offs along the ridge road where one can stop and view the stars, including the **Lookout (8)** and the **Brockway Summit (9)**.

Below is a map showing these vantage points in surrounding areas which are easily accessible from the Lodge (*all within a 6 mile drive of the Lodge*). The vantage points are numbered to indicate each distinct vantage point.

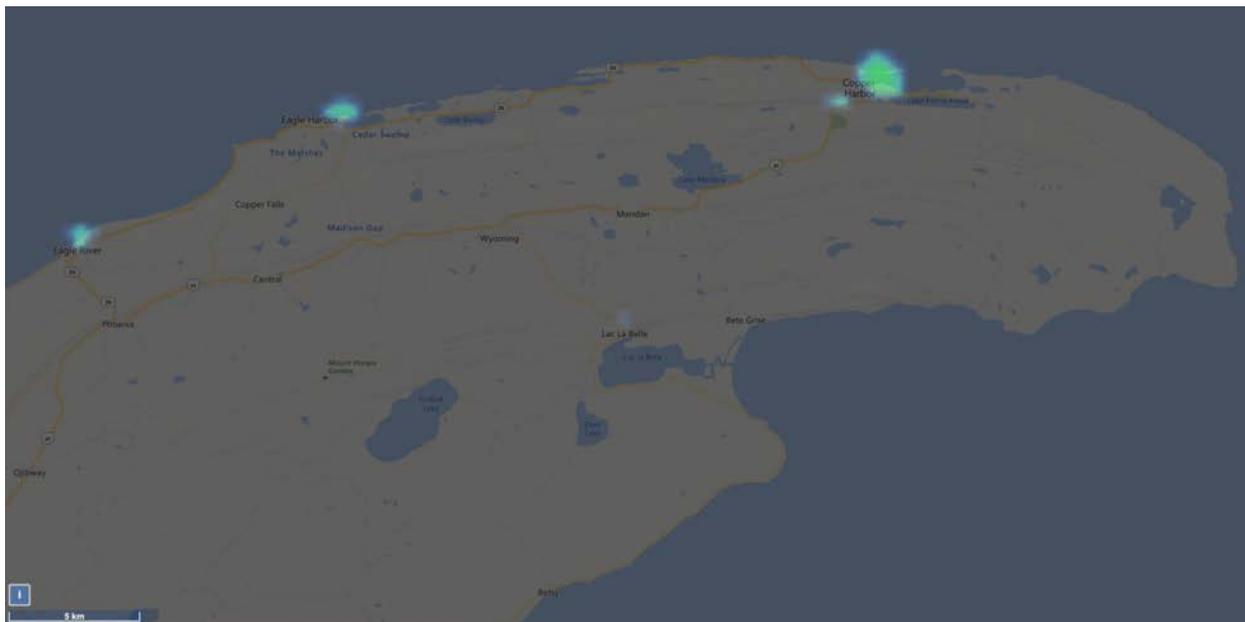


Many of these vantage points offer great opportunities for viewing the Northern Lights.



Photo taken by Pam Dyl, a former KML staff member

Other areas that could be of interest, and are just off the map, are the Keweenaw Point, Estivant Pines, the Lake Medora boat ramp, Esrey Park, Eagle Harbor Beach, the beach at Eagle River, Mt. Bohemia, Lac La Belle, and more. The two maps below show Keweenaw County outlined and how little development and light pollution there is in Keweenaw County.



Source: lightpollutionmap.info, using the VIIRS 2021 data for the map overlay

Various entities have submitted proposals to the Michigan Department of Natural Resources (DNR) to purchase close to 16,000 to 33,000 acres around the Lodge and at the top of the Keweenaw which would become a state park. This land is adjacent to the Lodge property. If that land purchase takes place, it would create the 3rd largest state park in Michigan and would

make most of the tip of the Keweenaw an outdoor destination This will help protect the dark skies from light pollution.



Milkyway, at High Rock - Keweenaw Point (photo taken by Chris Guiber, KML staff member)

The Lodge is situated near two national parks, Keweenaw National Historical Park and Isle Royale National Park (an island). National parks are known for their ability to see the stars, as we have seen several US national parks be designated as dark sky parks by the International Dark-Sky Association. [16 as of April 15, 2021⁴]. These parks include both wilderness-oriented and historically-oriented national parks. In the Keweenaw we have both, with the Keweenaw Mountain Lodge situated between the two national parks. Since the Lodge has a similar feel to national parks being that the structures on the property have a WPA/CCC-era architecture, we relate to the national park philosophies.



In addition, we are also near several state parks at the top of the Keweenaw: Fort Wilkins State Park. Interestingly enough, there is legislation in Michigan that does not allow state parks in the Upper Peninsula of Michigan to apply for being a dark sky park⁵. However, state parks in the U.P.



offer wonderful night sky viewing. Thus, another reason that we are taking the initiative to champion this project and to educate state park visitors about viewing the dark sky. [Bob Wild, from Fort Wilkins has written a support letter]

Note: McClain State Park is within a 45 minute drive of the Keweenaw Mountain Lodge, and offers views of the dark skies and the Northern Lights from the shores of Lake Superior.

All of these places provide additional locations that visitors can view the stars from, with the Lodge being the headquarters for the primary stargazing educational and outreach activities that are organized and championed at the top of the Keweenaw.

To conclude, the Upper Peninsula (U.P.) of Michigan is a wonderful place to take advantage of viewing the dark skies. Being a peninsula at the top of a peninsula, the Keweenaw offers endless opportunities to stargaze. This is illustrated in the letters of support from individuals and organizations, as well as in cases such as Megan Elwood Madden, Professor of Geochemistry at the University of Oklahoma. Originally from Illinois, Megan spent the summers in the Keweenaw. As a kid, looking up at the stars in Copper Harbor led Megan to pursue a career as a scientist interested in geochemistry:

“When I was a kid, I used to lie on our dock and stare up into space trying to grasp just how big the Universe was, how long ago the light left the stars before it reached me and

⁴ Source: <https://www.darksky.org/our-work/conservation/idsp/parks/>

⁵ Public Act 451 of 1994, as referenced in Dr. T.K. Lawless County Park application, page 61

much more. I knew then that I wanted to be [a] scientist and learn more about the world and the Universe around me.”

Source: <https://solarsystem.nasa.gov/people/2020/megan-elwood-madden/>

All of the viewing areas, including the Lodge property, that are mentioned are open to the public and available to be accessed to view the stars at night.

Park Resources

Natural Resources

The Keweenaw Mountain Lodge has about 3 miles of hiking and biking trails on property, with direct access to 35+ more miles of trails located in the Copper Harbor Trails System. In the winter, the property offers 6 miles of cross country ski trails and 2 miles of snowshoe trails. The mixed forests are made predominantly of tall white pines, birch, maple, and oak. The trails are lined with thimbleberries, huckleberries, and blueberries. Columbine, Milkweed, Big-Leaved Aster, and Black Eyed Susan make up some of the common wildflowers found on the grounds. These habitats are home to over 300 species of bird as well as deer, bear, porcupine, marten, coyote, rabbit, wolf and more.

Historic Resources

The Lodge building and rustic log cabins found at the Keweenaw Mountain Lodge are original to the development of the property in 1934 (*exceptions: Cabins 6 and 22 each were destroyed by fire and completely rebuilt, the conference room portion of the lodge building was added in 2007, the 6-room motel was built in 1984 and is currently employee housing*). The cabins and the lodge were built using the timber that was harvested from the 9 hole golf course.

The golf course was originally planned to be an 18 hole golf course, however was scaled back to 9 holes after it was found how much maintenance and time it took to upkeep. The back 9 was routed, but not built. They are now the on-property trail system called the Back 9 Trails that connect to the greater Copper Harbor Trails Club system. Along the trails you will find signs indicating where you are on the Back 9 had the back 9 holes been built.

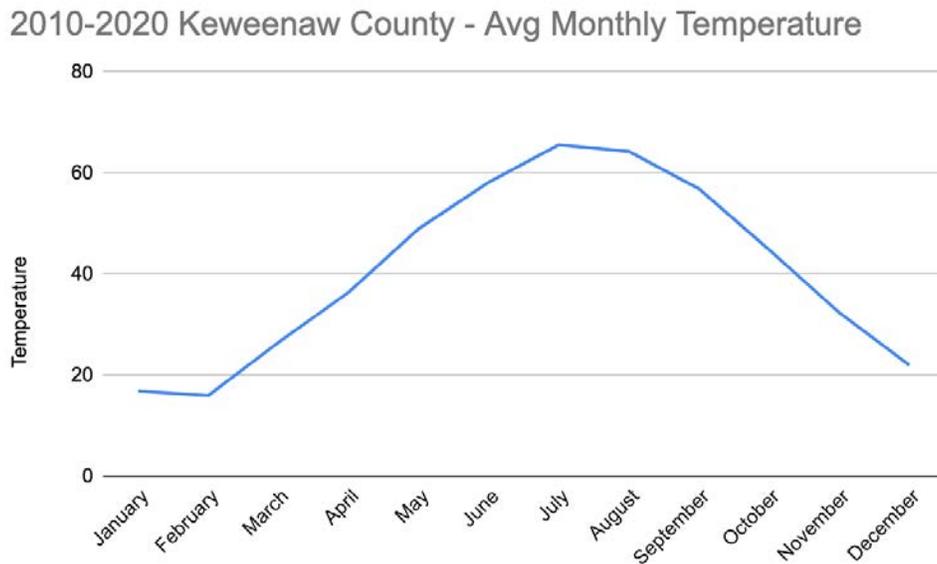
As mentioned earlier, the Keweenaw Mountain Lodge and cabins are protected under both the State (1976) and National (1980) registers of Historic Places.

Weather and Climate

The Keweenaw Peninsula is a finger of land that is surrounded by Lake Superior, and separated from the rest of the Upper Peninsula of Michigan by the Keweenaw Waterway. Lake Superior significantly controls the climate of the Keweenaw Peninsula, and keeps it notoriously

unpredictable. Copious amounts of lake-effect snow will fall on the Keweenaw each winter as a result of cold air masses passing over the warmer air hovering above the lake. Average snowfall in the Keweenaw is 250 inches in a winter season. Spring in the Keweenaw is a short and sweet transition into a mild summer. Fall brings a gorgeous display of color as the trees begin to prepare for another winter season.

The average monthly temperature ranges from 16 to 67 degrees fahrenheit throughout the year. Below is a chart showing the average monthly temperatures in Keweenaw County for 11 years, from 2010 to 2020.



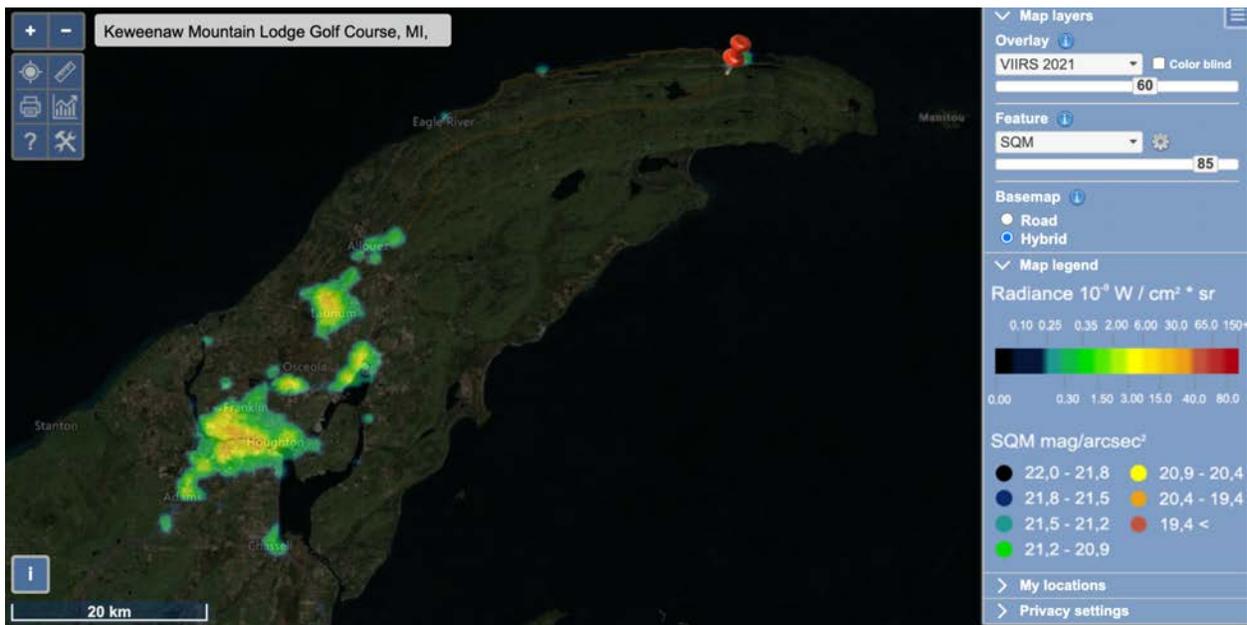
With the lake effect from Lake Superior, we see the variability of cloud cover and perception throughout the year. As such, we see an average of 150-160 days of sun / clear nights. This is not ideal for stargazing when compared to places like Colorado where they have 300-330 days of sun / clear nights. However, when the skies are clear, they are crystal clear. And this is one of the reasons that the Keweenaw is known for its heavy snow.

Current weather information can be seen on our website via our Webcam and Outdoor Activities pages. We have our own webcams and weather station that provide this information in real time for visitors to our website. We utilize the Clear Sky Chart for the area, Copper Harbor, which is provided in real time from cleardarksky.com. Below are several screenshots of the information provided on our webpages that help visitors know the weather conditions on the property at any given time.

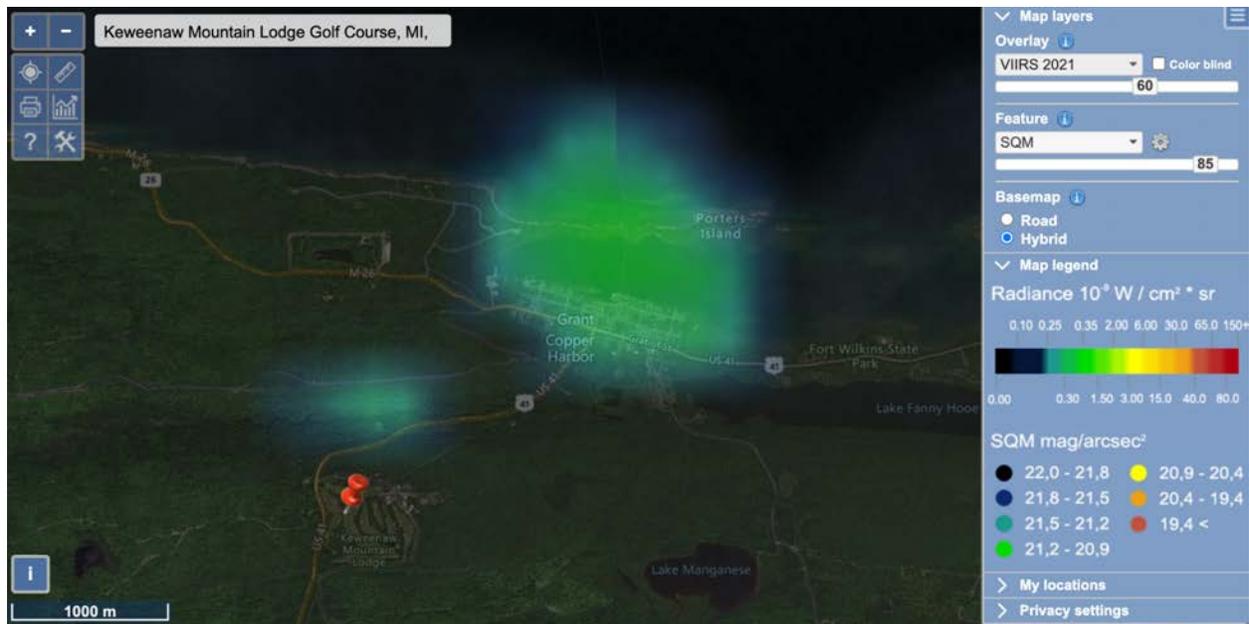
Artificial Light and Light Pollution

Light pollution is defined as “the brightening of the night sky caused by street lights and other man-made sources, which has a disruptive effect on natural cycles and inhibits the observation of stars and planets.”

Man-made or artificial light is used excessively and inappropriately in many situations. Poorly shielded lights not only waste electricity, but also waste the light itself by letting it escape into the night sky instead of focusing it down on the area or objects it is intended to illuminate. Light pollution disrupts wildlife and ecosystems, and has an impact on human health.



This map shows an excerpt from www.lightpollutionmap.info using the 2021 measurement of light pollution on a panned out map of the Keweenaw Peninsula. The location of the Keweenaw Mountain Lodge is indicated with the red pin on the map. The Keweenaw Mountain Lodge is 35 miles from any significant light pollution, with the top of the Keweenaw being surrounded on 3 sides by a large body of water, Lake Superior. Being surrounded by Lake Superior is a large help in mitigating artificial light population as developments and lights can not easily be installed on water..



This map shows a closer view of the Keweenaw Mountain Lodge and surrounding Copper Harbor area, with the Keweenaw Mountain Lodge being the red pin.

These images from www.lightpollutionmap.info use data from 2021. When comparing 2018, 2019, and 2020 data to 2021 data, one can see the light population levels on the lodge property have decreased since installing the dark sky compliant and LED lights in February 2021.

Potential Threats to the Dark Skies at the Top of the Keweenaw

As mentioned earlier, the Keweenaw Mountain Lodge is located at the top of the Keweenaw peninsula. The immediate area surrounding the Keweenaw Mountain Lodge is currently wilderness. Copper Harbor is a mile away from the resort, and has a year-round population of less than 150 people. Other than Copper Harbor, there is Eagle Harbor, Eagle River, and Lac La Belle, which are all over 15 miles away from the resort. They are also small towns with a limited number of year-round visitors. Outside these small towns, the rest of the area at the top of the peninsula is undeveloped wilderness with homes sprinkled in between. The threat to the dark skies is that this wilderness area becomes more and more developed.

The nearest source of emitted light is 1 mile from the Lodge is Copper Harbor, albeit relatively low when compared to small and medium-sized towns. The emitted light from Copper Harbor has increased and decreased over the last 10 years when looking at the trend via lightpollutionmap.info, which is correlated with the number of people that are living in Copper Harbor in any given year (ranging from 80 to 150 individuals the past 10 years). There are a combination of residential dwellings, hotels, stores, and restaurants in Copper Harbor which have light fixtures that emit light. In addition there are street lights on the limited number of

roads in the town, and the town does not have any stop lights. That said, we will continue to educate year-round and part-time residents and the governing zoning body (Keweenaw County) about dark-sky compliant lighting for new installs, and how to improve the current lighting so it is dark sky compliant.

The nearest **sizable** concern to the resort's dark skies are the cities of Calumet, Hancock, and Houghton, which are over 30-50 miles away, to the south, and Marquette, which is 150 miles to the south east.

As a supporter of dark skies, we continue to inform and educate people in the region on the dark sky initiatives that we are working on. This information will help others work on fostering dark sky-related initiatives (e.g. dark-sky compliant light fixtures). We do this now and will do so going forward as stargazing is a favorite past-time in the Keweenaw. Along with leading by example (see next section, Lighting Project: Street Lights), we also hold light management workshops and provide comments to the local governing bodies on the zoning ordinances during appropriate times. Our first lighting management workshop was held this past November (2021), which was attended by local residents who were interested in improving their lighting on their personal buildings. In regards to talking with local governing bodies, we recently provided comments via email to the Keweenaw County Planning Commission when they held an open-comment-period on their zoning ordinances this past February (2022). Our comments addressed the importance of ensuring that lighting ordinances reflect the International Dark-Sky Association's lighting guidelines so that the community continues to value the dark skies [A copy of the email sent to the planning commission can be found in the Appendix]. Educational activities related to understanding how to implement dark-sky compliant lighting will continue to be a focal point of our dark-sky outreach activities.

Example Lighting Project: Street Lights

In Fall 2020 - Winter 2021, we embarked on a project to replace 28 high pressure sodium street lights fixtures around the property with LED dark-sky compliant fixtures. This was part of a Michigan's Environment, Great Lakes & Energy department (EGLE) grant focused on reducing energy. For the Lodge, it was both about reducing energy and reducing light pollution. Thus, we selected light fixtures that were dark-sky compliant. Below are pictures and results of the lessening of the light pollution caused by the older street light fixtures.

The street lights being replaced January / February 2021, showing the older lights



The make/model of the new street lights that were installed, in January / February 2021



RWL2-S-30-30-D-7P7-3-G- ALUM ARM
When ordered in 3K this is dark sky rated

RWL™ G2

Cobrahead

DESCRIPTION

The RWL™ G2 fixture from TGS represents a new performance-based, forward-thinking design for roadway lighting for residential/commercial streets, intersections, and high-speed roadways. Designed for both retrofit and new construction, RWL™ G2 provides multiple lumen packages with field adjustability and distribution options. A Comfort view optic lens is applied to minimize glare and backlight while maximizing luminaire efficacy. RWL™ G2 has tool-less entry providing quick access for installation and maintenance. A variety of control options are available for future upgrades.



APPLICATION

Roadway, Parking Lots, Walkways and General Outdoor Spaces



Here are the before-and-after pictures for when the street lights were replaced with dark-sky compliant street lights in the Lodge parking lot and along the cabin road on property (via our webcams from our web site).

Hole 1 / Brockway Webcam, with the old street lights in place. Hole 1 street light pole is where the cameras are installed



Hole 1 / Brockway Webcam, with the Hole 1 street light replaced with Dark-Sky Compliant light fixtures, but the cabin road street lights not yet changed out



Hole 1 / Brockway Webcam, with the Hole 1 street light and cabin road street lights replaced with Dark-Sky Compliant light fixture (note: even with more street lights working on the cabin road, there is less light pollution on the golf course)



Hole 1 / Brockway Mountain Webcam, looking at lights along the cabin road, after installing dark-sky compliant street lights (fully-shielded, LED lights) -- the Northern Lights are on the upper-right of the picture



Lodge Webcam, before changing out the street light next to the Lodge and before changing out the corner light with a dark-sky compliant light fixtures



Lodge Webcam, after changing out the street light next to the Lodge and before changing out the corner light with a dark-sky compliant light fixtures



Lodge Webcam, after changing out the street light next to the Lodge and before changing out the corner light with a dark-sky compliant light fixtures



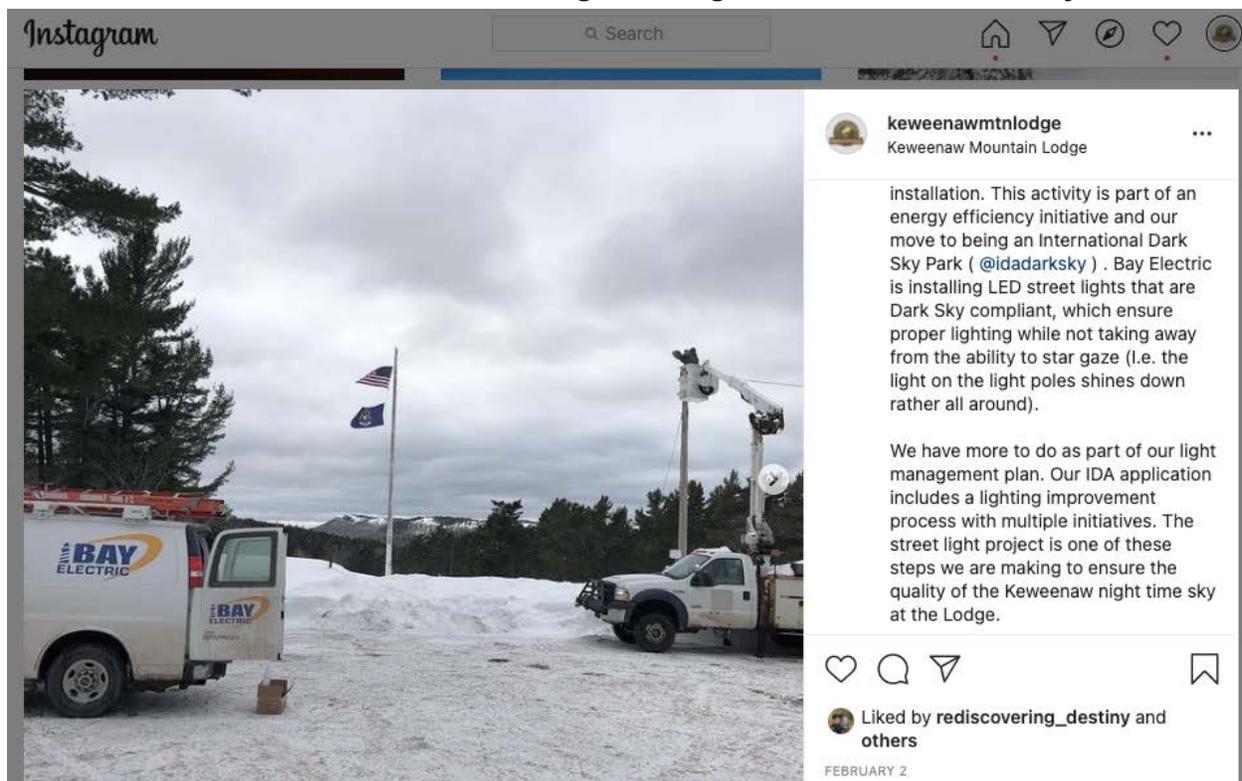
Lodge Webcam, after changing out the street light next to the Lodge and before changing out the corner light with a dark-sky compliant light fixtures, and without holiday lights (and the snow has melted)



With these changes to the exterior lighting, we should see a lower artificial light impact in the next update of the data on www.lightpollutionmap.info.

We work to let people know about the various lighting initiatives we are working on. The webcam of the Lodge and of Hole 1 / Brockway Mountain can be viewed at any time by going to our website, <https://keweenawmountainlodge.com/about/webcams/>. The webcams have provided users the ability to better understand what we are working on to foster the dark skies at the Lodge and in the Keweenaw, and see the changes in action. As well, we post on our social media channels on various occasions the lighting changes (see an example below of a post on Instagram about the street light installation). During our workshops we talk with attendees about the lighting changes, and why we are doing them. Plus, one of the workshops we hold is a light management workshop to help others understand the dark-sky compliant lighting strategy.

Post on the Keweenaw Mountain Lodge's Instagram Account on February 2, 2021



A blog post about the new street lights and why they are important for fostering dark skies was published on our website in February:

- [Energy Efficient and Dark Sky Compliant Street Lighting \(February 22, 2021\)](#)

A link to the blog post is provided above. As well, the blog post is included in the appendix of this application.

In addition, we have designed an infographic sign which can be placed in different areas of the resort to provide visitors additional information about the street light project. This sign helps educate visitors about lighting that fosters stargazing at the resort and throughout the Keweenaw. As well, we mention in the sign that we are able to provide information about how to work with Michigan's Department of Environment, Great Lakes, and Energy (EGLE) regarding the current grant program for energy efficiency.



[See appendix for a larger image of the sign]

The infographic sign layout has been designed in order to highlight other lighting projects that we have worked on in the past or will work on in the future, and educate more and more people about fostering stargazing.

Lighting Management Plan and Lighting Inventory

The Lodge was run by Keweenaw County for 84 years until it was purchased by Keweenaw Resort, LLC in 2018 (a private company). Since the ownership change, leadership has focused on moving step-by-step towards energy-efficient operations, as well as inventorying and

minimizing light pollution in order to magnify the beauty of the skies above us. Our overall philosophy of light management on the Lodge property is to only use lighting where and when it is needed, and when it is needed do so in an appropriate amount for the specified task required. When lighting is needed, outdoor lighting fixtures are fully shielded, 3,000K color temperature or less, and we make use of timers and motion sensors. This is for the purpose of protecting and preserving the current dark skies within the Keweenaw Mountain Lodge grounds, and to lead by example by promoting good outdoor lighting practices to the surrounding communities.

Lighting Management Plan

We have the following overarching guidelines when evaluating new lighting on Lodge property:

- Outside lighting must be dark-sky compliant: fully shielded, 3000K color temperature or less. Where it is an option, use timers and motion sensors -- with them staying on less than 5 minutes.
- Reduction of energy consumption using energy saving light fixtures, minimizing the time lights are on, and the removal of unnecessary lighting.
- Provide a safe observing area for dark sky viewing where the public can enjoy the beauty of the stars.
- As part of our education and outreach initiatives, we will work with individuals and organizations in the area to educate them about what we have learned regarding artificial lighting as it relates to dark skies.

Visitor Lighting

The use of auxiliary lighting at night can detract from a guest's experience. When walking around the property at night, guests are advised to use red light, and to shine the light towards the ground in order to not hinder the stargazing experience of others. For example, below is the text we have on our Stargazing page of our website regarding using flashlights on property.

Flashlights: It is useful to take a flashlight with you when you are walking around the property so you watch where you are stepping. To be considerate of others, a red flashlight is preferred. If you do not have one, inquire at the OAC about borrowing one. If using a flashlight that uses standard colored bulb, be respectful of others while viewing the night sky by making sure to shine it downwards and turn it off when not needed.



Through our education and messaging currently, and going forward, we provide guests with opportunities to understand the impacts of outdoor lighting on outdoor activities. The goal is to

provide for the enjoyment of stargazing and other nighttime activities, while still providing supplemental lighting for safety and navigation.

Temporary Lighting

Any temporary installation of outside lighting will adhere to the dark-sky compliant guidelines to the greatest possible extent, and whose duration will be limited to the shortest possible time.

Specifically for holiday lighting, the lights will not be in use for more than 60 continuous days (e.g. December 1 to January 31st for Christmas and New Year holiday lighting). When holiday lighting is string lighting, allowable light output will not exceed 70 initial lamp lumens or 125 lumens per linear foot of line or square foot of space.

Illuminated Signs

The use of illuminated signs on property is to be limited. Where illuminated signs are to be used, the fixtures will adhere to dark-sky lighting requirements and have the following time limits:

- Illuminated sign lights are turned on 2 hours prior to dawn, or turned on by 5am ET at the latest, and;
- Illuminated sign lights are turned off 3 hours after dusk, or by 10pm ET, whichever is the latest.

If an illuminated sign is needed for wayfinding, the lights will stay on longer to ensure safety (e.g. the resort entrance sign on US Hwy 41, as visitors arrive at all times of the night, as we are a remote destination). However, the dark-sky lighting requirements for the light fixtures will still need to be adhered to in those cases.

In the case that we are not able to use dark sky compliant lighting on those lights (e.g. for safety and navigation purposes), then the the operation of those illuminated signs will be prohibited from one hour after local sunset to one hour before local sunrise (unless for wayfinding/navigation or identification of business services during normal business hours). The signs must be single-color on a black background, and the luminance after sunset must not exceed 100 nits (100 candelas per m²) and the illuminated surface area of an individual sign must not exceed 200 ft² (18.6 m²).

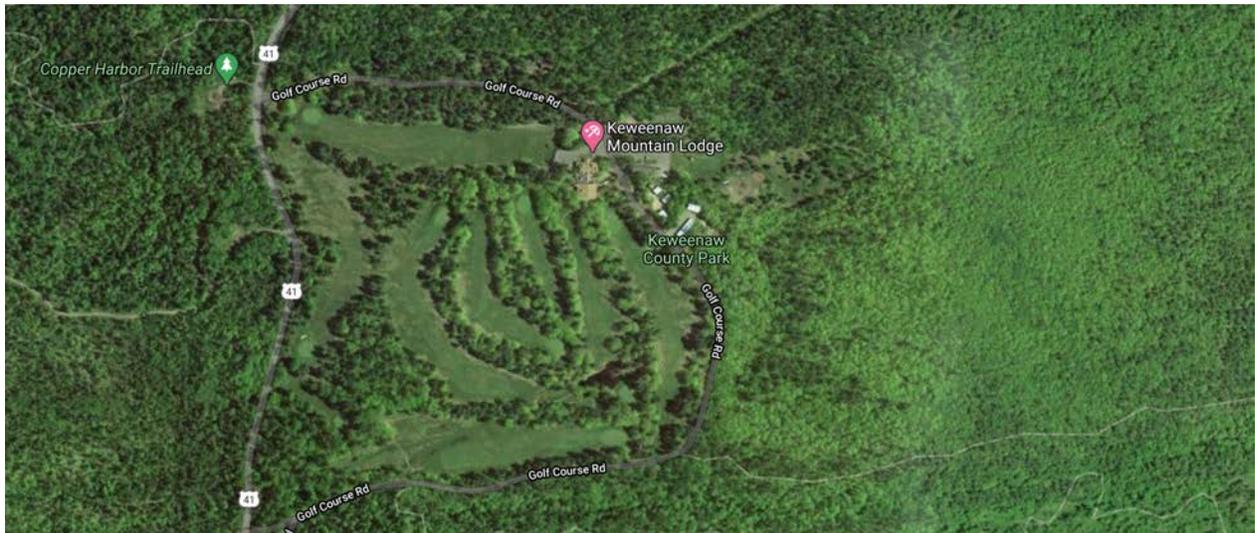
Warranting of Outdoor Lighting Installations

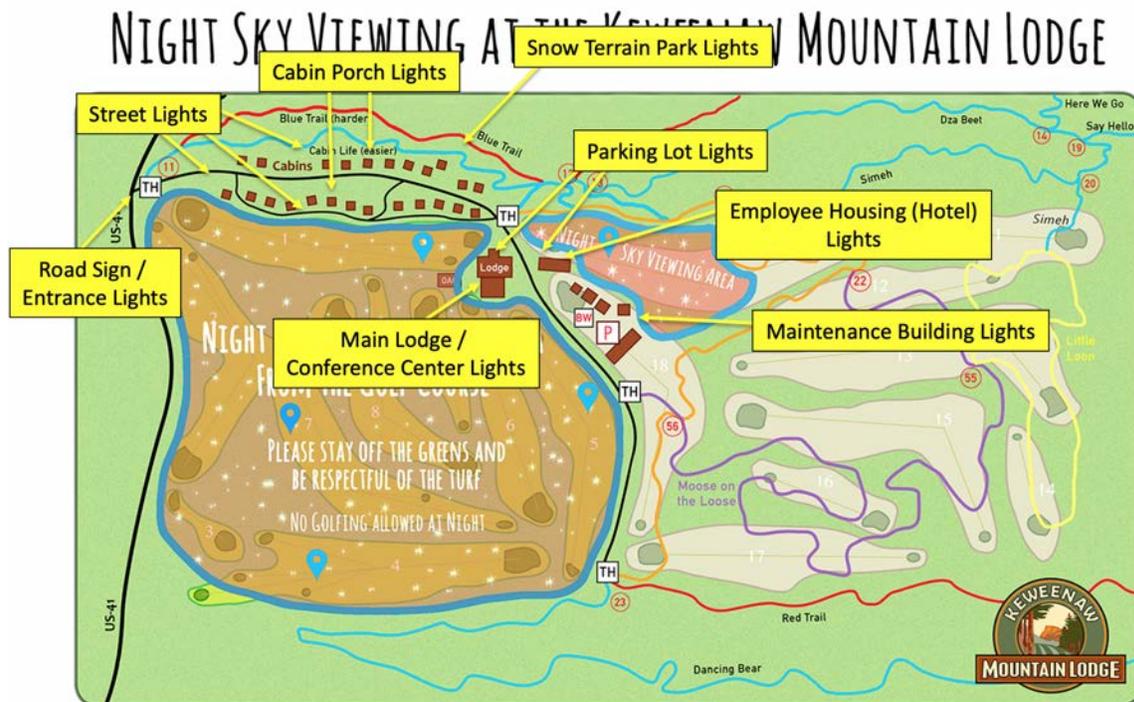
The installation of new outdoor lighting is permitted only in instances where management determines that a public safety hazard exists that can only be mitigated through the use of outdoor light at night. Where light at night is required for the safe performance of tasks or safe transit between locations, it will be used; otherwise, the default policy is to not add lighting.

A signed copy of this “Lighting Management Plan” can be found in the Appendix, and on our website.

Property Map, with Lighting Locations

Below are property maps of the resort. The first map shows a satellite view of the original 177 acres of the property (before the recent property acquisition of an additional 383 acres). The second map indicates the vicinity of each of the lighting groupings mentioned in the lighting inventory table, including the street lights we changed this past winter (changed to LED and fully shielded -- dark sky compliant).





PLEASE BE RESPECTFUL OF LODGING GUESTS WHEN NEAR THE CABINS: KEEP NOISE TO A MINIMUM
 THE NIGHT SKY CAN BE EASILY VIEWED FROM MANY SPOTS ON THE PROPERTY. THIS MAP HIGHLIGHTS VANTAGE POINTS (📍) FOR THE BEST VIEWING OF THE STARS

Lighting Inventory

Less than 3% of the Lodge property has lighting (<14 acres of the 560 acres). The light fixtures within that area are documented in the lighting inventory table. However, ideal viewing areas are outside the range of the lighting that is on property (as illustrated by the “Night Sky Viewing at the Keweenaw Mountain Lodge” map above).

Below is a table showing the lighting inventory on the Keweenaw Mountain Lodge property as of April 21, 2022. We inventoried 113 outside lights, with 93 of them (82%) being dark-sky compliant. Lights are grouped together based upon the different types of light fixtures and bulbs used. We have been working the past 3 years to install lights that are dark sky compliant: fully shielded, less than 3,000K color temperature, and energy efficient (e.g. LED).

There are several light types that we still need to improve as it relates to being dark sky compliant. Those are lights in the employee housing / hotel parking lot and the snow terrain park. The employee housing / hotel parking lot and snow terrain park lights are turned off. There is enough light in the rest of the Lodge’s parking lot that we do not need to use them in the remaining portion of the parking lot which is near the employee housing / hotel area. For the

snow terrain park, those lights will only be turned on when the terrain park is used (which is not later than 10pm on any given night), and it is not being used at this time⁶.

In addition, we continue to examine the lumen level of our lights. An example are the two wall packs on the Lodge building which are close to 10,000 lumens. As is explained:

“We wanted to make sure the areas the wall packs cover were sufficiently lit. The one on the conference center covers two entrances that are spaced fairly far apart. The service entrance is probably our most important area to remain lit, it is the most frequently used, as well as having the emergency firehose connection in that area. Also, even coming in at nearly 10,000 lumens it is significantly less than the old fixtures.” – Mike Miller, KML team member responsible for lighting selection

As Mike mentions, installing the two wall packs on the lodge building have greatly reduced the light pollution around those two outside areas. That said, we will continue to improve our lighting and will research other options of wall packs that can provide the same level of safety for our guests and staff members. The goal will be to have lumens closer to 1-3,000 lumens. This will be a trial-and-error process as these are two critical areas of activity for our staff and guests at the Lodge.

As we continue to get better at dark-sky compliant lighting, there will be options to find better solutions each year for every light on property (for example, modifying dimming settings of the new street lights, which means the light will emit less lumens). This continuous improvement is a process we follow on a regular basis when we are considering lighting at the Lodge. Such continuous improvement will lead to us changing lights on the property in the future with lights that have lower lumens or automatically dim at a certain time of night. Continuous improvement is important for us and for the dark sky park to succeed.

We strive to have 100% of our outside light fixtures dark-sky compliant within the next 5 years (including the snow terrain park, employee housing / hotel parking lot, and any new outside lighting we install), while decreasing our energy usage with inside lighting (e.g. continuing to replace with LED lights). This is achievable, as we currently have very few lights that are not dark-sky compliant currently on property; and for the ones that are not dark sky compliant, we are currently testing retrofit bulbs that will make these lights dark sky compliant (see notes for the Lighting Inventory Table).

----- Lighting Inventory Table Begins on the Next Page -----

⁶ The Snow Terrain Park isn't operable at this time. Snow Terrain Park was built and used for two winters, 2009-2010 and 2010-2011, and closed after that. The Terrain Park is planned to be used again in the near future, so we have included the lights in our inventory.

Lighting Inventory Table (as of April 21, 2022)

Location	Fixture	Fully Shielded?	Correlated Color Temperature (CCT)	Special Purpose, <500 Lumens	Application	Operable?	Conformity w/ LMP	
Street / Parking Lots	A. x28 Fixtures on 25' Poles, 30W LED, 3900lm	YES	3000K	NO	Parking Lots, Golf Course Road, Cabin Roads, Photozell Operated	YES	YES	
	B. x6 Fixtures on 25' Poles, 250W Metal Halide, 20000lm	YES	2500K (see note 1)	NO	Parking Lots, Photozell Operated	YES	NO (see note 1)	
Main Lodge / Conference Center	A. x2 Fixtures 8.5W LED, 800lm	YES	2700K	NO	Conference Center Entrances	YES	YES	
	B. x5 Fixtures 8.5W LED, 800lm	YES	2700K	NO	Main Lodge Corners	YES	YES	
	C. x3 Fixtures 50W LED, 6000lm	YES	3000K	NO	Conference Center Entrances/ Carport, Manually Operated	YES	YES	
	D. x2 Wall Packs 75W LED, 9594lm	YES	3000K	NO	Conference Center Walls, Photozell Operated	YES	YES	

Location	Fixture	Fully Shielded?	Correlated Color Temperature (CCT)	Special Purpose, <500 Lumens	Application	Operable?	Conformity w/ LMP
Road Sign / Entrance	A. x2 Fixtures 30W LED, 5200lm	YES	3000K	NO	Road Sign Illumination, Photocell Operated	YES	YES
	B. x2 Fixtures 6W LED, 500lm	YES	2700K	NO	Entrance Gate, Photocell Operated	YES	YES



Location	Fixture	Fully Shielded?	Correlated Color Temperature (CCT)	Special Purpose, <500 Lumens	Application	Operable?	Conformity w/ LMP
Maintenance Buildings	A. x2 Fixtures 70W LED, 8400lm	YES	3000K	NO	Garage Doors, Photocell Operated	YES	YES
	B. x1 Wall Pack 12W LED, 1440lm	YES	3000K	NO	Door, Photocell Operated	YES	YES



Location	Fixture	Fully Shielded?	Correlated Color Temperature (CCT)	Special Purpose, <500 Lumens	Application	Operable?	Conformity w/ LMP
Cabin Porches	A. x41 Fixtures 9.5W LED, 800lm	YES	2700K	NO	Cabin Entrances, Motion Sensor Operated (stay on less than 5 mins)	YES	YES
Employee Housing (Hotel)	A. x5 Fixtures 8.5W LED, 800lm	YES	2700K	NO	Hotel Doors, Photocell Operated	YES	YES



Location	Fixture	Fully Shielded?	Correlated Color Temperature (CCT)	Special Purpose, <500 Lumens	Application	Operable?	Conformity w/ LMP
Snow Terrain Park	A. x14 250W HID, 20000lm	YES	5000K (see note 2)	NO	Tree Mount, Only operated when in use	YES	NO (see note 2)



Notes referred to in the lighting inventory table above:

- Note 1: Even though the street light fixture is fully shielded, and the CCT is estimated at 2500K (*an estimate based upon visual inspection*), it does not meet our requirements for energy efficiency and LED lighting at this time. As with lighting that does not meet our lighting requirements, we have it in our development plans to replace these fixtures, which amount to 5 current street lights: 1 street light fixture next to the east side of the main lodge building, 3 street light fixtures in the hotel / employee housing parking lot (which are not turned on), and 1 street light next to the tennis courts (which is not turned on).
- Note 2: The 14 light fixtures that are on trees in the Snow Terrain Park are fully shielded, but do not meet our requirements for energy efficiency and LED lighting at this time. The current bulbs are 5000K (*an estimate based upon visual inspection*). They are turned off when the terrain park is not used. Currently the Snow Terrain Park has not been used since 2011. Once the Snow Terrain Park is open for use by visitors, the priority to change these light fixtures will be greater, and we will change them to be more energy efficient. We plan to retrofit these light fixtures with LED bulbs which are 3000K CCT, and 9000 lumens. When we do this, we will also adjust the fixtures to be level and not at an angle. However, they are our lowest priority for changing at this time because they are not heavily used, and when they are used, they are only used for a very limited time period (e.g. 5-9pm, 2-3 days a week).

As we have an illuminated sign at the entrance of the resort on US Hwy 41 that stays on all night for wayfinding purposes, additional pictures are shown below of the before and after we changed the position of the light figures and changed the light fixtures to be dark-sky compliant. As well, we have included a close up of one of the two lights on the sign (there are two lights on the sign -- and they mirror each other). The picture on the left is before changing the light fixtures, and the picture on the right is after changing the light fixture.



To provide more reference to the cabin porch lights, which are under a porch and on a motion sensor, a larger picture is provided. It is a picture of one of the cabins during the winter.



Also, of note, we recently removed 52 solar-powered cabin number lights that were not compliant with our lighting management plan. They were fully-shielded, however, they were 3500K CCT. Our lighting management states that our outside lights should be 3000K or less, and these simple light fixtures were not.



Lighting Ordinances for Keweenaw County

Per the county's ordinance, all lighting shall be down-shining and shielded from adjoining properties and roadway per the requirements of Section 15.2. Here is an excerpt of the Section 15.2 where lighting is referred to:

Section 15.2 LIGHTING REQUIREMENTS

A. All outdoor lighting above 150 watts, including illuminated signs, shall be placed, and shielded to reduce glare and reflect light away from adjacent Residential Districts and adjacent dwelling units as well as to prevent interference with the vision of persons on adjacent highways.

B. All freestanding outdoor lighting shall not exceed thirty (30) feet in height except to light a public athletic field, except for lighting located in public rights-of-way used to light public streets.

C. All off-street commercial parking areas open to the public shall be illuminated by natural or artificial light during all hours of operation, and not more than thirty (30) minutes after the business closes.

D. All lighting in business districts used for the external illumination of buildings, so as to feature said buildings, shall be placed and shielded so as not to interfere with the vision of persons on adjacent roads and streets or adjacent property.

E. Illumination of signs shall be directed or shaded downward so as not to interfere with the vision of persons on the adjacent roads and streets or adjacent property.

The full zoning ordinance can be found online at:

- <http://keweenawcountyonline.org/docs/ZoningOrdinance.pdf>

Our lighting meets or surpasses the lighting ordinances for Keweenaw County. Individuals on Lodge staff who oversee facilities maintenance are educated on the lighting guidelines. As a team, they work on the maintenance of outdoor lighting within the park and strive to meet or exceed the benchmarks prescribed for Dark Sky Parks as indicated by the International Dark-Sky Association.

By following our lead, individuals and organizations in the community can find ways to reduce their energy consumption and artificial light usage.

Night Sky Measurements

Measurements of the Keweenaw Mountain Lodge's dark skies were taken at numerous locations throughout the property using a Unihedron SQM HTS: 9005.80.60.00. The results are shown below (*median of the readings, which included 3 to 6 readings at each date/location*). Readings were taken on property, and at various surrounding areas that were mentioned in an earlier section. A map of where the readings were taken is also included.



These readings were taken between February and October 2021. We will continue to take readings of the sky quality on a regular basis going forward, and report them on our website and to IDA annually.

On Lodge Property, Sky Quality Measurements

64 unique date/location sky-quality readings were taken on the Lodge property from February to November 2021, with between 3 and 6 readings per unique date/location. Before compiling the overall average for Zenith readings we analyzed the data to ensure the data was reliable. This entailed inspecting the data with histogram charts. As a results, the 111 observations were removed based upon the following criteria (see Appendix for histogram charts):

- Removed readings when there was snow on the ground (33 observations)
- Removed June readings, as it is suspected that we had the Milky Way light affecting the reading (36 observations)
- Removed readings that were above 22, as they could be considered abnormal (per Barentine's comments) (18 observations)
- Removed the night's reading if greater than .15 differences between the max and min of the 6 readings for that night (24 observations)

After removing the 111 observations from the total data set of 368 observations, we were left with 257 observations to be used for the analysis. The average Zenith readings on the lodge property of these data points was 21.60 ± 0.2^7 mag_{SQM}/arcsec².

⁷ In early June 2021, as part of the IDA review process of our first version of our application, John Barentine (IDA) performed a similar statistical analysis on the measurements we provided between February and April 2021. In his statistical analysis of that initial set of data, he removed similar readings that we removed in our analysis as we followed the same instructions for analysis in order to get a clearer analysis of the data. The result of his statistical analysis of that initial data indicated a 21.60 ± 0.2 mag_{SQM}/arcsec². His email with that analysis is included in the appendix with the raw data. As well we have included the email sent to Ashley Wilson on November 15, 2021 detailing out the analysis we did for this version of the application. Of note: the average Zenith readings on the Lodge property of all the data points (without removing any of the data points) was 21.50 mag_{SQM}/arcsec²

The table below shows the median of the Zenith readings for the entire data set. Up to 6 readings were taken each time a reading was recorded (*the raw data consists of 368 readings which were used to compile the means for the 64 date/location readings that are shown in the table below*). The raw data for the sky quality measurements can be found in the Appendix, which includes additional information (e.g. the person that took the readings, the weather conditions). The raw data can also be found on our website in a spreadsheet format, which we keep updated on a monthly basis (*available to the general public*).

Sky Quality Measurements

Location	Zenith Readings	Date	Time	Temperature (°F)
Hole 1 Tee Box	21.43	Average		
	20.78	2/18/2021	12:00am	6 *
	21.11	3/6/2021	11:15pm	13 *
	21.14	3/12/2021	9:00pm	20 *
	21.51	4/3/2021	10:11pm	47
	21.51	4/10/2021	10:40pm	48
	21.84	5/11/2021	11:25pm	44
	21.68	5/12/2021	11:30pm	48
	21.31	6/8/2021	11:48pm	60
	21.67	7/10/2021	12:13am	60
	21.34	8/9/2021	10:53pm	66
	21.77	9/10/2021	10:32pm	65
	21.52	10/9/2021	11:37pm	64
	21.41	11/4/2021	10:38pm	40
Hole 8 Fairway	21.57	Average		
	21.53	3/6/2021	11.30pm	13 *
	21.63	7/10/2021	12:04am	60
	21.71	9/10/2021	10:27pm	65
	21.54	10/9/2021	11:33pm	64

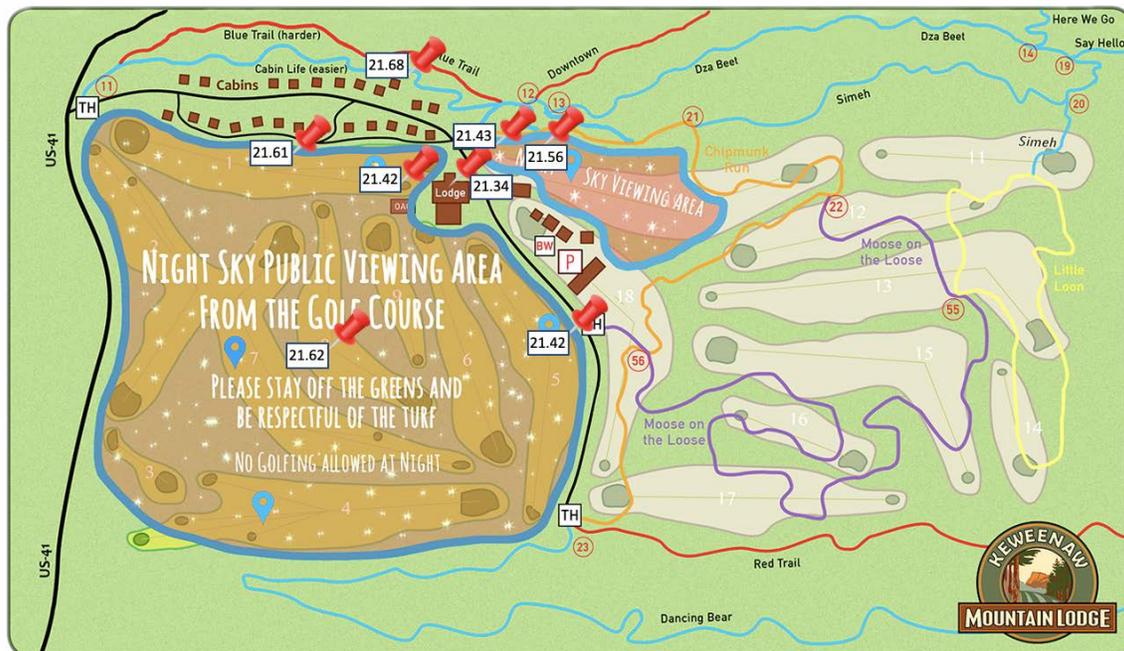
	21.42	11/4/2021	10:34pm	40
Back 9 Trailhead	21.45	Average		
	21.16	2/18/2021	12:14am	6 *
	20.19	2/20/2021	6:35am	4 *
	21.49	3/12/2021	9:00pm	20 *
	21.63	4/3/2021	9:55pm	47
	21.24	4/15/2021	10:59pm	32
	21.52	6/8/2021	11:45pm	60
	21.80	7/10/2021	12:22am	60
	21.73	8/9/2021	11:08pm	66
	22.08	9/10/2021	10:18pm	65
	21.63	10/9/2021	11:26pm	64
	21.54	11/4/2021	10:27pm	40
Tennis Court	21.41	Average		
	21.42	4/3/2021	10:20pm	47
	21.59	5/11/2021	11:18pm	44
	21.65	5/12/2021	11:23pm	48
	20.66	6/8/2021	11:28pm	60
	21.49	7/10/2021	12:40am	60
	21.55	8/9/2021	11:15pm	66
	21.66	9/10/2021	10:10pm	65
	21.31	10/9/2021	11:18pm	64
	21.36	11/4/2021	10:18pm	40
Open Field, East of Tennis Court	21.54	Average		
	21.80	4/3/2021	10:25pm	47
	21.74	5/11/2021	11:34pm	44
	21.72	5/12/2021	12:25pm	48

	20.71	6/8/2021	11:34pm	60
	21.63	7/10/2021	12:34am	60
	21.64	8/9/2021	11:15pm	66
	21.67	9/10/2021	10:12pm	65
	21.51	10/9/2021	11:20pm	64
	21.42	11/4/2021	10:21pm	40
Behind Cabin 23	21.70	Average		
	20.78	3/19/2021	10:00pm	35
	21.91	4/3/2021	10:42pm	47
	22.28	5/11/2021	11:41pm	44
	21.95	5/12/2021	11:18pm	48
	20.99	6/8/2021	11:34pm	60
	22.16	9/10/2021	10:04pm	65
	21.84	11/4/2021	10:13pm	40
In Front of Cabin 7, on Golf Course	21.58	Average		
	21.53	4/3/2021	10:34pm	47
	21.87	5/11/2021	11:35pm	44
	21.71	5/12/2021	11:34pm	48
	21.39	6/8/2021	11:50pm	60
	21.58	7/10/2021	12:09am	60
	21.47	8/9/2021	10:57pm	66
	21.77	9/10/2021	10:35pm	65
	21.53	10/9/2021	11:40pm	64
	21.39	11/4/2021	10:41pm	40
Lodge Roof	21.34	Average		
	21.34	4/10/2021	10:00pm	48

* We did not take the temperature reading at the time of taking the SQM reading, so this temperature is the average for that day in the Keweenaw (taken from the Houghton Memorial County airport, from wunderground.com)

Below is a map of where the readings were taken on the lodge property, as indicated by the red pins. The average SQM readings for each location are shown next to their respective red pins on the map.

NIGHT SKY VIEWING AT THE KEWEENAW MOUNTAIN LODGE



PLEASE BE RESPECTFUL OF LODGING GUESTS WHEN NEAR THE CABINS: KEEP NOISE TO A MINIMUM
 THE NIGHT SKY CAN BE EASILY VIEWED FROM MANY SPOTS ON THE PROPERTY. THIS MAP HIGHLIGHTS VANTAGE POINTS (📍) FOR THE BEST VIEWING OF THE STARS

Surrounding Areas, Sky Quality Measurements

Six (6) sky-quality readings were taken from surrounding areas in April 2021. The average Zenith readings from surrounding areas was 21.34.

Location	Zenith Readings	Date	Time	Temperature (°F)
Hebard Park	20.91	4/15/2021	10:08pm	40
Copper Harbor State Park	21.39	4/15/2021	10:20pm	40

Astor Shipwreck Park	21.49	4/15/2021	10:30pm	40
Fort Wilkins State Park	21.57	4/15/2021	10:36pm	40
Lake Superior at Jamsen's Bakery Dock	21.33	4/15/2021	10:43pm	40
Copper Harbor Community Center	21.34	4/15/2021	10:48pm	40

Documenting the Nighttime Horizons

Further analysis of the sky quality is documented in photographs of the night time horizons. The following 360 degree panoramic photo was taken on hole 4 on the property between 2:25 and 4:05 EST on December 12, 2021. It is a spherical panoramic merger of 24 photos.



[A larger, high-quality JPEG file of this image can be found on [our website](#), ~86mb]

The slight light dome in the center of the picture is south-southwest from the property, and is from the Houghton-Hancock area -- 45 miles south of the property. The light on the right portion of the picture is light from the Lodge building and the street lights on property.

On the night these photos were taken the temperature was 28°F, with a relative humidity of 81%. Winds were SSW 15 knots, gusting to 30 knots. Moonset was at 01:40 EST moonrise was 14:09 EST. Astronomical twilight began at 6:38 and ended at 18:52. The camera used to take the images was a Canon 7D Mark II, with Canon EFS 17-55mm lens [@17mm (w/ sensor 1.6x crop factor = 27.2mm)]. The camera details and settings are as follows:

- Camera: Canon 7d Mark ii
- Lens: Canon EFS 17-55mm [@17mm (w/ sensor 1.6x crop factor = 27.2mm)]
- Aperture: f2.8
- ISO: 3200
- Shutter: 15 sec
- White Balance: Daylight (5500K)
- Color Profile: sRGB
- Post-processing: Lightroom Classic:
 - Lens Correction to remove vignetting
 - Spherical Panorama Merge of 24 images

Night Sky Educational Programs and Outreach Initiatives

Providing information on the benefits of the dark skies and of good lighting for fostering dark skies is part of the activities at the Keweenaw Mountain Lodge. We provide this information when the staff at the Outdoor Activity Center interact with visitors on property, through our stargazing telescope program, in our educational workshops, and on our website. To help with garnering this knowledge, we are establishing relationships with various astronomy clubs and observatories.



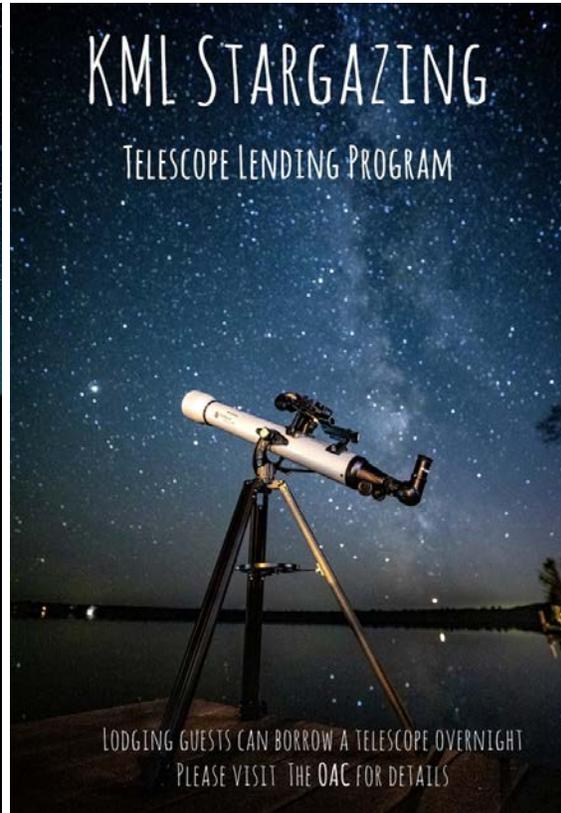
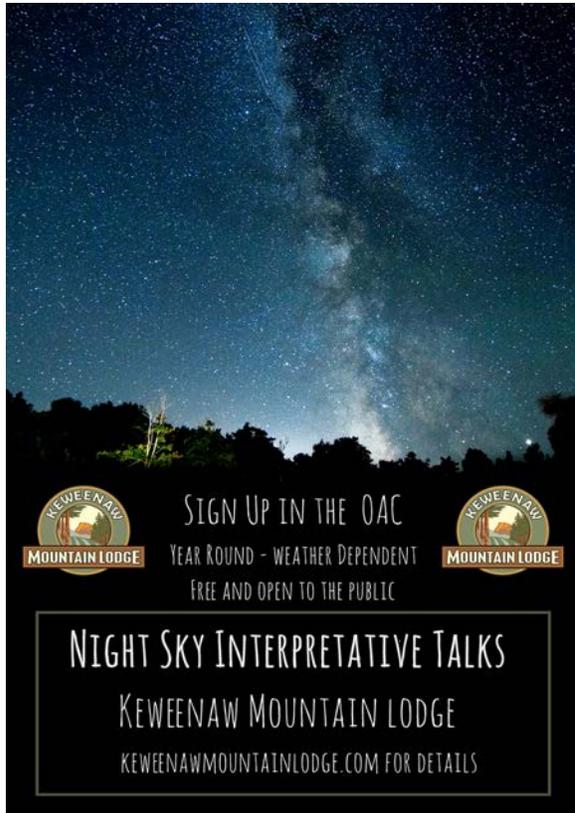
Night Sky Interpretive Talks

The Lodge staff are also available to hold night sky interpretative talks, where attendees learn about and view the cosmos.

Stargazer Telescope Program

We provide telescopes for visitors to use overnight to view the stars. Individuals are able to come to the Outdoor Activity Center at the Lodge and receive instructions on how to use a telescope, and be able to check a telescope out overnight. This is open to the public, with the rental program being free for lodging guests and non-lodging guests paying a nominal fee. Visitors can find more about the Telescope Lending Program on our web site at the following location:

- <https://keweenawmountainlodge.com/activities/stargazing/telescope-lending-program/>

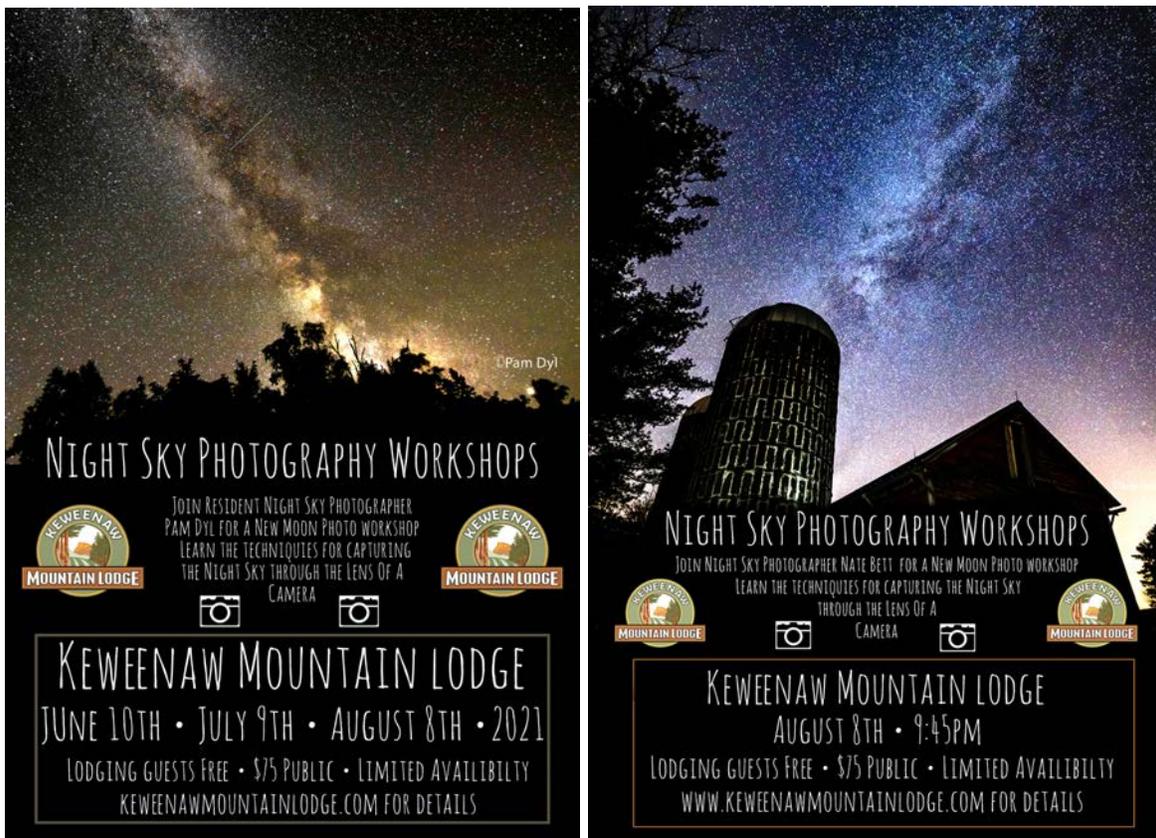


Educational Workshops

Night Time and Northern Lights Photography Workshops: Taught by Lodge instructors, attendees learn how to take night time photos (e.g. meteor storms, the Milky Way, Northern Lights). The Night Time Photography workshops are held during the summer (e.g. June, July, August), and the Northern Lights Photography Workshops are held between October and April (when the Northern Lights are more likely to be seen in the Keweenaw).

Lighting Management Workshop: Taught by Lodge instructors, attendees learn about how light pollution occurs, and how they can make changes to lighting on their own property to keep their skies dark. We work with the residents and local organizations with this event.

Below are several fliers from several of our night time photo workshops, and the results and pictures of these events.





The result of the summer Night Sky Photography Workshops are shown below, along with a link to the associated event page and blog posts for each. The blog posts recap each workshop, including pictures of the event. These blog posts can be viewed on our website. In addition, a copy of each blog post is included in the appendix of this document.

Stargazing: Night Sky Photography Workshop, June 10, 2021 (5 attendees)

June 10th Event link:

<https://keweenawmountainlodge.com/calendar/stargazing-night-sky-photography-workshop/>

Blog post link, recapping the June 10th event:

<https://keweenawmountainlodge.com/2021/06/17/june-10-2021-night-sky-photography-workshop-recap/>

Stargazing: Night Sky Photography Workshop, July 9, 2021 (9 attendees)

July 9th Event link:

<https://keweenawmountainlodge.com/calendar/stargazing-night-sky-photography-workshop-2/>

Blog post link, recapping the July 9th event:

<https://keweenawmountainlodge.com/2021/07/11/july-9-2021-night-sky-photography-workshop-recap/>

Stargazing: Night Sky Photography Workshop, August 8, 2021 (11 attendees)

August 8th Event link:

<https://keweenawmountainlodge.com/calendar/stargazing-night-sky-photography-workshop-3/>

Blog post link, recapping the August 8th event:

<https://keweenawmountainlodge.com/2021/08/09/august-8-2021-night-sky-photography-workshop-recap/>

Stargazing: Dark Sky Light Management Workshop, November 3, 2021 (7 attendees)

November 3rd Event link:

<https://keweenawmountainlodge.com/calendar/stargazing-dark-sky-light-management-workshop/>

Blog post link, recapping the November 3rd event:

<https://keweenawmountainlodge.com/2021/11/05/november-3-2021-dark-sky-light-management-workshop-recap/>

Stargazing: Northern Lights Photography Workshop, November 6, 2021 (3 attendees)

November 6th Event link:

<https://keweenawmountainlodge.com/calendar/stargazing-northern-lights-photography-workshop/>

Blog post link, recapping the November 6th event:

<https://keweenawmountainlodge.com/2021/11/09/november-6-2021-dark-sky-light-management-workshop-recap/>

Stargazing: Northern Lights Photography Workshop, December 4, 2021 (4 attendees)

December 4th Event link:

<https://keweenawmountainlodge.com/calendar/stargazing-northern-lights-photography-workshop-2/>

Blog post link, recapping the December 4th event:

<https://keweenawmountainlodge.com/2021/12/07/december-4-2021-northern-lights-photography-workshop-recap/>

Stargazing: Moonlit Snowshoe Hike, January 15, 2022 (14 attendees)

January 15th Event link:

<https://keweenawmountainlodge.com/calendar/winter-moonlight-snowshoe-hikes/>

Blog post link, recapping the January 15th event:

<https://keweenawmountainlodge.com/2022/01/16/january-15-2022-moonlit-snowshoe-hike-recap/>

Snowshoe Hare Event, with a Moonlit Snowshoe Hike, February 12, 2022 *(47 attendees)*

February 12th Event links (snowshoe hare and moonlit snowshoe hike):

<https://keweenawmountainlodge.com/calendar/snowshoe-hare/>

<https://keweenawmountainlodge.com/calendar/winter-moonlight-snowshoe-hikes-2022-02-12/>

Blog post link, recapping the February 12th event:

<https://keweenawmountainlodge.com/2022/02/14/2022-snowshoe-hare-recap/>

Stargazing: Moonlit Snowshoe Hike, March 19, 2022 *(11 attendees)*

March 19th Event link:

<https://keweenawmountainlodge.com/calendar/winter-moonlight-snowshoe-hikes-2022-03-19/>

Blog post link, recapping the March 19th event:

<https://keweenawmountainlodge.com/2022/03/21/march-19-2022-moonlit-snowshoe-hike-recap/>

Stargazing: Northern Lights Photography Workshop, April 2, 2022 *(5 attendees)*

April 2nd Event link:

<https://keweenawmountainlodge.com/calendar/stargazing-northern-lights-photography-workshop-5/>

Blog post link, recapping the April 2nd event:

<https://keweenawmountainlodge.com/2022/04/05/april-2-2022-northern-lights-photography-workshop-recap/>



The two photos on this page are photos taken during the August 8th, 2021 workshop, where attendees worked on their night sky photo skills on the fairway of Hole 9 at the Keweenaw Mountain Lodge. The workshop was taught by Nate Bett. (Photos of the workshop taken by Chris Guibert & Tom Oliver)

As we build out our stargazing activities each year going forward, we look to partner with more and more dark sky enthusiasts and organizations to help build out the educational and outreach initiatives in the Keweenaw. For example, there are individuals in the area that have a passion for night sky photography, namely the Northern Lights (e.g. Clayton Anderson, George Bailey, Steve Brimm, Jeremy Rowe). And multiple individuals and organizations have approached us asking about hosting a dedicated annual dark sky star party, which we are looking into further.



Stargazing Calendar of Events

Over the past 12-18 months, the Keweenaw Mountain Lodge has been working on building out activities related to enjoying gazing at the stars. The stargazing activities are aligned with our overall outdoor activity focus at the resort.

Here is the stargazing calendar of events that have a focus on stargazing in 2021 and 2022, from June 2021 to September 2022. These events are designed to excite and educate guests about the benefits of eliminating light pollution and appreciating the dark sky.

Date	Event	Notes
June 10, 2021	Night Sky Photo Workshop and New Moon Viewing Party	View the night sky and solar eclipse under a New Moon [see blog post for review of the event]
July 9, 2021	Night Sky Photo Workshop and New Moon Viewing Party	View the night sky under a New Moon and learn how to take the best night sky photos [see blog post for review of the event]
August 8, 2021	Night Sky Photo Workshop and New Moon Viewing Party	View the night sky under a New Moon and learn how to take the best night sky photos [see blog post for review of the event]
November 3, 2021	Dark Sky Light Management Workshop	View the night sky and learn about how to create lighting that does take away from one's view of the stars [see blog post for review of the event]
November 6, 2021	Northern Lights Photo Workshop	View the night sky and learn how to take pictures of the Northern Lights [see blog post for review of the event]
December 4, 2021	Northern Lights Photo Workshop	View the night sky and learn how to take pictures of the Northern Lights [see blog post for review of the event]
January 15, 2022	Moonlit Snowshoe Hike	Guided night time interpretive snowshoe hike [see blog post for review of the event]
February 12, 2022	Snowshoe Hare Event	Includes a guided night time interpretive snowshoe hike [see blog post for review of the event]
March 19, 2022	Moonlit Snowshoe Hike	Guided night time interpretive snowshoe hike [see blog post for review of the event]
April 2, 2022	Northern Lights Photo Workshop	View the night sky and learn how to take pictures of the Northern Lights [see blog post for review of the event]
April 22-30, 2022	International Dark Sky Week	
April 30, 2022	Night Sky Photo Workshop	View the night sky and learn how to take the best night sky photos

May 29, 2022	Night Sky Photo Workshop	View the night sky and learn how to take the best night sky photos
May 30, 2022	New Moon Viewing Party	View the Night sky under a New Moon
June 25, 2022	Night Sky Photo Workshop	View the night sky and learn how to take the best night sky photos
June 28, 2022	New Moon Viewing Party	View the Night sky under a New Moon
July 28, 2022	New Moon Viewing Party	View the Night sky under a New Moon
July 30, 2022	Night Sky Photo Workshop	View the night sky and learn how to take the best night sky photos
August 26, 2022	New Moon Viewing Party	View the Night sky under a New Moon
August 28, 2022	Night Sky Photo Workshop	View the night sky and learn how to take the best night sky photos
September 25, 2022	New Moon Viewing Party	View the Night sky under a New Moon

These scheduled events, along with notices on the calendar of new moon and meteor showers, can be seen on our website in the Calendar of Events:

- <https://keweenawmountainlodge.com/calendar/> (filter by “Stargazing” events)

Additional lighting management workshops, and several astronomy workshops with astronomy clubs, are also being planned for in 2022. They will be added to the 2022 calendar once the details are finalized.

Astronomy Clubs & Observatories

The Keweenaw Mountain Lodge is working on putting education and outreach activities into place with astronomy clubs. Programs will encourage interest in astronomy and valuing the preservation of the Lodge’s dark skies for future generations. The Marquette Amateur Astronomers who strive to further the public’s interest and wonder of the cosmos, and Michigan Technical University



AMJOCH Observatory⁸ where Michigan Tech students use the observatory to grow their own knowledge base of the night sky and offer community outreach events have both expressed interest in a partnership. One of the support letters is from a student in the Michigan Tech club, Troy Morris, who is a co-founder of a company (Kall Morris, Inc) that is focusing on cleaning up trash in space. We continue to be in contact with these groups to forge stronger relationships with them, as well as other astronomy-related organizations.

Outreach Commitment

To further demonstrate the Keweenaw Mountain Lodge's commitment to protecting and promoting dark skies, we will work to establish partnerships with surrounding communities. Initially, we will focus on establishing partnerships with the communities for which there is evidence of light pollution within our horizon photos. Specifically, at this time, our outreach will include, but not be limited to, the communities of Calumet, MI, Houghton/Hancock, MI, and Marquette, MI. Michigan Technological University and Northern Michigan University are located within the city limits of Houghton, MI and Marquette, MI, respectively. Each of these universities have robust science and technology programs and actively use their location within close proximity to popular outdoor recreation sites and expansive wilderness as a marketing tool to prospective students and their families. The Keweenaw Mountain Lodge will work to engage with city officials, business owners, faculty and staff, student organizations, university administration, media, and members of each of the aforementioned communities about the importance of proper light management and how it can impact energy use, wildlife, health, public safety, and budgetary needs. To support our outreach, we will use many of the standardized materials produced by IDA to highlight what we are doing, why it is important, what we have accomplished thus far, and how our outlying communities can effectively and efficiently move toward improved light management.

Additionally we have received interest from the media in the state of Michigan (both locally, down state, and in neighboring states). This news coverage in online and print media keeps the public informed of stargazing, fostering the dark sky, and our dark sky park application process. A sampling of the news articles are shown below (titles of the articles are provided, along with links to the articles online).

[Keweenaw Mountain Lodge applies to become International Dark Sky Park](#)

(Nov 22, 2021)

WJMN Local 3 / Brianna MacLean

[November dark skies shine in the Keweenaw](#)

(Nov 17, 2021)

Daily Mining Gazette

⁸ Source of image of the observatory: <https://www.mtu.edu/physics/research/amjoch.html> . The Observatory is in Atlantic Mine, near Michigan Tech University's campus, 50 miles from the Keweenaw Mountain Lodge.

[November is prime time for stars, Northern Lights in Michigan's Keweenaw; where to watch](#)

(Nov 17, 2021)

MLive / Emily Bingham

[Stargazing in the Midwest doesn't get any better than in Michigan's Upper Peninsula](#)

(Nov 4, 2021)

Chicago Tribune / Terri Colby

[5 Expert Tips for the Most Spectacular Summer Stargazing](#)

(Jun 1, 2021)

Thrillist

[Historic U.P. resort applying to be 3rd International Dark Sky Park in Michigan](#)

(Apr 23, 2021)

Detroit Free Press

[Historic Keweenaw lodge applying to become Upper Peninsula's first international dark sky park](#)

(Apr 21, 2021)

MLive

[Keweenaw Mountain Lodge applies to be Dark Sky Park; The sky is the limit for this new addition](#)

(Apr 20, 2021)

TV6 / WLUC

International Dark Sky Park Support Letters

Individuals and organizations have graciously written support letters for this application. These are organizations that include the local county and township (Keweenaw County, Grant Township), the local and state tourism bureaus and economic development agencies (Keweenaw Convention and Tourism Bureau, Keweenaw Economic Development Alliance, Pure Michigan), the nearby state park (Ft. Wilkins State Park / Michigan Department of Natural Resources), conservation groups (Michigan Nature Association, Keweenaw Community Forest Company / KORC), and local businesses and clubs (Copper Harbor Trails Club, Kall Morris, Keweenaw Adventure Company, Keweenaw Traveler, and Mariner North, Mt. Bohemia). These letters are herein, listed in order of the date they were received.

Letter from Keweenaw Convention & Visitors Bureau, Brad Barnett

Keweenaw Convention & Visitors Bureau
56638 Calumet Avenue Calumet, MI 49913
Phone: (906) 337-4579 Fax: (906) 337-4285
Website: www.keweenaw.info Email: info@keweenaw.info

January 19, 2020

To the International Dark Sky Association:

It is my pleasure to write a letter in support of the Keweenaw Mountain Lodge to become an International Dark-Sky certified park.

Michigan's Keweenaw Peninsula is renowned for its incredible outdoor amenities and attracts visitors from across the United States seeking to connect with nature and participate in outdoor recreation. Because of the Keweenaw's northern geography and low levels of ambient light pollution, dark sky viewing (particularly of the Aurora Borealis) is popular activity for those drawn to the region, including photographers, star-chasers, campers, and the lay traveler. Creating a certified Dark-Sky park would build upon and amplify these activities for visitors.

Tourism is a critical component of the Keweenaw economy, and the park's creation will add to the existing visitor economy which supports more than 70% of employment in Keweenaw County. Keweenaw County includes nationally and internationally recognized attractions such as Isle Royale National Park, the Copper Harbor Mountain Bike Trails (IMBA Silver Level Ride Center) and Mount Bohemia Resort. Additionally, the County is home to numerous conversation sites allowing the public and visitors to experience the Great Outdoors year-round. The Keweenaw Mountain Lodge, located in Copper Harbor, is also an historic attraction and its ownership's philosophy of community partnership and public access to outdoor recreation make it a fantastic location for dark sky viewing.

In short, creating a certified Dark-Sky park at the Keweenaw Mountain Lodge would build upon the region's outdoor assets *and* help preserve one of the area's most precious characteristics: access to impeccable dark-sky viewing. We strongly encourage the International Dark-Sky Association to support the Keweenaw Mountain Lodge's efforts.

Sincerely,

Brad Barnett
Executive Director, Keweenaw Convention & Visitors Bureau

Letter from Keweenaw Economic Development Alliance, Jeff Ratcliffe



March 31, 2021

International Dark Sky Association
5049 E. Broadway Blvd #105
Tucson AZ, 85711

To Whom It May Concern:

On behalf of the Keweenaw Economic Development (KEDA) board of directors, the local economic development organization working in Keweenaw, Houghton, and Baraga counties, I am writing to support the Keweenaw Mountain Lodge's nomination as a Dark Sky Park.

John Mueller's acquisition of the Keweenaw Mountain Lodge has had a transformative effect on the lodge and the surrounding community with his embrace of outdoor adventure recreation and appreciation and promotion the Keweenaw's natural beauty. The Mountain Lodge is a unique and historic lodging establishment that blends perfectly with its beautiful surroundings. The Mountain Lodge not only provides a one-of-a-kind lodging experience that is a respite from busy lives but also offers a serene place to disconnect from the world and re-connect with nature. The Dark Sky Park will complement not only this experience but add to the experience of other visitors to the area and our residents.

Becoming a Dark Sky Park is a perfect next step to the Mountain Lodge's establishment as a unique destination in the Keweenaw and KEDA is excited to support this effort.

Sincerely,



Jeff Ratcliffe
Executive Director

902 College Avenue • P.O. Box 724 • Houghton, Michigan 49931 • 906-482-6817 • www.kedabiz.com

Letter from Keweenaw Adventure Company, Sam Raymond

April 1, 2021

To the International Dark Sky Association,

We at the Keweenaw Adventure Company – located in Copper Harbor, MI – are writing to nominate the Keweenaw Mountain Lodge (our neighbor) as a Dark Sky Park destination.

For over two-and-a-half-decades, the Keweenaw Adventure Company has been enacting ethical business practices that today are being defined on an international scale as sustainable and/or responsible tourism. We're a guide & outfitter company that truly values, respects and supports our pristine natural areas, our culturally rich heritage, our local community and economy. We understand our crucial role in facilitating experiences that "connect people with awe and respect to the Keweenaw Peninsula" — ultimately supporting regional sustainable tourism while maintaining the region's character and sense of place.

With that, having a Dark Sky Park destination in Copper Harbor would be an awesome attraction for the vast majority of our visitors looking to recreate in remote, pure regions unhindered by over-development. We annually host 5,000+ customers on our sea kayaking and mountain biking adventures each season – while an additional 5,000+ customers frequent our retail and bike repair shop – and a Dark Sky Park would undoubtedly complement efforts to attract yet more outdoor enthusiasts and adventures to the area.

Regards,

A handwritten signature in black ink, appearing to read "Sam Raymond".

Sam Raymond
Owner
Keweenaw Adventure Company

Letter from Copper Harbor Trails Club, Nathan Miller

April 3, 2021

Dear International Dark Sky Park Association,

On behalf of the Copper Harbor Trails Club, I would like to offer this letter of support for the Keweenaw Mountain Lodge's application to become a Dark Sky Park. We believe that the Keweenaw Mountain Lodge and the Copper Harbor area would be a perfect addition to the program. Our excellent dark skies offer visitors the opportunity to regularly glimpse the northern lights, Milky Way, meteor showers, and more.

Surrounded by Lake Superior on three sides, the undeveloped landscape surrounding the Keweenaw Mountain Lodge serves as an excellent backdrop for stargazing. We have been impressed with the efforts that have been put in to improve night sky viewing opportunities at the Lodge and look forward to seeing what they come up with next.

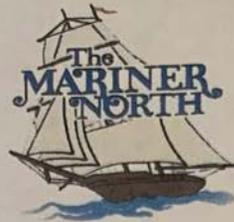
The Copper Harbor Trails Club maintains over 37 miles of non-motorized, human powered trails, many of which cross Keweenaw Mountain Lodge property. A big reason our visitors love hiking, mountain biking, and camping in the Copper Harbor area is the potential to see the northern lights and a far greater abundance of stars than they would back home under light-polluted skies. This designation would recognize the Lodge for its efforts and help to attract even more people keen on seeing the unmarred night.

On a personal level, I grew up about twenty minutes from one of the first International Dark Sky Parks, Cherry Springs State Park in Pennsylvania. I loved attending their astronomy events and grew to appreciate the beautiful nighttime views. The night skies here in the Keweenaw are easily comparable to Cherry Springs and are one of the reasons I came to live here. I believe that similar programs, events, and community benefits could be gleaned from accepting the Keweenaw Mountain Lodge as a Dark Sky Park.

A handwritten signature in black ink, appearing to read "Nathan Miller". The signature is fluid and cursive.

Nathan Miller
Executive Director, Copper Harbor Trails Club
www.copperharbortrails.org

Letter from Mariner North, Don and Peg Kauppi



P.O. Box 85 • Copper Harbor, Michigan 49918 • (906) 289-4637

**Re: Keweenaw Mountain Lodge
Dark Sky Nomination**

International Dark Sky Association:

We, at The Mariner North LLC, send this letter to show our strong support for the application/nomination of the Keweenaw Mountain Lodge, Copper Harbor, MI, as an International Dark Sky Park.

We have been in business here for 44 years and have seen our small, remote tourist town strive hard to offer our beautiful ancient geology, fresh Lake Superior water, gorgeous vistas and exposure to nature for public access, while still maintaining an environment that allows our customer base to enjoy world renowned trails...hiking, biking, kayaking, skiing etc in a natural, pristine setting.

The success of the Keweenaw Mountain Lodge nomination holds benefits not just for their business, but for the community of Copper Harbor and the other businesses as well. Our population is small however, our visiting tourists find our ability to service them very strong. International Dark Sky Association members will find the views from the Keweenaw Mountain Lodge grounds extraordinary, and will also have access to various locations, some easy to access and others worth the effort, on the Keweenaw Peninsula where they can continue to enjoy a complete connection with the cosmos.

The Keweenaw Mountain Lodge is open year round and with neighboring businesses has marketing abilities already in place for every season that would facilitate the Dark Sky membership enjoying our natural, unreal world in all seasons.

Thank you,

Two handwritten signatures in dark ink. The first signature is 'Don Kauppi' and the second is 'Peg Kauppi'. The signatures are written in a cursive, flowing style.

**Don and Peg Kauppi
Owners**

Letter from Fort Wilkins State Park, Bob WildGRETCHEN WHITMER
GOVERNORSTATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
LANSINGDANIEL EICHINGER
DIRECTOR

April 05, 2021

To International Dark Sky Association:

Fort Wilkins Historic State Park is pleased to provide this letter of support for a nomination of the Keweenaw Mountain Lodge to receive recognition as a Dark Sky Park.

Keweenaw Mountain Lodge is nestled in Copper Harbor, Michigan's northern most county. Far from urban areas, Northern Michigan has quality dark sky conditions. Keweenaw Mountain Lodge is a great candidate for a dark sky park for numerous reasons.

First, the location is great for night sky viewing because of its location, elevation, and view scape. It is just far enough from the nearby Lake Superior shoreline and the exposed bedrock cliffs (both of which can alter quality dark sky "seeing" conditions when using a telescope) and it offers expansive open sky views even for sights near the horizon which is often difficult to find around here.

Secondly, the staff at the Keweenaw Mountain Lodge fully embraces the concept of dark sky preservation.

Third is there is a definite need. Out of town visitors are often awed by the quality dark sky conditions Northern Michigan has to offer. This region's economy relies on tourism and we have plenty of tourists looking for a quality location for night sky viewing. Keweenaw Mountain Lodge is a great location to serve as a dark sky park.

Thank you for providing us with the opportunity to voice our enthusiasm and support for this proposal.

Sincerely,

*Robert Wild*Bob Wild
Park Supervisor
Fort Wilkins Historic State Park
Copper Harbor, Mi 49918

Letter from Grant Township, Scott Wendt

April 5, 2021

To the International Dark Sky Association:

It is the pleasure of the Grant Township Board, Keweenaw County Michigan, to support the nomination of the Keweenaw Mountain Lodge, the celebrated jewel of Grant Township, to receive recognition as a Dark Sky Park.

The historic Keweenaw Mountain Lodge, built by the WPA (Works Progress Administration) during the depths of the depression, is a designated Michigan State Historic Site and on the National Register of Historic Places. Nestled among topography that is reminiscent of mountainous northern New England, the Keweenaw Mountain Lodge is cradled by remote boreal forests, the deep waters of Lake Superior, and time worn conglomerate peaks. The ruggedness and natural beauty of the area has attracted visitors for generations to experience one of the most unique and treasured corners of the Midwest.

Known for the beauty of its intense Northern Light and Milky Way displays, the direct area surrounding the Keweenaw Mountain Lodge has long benefited from the Night Sky Tourism industry. With the advent of Night Sky Predictor Apps, visitors flock to the tip of the Keweenaw Peninsula to view the wonders the night holds. Set against the backdrop of passing freighters far out on the lake and nearly pristine dark skies, the viewing wonders of the Keweenaw Mountain Lodge and the surrounding area is truly a breath-taking adventure.

Receiving the Dark Sky Park recognition would be a great honor for the Keweenaw Mountain Lodge, one that will involve in-depth education and local preservation focus. The Keweenaw Mountain Lodge team has the drive, ambition, and passion to accept and foster a coveted Night Sky Park Designation to maintain and preserve the unique Upper Peninsula night sky viewing for generations yet to come.

Sincerely,

A handwritten signature in black ink, appearing to read "S. Wendt", is written over a horizontal line.

Scott Wendt, Grant Township Supervisor

KEWEENAW COUNTY
230 Gratiot Street | P.O. Box 76, Copper Harbor, MI 49918 | P: 906.289.4292 | F: 906.289.1029 | TTY: 800-469-3777
granttownshipmi.org

Grant Township Is An Equal Opportunity Employer And Provider



Letter from Michigan Nature Association, Julie Stoneman

April 7, 2021

To the International Dark Sky Association:

The Michigan Nature Association (MNA) enthusiastically endorses the Keweenaw Mountain Lodge's (KML) application for Dark Sky Park designation.

MNA is a statewide, nonprofit land trust dedicated to permanently protecting natural lands throughout the state to provide habitat for rare, threatened, and endangered species; imperiled natural communities; and unique geologic features. We have permanently protected hundreds of acres at the tip of Michigan's Keweenaw peninsula in close proximity to KLM and can attest to the singular quality and clarity of the night sky in this rugged and beautiful area.

Many of the lands we protect in the area are part of an important flyway for raptors and other migratory birds. These lands connect to a larger network of conservation lands held by both public and private entities, contributing to important wildlife corridors for a number of species. We know the importance of dark skies for wildlife movement and migration, and we applaud KML for working to not only manage and limit light pollution but to also pursue Dark Sky Park designation.

It is exciting to know that KML will provide sky watching programs and events that celebrate dark skies; educate about the negative impacts of light pollution on birds, wildlife, and people; and provide access for thousands to a wondrous natural resource that is becoming increasingly difficult to find—a truly dark sky.

We hope you will give KML's application your most serious consideration.

Thank you,

Julie Stoneman

Julie Stoneman
Director of Outreach and Education

www.michigannature.org

Letter from Keweenaw Community Forest Company (dba, KORC), Gina Nicholas**KEWEENAW
COMMUNITY
FOREST
COMPANY**

A Michigan 501(c)3
13992 Smith Fishery Road
Mohawk, MI 49950

April 8, 2021

Mr. John Mueller
Keweenaw Mountain Lodge
14252 US Highway 41
Copper Harbor, MI 49918

RE: Keweenaw Mountain Lodge Dark Sky Park Application

Dear John:

The purpose of this letter is to indicate the Keweenaw Community Forest Company (KCFC), a non-profit conservation and outdoor recreation company operating primarily in Keweenaw County, Michigan, strongly supports your application to the International Dark Sky Association for designation of the Keweenaw Mountain Lodge as a Dark Sky Park.

The major industry of Keweenaw County is tourism and there is increasing interest in conserving the dark night sky and providing safe viewing locations for visitors and residents. The Keweenaw Mountain Lodge is an ideal destination for a Dark Sky Park because it is accessible by everyone in all seasons. While Keweenaw is fortunate to have several great locations for viewing the night sky including planets, meteor showers, satellites, stars, constellations and the northern lights, several locations are only accessible on a seasonal basis.

Designating the Keweenaw Mountain Lodge as a Dark Sky Park would also enhance education opportunities for our area. In the past, conservation organizations have sponsored night sky events with astronomy professors from Michigan Technological University, but have not done so in recent years due to safety and liability concerns of the landowners. The Keweenaw Mountain Lodge is a great location for hosting educational events as well as expanding visitor opportunities.

KCFC supports your application for a Dark Sky Park at Keweenaw Mountain Lodge and looks forward to a favorable decision by the International Dark Sky Association.

Sincerely,

Gina M. Nicholas
President, Keweenaw Community Forest Company

Note: Keweenaw Community Forest Company is the legal entity for Keweenaw Outdoor Recreation Coalition (KORC). KORC's mission is to bring together individuals, businesses, and outdoor recreation, conservation, and community organizations to secure permanent public access to at-risk land in the Keweenaw.

Letter from Charlie Eschbach, Estivant Pines

The Keweenaw Traveler
110 Quincy St.
Hancock. Mi. 40031

Subject: Keweenaw Mountain Lodge and Resort Dark Sky nomination.

In the last 31 years I have been editor and publisher of the Keweenaw Traveler which is our area tourist information publication. We feature the Keweenaw in all it's natural wonders with detail hikes, water routes, mountain biking and how to visit our natural attractions. Each year we cover the Perseid meteor showers and the frequent Aurora displays..

The Keweenaw Mountain Lodge and Resort (which we refer to as the “Jewel of the Keweenaw”) is positioned on the spine of the Keweenaw Peninsula. That combined with the Peninsula's exposure to the dark sky and black expanse of Lake Superior, make the Resort perfect as a Dark Sky observatory.

When you combine the Dark Sky attractions with the comfort of the Resort as your base camp, the countless outdoor adventures during the day will complete what we call PURE KEWEENAW.

Long Time Keweenaw Traveler

Charles Eshbach

Letter from Keweenaw County, Don Piche

5095 4th Street, Eagle River, MI 49950
(906) 337-2229

To the International Dark Sky Association:

Keweenaw County is writing in support of the Keweenaw Mountain Lodge's request for recognition as a Dark Sky Park.

The Mountain Lodge was owned by Keweenaw County from the time of its construction in the 1930(s) until it was sold to Keweenaw Resort, a private company headed by John Mueller, in 2018. The County has been delighted with the progress of the Mountain Lodge under Keweenaw Resort's ownership. Significant rehabilitation and maintenance measures and upgrades have been undertaken at the Mountain Lodge without any adverse impact to the historic nature of the property and its wilderness ambience. Notably, with reference to the Dark Sky application, street lighting and some interior lights were recently modernized to mitigate any upward glare toward the sky.

Under its new ownership, the Mountain Lodge has been transformed from a seasonal to year-round destination to the benefit of the Mountain Lodge and other local businesses. The Mountain Lodge remains welcoming to the public and cooperative with local organizations, such as the Copper Harbor Trails Club, in jointly-promoting adventure and wilderness tourism and related events. New walking, skiing, and snow shoe trails have been established at the Mountain Lodge, and horse trails may be established on nearby property that the Mountain Lodge is seeking to acquire from the County. Additional activities, such as a winter snow park, are expected in the future.

Designation as a Dark Sky Park is wholly consistent with Keweenaw Resort's vision and local residents' aspirations for their community. Star gazers and night photographers are the types of persons that are drawn to the northern portion of Keweenaw County, along with like-minded nature, silent sports, and adventure enthusiasts.

Maintaining a dark sky in northern Keweenaw County at the Mountain Lodge and elsewhere will help keep the County a wonderful and largely unspoiled destination for present and future generations of visitors. The County strongly encourages approval of the Mountain Lodge's application.

Sincerely,

Donald Piche, Chairman
Keweenaw County Board of Commissioners

Letter from Kall Morris Inc, Troy Morris**KALL MORRIS INC****KEEPING SPACE CLEAR FOR ALL**

April 16, 2021

To the International Dark Sky Association:

With pleasure we write this letter of support for the Keweenaw Mountain Lodge to become an International Dark Sky Park.

The Keweenaw Peninsula is remarkable to residents and visitors, as it stands out among the Upper Peninsula, let alone Michigan, the entire Midwest, and as a highlight of the United States for its access to nature and availability of outdoor recreation. The abundance of natural beauty extends from the stones and shores to the skies above it, as Lake Superior shields the Keweenaw from the far-off cities that visitors flock from. With this northern and remote position coupled with low light pollution, daytime visitors have been treated to nighttime vistas overhead for decades, enjoying otherwise-unavailable views of the Milky Way, natural constellations, and the conveniently located Aurora Borealis. The identification of this outdoor abundance by the Dark Sky certification of Keweenaw Mountain Lodge would help promote these properties while securing them for future visitors and generations.

As a relatively undisturbed and remote segment of the American continent, tourism to the area is as important to the education of visitors as it is vital to the area economy. The Keweenaw is home to an amazing array of nationally and internationally renowned environmental attractions, building on the prestige of the entire Upper Peninsula for both the casual and committed adventurers. With the Keweenaw Mountain Lodge's location in famed Copper Harbor, this Dark Sky park will join as a jewel in the crown among Isle Royale National Park, the repeatedly awarded Copper Harbor Mountain Bike Trails, and the distinguished Mount Bohemia Resort. These already-present natural attractions demonstrate the community partnership philosophy that extends these outdoor opportunities to residents and visitors alike.

In conclusion, the certification of Keweenaw Mountain Lodge as an International Dark Sky Park would preserve the present potential of unobstructed and undiluted views for visitors of the near and continued future. We strongly encourage the International Dark Sky Association to support the Keweenaw Mountain Lodge's efforts and appreciate your consideration.

Sincerely,



Troy M. Morris, Director of Operations

www.kallmorris.com

Email: troy@kallmorris.com Phone: (815) 528-8665



Letter from Pure Michigan, Dave Lorenz

April 19, 2021

To the International Dark Sky Association:

It is my pleasure to write a letter in support of the Keweenaw Mountain Lodge's application for International Dark-Sky Park designation.

Michigan's Keweenaw Peninsula is renowned for its incredible outdoor amenities and attracts visitors from all over the world seeking to connect with nature and participate in outdoor recreation. Because of the Keweenaw's northern geography and low levels of ambient light pollution, dark sky viewing (particularly of the Aurora Borealis) is a popular activity for those drawn to the region, including photographers, star-chasers, campers, and lay travelers. Creating a certified Dark-Sky park would build upon and amplify these activities for visitors.

Tourism is a critical component of the Keweenaw economy, and the park's creation will add to the existing visitor economy supporting more than 70% of employment in Keweenaw County. Keweenaw County includes nationally and internationally recognized attractions such as Isle Royale National Park, the Copper Harbor Mountain Bike Trails (IMBA Silver Level Ride Center) and Mount Bohemia Resort. Additionally, the County is home to numerous sites allowing visitors to experience the Great Outdoors year-round. The Keweenaw Mountain Lodge, located in Copper Harbor, is also a historic attraction and its ownership's philosophy of community partnership and public access to outdoor recreation make it a fantastic location for dark sky viewing.

Creating a certified Dark-Sky park at the Keweenaw Mountain Lodge would build upon the region's outdoor assets *and* help preserve one of the area's most precious characteristics: access to breathtaking dark-sky viewing. I strongly support International Dark-Sky designation for the Keweenaw Mountain Lodge, Copper Harbor, Michigan.

Sincerely,

A handwritten signature in black ink that reads "Dave Lorenz".

Dave Lorenz, Vice President
MEDC - Travel Michigan
300 N. Washington Square
Lansing, MI 48913
(517) 243-3073

Michigan Economic Development Corporation

300 North Washington Square | Lansing, MI 48913 | 888.522.0103 | michiganbusiness.org | michigan.org

Letter from Mt. Bohemia, Lonie Glieberman

April 23, 2021

To the International Dark Sky Association:

The Keweenaw Mountain Lodge is looking to become a dark sky center. Mount Bohemia supports their endeavor. The Keweenaw Mountain Lodge is an historic resort which has a rich WPA-era history and a great ambiance nestled in the woods and the hills – the wilderness of the Keweenaw.

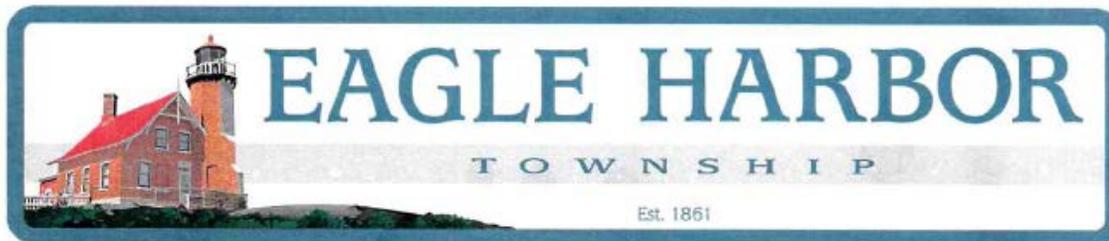
Tourism drives a large portion of the economy in the Keweenaw. The dark sky in the Keweenaw, with its easy ability to see the stars above us, is an attraction to visitors to the area. A designated dark sky park, with solid leadership, would give tourists an additional outdoor activity to do at night.

Dark skies are an interesting special attraction that few communities can offer. Creating a designated dark sky park headquartered at Keweenaw Mountain Lodge would greatly enhance the tourism offerings of the Keweenaw. The Keweenaw is home to the Midwest top mountain biking, hiking, and skiing destinations. Adding a designated dark sky park that promotes the entire Keweenaw in a fashion that is in-line with these outdoor activities. The Keweenaw Mountain Lodge is ideally situated to provide this unique service in the Midwest.

Please strongly consider the Keweenaw Mountain Lodge for this designation. They are an ideal candidate and a perfect physical spot for creating star gazing at night – in the Keweenaw.

Regards,

Lonie Glieberman
President
Mount Bohemia ski resort

Letter from Eagle Harbor Township, Rich Probst

November 15th, 2021

To: International Dark-Sky Association
Re: Keweenaw Mountain Lodge – Keweenaw Dark Sky Wilderness application
From: Eagle Harbor Township, Michigan - Park Committee

Eagle Harbor Township is situated in Keweenaw County, Michigan. The Keweenaw Peninsula is rapidly becoming a wilderness adventure and eco-friendly tourist destination in the Midwest. Such wilderness and eco-tourist activities include but are not limited to mountain biking, hiking trails, bird watching, designated ATV and snowmobile trails, fishing, water sports such as kayaking and night sky viewing.

Within Eagle Harbor Township are many locations which encourage participation by the public in all of these activities. One of these locations is Brockway Mountain. Brockway Mountain West Bluff is 700 feet above Lake Superior offering incredible views of lake, peninsula and the night sky. Brockway Mountain was privately owned and open to the public with access by a seasonal road maintained by the Keweenaw County Road Commission. When the 320 acre summit property went for sale, the Township and local partners were fortunate to be able purchase the property with the intention of keeping it open to the public. Eagle Harbor Township has placed the development of Brockway Mountain into its 5-year Recreational Plan and 5-year Comprehensive Plan, both recently updated. Both of these plans encourage additional development of wilderness and eco-friendly tourist activities.

Currently there are many uses of Brockway Mountain. One of these is night sky viewing. The Keweenaw Mountain Lodge located in neighboring Grant Township is promoting itself as a location to experience wilderness activities which includes night sky viewing. They hold night sky workshops to educate people how to take night sky photos, how to use portable telescopes and have taken guests to Brockway Mountain to practice these skills.

The Keweenaw Mountain Lodge is in the process of applying for official Dark Sky designation. The Park Committee encourages the Lodge to continue to pursue this application and designation. Night sky viewing is a passive activity that fits into the wilderness and eco-friendly tourist industry that is being promoted for our area, and we hope the International Dark Sky Association acts favorably on the Keweenaw Mountain Lodges application.

Sincerely,

A handwritten signature in blue ink that reads "Rich Probst, Jr." in a cursive style.

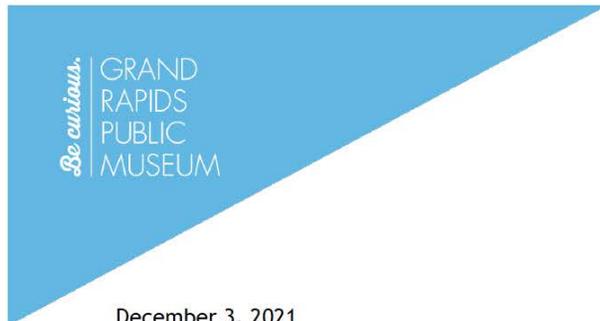
Rich Probst, Jr. – Township Supervisor
Eagle Harbor Township Park Committee

cc: John Mueller, Keweenaw Mountain Lodge – Keweenaw Dark Sky Wilderness

• 321 Center Street Eagle Harbor, Michigan 49950-9722 • Phone: 906-289-4407 • Fax: 906-289-4462 •

• E-mail: office@eagleharbortwp.org • Web: www.eagleharbortwp.org •

Eagle Harbor Township is an equal opportunity provider and employer. TDD # 711

Letter from Roger B. Chaffee Planetarium, David L. DeBruyn

December 3, 2021

International Dark Sky Association

To Whom It May Concern:

It is my understanding that an application is being filed to designate a region in Michigan's Keweenaw Peninsula as a "Dark Sky Wilderness." When I first heard about this a few weeks ago, and was asked to write a letter of support, my first thought was "This could be the best spot for a dark sky park east of the Mississippi River!"

The pristine wonders of the Keweenaw are well known to nature loving Michigan residents such as myself, and are also a destination for many from other parts of the U.S. and beyond during all seasons. Could there be a better idea than to add to that list a dark sky park for optimum appreciation of one of the greatest wonders of all, looking into a dark star speckled sky?

As a professional astronomy education specialist for more than half a century, I have looked upward into such a sky many times, but have mostly had to travel great distances to do so. I am well aware that we do have the Headlands Dark Sky Park near Mackinaw City, and as one of many involved in its development, realize it is a great asset visited annually by thousands. There are also dark sky preserves at a number of state parks that are appreciated by those who seek them out.

Still, all are close enough to significant population centers to be affected to some degree by light pollution. With the anticipated cooperation from the Houghton area, and nothing but expansive areas of water on three sides, the Keweenaw Dark Sky Wilderness would seem to me to have the potential to be among the darkest of dark sky parks.

It also would be ideally situated to benefit from the low humidity high pressure systems that sweep down periodically from Canada.

For these reasons, and others, I add my hearty support for this project.

Sincerely,

David L. DeBruyn
Curator Emeritus
Roger B. Chaffee Planetarium, Grand Rapids Public Museum



272 Pearl Street NW
Grand Rapids, Michigan 49504
616.456.3977
grpm.org

Appendix

Appendix A: KML Historic Preservation Easement

Below is a copy of the recorded documents related to the historic preservation easement for the Keweenaw Mountain Lodge. The documents were recorded on September 5, 2018, when Keweenaw Resort, LLC purchased the Lodge from Keweenaw County.



20180571

20180571

September 05, 2018 1:46 PM

Julie A. Carlson
Register of Deeds

Fees: \$30.00

KEWEENAW COUNTY Pages: 6**HISTORIC PRESERVATION EASEMENT****KEWEENAW MOUNTAIN LODGE AND GOLF COURSE COMPLEX, TOWNSHIP OF GRANT, KEWEENAW COUNTY MICHIGAN**

This historic preservation easement (the "Easement") is made the 5th day of September 2018 between KEWEENAW COUNTY as GRANTOR of a historic preservation easement (hereafter referred to as the "Grantor") whose address is 5095 4th Street, Eagle River, MI 49950, and the MICHIGAN STATE HOUSING DEVELOPMENT AUTHORITY, a principal state department acting through its STATE HISTORIC PRESERVATION OFFICE ("SHPO" or "Grantee"), whose address is 735 East Michigan Ave., Lansing, Michigan, 48912. The Grantor is the recipient of a 2007 Community Facility Grant Award from the United States Department of Agriculture, Rural Housing Service (USDA). The consideration for this Easement totals Ten thousand dollars (\$10,000) received from the USDA with the condition of granting this Easement to the Grantee.

The property that is the subject to this Easement is the Keweenaw Mountain Lodge and Golf Course Complex, as described below (the "Property"), is listed in the National Register of Historic Places (the "National Register"). The Property is a parcel of land located in Grant Township, Keweenaw County, Michigan, and is more particularly described as:

A parcel of land being a part of the South Half (S ½) of Section 31, T59N, R28W, Grant Township, Keweenaw County, Michigan AND the North Half of Section 6, T58N, R28W, Grant Township, Keweenaw County, Michigan described as: Beginning at the Southeast corner of said Section 31, T59N, R28W and the Northeast corner of said Section 6, T58N, R28W thence S. 00° 17' 27" E. 1766.33 feet along the East line of said Section 6; thence N. 89° 10' 31" W. 4220.22 feet to a point on the Easterly right of way line of Highway U.S. 41 (33 feet from center line); thence along the Easterly right of way line of said Highway the following eight courses N. 00° 49' 59" W. 33.95 feet to the point of curvature of a curve to the Right (Radius = 1041.27 feet, Delta = 15° 36' 17", Chord Bears N. 07° 53' 20" E. 282.72 feet); thence along the arc of said curve to the Right 283.59 feet; thence N. 15° 41' 29" E. 604.59 feet to the point of curvature of a curve to the Left (Radius = 620.65 feet, Delta = 35° 53' 27", Chord Bears N. 02° 15' 15" W. 382.46 feet); thence along the arc of said curve to the Left 388.78 feet; thence N. 20° 11' 58" W. 242.73 feet to the point of curvature of a curve to the Right (Radius = 724.21 feet, Delta = 19° 14' 13", Chord Bears N. 10° 34' 52" W. 242.01 feet); thence along the arc of said curve to the Right 243.15 feet to point on the North line of said Section 6; thence S. 89° 35' 55" E. 167.06 feet along the North line of said Section 6 to a point on the Southeasterly right of way line of said Highway (200 feet from the center line) and to

the point of curvature of a curve to the Right (Radius = 557.21 feet, Delta = 28° 09' 25", Chord Bears N. 12° 42' 25" E. 271.08 feet); thence along the arc of said curve to the Right 273.83 feet; thence N. 55° 56' 17" E. 183.29 feet; thence N. 88° 38' 15" E. 998.32 feet; thence S. 51° 39' 00" E. 552.02 feet; thence S. 85° 13' 53" E. 189.44 feet; thence S. 20° 26' 38" E. 50.49 feet to a point on the South line of said Section 31, thence S. 89° 23' 51" E. 2136.51 feet to the point of beginning of this description.

Said Property being shown as Parent Parcel #1 and Proposed Parcel "A" on Sheet #1 of a Certificate of Survey recorded in the records of the Keweenaw County Register of Deeds on July 14, 2017, Document No. 20170422, as amended by a Scrivener's Affidavit filed on August 23, 2017, Document No. 20170502.

This Easement is executed consistent with Subpart 11 of Part 21 of Article 1, Conservation and Historic Preservation Easements of the Michigan Environmental Protection Act, MCL 324.2140 *et seq.* and is subject to the following conditions and covenants:

- (1) The purpose of this Easement is to protect the existing improvements on the Property, namely the original mountain lodge building/club house (with its kitchen, bar, dining, seating, sales, office, and porch areas), the golf course, cabins constructed in the 1930(s), and the conference center added to the original mountain lodge building with SHPO's approval between 2006-2007 (the "Existing Improvements").
- (2) This Easement does not apply to the motel, the maintenance buildings and outbuildings on the Property (the "Noncontributing Buildings"). Alteration, rehabilitation and demolition of the Noncontributing Buildings may be undertaken without the consultation or permission of the SHPO, its successors or assigns.
- (3) Grantor covenants on behalf of itself, its heirs, successors and assigns that the Owner of the Property will restore, maintain and preserve the Existing Improvements in accordance with the recommended approaches of the U.S. Secretary of Interior's *Standards for the Treatment of Historic Properties*, 36 CFR 67-68 (the "Secretary's Standards") in order to preserve those qualities that made the Property eligible for listing on the National Register.
- (4) No construction, alteration or rehabilitation to the Existing Improvements, nor any new construction to the Property shall be undertaken or permitted to be undertaken that would affect the historic features or historic character of the Existing Improvements without consultation with and the express permission of the SHPO, its successors or assigns; provided, however, in the event a written request is not approved by SHPO within thirty (30) days after written submission, such construction, alteration or rehabilitation may be undertaken in accordance with the recommended approaches of the Secretary's Standards. So long as the Owner of the Property does not permit any building or improvement to be constructed or exist on the Property at a height greater than the present roof of the Lodge building, expansion of the existing golf course into the eastern portion of the Property shall not be deemed to affect the historic features or character of the Existing Improvements.
- (5) Development of the eastern portion of the Property shall be restricted to that parcel of land that is located beyond the easternmost point of Golf Course Road, except for

expansion of the existing golf course into the eastern portion of the Property, which shall not be restricted. All plans for any construction improvement on the eastern portion of the Property shall first be presented to the SHPO for review and comment before commencement of any construction. The Owner of the Property shall not permit any building or improvement to be constructed or exist on the Property at a height greater than the present roof of the Lodge building.

- (6) The SHPO shall be permitted at all reasonable times to inspect the Property in order to ascertain if the above conditions are being met.
- (7) In the event of a violation of this Easement, and in addition to any current or future remedy provided by law, the SHPO may, following reasonable notice to the Owner of the Property, institute suit to enjoin the violation or to require the restoration of the Existing Improvements, obtain specific performance, and pursue other remedies provided by law.
- (8) This Easement is binding on the Grantor and its heirs, successors and assigns in perpetuity. All stipulations and covenants within this document shall be inserted by the Grantor verbatim or by express reference in any deed or other legal instrument by which the Grantor divests itself of any interest or any part interest in the Property.
- (9) Failure of the SHPO to exercise any right or remedy granted under this instrument shall not have the effect of waiving or limiting the exercise of any other right or remedy or use of such right or remedy at any other time.
- (10) This Easement shall be a binding servitude upon the Property and shall be deemed to run with the land. Grantor further agrees to promptly and properly record this Easement in the Register of Deeds' Office in the county in which the Property is located. Execution of this Easement shall constitute conclusive evidence that the Grantor agrees to be bound by the foregoing conditions and restrictions and agrees to perform the obligations as described within this Easement.
- (11) The Owner of the Property shall bear all costs necessary to preserve the historic integrity of the features, materials, appearance, workmanship and environment of the Existing Improvements pursuant to the U.S. Secretary of the Interior's *Standards for the Treatment of Historic Properties*, 36 CFR 67-68. Nothing in this Easement prohibits the Owner of the Property from seeking financial assistance from any other source for additional preservation efforts.
- (12) The Owner of the Property shall bear all costs of the continued maintenance and repair of the Property so as to keep it in a sound state of repair, prevent deterioration and preserve the architectural and historical, and archaeological integrity of the Property and enhance those qualities that make the Property eligible for listing in the National Register of Historic Places.
- (13) Any visual or structural alterations to the Property shall be made in accordance with the recommended approaches in the U.S. Secretary of the Interior's *Standards for the Treatment of Historic Properties*, 36 CFR 67-68, and no visual or structural

- alterations will be made to the Property without prior written permission from the Grantee, its successors or assigns, which shall not be unreasonably withheld.
- (14) The Owner of the Property will provide public access to the Existing Improvements no less than twelve (12) days each calendar year so that the general public can view the Existing Improvements. The days the Existing Improvements are available to the public will be equitably spaced. The Owner of the Property may take into account seasonal and other factors that will most effectively afford public access.
 - (15) The Owner of the Property may charge a reasonable nondiscriminatory admission fee to the public that is comparable to fees charged at similar facilities in the area. The Owner of the Property will not discourage public visitation of the Property during the time public access is required in accordance with the preceding paragraph of this Easement.
 - (16) The Owner of the Property shall comply with the Elliott-Larsen Civil Rights Act, MCL 37.2101 *et seq.*, the Persons with Disabilities Civil Rights Act, MCL 37.1101 *et seq.*, and all other state, federal and local fair employment practices and equal opportunity laws and covenants that it shall not discriminate against any employee or applicant for employment, to be employed in the performance of this Easement with respect to his or her hire, tenure, terms, conditions, or privileges of employment, or any other matter directly or indirectly related to employment, because of his or her race, religion, color, national origin, age, sex, height, weight, marital status, or disability that is unrelated to the individual's ability to perform the duties of a particular job or position. The Owner of the Property agrees to include in every subcontract entered into for the performance of its obligations under this Easement this same covenant not to discriminate in employment.
 - (17) The Owner of the Property must comply with the Americans with Disabilities Act and with Section 504 of the Rehabilitation Act when interior public access is required at least twelve (12) days per calendar year. The Owner of the Property is not required to make every part of the Property accessible to and useable by disabled persons by means of physical alterations. During public access periods, videos, slide presentations and/or other audio-visual media should be used to depict otherwise inaccessible areas or features. The intent of this paragraph is to communicate that the preservation/accessibility issue must be addressed and that the solution is to take careful steps to determine what can be done to improve access without sacrificing historic fabric.
 - (18) If the Owner of the Property leases the Property, the Owner of the Property covenants to incorporate into the lease all of the terms, conditions and covenants of this Easement.
 - (19) The Grantor acknowledges that the Grantee, after providing written notice to the Owner of the Property, may institute action(s) to enjoin violations of this Easement, to require specific performance, and to require restoration of the Property in

conformity with the U.S. Secretary of the Interior's *Standards for the Treatment of Historic Properties*, 36 CFR 67-68. The Grantee has available to it all legal and equitable remedies to enforce Grantor's obligations under this Easement. If the Owner of the Property is found by a court of competent jurisdiction to have violated any of its obligations, the Owner of the Property shall reimburse the Grantee for all costs and expenses incurred in connection with the Grantee's enforcement of the terms of this Easement, including but not limited to all court costs, attorney's fees, architectural fees, engineering and expert witness fees.

- (20) The SHPO may, for good cause, modify or cancel any or all of the foregoing restrictions upon application of the Grantor, its heirs, successors or assigns. The SHPO reserves the right to assign its responsibilities under this Easement to a third party that may be, but is not limited to, another government entity or non-profit organization.
- (21) This Easement will be interpreted in accordance with the laws of the State of Michigan. If any provision of this document or future amendment to this document is found to be illegal or otherwise unenforceable by a court of competent jurisdiction, such provision shall be severed and such action will not affect the enforceability of the remaining provisions of this Easement.

This Easement shall be binding upon the Property and shall be deemed to run with the land. Execution and recording of this Easement in the Keweenaw County Register of Deeds' Office shall constitute conclusive evidence that the Grantor agrees to be bound by the foregoing conditions and restrictions and agrees to perform the obligations as described within this Easement.

IN WITNESS WHEREOF, the Grantor subscribes its name on the date set forth below:

GRANTOR:
KEWEENAW COUNTY



By: Donald Piche, Chairman
Keweenaw County Board of Commissioners

Date: September 5, 2018

STATE OF MICHIGAN)
)
 COUNTY OF KEWEENAW)

The foregoing instrument was acknowledged before me on September 5, 2018, by Donald Piche, Chairman of the Keweenaw County Board of Commissioners, acting on behalf of Keweenaw County.

 Charles W. Miller, Notary Public
 State of Michigan, County of Keweenaw
 My commission expires August 20, 2024

Acting in Houston County

**THIS INSTRUMENT IS EXEMPT FROM REAL ESTATE TRANSFER TAXES
 PURSUANT TO SECTION 5(h) OF 1966 PA 134, MCL 207.505(h)(i), AND
 SECTION 6(h) OF 1993 PA 330, MCL 207.526(h)(i)**

<p>Drafted By: Kara Hart-Negrich Legal Affairs – Preservation Office Michigan State Housing Development Authority 735 E. Michigan Ave. Lansing, MI 48912 (517) 335-2273</p> <p>After Recording, Return to: Kara Hart-Negrich Legal Affairs – Preservation Office Michigan State Housing Development Authority 735 E. Michigan Ave. Lansing, MI 48912 (517) 335-2273</p>	<p>Legal Description Reviewed By: Kara Hart-Negrich Legal Affairs – Preservation Office Michigan State Housing Development Authority 735 E. Michigan Ave. Lansing, MI 48912 (517) 335-2273</p>
---	---

Appendix B: Lighting Management Plan - Signed

Below is the latest copy of the official Lighting Management Plan, signed on December 14, 2021 by the owner of the resort, John Mueller (who is personally a member of IDA), and Mike Miller (KML staff member, who is responsible for the lighting at the resort).



Lighting Management Plan

Date last updated: December 14, 2021
Author(s): Mike Miller, John Mueller

We take lighting seriously.

For our lighting requirements we follow the International Dark-Sky Association's guidelines, and are inline with fostering the dark skies and being designated as an International Dark Sky Park.

We have the following overarching guidelines when evaluating new lighting on Lodge property:

- Outside lighting must be dark-sky compliant: fully shielded, 3000K color temperature or less. Where it is an option, use timers and motion sensors -- with them staying on less than 5 minutes.
- Reduction of energy consumption using energy saving light fixtures, minimizing the time lights are on, and the removal of unnecessary lighting.
- Provide a safe observing area for dark sky viewing where the public can enjoy the beauty of the stars.
- As part of our education and outreach initiatives, we will work with individuals and organizations in the area to educate them about what we have learned regarding artificial lighting as it relates to dark skies.

Visitor Lighting

The use of auxiliary lighting at night can detract from a guest's experience. When walking around the property at night, guests are advised to use red light, and to shine the light towards the ground in order to not hinder the stargazing experience of others. For example, below is the text we have on our Stargazing page of our website regarding using flashlights on property.

Through our education and messaging currently, and going forward, we provide guests with opportunities to understand the impacts of outdoor lighting on outdoor activities. The goal is to provide for the enjoyment of stargazing and other nighttime activities, while still providing supplemental lighting for safety and navigation.

Temporary Lighting

Any temporary installation of outside lighting will adhere to the dark-sky compliant guidelines to the greatest possible extent, and whose duration will be limited to the shortest possible time.

Lighting Management Plan

2021-12-14

Specifically for holiday lighting, the lights will not be in use for more than 60 continuous days (e.g. December 1 to January 31st for Christmas and New Year holiday lighting). When holiday lighting is string lighting, allowable light output will not exceed 70 initial lamp lumens or 125 lumens per linear foot of line or square foot of space.

Illuminated Signs

The use of illuminated signs on property is to be limited. Where illuminated signs are to be used, the fixtures will adhere to dark-sky lighting requirements and have the following time limits:

- Illuminated sign lights are turned on 2 hours prior to dawn, or turned on by 5am ET at the latest, and;
- Illuminated sign lights are turned off 3 hours after dusk, or by 10pm ET, whichever is the latest.

If an illuminated sign is needed for wayfinding, the lights will stay on longer to ensure safety (e.g. the resort entrance sign on US Hwy 41, as visitors arrive at all times of the night, as we are a remote destination). However, the dark-sky lighting requirements for the light fixtures will still need to be adhered to in those cases.

In the case that we are not able to use dark sky compliant lighting on those lights (e.g. for safety and navigation purposes), then the the operation of those illuminated signs will be prohibited from one hour after local sunset to one hour before local sunrise (unless for wayfinding/navigation or identification of business services during normal business hours). The signs must be single-color on a black background, and the luminance after sunset must not exceed 100 nits (100 candelas per m²) and the illuminated surface area of an individual sign must not exceed 200 ft² (18.6 m²).

Warranting of Outdoor Lighting Installations

The installation of new outdoor lighting is permitted only in instances where management determines that a public safety hazard exists that can only be mitigated through the use of outdoor light at night. Where light at night is required for the safe performance of tasks or safe transit between locations, it will be used; otherwise, the default policy is to not add lighting. Vehicle parking area lighting shall be prohibited.

Per the county's ordinance, all lighting shall be down-shining and shielded from adjoining properties and roadway per the requirements of Section 15.2. Here is an excerpt of the Section 15.2 where lighting is referred to:

Lighting Management Plan

2021-12-14

Section 15.2 LIGHTING REQUIREMENTS

A. All outdoor lighting above 150 watts, including illuminated signs, shall be placed, and shielded to reduce glare and reflect light away from adjacent Residential Districts and adjacent dwelling units as well as to prevent interference with the vision of persons on adjacent highways.

B. All freestanding outdoor lighting shall not exceed thirty (30) feet in height except to light a public athletic field, except for lighting located in public rights-of-way used to light public streets.

C. All off-street commercial parking areas open to the public shall be illuminated by natural or artificial light during all hours of operation, and not more than thirty (30) minutes after the business closes.

D. All lighting in business districts used for the external illumination of buildings, so as to feature said buildings, shall be placed and shielded so as not to interfere with the vision of persons on adjacent roads and streets or adjacent property.

E. Illumination of signs shall be directed or shaded downward so as not to interfere with the vision of persons on the adjacent roads and streets or adjacent property.

The full zoning ordinance can be found online at:

- <http://keweenawcountyonline.org/docs/ZoningOrdinance.pdf>

Our lighting meets or surpasses the lighting ordinances for Keweenaw County. Individuals on Lodge staff who oversee facilities maintenance are educated on the lighting guidelines. As a team, they work on the maintenance of outdoor lighting within the park and strive to meet or exceed the benchmarks prescribed for Dark Sky Parks as indicated by the International Dark-Sky Association.

By following our lead, individuals and organizations in the community can find ways to reduce their energy consumption and artificial light usage.

Approved By:  '21
John Mueller
Owner/Member, Keweenaw Resort, LLC

Approved: December 14, 2021

Appendix C: Sky Quality Measurement Raw Data

We started taking sky quality measurements in February 2021. Below is the raw data from these measurements. These measurements were taken with a Unihedron SQM HTS: 9005.80.60.00.

Keweenaw Dark Sky Wilderness Sky Quality Measurements					Avg SQM: 21.50											
					Total readings: 368											
Using a Unihedron SQM (Light Meter) HTS: 9005.80.60.00																
Location	Zenith Readings	Date	Time	Temp (°F)	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Readings Taken By:	Weather Conditions	Direction Facing When Taking the Reading			
Hole 1 Tee Box	21.43				Avg											
	20.78	2/18/2021	12:00 AM	6 *	20.79	20.79	20.77				John Mueller	Clear skies, no moon in the sky, (7 days after a new moon), snow on the ground	West			
	21.11	3/6/2021	11:15 PM	13 *	21.10	21.12	21.12				Nick Niffin	Clear skies, no moon in the sky, (7 days before a new moon), snow on the ground	N/A			
	21.14	3/12/2021	9:00 PM	20 *	21.14	21.15	21.12	21.22	21.11	21.12	John Mueller	Clear skies, no moon in the sky (1 day before a new moon), snow on the ground	West			
	21.51	4/3/2021	10:11 PM	47	21.53	21.42	21.53	21.54	21.53	21.49	John Mueller	Clear skies, no moon in the sky (8 days before a new moon), snow on the ground	West			
	21.51	4/9/2021	10:40 PM	48	21.50	21.52	21.42	21.52	21.56	21.52	John Mueller	Clear skies, no moon in the sky (2 days before a new moon), snow on the ground	West			
	21.84	5/11/2021	11:26 PM	44	21.82	21.82	21.83	21.86	21.81	21.89	Martin Mueller	Clear skies, no moon in the sky (new moon)	West			
	21.68	5/12/2021	11:30 PM	48	21.65	21.64	21.70	21.72	21.67	21.68	Martin Mueller	Clear skies, no moon in the sky (1 day after a new moon)	East			
	21.31	6/8/2021	11:48 PM	60 *	21.26	21.30	21.35	21.35	21.31	21.29	Martin Mueller	Clear skies, no moon in the sky (2 days before a new moon)	West			
	21.67	7/10/2021	12:13 AM	60	21.67	21.71	21.65	21.66	21.66	21.65	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West			
	21.34	8/9/2021	10:53 PM	66	21.32	21.26	21.29	21.37	21.41	21.36	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West			
21.77	9/10/2021	10:32 PM	65	21.76	21.72	21.76	21.78	21.79	21.78	Martin Mueller	Clear skies, no moon in the sky (4 days after a new moon)	West				
21.52	10/9/2021	11:37 PM	64	21.53	21.53	21.51	21.53	21.52	21.51	Martin Mueller	Clear skies, no moon in the sky (3 days after a new moon)	West				
21.41	11/4/2021	10:38 PM	40	21.42	21.41	21.41	21.43	21.39	21.42	Martin Mueller	Clear skies, no moon in the sky (new moon)	West				
Hole 8 Fairway	21.57				Avg											
	21.53	3/6/2021	11:30 PM	13 *	21.50	21.55	21.55				Nick Niffin	Clear skies, no moon in the sky, (7 days before a new moon), snow on the ground	N/A			
	21.63	7/10/2021	12:04 AM	60	21.59	21.64	21.60	21.64	21.67	21.62	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West			
	21.71	9/10/2021	10:27 PM	65	21.71	21.72	21.71	21.72	21.71	21.71	Martin Mueller	Clear skies, no moon in the sky (4 days after a new moon)	West			
	21.54	10/9/2021	11:33 PM	64	21.53	21.53	21.53	21.59	21.52	21.52	Martin Mueller	Clear skies, no moon in the sky (3 days after a new moon)	West			
	21.42	11/4/2021	10:34 PM	40	21.47	21.41	21.42	21.41	21.40	21.41	Martin Mueller	Clear skies, no moon in the sky (new moon)	West			

Location	Zenith Readings	Date	Time	Temp (°F)	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Readings Taken By:	Weather Conditions	Direction Facing When Taking the Reading	
Back 9 Trailhead	21.45				Avg									
	21.16	2/18/2021	12:14 AM	6 *	21.14	21.14	21.19				John Mueller	Clear skies, no moon in the sky, (7 days after a new moon), snow on the ground	West	
	20.19	2/20/2021	6:35 AM	4 *	20.22	20.20	20.16				John Mueller	Clear skies, no moon in the sky, (9 days after a new moon), snow on the ground	West	
	21.49	3/12/2021	9:00 PM	20 *	21.43	21.48	21.50	21.55	21.50	21.46	John Mueller	Clear skies, no moon in the sky (1 day before a new moon), snow on the ground	West	
	21.63	4/3/2021	9:55 PM	47	21.63	21.60	21.63	21.62	21.63	21.64	John Mueller	Clear skies, no moon in the sky (8 days before a new moon), snow on the ground	West	
	21.24	4/15/2021	10:59 PM	32	21.22	21.28	21.37	21.31	21.14	21.11	John Mueller	Clear skies, no moon in the sky (4 days after a new moon), snow on the ground	West	
	21.52	6/8/2021	11:45 PM	60 *	21.49	21.48	21.52	21.51	21.53	21.56	Martin Mueller	Clear skies, no moon in the sky (2 days before a new moon)	South	
	21.80	7/10/2021	12:22 AM	60	21.77	21.81	21.80	21.81	21.78	21.80	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West	
	21.73	8/9/2021	11:08 PM	66	21.72	21.73	21.71	21.72	21.72	21.80	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West	
	22.08	9/10/2021	10:18 PM	65	22.07	22.09	22.08	22.06	22.10	22.07	Martin Mueller	Clear skies, no moon in the sky (4 days after a new moon)	West	
	21.63	10/9/2021	11:26 PM	64	21.63	21.61	21.65	21.63	21.63	21.60	Martin Mueller	Clear skies, no moon in the sky (3 days after a new moon)	South	
	21.54	11/4/2021	10:27 PM	40	21.54	21.54	21.51	21.57	21.52	21.53	Martin Mueller	Clear skies, no moon in the sky (new moon)	South	
	Tennis Court	21.41				Avg								
		21.42	4/3/2021	10:20 PM	47	21.50	21.55	21.22	21.34	21.43	21.46	John Mueller	Clear skies, no moon in the sky (8 days before a new moon), snow on the ground	West
21.59		5/11/2021	11:18 PM	44	21.64	21.47	21.67	21.56	21.64	21.53	Martin Mueller	Clear skies, no moon in the sky (new moon)	North East	
21.65		5/12/2021	11:23 PM	48	21.63	21.68	21.67	21.62	21.65	21.65	Martin Mueller	Clear skies, no moon in the sky (1 day after a new moon)	North East	
20.66		6/8/2021	11:28 PM	60 *	20.66	20.67	20.68	20.67	20.67	20.59	Martin Mueller	Clear skies, no moon in the sky (2 days before a new moon)	North East	
21.49		7/10/2021	12:40 AM	60	21.60	21.54	21.41	21.53	21.50	21.37	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West	
21.55		8/9/2021	11:15 PM	66	21.54	21.58	21.41	21.61	21.59	21.54	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West	
21.66		9/10/2021	10:10 PM	65	21.64	21.64	21.63	21.68	21.73	21.66	Martin Mueller	Clear skies, no moon in the sky (4 days after a new moon)	East	
21.31	10/9/2021	11:18 PM	64	21.36	21.26	21.30	21.40	21.24	21.31	Martin Mueller	Clear skies, no moon in the sky (3 days after a new moon)	West		
21.36	11/4/2021	10:16 PM	40	21.41	21.33	21.36	21.33	21.37	21.38	Martin Mueller	Clear skies, no moon in the sky (new moon)	West		

Location	Zenith Readings	Date	Time	Temp (°F)	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Readings Taken By:	Weather Conditions	Direction Facing When Taking the Reading
Open Field, East of Tennis Court	21.54	Avg											
	21.80	4/3/2021	10:25 PM	47	21.81	21.82	21.78	21.78	21.79	21.82	John Mueller	Clear skies, no moon in the sky (8 days before a new moon), snow on the ground	West
	21.74	5/11/2021	11:34 PM	44	21.73	21.71	21.69	21.81	21.72	21.78	Martin Mueller	Clear skies, no moon in the sky (new moon)	East
	21.72	5/12/2021	12:25 PM	48	21.70	21.71	21.71	21.72	21.70	21.78	Martin Mueller	Clear skies, no moon in the sky (1 day after a new moon)	East
	20.71	6/8/2021	11:34 PM	60 *	20.69	20.71	20.69	20.72	20.73	20.74	Martin Mueller	Clear skies, no moon in the sky (2 days before a new moon)	East
	21.63	7/10/2021	12:34 AM	60	21.61	21.62	21.64	21.64	21.63	21.62	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West
	21.64	8/9/2021	11:15 PM	66	21.63	21.64	21.63	21.64	21.69	21.63	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West
	21.67	9/10/2021	10:12 PM	65	21.66	21.67	21.66	21.72	21.66	21.66	Martin Mueller	Clear skies, no moon in the sky (4 days after a new moon)	South
	21.51	10/9/2021	11:20 PM	64	21.50	21.49	21.50	21.52	21.52	21.50	Martin Mueller	Clear skies, no moon in the sky (3 days after a new moon)	West
	21.42	11/4/2021	10:21 PM	40	21.46	21.41	21.43	21.40	21.42	21.42	Martin Mueller	Clear skies, no moon in the sky (new moon)	West
Behind Cabin 23	21.70	Avg											
	20.78	3/19/2021	10:00 PM	35	20.75	20.89	20.58	20.87	20.87	20.70	John Mueller	Clear skies, a small crescent moon in the sky, snow on the ground	North
	21.91	4/3/2021	10:42 PM	47	21.94	21.92	21.92	21.89	21.92	21.87	John Mueller	Clear skies, no moon in the sky (8 days before a new moon), snow on the ground	West
	22.28	5/11/2021	11:41 PM	44	22.31	22.28	22.30	22.28	22.25	22.27	Martin Mueller	Clear skies, no moon in the sky (new moon)	North East
	21.95	5/12/2021	11:18 PM	48	21.89	21.93	21.92	21.96	21.98	22.00	Martin Mueller	Clear skies, no moon in the sky (1 day after a new moon)	North East
	20.99	6/8/2021	11:34 PM	60 *	20.90	20.97	20.98	21.00	21.06	21.02	Martin Mueller	Clear skies, no moon in the sky (2 days before a new moon)	North East
	22.16	9/10/2021	10:04 PM	65	22.19	22.18	22.05	22.25	22.14	22.14	Martin Mueller	Clear skies, no moon in the sky (4 days after a new moon)	East
	21.84	11/4/2021	10:13 PM	40	21.91	21.83	21.83	21.83	21.83	21.81	Martin Mueller	Clear skies, no moon in the sky (new moon)	East

Location	Zenith Readings	Date	Time	Temp (°F)	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Readings Taken By:	Weather Conditions	Direction Facing When Taking the Reading
In Front of Cabin 7, on Golf Course	21.58	Avg											
	21.53	4/3/2021	10:34 PM	47	21.64	21.72	21.60	21.43	21.38	21.43	John Mueller	Clear skies, no moon in the sky (8 days before a new moon), snow on the ground	West
	21.87	5/11/2021	11:35 PM	44	21.85	21.91	21.84	21.85	21.89	21.88	Martin Mueller	Clear skies, no moon in the sky (new moon)	West
	21.71	5/12/2021	11:34 PM	48	21.66	21.71	21.73	21.72	21.74	21.70	Martin Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West
	21.39	6/8/2021	11:50 PM	60 *	21.45	21.45	21.31	21.37	21.40	21.33	Martin Mueller	Clear skies, no moon in the sky (2 days before a new moon)	West
	21.58	7/10/2021	12:09 AM	60	21.56	21.58	21.56	21.58	21.58	21.59	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West
	21.47	8/9/2021	10:57 PM	66	21.43	21.44	21.48	21.46	21.46	21.52	John Mueller	Clear skies, no moon in the sky (1 day after a new moon)	West
	21.77	9/10/2021	10:35 PM	65	21.76	21.72	21.76	21.78	21.79	21.78	Martin Mueller	Clear skies, no moon in the sky (4 days after a new moon)	West
	21.53	10/9/2021	11:40 PM	64	21.53	21.52	21.52	21.51	21.56	21.51	Martin Mueller	Clear skies, no moon in the sky (3 days after a new moon)	West
	21.39	11/4/2021	10:41 PM	40	21.39	21.39	21.42	21.38	21.38	21.39	Martin Mueller	Clear skies, no moon in the sky (new moon)	West
Lodge Roof	21.34	Avg											
	21.34	4/10/2021	10:00 PM	48	21.33	21.35	21.32	21.34	21.35		John Mueller	Partly cloudy, no moon in the sky (1 day before a new moon)	West
Hebard Park	20.91	4/15/2021	10:08 PM	40	20.88	20.87	20.90	20.92	20.92	20.97	John Mueller	Clear skies, no moon in the sky (4 days after a new moon) - readings taken when the sunlight was not completely gone	North
Copper Harbor State Park	21.39	4/15/2021	10:20 PM	40	21.36	21.39	21.38	21.38	21.40	21.40	John Mueller	Clear skies, no moon in the sky (4 days after a new moon)	North
Astor Shipwreck Park	21.49	4/15/2021	10:30 PM	40	21.64	21.47	21.39	21.41	21.31	21.71	John Mueller	Clear skies, no moon in the sky (4 days after a new moon)	North
Fort Wilkins State Park	21.57	4/15/2021	10:36 PM	40	21.60	21.59	21.55	21.57	21.56	21.57	John Mueller	Clear skies, no moon in the sky (4 days after a new moon)	North
Lake Superior at Jamsen's Bakery Dock	21.33	4/15/2021	10:43 PM	40	21.32	21.30	21.31	21.34	21.37	21.33	John Mueller	Clear skies, no moon in the sky (4 days after a new moon)	North
Copper Harbor Community Center	21.34	4/15/2021	10:48 PM	40	21.37	21.32	21.33	21.35	21.32	21.32	John Mueller	Clear skies, no moon in the sky (4 days after a new moon)	North

This data can also be access online via a spreadsheet using the following link:

- <https://bit.ly/3AtPcjG>

As part of the IDA review process with our first version of the application, John Barentine, IDA program manager performed an analysis on the raw data of our sky quality measurements (sky quality readings taken between February and April 2021). Below is a copy of his email from June 10, 2021.



John Mueller <john@keweenawresort.com>

Dark Sky Park Application: Keweenaw Dark Sky Wilderness -- Ver 1.0

John Barentine <john@darksky.org>

Thu, Jun 10, 2021 at 4:46 PM

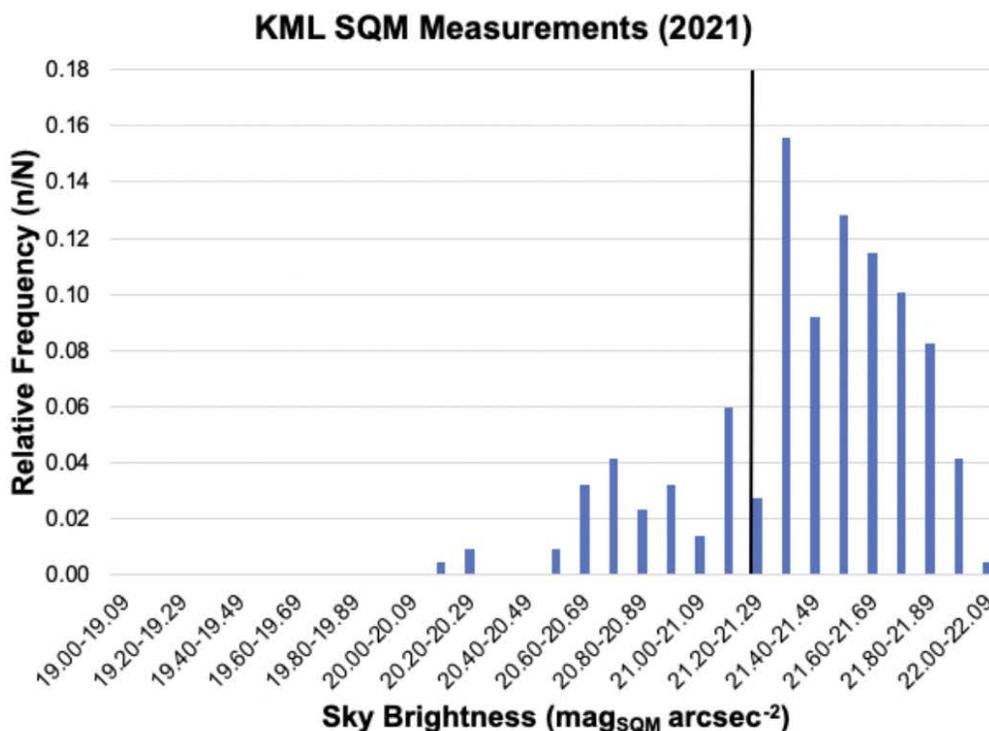
To: John Mueller <john@keweenawresort.com>

Cc: Mariah Summers <mariah@keweenawresort.com>, Ashley Wilson <ashley@darksky.org>

Hi John,

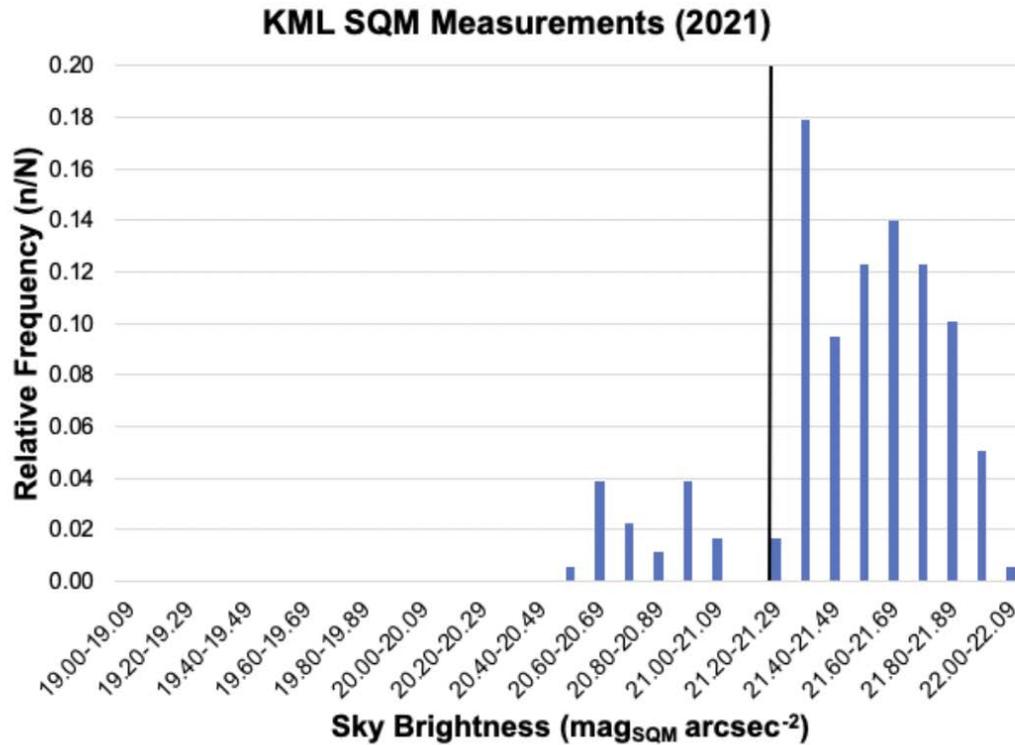
THANKS very much for this. It's super insightful. I pulled over all of your measurements and then made some cuts on the data set that I think improve the results. With dozens to hundreds of measurements scattered over a few months, it's helping get at what the real, underlying conditions are like.

First I plotted the frequency distribution of all of your measurements (N = 218). The vertical black line shows the cutoff for IDSP status (~21.2 magnitudes per square arcsecond).



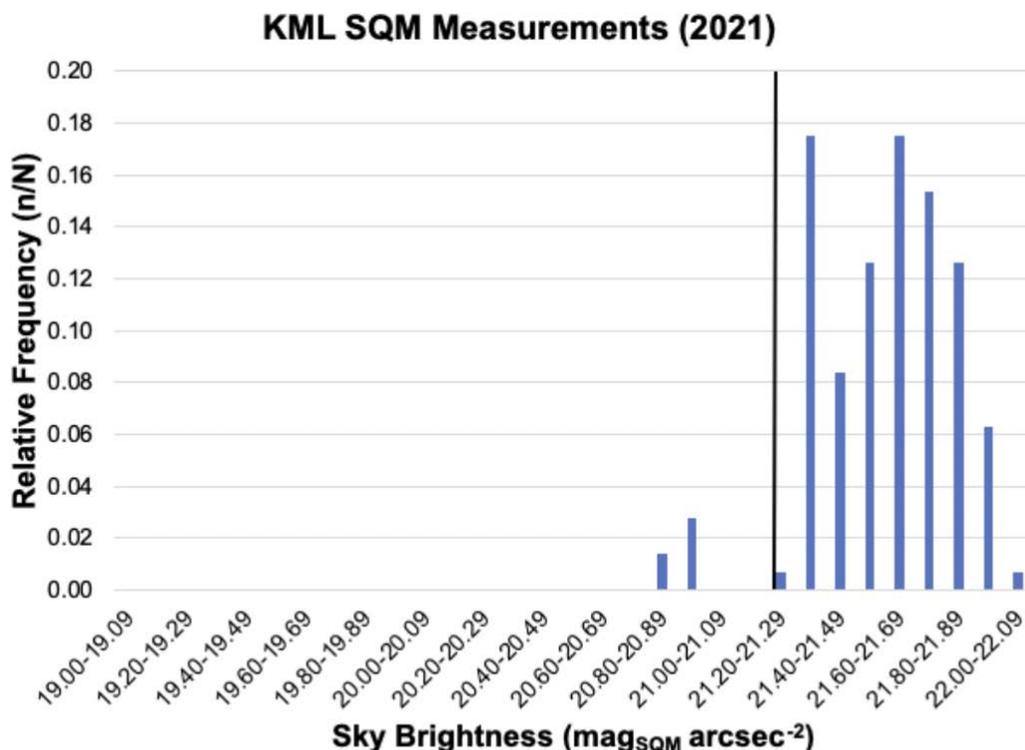
I thought the number of measurements brighter than this didn't seem right. This data set has a mean and scatted of about 21.4 ± 0.4 mag_{SQM}/arcsec². So I started doing some cuts.

First, I cut the observations made when the air temperature was < 32 degrees, thinking that it was more likely (but not definite) that there was snow on the ground those nights. And in fact, they were mostly in April. That leaves N = 179. The distribution changed, but not by much:



Then I made one more cut, which was to exclude your data from 8th June, leaving $N = 143$. The reason is that you're using the "non-L" version of the SQM that sees a very large amount of the sky at once (as opposed to the SQM-L version, which sees a much narrower field and excludes more sky away from the zenith). I suspected that the Milky Way was within the beam of your SQM on that night, given the hour at which you made the observations. We know that the Milky Way can add up to 0.2-0.3 magnitudes to SQM readings when it falls in the beam, which knocks out a lot of the nights in summer from mid-northern latitudes because it will make the readings look artificially.

And sure enough, most of those bright readings went away:



Notice now, too, how the bars to the right of the black line are starting to look more like bell curve? That's just as we would expect. The readings around 20.8 and 20.9 are still somehow spurious to me, and anything darker than 22.0 is generally considered to be unphysical. Dropping those points leaves 131 measurements, which is still plenty for good statistics. The result suggests that your 'typical' sky at KML is therefore 21.6 ± 0.2 mag_{SQM}/arcsec².

I think that is much closer to the right answer, and it is consistent with my expectation for what you would find. Excluding the outliers, the fact that the distribution looks much like a bell curve supports that conclusion. And it puts you very definitely on the right side of the plot in terms of International Dark Sky Park eligibility, so this is good news.

Keep taking data as you're able. In addition to the usual caveats like avoiding twilight and moonlight, keep an eye out for the Milky Way. This time of year you don't have much time to measure between the end of evening twilight and when the Milky Way is high enough that it will contaminate your data; the only option is to measure just before morning twilight, when by that point it's mostly out of the way. There's a similar effect in mid-winter to be aware of. As long as we're aware of when the data were taken, it's easier to understand what these influences are on the results.

Do let me know if you have any questions about any of the above. Thanks.

Best,

John

Below is an email sent to Ashley Wilson, IDA program manager, on November 15, 2021 detailing out the analysis of the data points, and doing a similar analysis as John Baratine did in June -- but including additional recordings that had been made since April 2021 -- for a period of February 2021 - November 2021.



John Mueller <john@keweenawresort.com>
to Ashley ▾

Nov 15, 2021, 1:05 AM



Ashely, hope your weekend was good.

I have run the statistical analysis on [our Sky Quality Measurement data](#), similar to what John Barentine did in June.

Even when using more data (as we have collected data throughout the summer and the fall since John B. did his analysis), the result is the same as his results: $21.6 \pm 0.2 \text{ mag}_{\text{SDM}}/\text{arcsec}^2$

Below are the before and after histogram charts showing the frequencies of the readings based upon 0.10 bin increments. The "after" chart takes into account removing 111 observations (readings) using the following logic:

- Removed readings when there was snow on the ground (*33 observations*)
- Removed June readings, as it is suspected that we had the Milky Way light affecting the reading. (*36 observations*)
- Removed readings that were above 22, as they could be considered abnormal (per Barentine's comments) (*18 observations*)
- Removed the night's reading if greater than .15 differences between the max and min of the 6 readings for that night (*24 observations*)

The attached PDF shows the data set, with the cells highlighted with different colors to indicate which observations were removed and why (warning: small font :-).

After removing the 111 observations from the total data set of 368 observations, we were left with 257 observations to be used for the analysis.

The resulting "after" chart shows a bell curve pattern of the data (*using 257 observations*).

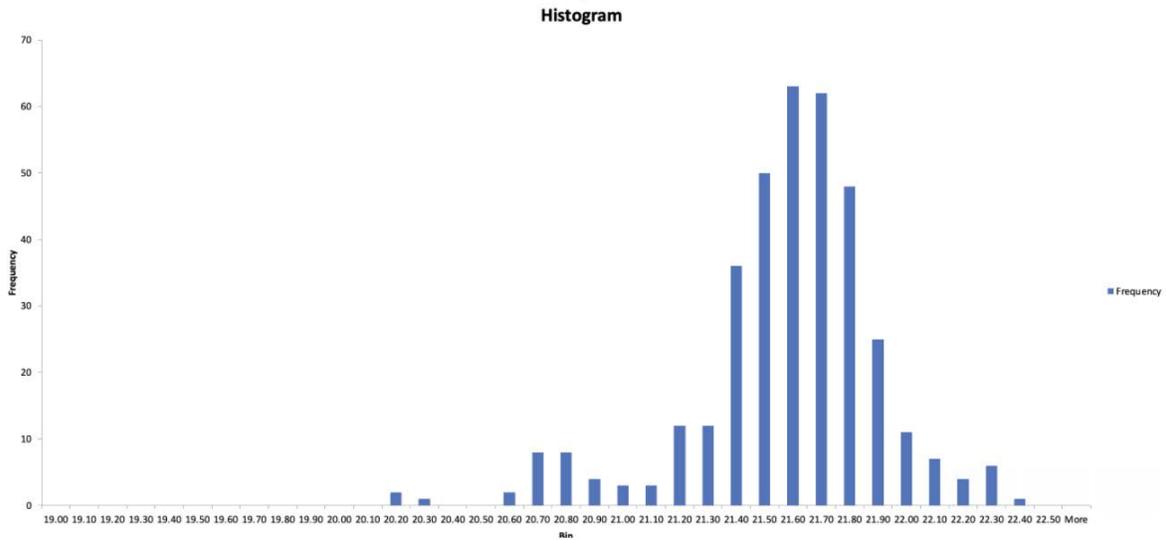
Let me know what questions you have about this analysis, and your suggestions on how it should be presented in the application.

Thanks.

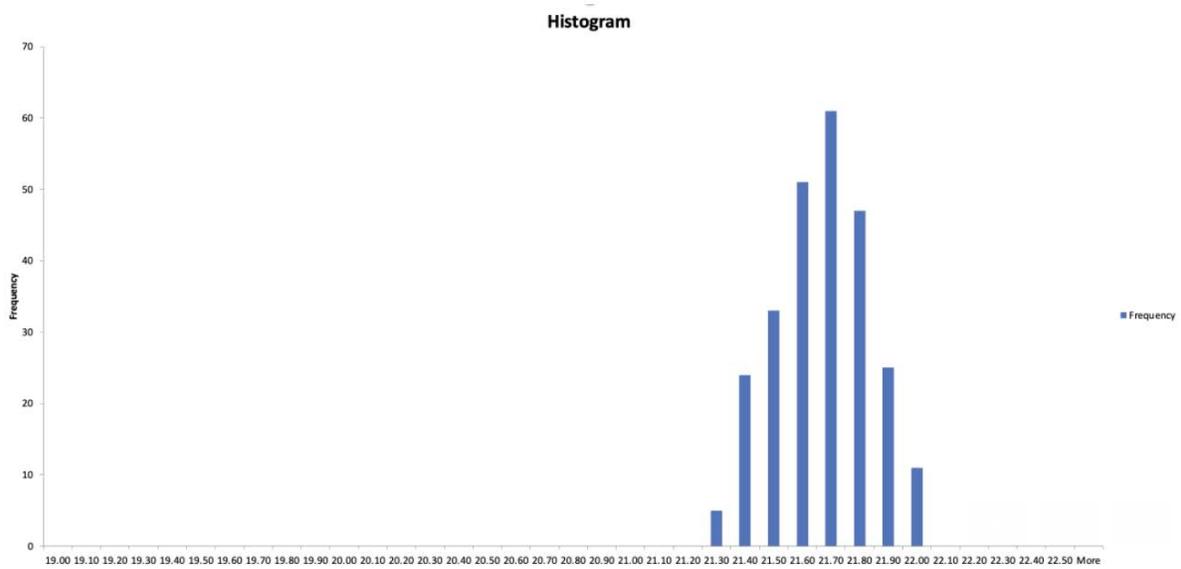
- JM

=====

Before removing the described observations



After removing the described observations



Attachment to that email (in a PDF attachment to the email):

Location	Zenith	Read Date	Time	Temp (°F)	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Max	Mn	Range	Readings Taken By:	Weather Conditions	Direction Fac				
Hole 1 Tee E	21.43 Avg	20.78	2/18/21	12:00 AM	6 *	20.79	20.79	20.77				20.79	20.77	0.02	John Mueller	Clear skies, no moon in the sk-West				
		21.11	3/8/21	11:15 PM	13 *	21.1	21.12	21.12					21.12	21.1	0.02	Nick Nffin	Clear skies, no moon in the sk-N/A			
		21.14	3/12/21	9:00 PM	20 *	21.14	21.15	21.12	21.22	21.11	21.12		21.22	21.11	0.11	John Mueller	Clear skies, no moon in the sk-West			
		21.51	4/3/21	10:11 PM	47	21.53	21.42	21.53	21.54	21.53	21.49		21.54	21.42	0.12	John Mueller	Clear skies, no moon in the sk-West			
		21.51	4/9/21	10:40 PM	48	21.5	21.52	21.42	21.52	21.56	21.52		21.56	21.42	0.14	John Mueller	Clear skies, no moon in the sk-West			
		21.84	5/11/21	11:26 PM	44	21.82	21.82	21.83	21.86	21.81	21.89		21.89	21.81	0.08	Martin Mueller	Clear skies, no moon in the sk-West			
		21.68	5/12/21	11:30 PM	48	21.65	21.64	21.7	21.72	21.67	21.68		21.72	21.64	0.08	Martin Mueller	Clear skies, no moon in the sk-East			
		21.31	6/8/21	11:48 PM	60 *	21.26	21.3	21.35	21.35	21.31	21.29		21.35	21.26	0.09	Martin Mueller	Clear skies, no moon in the sk-West			
		21.67	7/10/21	12:13 AM	60	21.67	21.71	21.65	21.66	21.66	21.65		21.71	21.65	0.06	John Mueller	Clear skies, no moon in the sk-West			
		21.34	8/9/21	10:53 PM	66	21.32	21.26	21.29	21.37	21.41	21.36		21.41	21.26	0.15	John Mueller	Clear skies, no moon in the sk-West			
		21.77	9/10/21	10:32 PM	65	21.76	21.72	21.76	21.76	21.79	21.79		21.79	21.72	0.07	Martin Mueller	Clear skies, no moon in the sk-West			
		21.52	10/9/21	11:37 PM	64	21.53	21.53	21.51	21.53	21.52	21.51		21.53	21.51	0.02	Martin Mueller	Clear skies, no moon in the sk-West			
		21.41	11/4/21	10:38 PM	40	21.42	21.41	21.41	21.43	21.39	21.42		21.42	21.39	0.04	Martin Mueller	Clear skies, no moon in the sk-West			
		Hole 8 Fairw	21.57 Avg	21.53	3/6/21	11:30 PM	13 *	21.5	21.55	21.55				21.55	21.5	0.05	Nick Nffin	Clear skies, no moon in the sk-N/A		
				21.63	7/10/21	12:04 AM	60	21.59	21.64	21.6	21.64	21.67	21.62		21.67	21.59	0.08	John Mueller	Clear skies, no moon in the sk-West	
21.71	9/10/21			10:27 PM	65	21.71	21.72	21.71	21.72	21.71	21.71		21.72	21.71	0.01	Martin Mueller	Clear skies, no moon in the sk-West			
21.54	10/9/21			11:33 PM	64	21.53	21.53	21.53	21.59	21.52	21.52		21.59	21.52	0.07	Martin Mueller	Clear skies, no moon in the sk-South			
21.42	11/4/21			10:34 PM	40	21.47	21.41	21.42	21.41	21.4	21.41		21.47	21.4	0.07	Martin Mueller	Clear skies, no moon in the sk-West			
Back 9 Trail	21.45 Avg	21.16	2/18/21	12:14 AM	6 *	21.14	21.14	21.19				21.19	21.14	0.05	John Mueller	Clear skies, no moon in the sk-West				
		20.19	2/20/21	6:35 AM	4 *	20.22	20.2	20.16					20.22	20.16	0.06	John Mueller	Clear skies, no moon in the sk-West			
		21.49	3/12/21	9:00 PM	20 *	21.43	21.48	21.5	21.55	21.5	21.46		21.55	21.43	0.12	John Mueller	Clear skies, no moon in the sk-West			
		21.63	4/3/21	9:55 PM	47	21.63	21.6	21.63	21.62	21.63	21.64		21.64	21.6	0.04	John Mueller	Clear skies, no moon in the sk-West			
		21.24	4/15/21	10:59 PM	32	21.22	21.28	21.37	21.31	21.14	21.11		21.37	21.11	0.26	John Mueller	Clear skies, no moon in the sk-West			
		21.52	6/8/21	11:45 PM	60 *	21.49	21.48	21.52	21.51	21.53	21.56		21.56	21.48	0.08	Martin Mueller	Clear skies, no moon in the sk-South			
		21.8	7/10/21	12:22 AM	60	21.77	21.81	21.8	21.81	21.78	21.8		21.81	21.77	0.04	John Mueller	Clear skies, no moon in the sk-West			
		21.73	8/9/21	11:08 PM	66	21.72	21.73	21.71	21.72	21.72	21.8		21.81	21.71	0.09	John Mueller	Clear skies, no moon in the sk-West			
		22.08	9/10/21	10:18 PM	65	22.07	22.09	22.08	22.06	22.1	22.07		22.1	22.06	0.04	Martin Mueller	Clear skies, no moon in the sk-West			
		21.63	10/9/21	11:26 PM	64	21.63	21.61	21.65	21.63	21.63	21.6		21.65	21.6	0.05	Martin Mueller	Clear skies, no moon in the sk-South			
		21.54	11/4/21	10:27 PM	64	21.54	21.54	21.51	21.57	21.52	21.53		21.57	21.51	0.06	Martin Mueller	Clear skies, no moon in the sk-South			
		Tennis Cou	21.41 Avg	21.42	4/3/21	10:20 PM	47	21.5	21.55	21.22	21.34	21.43	21.46	21.55	21.22	0.33	John Mueller	Clear skies, no moon in the sk-West		
				21.59	5/11/21	11:18 PM	44	21.64	21.47	21.67	21.56	21.64	21.53		21.67	21.47	0.2	Martin Mueller	Clear skies, no moon in the sk-North East	
				21.65	5/12/21	11:23 PM	48	21.63	21.68	21.67	21.62	21.65	21.65		21.68	21.62	0.06	Martin Mueller	Clear skies, no moon in the sk-North East	
				20.66	6/8/21	11:28 PM	60 *	20.66	20.67	20.68	20.67	20.67	20.59		20.68	20.59	0.09	Martin Mueller	Clear skies, no moon in the sk-North East	
21.49	7/10/21			12:40 AM	60	21.6	21.54	21.41	21.53	21.5	21.37		21.6	21.37	0.23	John Mueller	Clear skies, no moon in the sk-West			
21.55	8/9/21			11:15 PM	66	21.54	21.58	21.41	21.61	21.59	21.54		21.61	21.41	0.2	John Mueller	Clear skies, no moon in the sk-West			
21.66	9/10/21			10:10 PM	65	21.64	21.64	21.63	21.68	21.73	21.66		21.73	21.63	0.1	Martin Mueller	Clear skies, no moon in the sk-East			
21.31	10/9/21			11:18 PM	64	21.36	21.26	21.3	21.4	21.24	21.31		21.4	21.24	0.16	Martin Mueller	Clear skies, no moon in the sk-West			
21.36	11/4/21			10:18 PM	40	21.41	21.33	21.36	21.33	21.37	21.38		21.41	21.33	0.08	Martin Mueller	Clear skies, no moon in the sk-West			
Open Field,	21.54 Avg			21.8	4/3/21	10:25 PM	47	21.81	21.82	21.78	21.78	21.79	21.82	21.82	21.78	0.04	John Mueller	Clear skies, no moon in the sk-West		
		21.74	5/11/21	11:34 PM	44	21.73	21.71	21.69	21.81	21.72	21.78		21.81	21.69	0.12	Martin Mueller	Clear skies, no moon in the sk-East			
		21.72	5/12/21	12:25 PM	48	21.7	21.71	21.71	21.72	21.7	21.78		21.78	21.7	0.08	Martin Mueller	Clear skies, no moon in the sk-East			
		20.71	6/8/21	11:34 PM	60 *	20.69	20.71	20.69	20.72	20.73	20.74		20.74	20.69	0.05	Martin Mueller	Clear skies, no moon in the sk-East			
		21.63	7/10/21	12:34 AM	60	21.61	21.62	21.64	21.64	21.63	21.62		21.64	21.61	0.03	John Mueller	Clear skies, no moon in the sk-West			
		21.64	8/9/21	11:15 PM	66	21.63	21.64	21.63	21.64	21.69	21.63		21.69	21.63	0.06	John Mueller	Clear skies, no moon in the sk-West			
		21.67	9/10/21	10:12 PM	65	21.66	21.67	21.66	21.72	21.66	21.66		21.72	21.66	0.06	Martin Mueller	Clear skies, no moon in the sk-South			
		21.51	10/9/21	11:20 PM	64	21.5	21.49	21.5	21.52	21.52	21.5		21.52	21.49	0.03	Martin Mueller	Clear skies, no moon in the sk-West			
		21.42	11/4/21	10:21 PM	40	21.46	21.41	21.43	21.4	21.42	21.42		21.46	21.4	0.06	Martin Mueller	Clear skies, no moon in the sk-West			
		Behind Cab	21.7 Avg	20.78	3/19/21	10:00 PM	35	20.75	20.89	20.58	20.87	20.87	20.7	20.89	20.58	0.31	John Mueller	Clear skies, a small crescent n North		
21.91	4/3/21			10:42 PM	47	21.94	21.92	21.92	21.89	21.92	21.87		21.94	21.87	0.07	Martin Mueller	Clear skies, no moon in the sk-West			
22.28	5/11/21			11:41 PM	44	22.31	22.26	22.3	22.28	22.25	22.27		22.31	22.25	0.06	Martin Mueller	Clear skies, no moon in the sk-North East			
21.95	5/12/21			11:18 PM	48	21.89	21.93	21.92	21.96	21.98	22		22	21.89	0.11	Martin Mueller	Clear skies, no moon in the sk-North East			
20.99	6/8/21			11:34 PM	60 *	20.9	20.97	20.98	21	21.06	21.02		21.06	20.9	0.16	Martin Mueller	Clear skies, no moon in the sk-North East			
22.16	9/10/21			10:04 PM	65	22.19	22.18	22.05	22.25	22.14	22.14		22.25	22.05	0.2	Martin Mueller	Clear skies, no moon in the sk-East			
21.84	11/4/21			10:13 PM	40	21.91	21.83	21.83	21.83	21.83	21.81		21.91	21.81	0.1	Martin Mueller	Clear skies, no moon in the sk-East			
In Front of c	21.58 Avg			21.53	4/3/21	10:34 PM	47	21.64	21.72	21.6	21.43	21.38	21.43	21.72	21.38	0.34	John Mueller	Clear skies, no moon in the sk-West		
				21.87	5/11/21	11:35 AM	44	21.85	21.91	21.84	21.85	21.89	21.88		21.91	21.84	0.07	Martin Mueller	Clear skies, no moon in the sk-West	
				21.71	5/12/21	11:34 PM	48	21.66	21.71	21.73	21.72	21.74	21.7		21.74	21.66	0.08	Martin Mueller	Clear skies, no moon in the sk-West	
		21.39	6/8/21	11:50 PM	60 *	21.45	21.45	21.31	21.37	21.4	21.33		21.45	21.31	0.14	Martin Mueller	Clear skies, no moon in the sk-West			
		21.58	7/10/21	12:09 AM	60	21.56	21.58	21.56	21.58	21.58	21.59		21.59	21.56	0.03	John Mueller	Clear skies, no moon in the sk-West			
		21.47	8/9/21	10:57 PM	66	21.43	21.44	21.48	21.46	21.46	21.52		21.52	21.43	0.09	John Mueller	Clear skies, no moon in the sk-West			
		21.77	9/10/21	10:35 PM	65	21.76	21.72	21.76	21.78	21.79	21.78		21.79	21.72	0.07	Martin Mueller	Clear skies, no moon in the sk-West			
		21.53	10/9/21	11:40 PM	64	21.53	21.52	21.52	21.51	21.56	21.51		21.56	21.51	0.05	Martin Mueller	Clear skies, no moon in the sk-West			
		21.39	11/4/21	10:41 PM	40	21.39	21.39	21.42	21.38	21.38	21.39		21.42	21.38	0.04	Martin Mueller	Clear skies, no moon in the sk-West			
		Avg	21.6																	
Std Dev	0.2																			
Count	257																			
Num Remov	111	30%																		

Appendix D: Sampling of Dark-Sky-Related Workshop / Activities Blog Posts, Signs, and Social Media Posts

Below is a sampling of the blog posts recapping some of our dark-sky-related workshops and activities, signs, and our social media posts related to dark skies / stargazing.

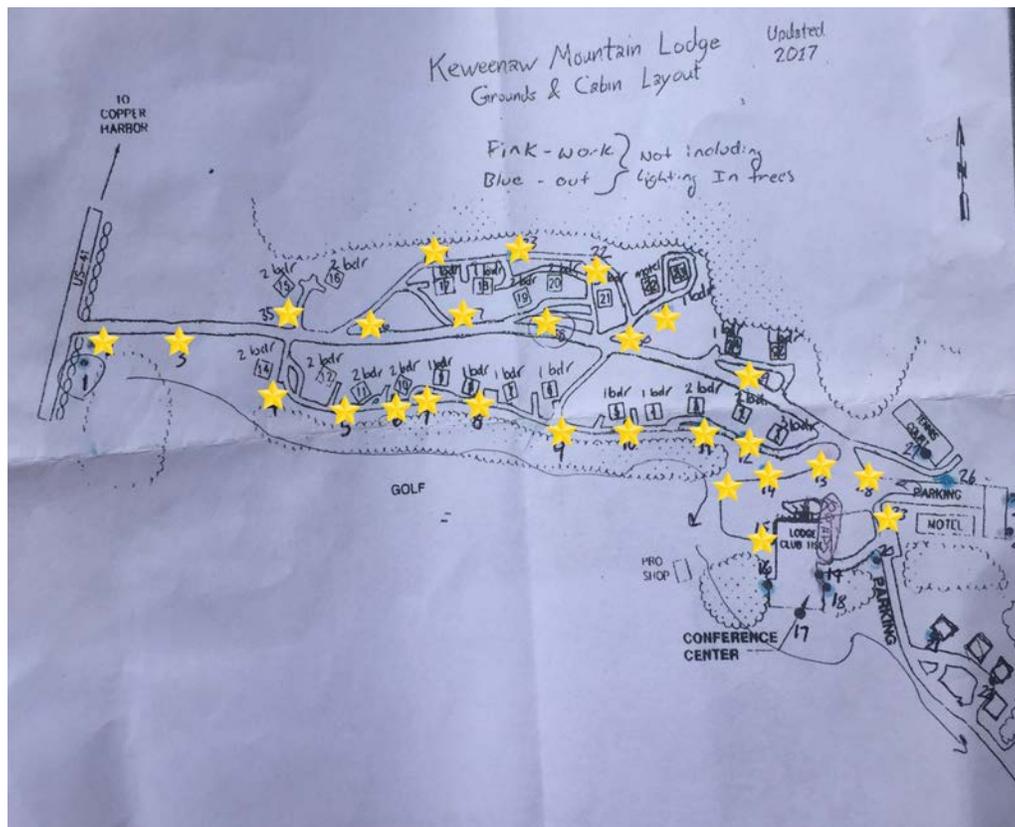
Energy Efficient and Dark Sky Compliant Street Lighting, February 22, 2021

FEBRUARY 22, 2021 BY JOHN MUELLER

Energy Efficient and Dark Sky Compliant Street Lighting

Over the past year we have been working on implementing better lighting at the Lodge which is more energy efficient and dark sky compliant. One of the projects we implemented was installing 28 new street light fixtures. This project was partially funded by a grant from [Michigan's Department of Environment, Great Lakes, and Energy \(EGLE\)](#) (project contact at EGLE: Jake Wilkinson).

The street lights that were replaced are around the parking lot of the Lodge, the streets lights along Golf Course Road (the entry road into the resort), the cabin road between Golf Course Road and the golf course, and the cabin road between Golf Course Road and the north side forest were . These were high pressure sodium light fixtures, and were not shielded.



The high pressure sodium lighting used for the street lighting on the property was older technology. Since they had been installed, newer technology for street light fixtures have been developed that use less energy. We had an energy audit performed in 2018 / 2019 by [Michigan Energy Options](#) which highlighted the areas where we can be more energy efficient (audit

performed via a grant provided by [WUPPDR](#)). One of the recommendations for improving our energy efficiency at the Lodge (ie. energy conservation measures) was to replace the high pressure sodium light fixtures and bulbs with LED street lights.

As well, these street light fixtures were casting light in unnecessary areas. In other words, the older light fixtures were contributing to light pollution. This unnecessary light was taking away from the natural darkness that the Keweenaw is known for and stargazers crave at the Lodge.



Street lights around the world are one of the highest contributors to light pollution. Thus, the street light project was on the top of our list for addressing our dark sky initiatives.

We started working on it in the summer of 2020, with a sample of one fixture installed in August 2020 to see how the fixture would look and work on the property (on Golf Course Road, near cabins 24 and 25). After feeling comfortable with the sample light we selected, we ordered the remaining 27 fixtures. Due to a backlog of the lights we did not receive this order of lights until late Fall 2020. As well, the electrical contractor, [Bay Electric](#) was backlogged with multiple projects. This led to the light being installed in January and February 2021.



Bay Electric installing new street lighting at the Lodge — in the Lodge Parking Lot



Bay Electric installing new street lighting at the Lodge — in the Lodge Parking Lot

The light fixtures that we selected were from [Truly Green Solutions](#), a [Cobrahead RWL G2](#) model.



RWL2-S-30-30-D-7P7-3-G- ALUM ARM
When ordered in 3K this is dark sky rated

RWL™ G2 **Cobrahead**

DESCRIPTION

The RWL™ G2 fixture from TGS represents a new performance-based, forward-thinking design for roadway lighting for residential/commercial streets, intersections, and high-speed roadways. Designed for both retrofit and new construction, RWL™ G2 provides multiple lumen packages with field adjustability and distribution options. A Comfort view optic lens is applied to minimize glare and backlight while maximizing luminaire efficacy. RWL™ G2 has tool-less entry providing quick access for installation and maintenance. A variety of control options are available for future upgrades.

APPLICATION

Roadway, Parking Lots, Walkways and General Outdoor Spaces



Here are the before-and-after pictures for when the street lights were replaced with dark-sky compliant street lights in the Lodge parking lot and along the cabin road on property (via our [webcams](#) from our web site).



Hole 1 / Brockway Webcam, with the old street lights in place. This shows how much light was being cast across hole number 1.



Hole 1 / Brockway Webcam, with the Hole 1 street light replaced with Dark-Sky Compliant light fixtures (but the cabin road street lights not yet changed out)



Hole 1 / Brockway Webcam, with the Hole 1 street light and cabin road street lights replaced with Dark-Sky Compliant light fixture (note: even with more street lights working on the cabin road, there is less light pollution on the golf course)

Why are we so focused and intentional in our lighting at the Lodge? It is because of the benefits of the dark skies to human beings, wildlife, and our natural surroundings in the Keweenaw. The benefits of dark skies are:

- Improve one's circadian clock (or rhythm) — sleep patterns, hormone release, eating habits and digestion, and body temperature; for good health, we need sunshine as well as darkness [i.e. better circadian clock means a better sleep, which contributes to better overall health]
- Improving ecological integrity — many plants, wildlife, and insects rely on darkness to forage, breed and navigate, thus dark skies help them survive. [e.g. many birds migrate at night, and the top of the Keweenaw is one of their byways]
- Ensuring the full enjoyment of a wilderness experience

More research on how light affects humans and wildlife can be found on the IDA's website at:



- <https://www.darksky.org/our-work/grassroots-advocacy/resources/research/>

Watch the short film, [Losing the Dark \(2013\)](#), about the changes of the darkness and watch the trailer of the [Saving the Dark \(2019\)](#) movie produced by [savingourstars.org](#).

URLs:

- <https://keweenawmountainlodge.com/2021/02/22/energy-efficient-and-dark-sky-compliant-street-lighting/>

Stargazing: Night Sky Photography Workshop, June 10, 2021

JUNE 17, 2021 BY PAM DYL

June 10, 2021: Night Sky Photography Workshop Recap

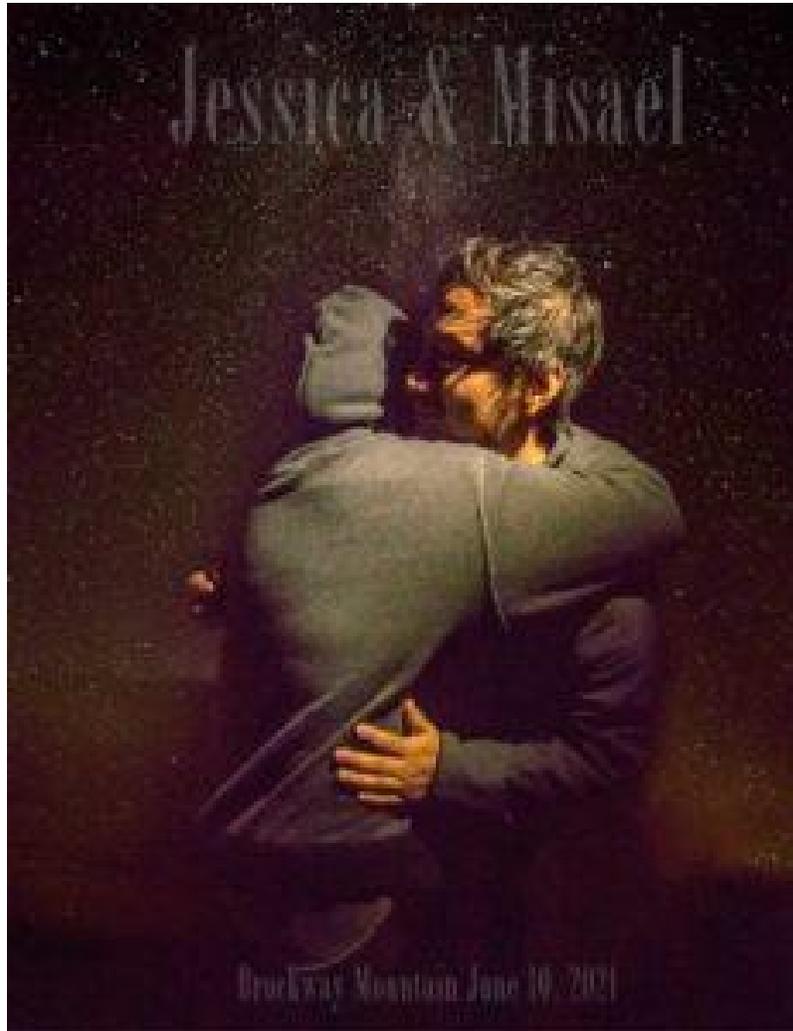
This summer we have three night sky photography workshops planned at the Keweenaw Mountain Lodge as part of our [stargazing](#) activities. These workshops are to teach night-sky and photography enthusiasts how to take high-quality pictures of the dark sky.

Our first night sky photography workshop was held earlier this month, during the month's new moon on [June 10, 2021](#). The workshop started with a classroom session discussing topics such as: camera settings, camera equipment, locations around the Keweenaw that have clear viewing points, other night sky photography topics that were discussed were: Northern Lights, Moon, Lightning, Meteors/Fireballs/Shooting stars etc. The classroom session was about an hour and fifteen minutes long, next was the hands-on part of the workshop.

To be able to see the stars at night, good weather is needed. After finishing up the indoor lecture portion of the workshop in the Outdoor Activity Center, we stepped outside with our cameras to find the weather being cloudy and foggy. We were hoping the weather would break during the classroom session but we were not that fortunate.

That did not deter the enthusiasm of the group. We decided to go on an adventure and headed up to Brockway Mountain in hopes of being able to see some stars. It was eerily foggy on the drive up to the mountain, and we regrouped at the top. We hung out and chatted and patiently waited for the stars to come out. The stars did break through the clouds every little while.

Just as we were all getting ready to call it a night, one of the group's participants, Misael, got down on one knee and proposed to his girlfriend, Jessica. She of course, said YES!!



What a great way to end the evening. Congratulations Misael & Jessica!!

There will be two more workshops this summer, [July 9](#) and [August 8](#), 2021. Reserve your spot by emailing outdoor-activities@keweenawresort.com or by calling 906-289-4403 ext 4

URLs:

- <https://keweenawmountainlodge.com/calendar/stargazing-night-sky-photography-workshop/>
- <https://keweenawmountainlodge.com/2021/06/17/june-10-2021-night-sky-photography-workshop-recap/>

Stargazing: Night Sky Photography Workshop, July 9, 2021

JULY 11, 2021 BY PAM DYL

July 9, 2021: Night Sky Photography Workshop Recap

This summer we have three night sky photography workshops planned at the Keweenaw Mountain Lodge as part of our [stargazing](#) activities. These workshops are to teach night-sky and photography enthusiasts how to take high-quality pictures of the dark sky.

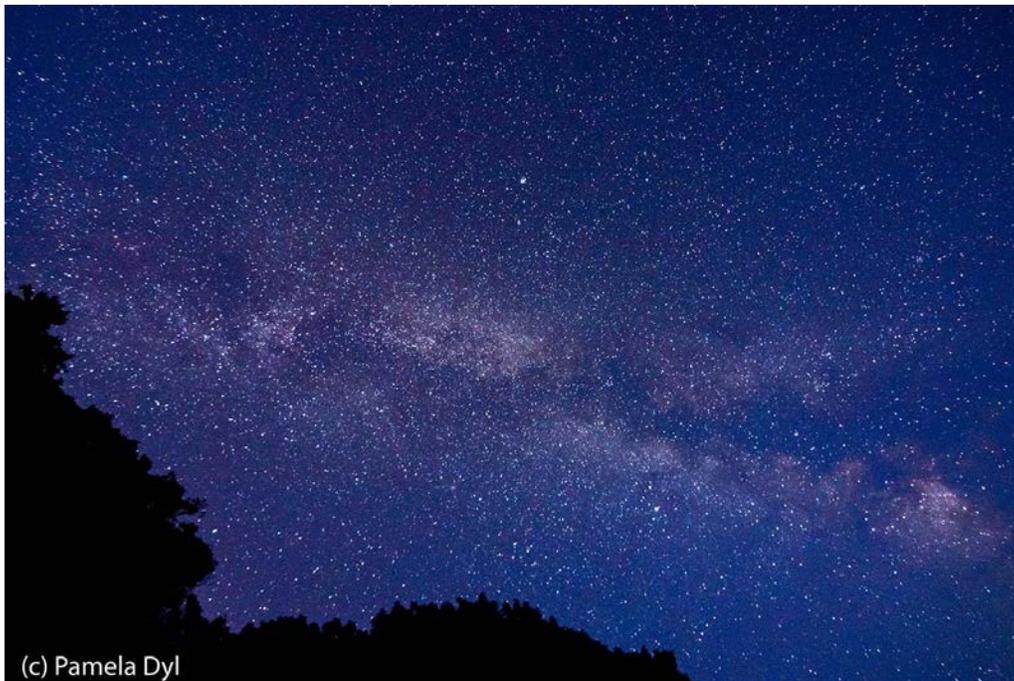
Our second night sky photography workshop was held this past Friday, during the month's new moon on [July 9, 2021](#). We met in the Lodge's conference center, as the workshop started with a classroom session discussing topics such as: camera settings, camera equipment, and locations around the Keweenaw that have clear viewing points. Other night sky photography topics that were discussed were: Northern Lights, Moon, Lightning, Meteors/Fireballs/Shooting stars etc. The classroom session was about an hour long.



To be able to see the stars at night, good weather is needed. We had wonderful weather. So after finishing up the indoor lecture portion of the workshop, we stepped outside with our cameras.

The group split into two, with one group going to one of the prime locations on the property to view the Milky Way (hole 9 green), while the other group headed to the top of Brockway Mountain.

Instructor, Pam Dyl, was able to show the group on hole 9 green how she works with the settings on her camera. For example, here are two photos she took during the outdoor session of the Milky Way. In the second photo, you can see the flag stick on hole 9 green, with the Milky Way above the treeline. As a bonus, there are 5 shooting stars in that picture.



The second group headed to Brockway Mountain, where Scott Ochodnicki, from Copper Harbor Observatory, showed how the [Stellina](#) telescope can highlight. Lodge team member, Chris Guibert, was part of the group on Brockway Mountain with Scott was able to take some pictures of the Milky Way on Brockway Mountain and Scott's Stellina telescope.





There will be one more workshop this summer, [August 8](#), 2021. Reserve your spot by emailing outdoor-activities@keweenawresort.com or by calling 906-289-4403 ext 4

URLs:

- <https://keweenawmountainlodge.com/calendar/stargazing-night-sky-photography-workshop-2/>
- <https://keweenawmountainlodge.com/2021/07/11/july-9-2021-night-sky-photography-workshop-re-cap/>

Stargazing: Night Sky Photography Workshop, August 8, 2021**AUGUST 9, 2021 BY CHRIS GUIBERT****August 8, 2021: Night Sky Photography Workshop Recap**

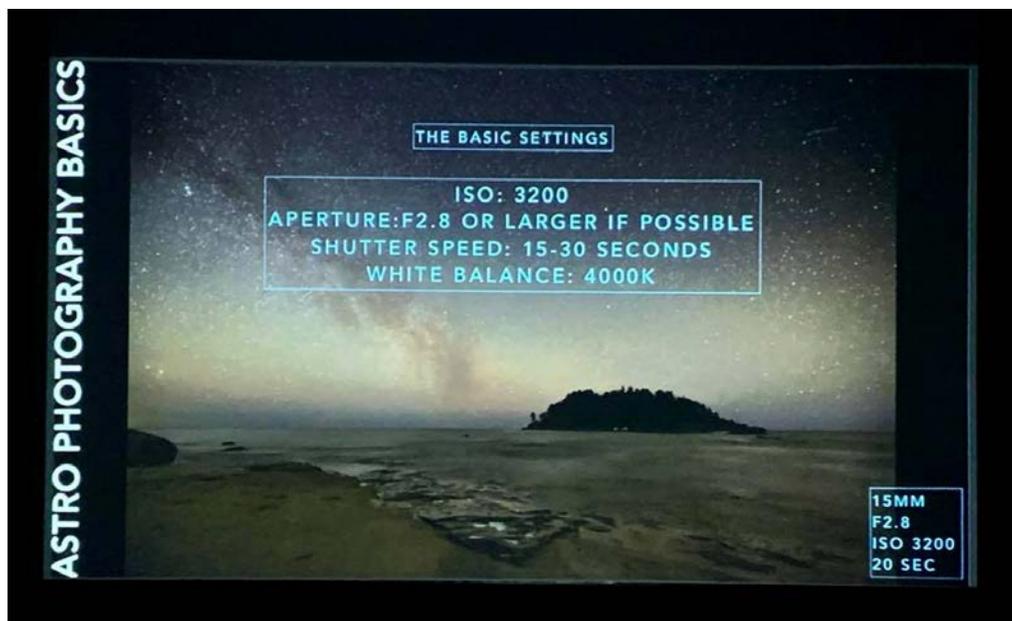
This summer we have had three night sky photography workshops at the Keweenaw Mountain Lodge as part of our [stargazing](#) activities. These workshops taught night-sky and photography enthusiasts how to take high-quality pictures of the dark sky.

Our third night sky photography workshop was held this past Sunday, during the month's new moon on [August 8, 2021](#), and a couple of days before the peak of the [Perseid Meteor Shower](#). For the first half of the class, [Nathan Bett](#) shared his techniques in a classroom presentation. The second half of the class we journeyed out onto the ninth fairway and had some hands on learning.

The "class room" portion of the workshop lasted around 1.5 hours, during which time several of Nate's nuggets for taking night sky photos were discussed.







After finishing up the indoor lecture portion of the workshop, we journeyed outside with our cameras onto the ninth fairway for some hands on learning. To be able to see the stars at night, good weather is needed. It had rained earlier in the day, and was cloudy for most of the afternoon. However, the evening had some glimmer of hope. It was not the clearest of nights, but attendees were able to see some stars, take some pictures, and get some specific experience with Nate. Nate spent time walking around to each attendee's setup on Hole 9 and talking about their different settings. The sky was thick with moisture and haze from distant wildfires, however, we all walked away with more insight into night sky photography.



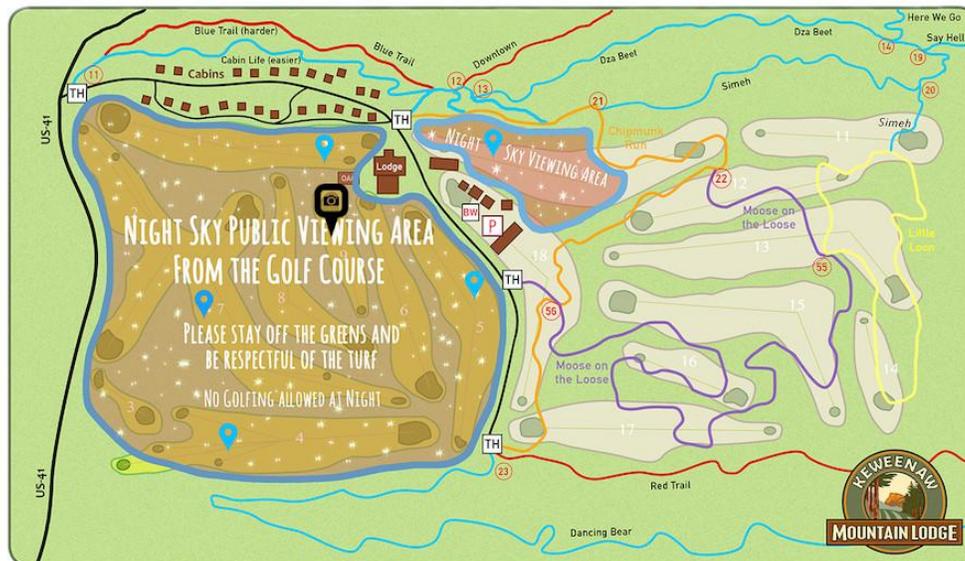
Instructor, Nate Bett, was able to show the group on hole 9 green how he works with the settings on his camera. [Photo credit: Chris Guibert]



Attendees of the August 8th workshop work on their night sky photo skills on the fairway of Hole 9 at the Keweenaw Mountain Lodge. [Photo credit: Tom Oliver]

Below is a map of the stargazing locations on the Keweenaw Mountain Lodge property. The location on Hole 9 where the outside portion of the workshop was held is identified on the map with the black camera icon.

NIGHT SKY VIEWING AT THE KEWEENAW MOUNTAIN LODGE



PLEASE BE RESPECTFUL OF LODGING GUESTS WHEN NEAR THE CABINS: KEEP NOISE TO A MINIMUM

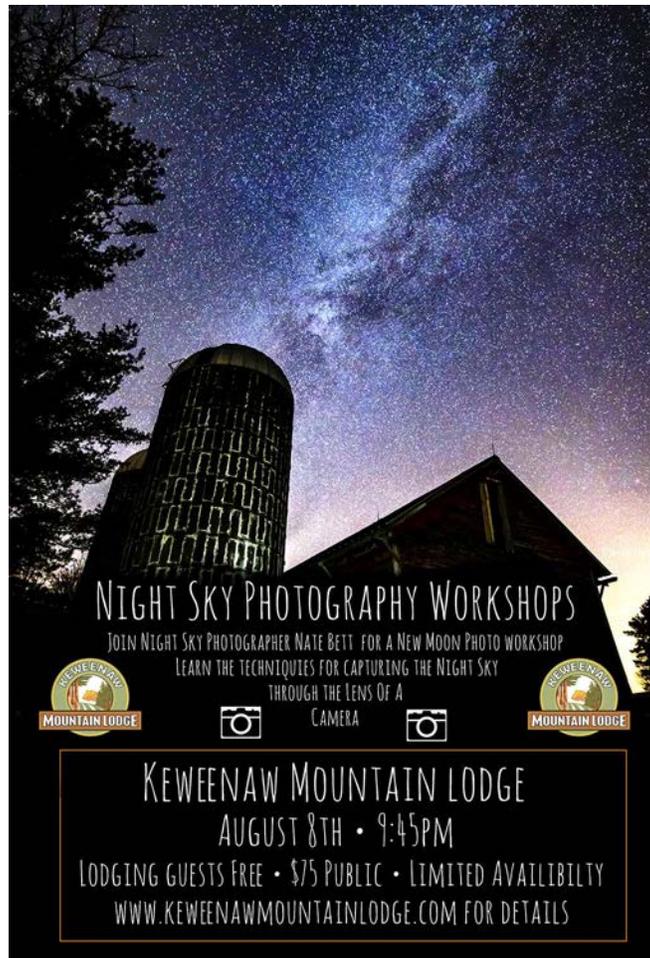
THE NIGHT SKY CAN BE EASILY VIEWED FROM MANY SPOTS ON THE PROPERTY. THIS MAP HIGHLIGHTS VANTAGE POINTS (📍) FOR THE BEST VIEWING OF THE STARS



About the Instructor: Nate Bett

Nathan Bett is a photographer and educator in Hancock Michigan. Although originally from Marquette, Michigan, Nathan recently relocated to Hancock from New York City, where he taught at the City University Of New York, and represented a major camera manufacturer as a technical specialist in photography.

He now spends his time indulging in the over abundance of natural beauty in his native UP and spending excesses of time outdoors with his family. Nathan maintains a passion for photography and the outdoors that he delights in sharing with students. His work can be viewed at nathanbett.com and [@natebett](https://www.instagram.com/natebett) and [@artmonstermedia](https://www.instagram.com/artmonstermedia) on Instagram.



URLs:

- <https://keweenawmountainlodge.com/calendar/stargazing-night-sky-photography-workshop-3/>
- <https://keweenawmountainlodge.com/2021/08/09/august-8-2021-night-sky-photography-workshop-recap/>

Stargazing: Dark Sky Light Management Workshop, November 3, 2021

NOVEMBER 5, 2021 BY ADMIN

November 3, 2021: Dark Sky Light Management Workshop**Recap**

We held a [workshop on Wednesday, November 3rd, 2021](#) that covered light management, and what we are working on at the Lodge to foster dark-skies at the Lodge and in the Keweenaw.

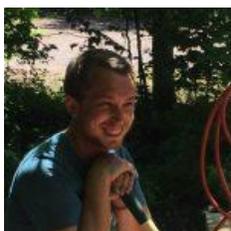
The Lodge has been working to reduce its light pollution on the dark sky for the past year or so. KML staff member, Mike Miller, has been responsible for the light management, and inventorying the lighting at the Lodge. As part of that activity, he has been able to see where the Lodge can improve on both lighting and energy efficiency. This has helped move the Lodge forward with the [International Dark Sky Park designation application](#) that is currently being reviewed by the [International Dark-Sky Association](#).

In this workshop, Mike went through the history of the Keweenaw and the Lodge to give the attendees a perspective of where the Lodge has come from, and what makes the Keweenaw so special — including for stargazing. He went through the negative effects that artificial light has on one's environment, and then what we have been doing at the Lodge to decrease our effect on light pollution.

Here is a bullet point of the topics covered:

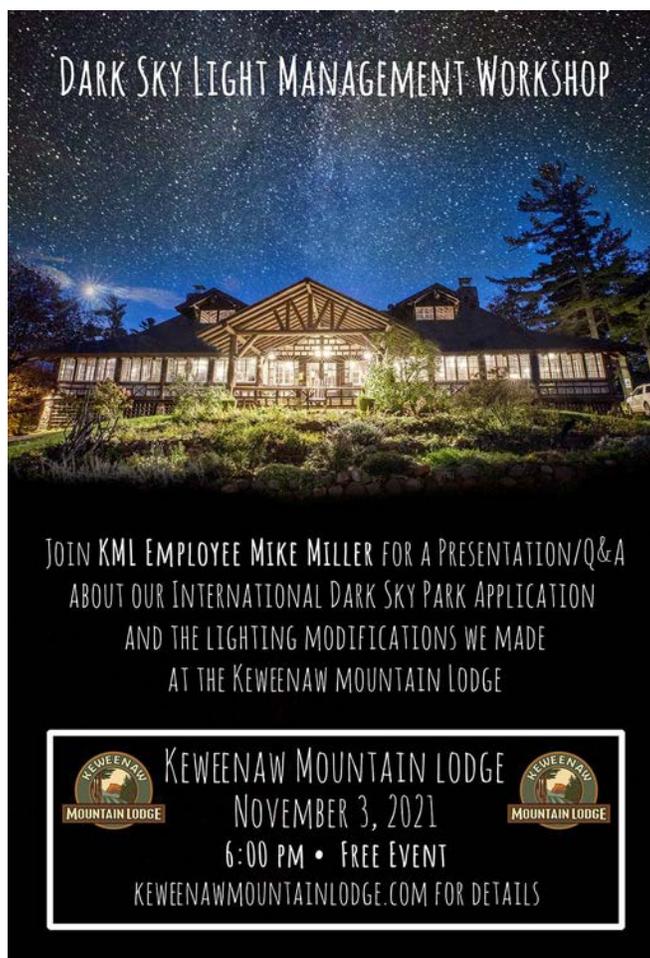
- Brief Lodge/Keweenaw history and background
- International Dark-Sky Association (IDA) background info
- Defined Light Pollution, its varieties (glare, cluster, light trespass, and skyglow), and explained the effects of light pollution on the environment (fireflies, sea turtles, birds and insects specifically), as well as the negative effects on humans.
- IDAs various requirements for outdoor lighting
- The Lodge's strategy for choosing our dark sky lighting and [our lighting management plan](#)
- Q&A

The 30-minute talk can be viewed via the link below.

**About the Instructor: Mike Miller**

Mike Miller is a staff member at the Keweenaw Mountain Lodge. As a member of the facilities maintenance team at the Lodge, he is responsible for the light management at the resort, and has been working to have the

Lodge's lighting be dark-sky compliant in order for Lodge guests and the general public to enjoy the stars at the top of the Keweenaw.



URLs:

- <https://keweenawmountainlodge.com/calendar/stargazing-dark-sky-light-management-workshop/>
- <https://keweenawmountainlodge.com/2021/11/05/november-3-2021-dark-sky-light-management-workshop-recap/>

Stargazing: Northern Lights Photography Workshop, November 6, 2021**NOVEMBER 9, 2021 BY TOM OLIVER****November 6, 2021: Northern Lights Photography Workshop****Recap**

We are now shifting into our northern lights season with workshops, and held our first northern lights photo workshop this past Saturday, November 6th. We had three night sky photography workshops during the summer, and a fall color photo workshop in October. This northern lights photo workshop is a nice transition into the winter, where we have the possibilities of seeing the northern lights in the Keweenaw (October to April has the highest probabilities to see the northern lights).

The northern lights photo workshop on Saturday was a success. We had 3 people at the session (limit is 5 persons), along with myself and the instructor, Nate Bett. All the participants expressed great satisfaction to me afterwards.

For the first half of the class, [Nathan Bett](#) shared his techniques in a classroom presentation. The second half of the class we journeyed out onto the ninth fairway and had some hands on learning.

The “class room” portion of the workshop lasted around an hour and a half, during which time several of Nate’s nuggets for taking night sky photos were discussed and he was able to spend some time with participants teaching them about their specific cameras and their settings.





After finishing up the indoor lecture portion of the workshop, we journeyed to Hunters Point, in Copper Harbor, with our cameras for some hands-on learning.

We were fortunate to have the clouds clear and Nate was able to show the photographers that if the atmospheric conditions warrant it, even with lower KPI values, the sensors of the cameras could pick up Aurora glow. He also demonstrated light painting, during which one of the photographers caught a beautiful bright shooting star. We were out on site until 10:30 pm and participants were still eager for taking more pics.

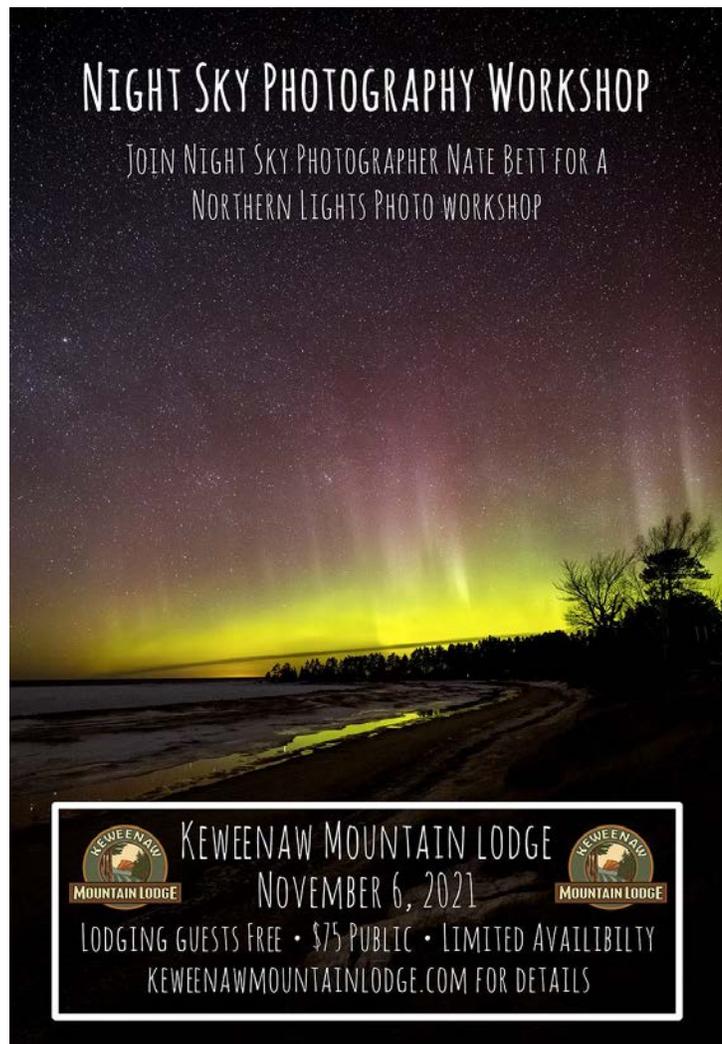


Our next Northern Lights Photo Workshop will be held [December 4th](#). Please contact the Keweenaw Mountain Lodge, Outdoor Activity Center or Events Department for more details and to reserve your space.



**About the Instructor:
Nate Bett**

Nathan Bett is a photographer and educator in Hancock Michigan. Although originally from Marquette, Michigan, Nathan recently relocated to Hancock from New York City, where he taught at the City University Of New York, and represented a major camera manufacturer as a technical specialist in photography. He now spends his time indulging in the over abundance of natural beauty in his native UP and spending excesses of time outdoors with his family. Nathan maintains a passion for photography and the outdoors that he delights in sharing with students. His work can be viewed at nathanbett.com and [@natebett](#) and [@artmonstermedia](#) on Instagram.



URLs:

- <https://keweenawmountainlodge.com/calendar/stargazing-northern-lights-photography-workshop/>
- <https://keweenawmountainlodge.com/2021/11/09/november-6-2021-dark-sky-light-management-workshop-recap/>

Stargazing: Northern Lights Photography Workshop, December 4, 2021

DECEMBER 7, 2021 BY TOM OLIVER

December 4, 2021: Northern Lights Photography Workshop**Recap**

Our [second photography workshop](#) in our series focusing on photographing the northern lights was a success. We had 4 people participate in the session (limit is 5 persons), along with myself and the instructor, Nathan Bett. Unfortunately, the weather didn't cooperate with us for being able to get some practical experience following the instructional portion of the evening – the skies were cloudy and were intermittently dropping a bit of snow. Nonetheless, Nathan's instruction and discussion was informative, interesting, and fun. Afterwards, even without having the chance to see or photograph the night sky, every participant expressed great satisfaction to me about what they learned.

For the first portion of the class, Nathan Bett shared his extensive knowledge of auroras, night-time photography techniques, camera technology, and helpful additional resources in a classroom presentation. Nathan then spent time helping each participant to become more familiar with their own personal equipment (which ranged from prosumer DSLR cameras to smartphone cameras). Typically, the remainder of the class is used for some hands-on learning, either by viewing the dark sky from one of the golf course fairways at the lodge or venturing out to an agreed upon nearby destination which can also provide expansive views of the sky. All-in-all, this workshop lasted around two hours, during which time several of Nathan's tips for taking night sky photos were discussed and he was able to spend some time with each participant – getting to know them each a little better and teaching them about their specific cameras and their settings.



Auroras occur throughout the year. However, darkness is needed to be able to see them. The long periods of daylight during the northern hemisphere's summer months tend to render most of them, during that time period, invisible to our eyes; so, we most often focus on seeing northern lights during the remainder of the year. The months of January, February, and March, because of their long nights, tend to be the most popular times to go Aurora hunting. Additionally, The dates surrounding a new moon tend to have darker nights, which could increase the likelihood of photographing the northern lights (if the weather cooperates). I can't think of a better way to spend a weekend – long, dark nights to learn about and possibly see/photograph the northern lights and then (here at the Keweenaw Mountain Lodge) plenty of snow to play in during the day.



The Keweenaw Mountain Lodge has scheduled multiple Northern Lights Photography Workshops for this winter season – each one scheduled for a weekend around the time of a new moon. Our [next Northern Lights Photo Workshop](#) will be held [Saturday, January 29th, 2022 at 7:30pm](#).

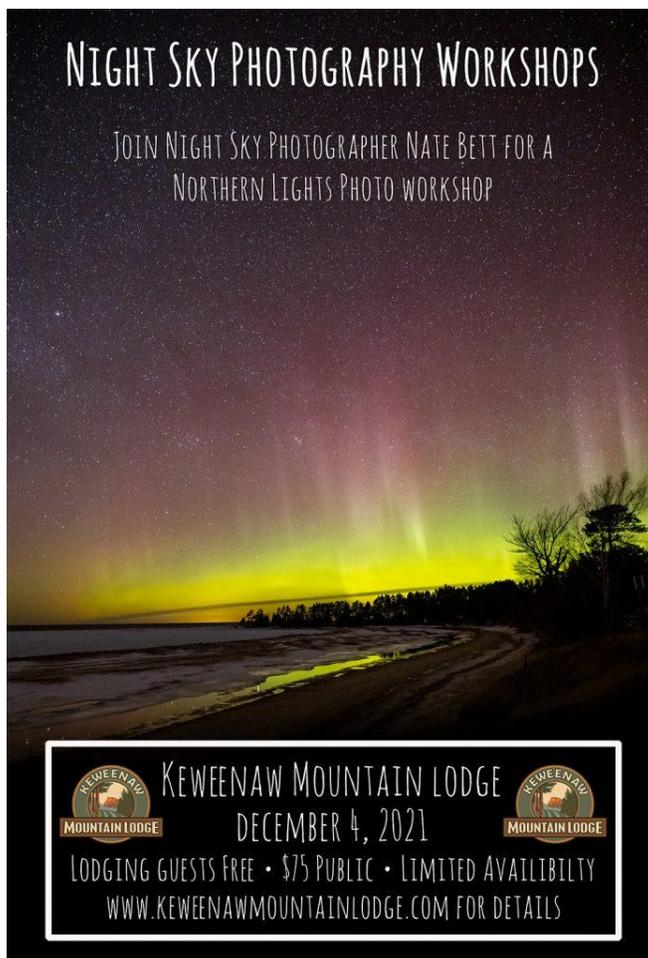
Please see our [Calendar of Events](#) for the complete listing of upcoming workshops, then contact the Keweenaw Mountain Lodge – Outdoor Activity Center or Events Department for more details and to reserve your space.



About the Instructor: Nate Bett

Nathan Bett is a photographer and educator in Hancock Michigan. Although originally from Marquette, Michigan, Nathan recently relocated to Hancock from New York City, where he taught at the City University Of New York, and represented a major camera manufacturer as a technical specialist in photography.

He now spends his time indulging in the over abundance of natural beauty in his native UP and spending excesses of time outdoors with his family. Nathan maintains a passion for photography and the outdoors that he delights in sharing with students. His work can be viewed at nathanbett.com and [@natebett](https://www.instagram.com/natebett) and [@artmonstermedia](https://www.instagram.com/artmonstermedia) on Instagram.



URLs:

- <https://keweenawmountainlodge.com/calendar/stargazing-northern-lights-photography-workshop-2/>
- <https://keweenawmountainlodge.com/2021/12/07/december-4-2021-northern-lights-photography-workshop-recap/>

Stargazing: Moonlit Snowshoe Hike, January 15, 2022

JANUARY 16, 2022 BY CHRIS GUIBERT

January 15, 2022: Moonlit Snowshoe Hike Recap*“Our truest life is when we are in dreams awake,”**— Henry David Thoreau —*

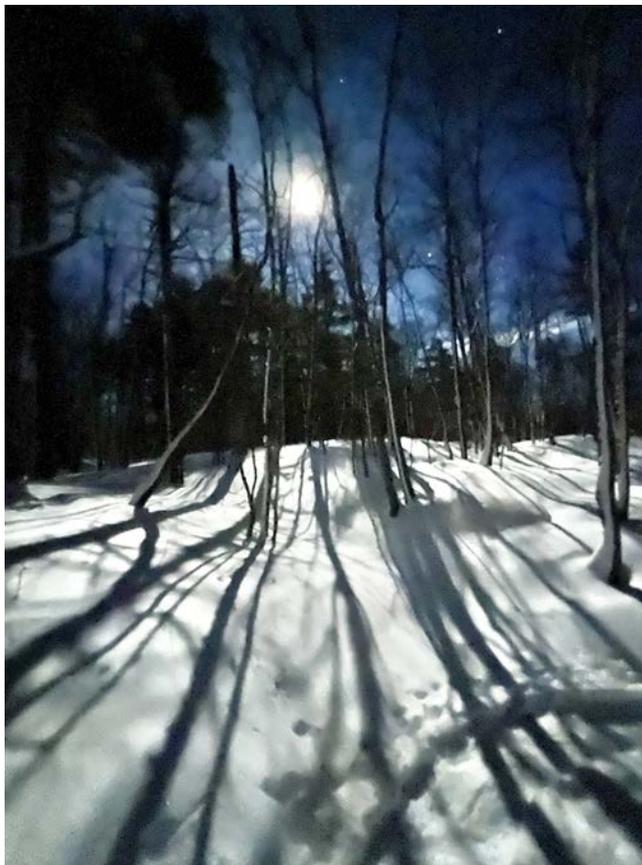
Last night’s [moonlit snowshoe hike](#) felt like a dream – it was truly a magical night for all.

About a month ago, the [Outdoor Activities](#) team at the Lodge was discussing different adventures to do this winter season and that would be special and unique for guests. Night time snowshoe hikes was one of the ideas. A great idea, especially with our drive to foster the night sky activities in the Keweenaw. Upon further discussion to hash out how the hikes would go and what dates would be good, someone suggested doing the hikes during the full moon!

We checked the lunar calendar and picked three Saturday nights that were close to a full moon: [January 15th](#), [February 12th](#), and [March 19th](#). Yesterday, January 15th, was our first scheduled hike.



Our group met at the winter Outdoor Activities Center (OAC) at 6:30pm and prepped for our 7:00pm departure. We readied our snowshoes and poles, checked our lights, layered our clothing, and discussed the route. Some people brought their own snowshoes, others [rented](#) and some took advantage of the free [snowshoes](#) available to lodging guests. For some this was their first time snowshoeing, and for others this was their hundredth time. Regardless of experience, all that was needed was a sense of adventure. At 7:10 we headed out the door and began our trek. Mother nature gifted us a beautiful night. The moon was bright and we barely needed to use our flashlights.



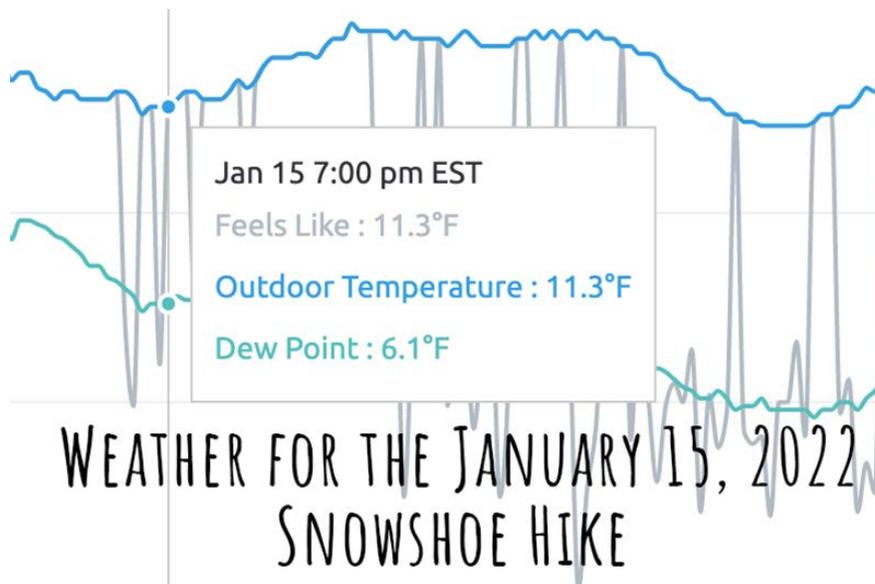
The snowshoe trail was recently packed, so it was easy to follow in the moonlight. We traversed across the golf course and worked our way onto the Dancing Bear Trail. The moonlit shadows waltzed across the snow. Walking through the woods felt like a waking dream. We trekked under the cliffs glowing in the moonlight.



The group gathered for a moment on the edge of the woods and OAC guide, Tom Oliver, tried calling to a barred owl. He brought with him a small speaker with a prerecorded owl call. The group was silent, hoping to hear a call back; however, all we could hear was a gentle whisper of the night (there was hardly any wind). We trekked on, traversing back across the [golf course](#). We snowshoed our way towards the main entrance of the Lodge on US Hwy 41. We crossed the driveway and started to climb the Blue Trail, a historic legacy trail built by the [National Youth Administration](#) (NYA) in the late 1930's. We stopped one more time for Tom to try to get a barred owl to call, however, still no luck for a returned call by a creature in the wild. The Lodge was soon in our sights and the group made one final push up the last hill to the warmth of the historic Lodge building.



When we originally planned this adventure, we had no idea what the weather would be like. The Keweenaw receives [over 200 inches of snow a year](#) – let us just say it is SNOWS A LOT! We were gifted a beautifully clear night for our first ever [Moonlit Snowshoe Hike](#) at the Lodge. Fifteen of us had a magical experience that will be hard to forget. A dreamlike trek under the moon and the stars with friends old and new. It was truly fun, joyous and adventuresome.



Additional Resources

- Learn more about future [Moonlit Snowshoe Hikes](#)
- Learn more about [Stargazing](#) activities at the Lodge
- Learn more about our application to become a designated [International Dark Sky Park](#)

URLs:

- <https://keweenawmountainlodge.com/calendar/winter-moonlight-snowshoe-hikes/>
- <https://keweenawmountainlodge.com/2022/01/16/january-15-2022-moonlit-snowshoe-hike-recap/>

Snowshoe Hare Event, with a Moonlit Snowshoe Hike, February 12, 2022

FEBRUARY 14, 2022 BY TOM OLIVER

2022 Snowshoe Hare Recap

On 12 February 2022, we expanded our winter event offerings by hosting the Snowshoe Hare. The Snowshoe Hare was a celebration of snowshoeing in the Keweenaw. As a themed event, it was highlighted by planned snowshoeing activities throughout the day and evening. Those activities included a presentation on Snowshoe Hare ecology in the afternoon, and hare/rabbit-themed cuisine offered in the Lodge's restaurant and Little Cabin Café.

The weather conditions at the Keweenaw Mountain Lodge cooperated the entire day. The high temperature only reached 7°F. However, the mostly-clear skies and low wind speeds gave a beautiful backdrop to the day's activities. One person described the landscape as "it's like Narnia around the Lodge."



Snowshoe racer, Amy Snow, running on a single-track section of the race course.

A Snowshoe Race was the first activity of the day. The 1.4 mile (2.25 km) course followed a combination of wide, flat groomed and narrow single track trails. The course made its way through the open areas and the wooded settings of the lodge property. Three runners completed the race, with times ranging from 18:04 to 35:48. The overall and top men's finisher was Drew Wilson, setting the course record of 18:04. Amy Oestreich, the top female finisher, set the course record for women at 25:38.



Drew Wilson, top finisher for the inaugural Snowshoe Hare Snowshoe race.

The second activity of the day was a Mindful Snowshoe Hike, led by Dayna Browning, a certified Koru Mindfulness instructor and wellness advocate from Michigan Technological University. Dayna led eight snowshoers on the 1.5 mile snowshoe hike focused on balance, being mindful and quiet, and connecting with their surroundings. Through her guidance participants experienced nature and the elements using all their senses. One snowshoer reported a great sense of relaxation from the hike, expressing that he felt “refreshed from the moderate activity and the crisp clean air filling his lungs.” Another snowshoer stated she felt peaceful from her heightened sense of awareness among the quiet snow-filled trees.



Mindful snowshoers participate in introductions and itinerary, from instructor Dayna Browning.

Later in the afternoon, Tom Oliver (the lodge's Events and Educational Specialist) gave a presentation on Snowshoe Hare (*Lepus americanus*) ecology. Eleven guests attended the presentation. They learned the differences between rabbits and hares, the adaptations of snowshoe hares for surviving the harsh conditions of the north woods, the groundbreaking research on snowshoe hares that has helped biologists understand predator/prey relationships, and what conservation threats exist for snowshoe hares.



"If what you saw was this big...it was NOT a Snowshoe Hare!"

To close out the event, a Guided Moonlit Snowshoe Hike, was led by Chris Guibert (the lodge's Outdoor Activities Lead) and Tom Oliver. Twenty participants headed out into the still cool air of the night, exploring the forest and grounds of the lodge. In total, the snowshoers hiked about 1.75 miles. Although participants had red-colored lights to help their nighttime navigation, the combination of moonlight and white snow made flashlights unnecessary. While most participants

had prior snowshoeing experience, almost none had ever done it at night. The feedback we received for this experience was all positive, with participants using words like “amazing,” “unbelievable,” and “beautiful.”



Moving through the northwoods illuminated by only moon and its light reflected off the snow, is an unforgettable experience

To round out the Snowshoe theme, the Little Cabin Café offered rabbit sausage soup, as a lunch special, to help warm snowshoers coming in from the cold. The flavors of the sausage in the soup were complimented by those of kale, root vegetables, and chickpeas. The restaurant at the lodge offered Hasenpfeffer (marinated, slow-cooked rabbit), served with broccoli and

jeweled rice. The Hasenpfeffer was tender and delicious and accented perfectly by the dried fruits in the jeweled rice. Grand Rabbits Cream Ale by Blackrocks was also available – and on theme.

The Keweenaw Mountain Lodge partnered with Iverson Snowshoes and the Keweenaw Outdoor Recreation Coalition (KORC) for this event. Iverson Snowshoes provided promotional materials as well as a variety of their snowshoe models which could be used by patrons, free of charge. The Iverson snowshoes were borrowed 5 times over the course of the day. KORC had members on-site to explain the efforts of the organization and a specific call to action they are currently pursuing. KORC reported that they had several new members join, as well as a dozen forms for their latest call to action completed onsite.



Lodging guest, Brad Smit, is shown how to lace up the bindings on the Iverson traditional snowshoes he borrowed, courtesy of Iverson Snowshoes.

URLs:

- <https://keweenawmountainlodge.com/calendar/snowshoe-hare/>
- <https://keweenawmountainlodge.com/calendar/winter-moonlight-snowshoe-hikes-2022-02-12/>
- <https://keweenawmountainlodge.com/2022/02/14/2022-snowshoe-hare-recap/>

Stargazing: Moonlit Snowshoe Hike, March 19, 2022

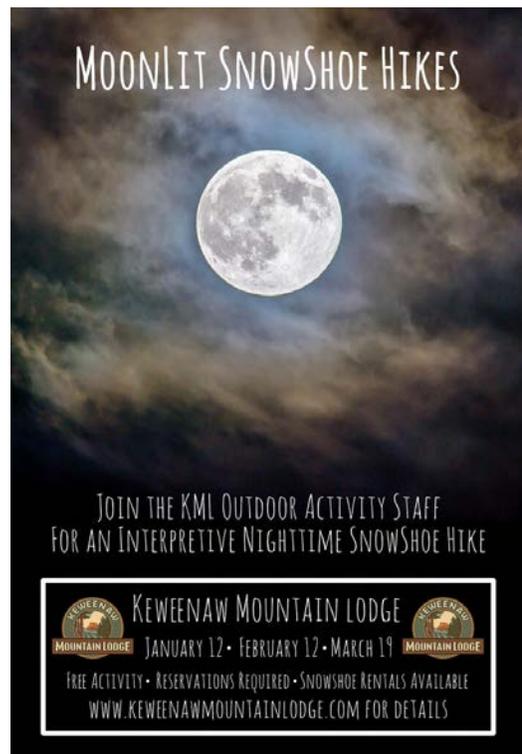
MARCH 21, 2022 BY TOM OLIVER

March 19, 2022: Moonlit Snowshoe Hike Recap

This past December, the Outdoor Activities team at the Lodge was discussing different, special, adventures to offer guests this winter season. Night time snowshoe hikes were one of the ideas. Ultimately, we decided to experiment with offering monthly guided snowshoe hikes under the light of the full moon. This turned out to be a great idea, especially with our drive to promote activities under the Keweenaw night sky.

Beginning a new program of night activities came with its own set of challenges and uncertainties, though.

1. We didn't know what participants would expect from such an experience. Would people arrive with headlamps and flashlights or expect to follow a lighted path?
2. Under normal circumstances, guiding these types of activities has possible complications (e.g., managing large groups, people who might get cold and want to return early, someone getting injured, and varied levels of experience among participants) for which plans need to be established. Add in the darkness of night and potential complications can become very challenging.
3. The winter weather in the Keweenaw is extremely unpredictable. We could end up planning activities to happen under clear skies or be socked-in with a blizzard that drops 12-18" of snow overnight.



Setting the plan for the guided snowshoe hikes in motion, we ordered [flashlights that emit red light](#) for use instead of standard flashlights and headlamps, made sure that at least two staff members were always leading the excursions to ensure that no one went too fast and that no one would get left behind, and set the dates for the hikes based on the full moon dates for January, February and March.

The March 19th guided snowshoe hike had ten participants (nine adults and one child). Of the three hikes we guided this winter, this hike turned out to be the most challenging. We needed to set the time later in the evening due to the time change which occurred the week previous, meaning that the hike began an hour later than the others. Even so, the excursion began more as a twilight hike, instead of moonlit.

Also, on that particular evening, the moon wasn't scheduled to rise until very near the time we would be finishing. This resulted in visibility being far less than the other hikes, for which the moonlight reflecting off the snow had provided enough light that we never needed the red flashlights. On this hike red-lights were definitely needed in wooded, pitch black, sections of the trail. Plus, during the week before the hike, the region experienced unseasonably warm temperatures, which caused portions of the trail to get buried by small avalanches from cliff lines overhead, while other sections of the trail would collapse under foot, due to snow melt undercutting the trail.

With all of the obstacles encountered on this particular hike, though, everyone approached it with an adventurous, helpful spirit and every participant expressed that they had a great time, learned new things, and were pleased they had tried something they had never done before.



As we finished the hike, [the moon was rising behind the Lodge, providing a beautiful backdrop and grand finale](#). The thing we learned on this particular night is that the guided snowshoe hikes at the Keweenaw Mountain Lodge, no matter if they are dreamlike excursions under the moon and stars or vigorous and filled with obstacles, continue to be a truly fun, joyous, and adventuresome experience.

Additional Resources

- Learn more about future [Moonlit Snowshoe Hikes](#)
- Learn more about [Stargazing activities at the Lodge](#)
- Learn more about [our application to become a designated International Dark Sky Park](#)

URLs:

- <https://keweenawmountainlodge.com/calendar/winter-moonlight-snowshoe-hikes-2022-03-19/>
- <https://keweenawmountainlodge.com/2022/03/21/march-19-2022-moonlit-snowshoe-hike-recap/>
- <https://keweenawmountainlodge.com/2022/03/20/moonlit-lodge-a-beauty-photography/>

Stargazing: Northern Lights Photography Workshop, April 2, 2022**APRIL 5, 2022 BY TOM OLIVER****April 2, 2022: Northern Lights Photography Workshop Recap**

Our most recent photography workshop in our series focusing on photographing the northern lights was another success. We had five people participate in the session (the limit for this session was 6 people). The unique benefit that participants gained from this workshop was that there were four professional photographers on hand to help answer questions: Nathan Bett (the instructor), Heather Krut (Nathan's colleague), Chris Guibert (KML's Outdoor Activity Lead), and myself. Unfortunately, the weather did not cooperate with us for being able to get some practical experience following the instructional portion of the evening – the skies were very cloudy and showed no sign of clearing. Nonetheless, Nathan's instruction and discussion was informative, interesting, and fun. Afterwards, even without having the chance to see or photograph the night sky, every participant expressed great satisfaction to me about what they learned.



For the first portion of the class, Nathan Bett shared his extensive knowledge of auroras, night-time photography techniques, camera technology, and helpful additional resources during a classroom-style presentation. Nathan then spent time helping each participant to become more familiar with their own personal equipment (which ranged from prosumer DSLR cameras to smartphone cameras). Typically, the remainder of the class is used for some hands-on learning, either by viewing the dark sky from one of the golf course fairways at the lodge or

venturing out to an agreed upon nearby destination which can also provide expansive views of the sky.

All-in-all, this workshop lasted around two hours, during which several of Nathan's tips for taking night sky photos were discussed and he was able to spend some time with each participant – getting to know them each a little better and teaching them about their specific cameras and their settings.

Auroras occur throughout the year. However, darkness is needed to be able to see them. The long periods of daylight during the northern hemisphere's summer months tend to render most of them, during that time period, invisible to our eyes; so, we most often focus on seeing northern lights during the remainder of the year. The months of January, February, and March, because of their long nights, tend to be the most popular times to go Aurora hunting. Additionally, the dates surrounding a new moon tend to have darker nights, which could increase the likelihood of photographing the northern lights (if the weather cooperates). Although the winter season is approaching its end, I can not think of a better way to spend a weekend – using the long, dark nights to learn about and possibly see/photograph the northern lights and then (here at the Keweenaw Mountain Lodge) having plenty of snow to play in during the day.

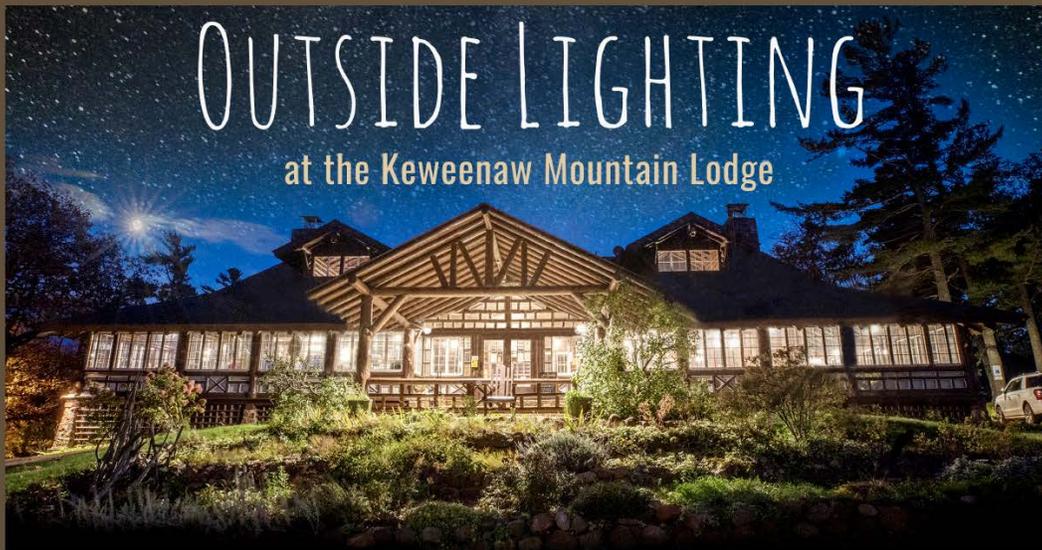
The Keweenaw Mountain Lodge has scheduled multiple Northern Lights Photography Workshops for this winter season – each one scheduled for a weekend around the time of a new moon. Our next [**Northern Lights Photo Workshop will be held Saturday, April 30th, 2022 at 7:30pm.**](#)

Please see our [Calendar of Events](#) for the complete listing of upcoming workshops, then contact the Keweenaw Mountain Lodge – Outdoor Activity Center or Events Department for more details and to reserve your space.

URLs:

- <https://keweenawmountainlodge.com/calendar/stargazing-northern-lights-photography-workshop-5/>
- <https://keweenawmountainlodge.com/2022/04/05/april-2-2022-northern-lights-photography-workshop-recap/>

An Example of a Sign on Property



STREET LIGHTING PROJECT (2020-2021)



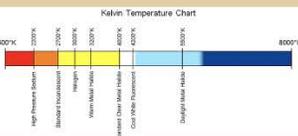
Between Aug. 2020 - Feb. 2021, We replaced 28 high pressure street light fixtures with dark sky compliant LED Fixtures. (Contractor: Bay Electric)



The changes to the streetlights decrease light pollution and energy consumption.

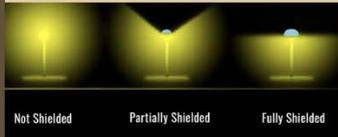


Our streetlights now use the Truly Green Solutions, RWL G2 Cobrahead. Their 3000K lights provide ample light for wayfinding

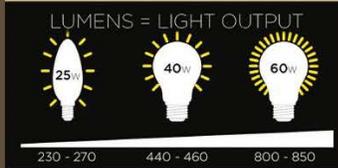


Color temperature is a way to describe light color and is measured in Kelvin (K). Light, at 3000K, is a warm, slightly yellow hue.

The lights we chose as replacements are fully-shielded. This means that light does not transmit above the horizontal plane of the fixture's bottom edge



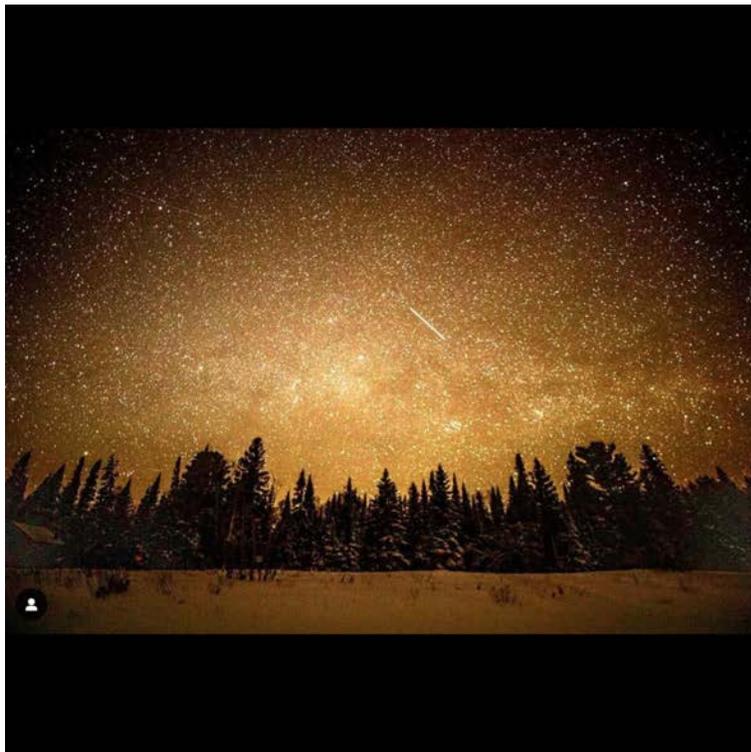
Lumen is a measure of light output, whereas watts measures energy use. With energy efficient LED technology, watts no longer reliably indicates bulb brightness. To be dark sky compliant, all special event lights must emit less than 500 lumens



THIS PROJECT WAS PARTIALLY FUNDED WITH A GRANT FROM THE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY (EGLE). EGLE'S MISSION IS "TO PROTECT MICHIGAN'S ENVIRONMENT AND PUBLIC HEALTH BY MANAGING AIR, WATER, LAND, AND ENERGY RESOURCES." TO LEARN MORE ABOUT THE GRANT, PLEASE CONTACT THE KEWEENAW MOUNTAIN LODGE.

To see more about our lighting plan please go to: keweenawmountainlodge.com

Sample of Social Media Posts



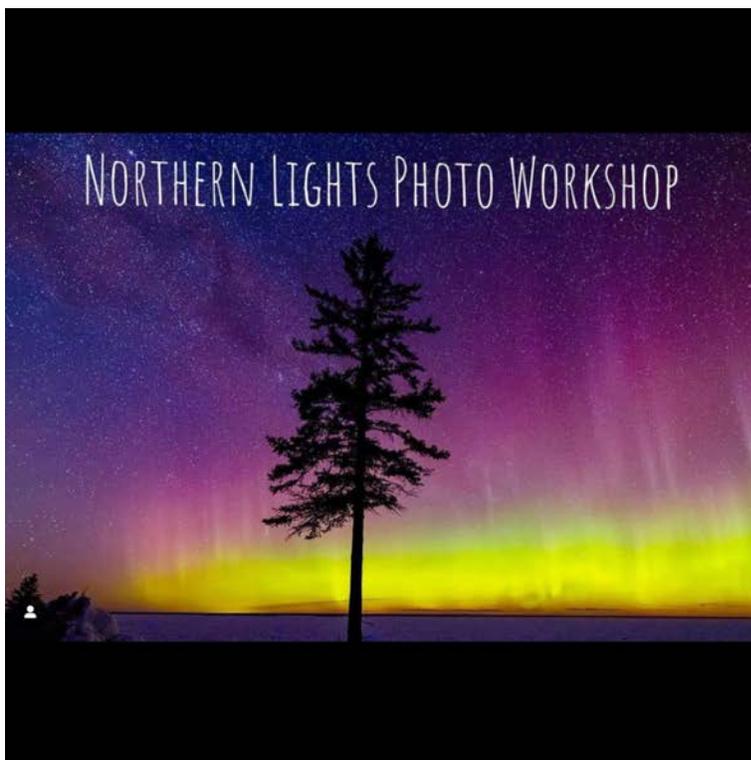
keweenawmtnlodge
Bete Grise Preserve

keweenawmtnlodge One of our core values at the Lodge is "Be fearless and persistent in learning on a daily basis". Early this morning Outdoor Activities Lead, [@chrisguibert_photography](#) went out to the Bete Grise beach in hopes to capture Comet Leonard with his camera. It was a clear morning and the stars in the night sky were magnificent.

The comment was supposed to be visible slightly above the eastern horizon with a telescope or binoculars. Chris was hoping to capture the comet with his camera but was unable to spot it with his naked eye or through the camera lens. He then turned his camera westward and shot this image capturing a meteor streaking across the night sky. Returning to the Lodge he learned that the Geminid meteor shower is peaking on the night of December 13th and the morning of December 14th. Chris has not given up the hunt for Comet Leonard, next chance he will bring his binoculars or use the Lodge's telescope.

Liked by [theupwell](#) and 197 others
9 HOURS AGO

Add a comment... [Post](#)



keweenawmtnlodge
Keweenaw Mountain Lodge

keweenawmtnlodge Night Sky/Northern Lights Photography Workshop

Saturday, December 4 - 7:30 pm - 9:30pm

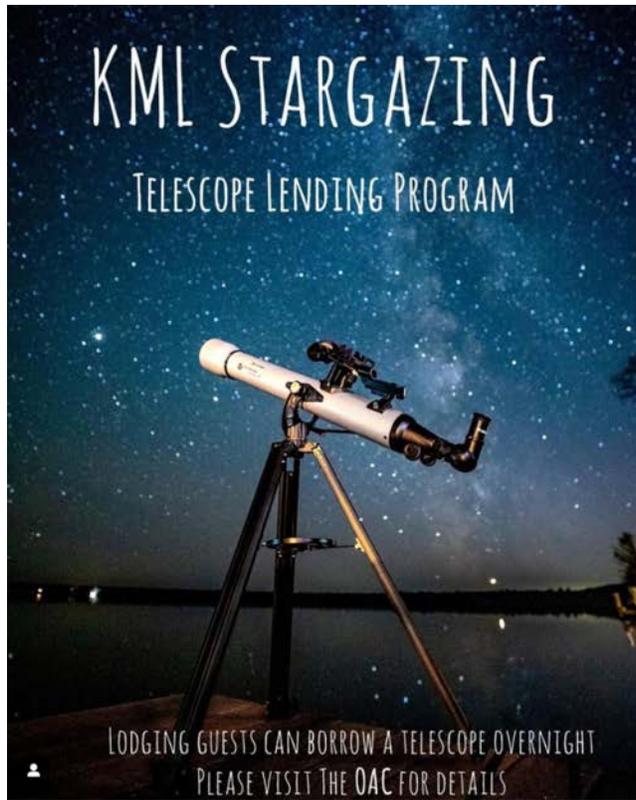
The purpose of this workshop is to educate people on how to capture the beauty of the northern lights and the night sky on camera. Topics being covered include equipment needed, camera settings, and the best locations for viewing. This workshop will start out with a brief powerpoint presentation (in the conference room), and then we will go outside for hands-on experience — taking pictures of the night time sky (hopefully northern lights) around the Lodge property - weather depending.

About the Instructor: Nate Bett

Nathan Bett is a photographer and educator in Hancock Michigan. Although originally from Marquette, Michigan, Nathan recently relocated to Hancock from New York City, where he taught at the

Liked by [theupwell](#) and 45 others
NOVEMBER 29

Add a comment... [Post](#)



keweenawmtnlodge
Keweenaw Mountain Lodge

keweenawmtnlodge Stargazing on the Keweenaw is a year round activity. The lack of light pollution allows for clear views of the Milky Way, the moon and many of the planets in our solar system. The Keweenaw Mountain Lodge offers the free use of a telescope through our stargazer program. If you are staying at the Lodge you can check out a telescope for no additional charge. Just stop in the OAC or call (906) 289-4403 to reserve. To learn more about stargazing at the Lodge please check our website under Outdoor Activities: <https://keweenawmountainlodge.com/activities/stargazing/>

#stargazing #internationaldarkskyassociation #keweenaw #keweenawpeninsula #celestron telescope #upperpeninsula #upperpeninsulamichigan #darksky #darkskypark #idasarksky #michigan #michigannightlife #michigantravel #michiganstays #yooper #yooperlife #astronomy #astrophotography #astronomylover #astronomynerd #

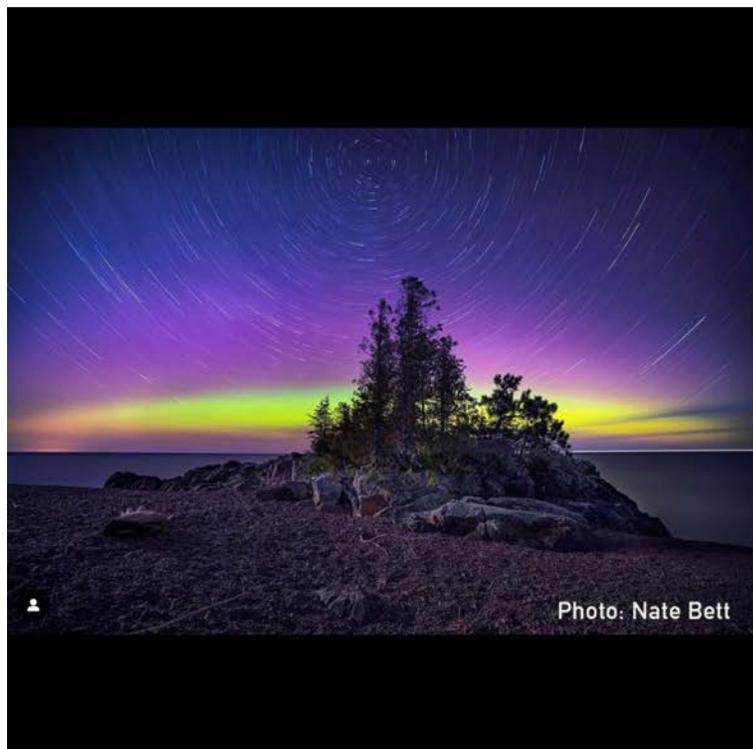
2w

koar.up THIS IS SO COOL!

Liked by **keweenawpeninsula** and 41 others

NOVEMBER 22

Add a comment... Post



keweenawmtnlodge
Keweenaw Mountain Lodge

keweenawmtnlodge Recently there has been some exciting solar activity creating some beautiful northern lights in the Upper Peninsula. This Saturday night we are hosting a Northern Lights Photo Workshop led by instructor @natebett Although we can't guarantee that the northern lights will appear, we will cover techniques and equipment for capturing this celestial phenomenon. The workshop will also discuss how to photo the Milky Way and other night sky imagery.

For more information please check our website: <https://keweenawmountainlodge.com/calendar/stargazing-northern-lights-photography-workshop/>

To sign up please call the Outdoor Activity Center (906) 289-4403 ext 4.

#northernlights #photoworkshop #photoworkshops #internationaldarkskyassociation #keweenaw #keweenawpeninsula #copperharbor #keweenawmountainlodge #upperpeninsula

Liked by **theupwell** and 264 others

NOVEMBER 5

Add a comment... Post



keweenawmtnlodge
Keweenaw Mountain Lodge

keweenawmtnlodge Join us tonight in our conference room to hear about our International Dark Sky Application (@idadarksky). Staff member, Mike Miller will talk about the lighting changes we have done to the Lodge to make our property more dark Sky compliant.

You can also virtually attend the meeting by using this link: <https://meet.google.com/kot-iikr-sut?hs=224>

#internationaldarkskyassociation #darksky #keweenaw #keweenawpeninsula #michigandarkskypark #darkskypark #nightsky #nightskyphotography #copperharbor #copperharbormichigan #astronomy #starsabove #puremichigan #puremichiganders #yooper #houghton #hancockmichigan #calumetmichigan

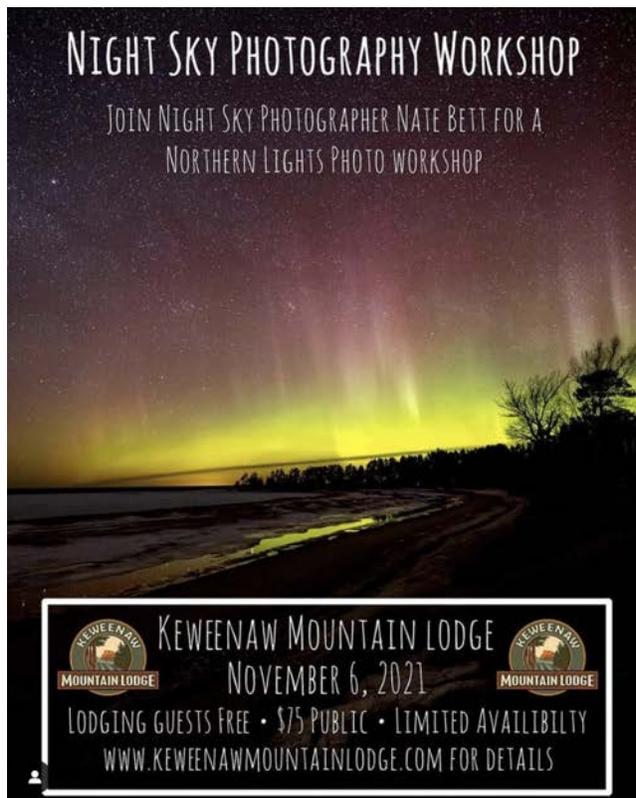
5w

Like Comment Share Bookmark

Liked by theupwell and 46 others

NOVEMBER 3

Add a comment... Post



keweenawmtnlodge
Keweenaw Mountain Lodge

keweenawmtnlodge Night Sky/Northern Lights Photography Workshop

The purpose of this workshop is to educate people on how to capture the beauty of the northern lights and the night sky on camera. Topics being covered include equipment needed, camera settings, and the best locations for viewing. This workshop will start out with a brief powerpoint presentation (in the conference room), and then we will go outside for hands-on experience — taking pictures of the night time sky (hopefully northern lights) around the Lodge property - weather depending.

About the Instructor: Nate Bett

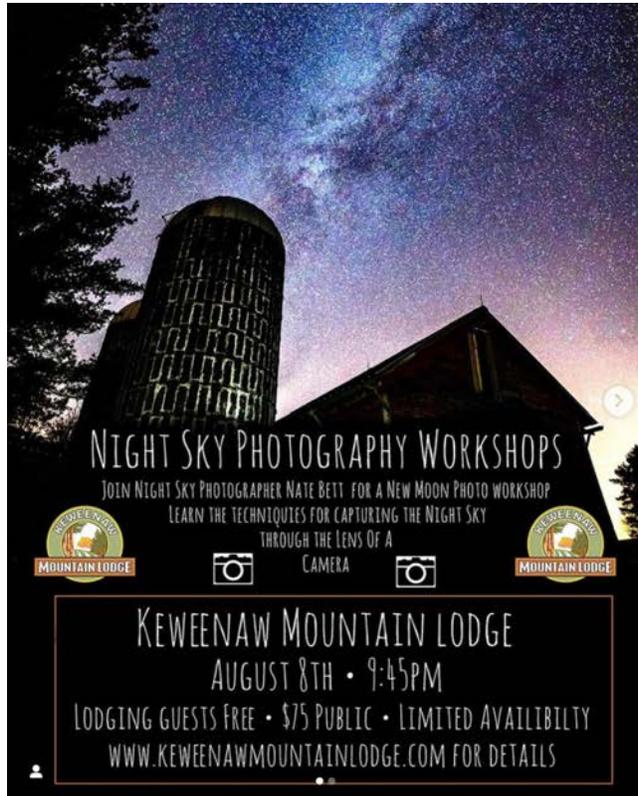
Nathan Bett is a photographer and educator in Hancock Michigan. Although originally from Marquette, Michigan, Nathan recently relocated to Hancock from New York City, where he taught at the City University Of New York, and represented a major camera manufacturer as a technical specialist in photography. He now spends his time indulging in the over abundance of natural beauty in his native UP and spending

Like Comment Share Bookmark

Liked by theupwell and 38 others

OCTOBER 25

Add a comment... Post



keweenawmtnlodge
Keweenaw Mountain Lodge

keweenawmtnlodge Join the Keweenaw Mountain Lodge for our New Moon - Night Sky Photography workshop on August 8th. This class features photographer Nathan Bett.

Nathan Bett is a photographer and educator in Hancock Michigan. Although originally from Marquette, Michigan, Nathan recently relocated to Hancock from New York City, where he taught at the City University Of New York, and represented a major camera manufacturer as a technical specialist in photography. He now spends his time indulging in the over abundance of natural beauty in his native UP and spending excesses of time outdoors with his family. Nathan maintains a passion for photography and the outdoors that he delights in sharing with students. His work can be viewed at nathanbett.com and [@natebett](https://www.instagram.com/natebett) and [@artmonstermedia](https://www.instagram.com/artmonstermedia) on Instagram

For more information please check our website: <https://keweenawmountainlodge.com/calendar/stargazing-night-sky-photography-workshop-3/> Space is limited so please call the Outdoor Activity Center to reserve your spot: (906) 289-4403 ext 4

Like Comment Share

Liked by [eagleharborgeneralstoremuseum](#) and 57 others

AUGUST 2

Add a comment... Post



keweenawmtnlodge
Keweenaw Mountain Lodge

keweenawmtnlodge Do you want to learn how to take pictures of the dark skies in the Keweenaw?

Join night sky photographer and KML staff member Pam Dyl for our second Night Sky Photo Workshop tonight, July 9th.

Tonight is a new moon. We hold these classes during the new moon in hopes of having a clear moonless night.

The first part of the class is held inside with discussions about the the Milky Way, Northern Lights and strategic places on the Keweenaw for star gazing amongst other things. Then we head outside for a hand's on field lesson of night sky camera techniques.

Class starts at 10pm and goes til about midnight. Please call the OAC (906) 289-4403 ext 4 for more info and to reserve a spot. Class is limited to 6 people, Cost is \$75 or free to KML lodging guests.

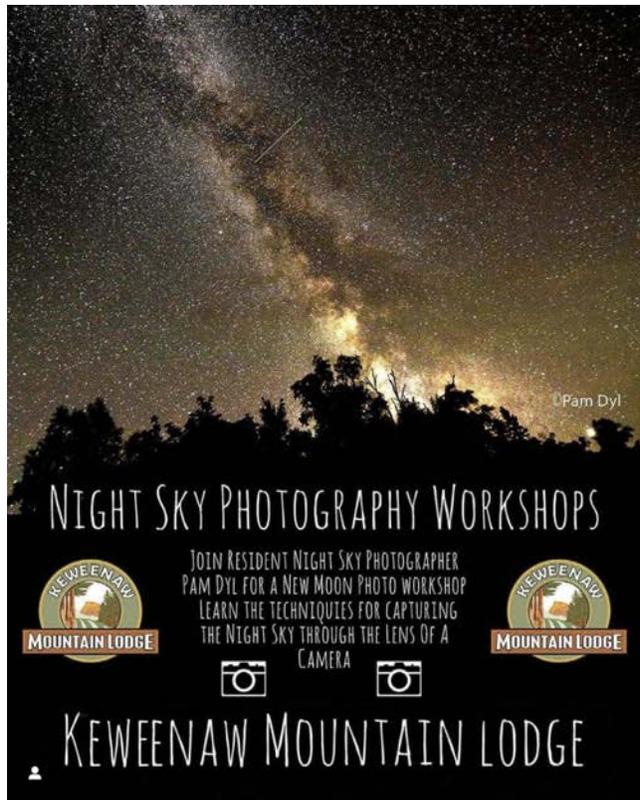
[#nightsky](#) [#nightskyphotography](#) [#keweenaw](#)
[#keweenawpeninsula](#) [#darksky](#) [#internationaldarkskyassociation](#)

Like Comment Share

Liked by [theupwell](#) and 25 others

JULY 9

Add a comment... Post



keweenawmtnlodge
Keweenaw Mountain Lodge

keweenawmtnlodge Join night sky photographer and KML staff member Pam Dyl for our second Night Sky Photo Workshop on July 9th. We hold these classes during the new moon in hopes of having a clear moonless night. The first part of the class is held inside with discussions about the the Milky Way, Northern Lights and strategic places on the Keweenaw for star gazing amongst other things. Then we head outside for a hand's on field lesson of night sky camera techniques. Class starts at 10pm and goes til about midnight. Please call the OAC (906) 289-4403 ext 4 for more info and to reserve a spot. Class is limited to 6 people. Cost is \$75 - free to KML lodging guests

#nightsky #nightskyphotography #keweenaw #keweenawpeninsula #darksky #internationaldarkskyassociation #puremichigan #upperpeninsula #michiganastronomers #astronomylover #astronomyphotography #upperpeninsulamichigan #upnorthlife #camerawoman #copperharbor #copperharbormichigan #escapethecity #newmoon #michigandarksky #michigandarkskypark

23w

Like Comment Share

Liked by eagleharboregeneralstoremuseum and 81 others

JULY 3

Add a comment... Post



keweenawmtnlodge
Keweenaw Mountain Lodge

keweenawmtnlodge April 5 - 12 is International Dark Sky Week. Stargazing and astronomy is the oldest of the natural sciences and the Lodge is strategically located in one of the best areas in Michigan for viewing the night sky.

The Keweenaw Mountain Lodge has been working on becoming a designated International Dark Sky Park. This process involves developing a lighting management plan including replacing the street lights and various lights on the cabins and the lodge building, measuring the light (or lack of) and getting support letters.

This is one of the reasons that the cell tower placement (with red flashing lights) can have a direct impact on the experience our guests will have. You can follow the progress of our application under the projects section of the website:
<https://keweenawmountainlodge.com/projects/international-dark-sky-park-application/>

Like Comment Share

Liked by houghtonspirits and 72 others

APRIL 5

Add a comment... Post



keweenawmtnlodge
Keweenaw Mountain Lodge

keweenawmtnlodge This week we are continuing with the new street light installation. This activity is part of an energy efficiency initiative and our move to being an International Dark Sky Park (@idadarksky). Bay Electric is installing LED street lights that are Dark Sky compliant, which ensure proper lighting while not taking away from the ability to star gaze (i.e. the light on the light poles shines down rather all around).

We have more to do as part of our light management plan. Our IDA application includes a lighting improvement process with multiple initiatives. The street light project is one of these steps we are making to ensure the quality of the Keweenaw night time sky at the Lodge.

Make sure to take the time to look UP at night this week, and star gaze....before we get more snow fall.

#keweenaw #copperharbor
#keweenawmountainlodge #internationaldarksky
#internationaldarkskypark #idadarksky

Liked by **chassellchocolate** and 170 others

FEBRUARY 2

Add a comment... [Post](#)

Appendix E: Email: Keweenaw County - Zoning Ordinance - Comments

Below is a copy of an email sent to the Keweenaw County Planning Commission during the open-comment-period in February 2022. In the email, we highlight to the commission the importance of dark-sky compliant lighting and suggest several additional items for the commission to think about when updating the lighting ordinances for the county. We reference the International Dark-Sky Association's lighting guidelines.



John Mueller <john@keweenawresort.com>

Keweenaw County - Zoning Ordinance - Comments

1 message

John Mueller <john@keweenawresort.com>
To: planning@keweenawcountymi.gov

Fri, Feb 25, 2022 at 10:43 PM

Hi,

Thank you for taking into consideration feedback from the community regarding the Keweenaw County zoning ordinance.

Several items that would be good to review are **lighting** and **communication towers**.

- **Lighting**

Section 15.2 outlines the outdoor lighting requirements. It is good to see this section, and the other sections that reference the outdoor lighting requirements section. This is important from a perspective of fostering the dark skies in the Keweenaw -- which is one of the [assets of the Keweenaw](#). There are 5 clauses in section 15.2 which guide citizens of the county when designing and installing outdoor lighting. It is wonderful to know that the lighting should be **downward** shining and **fully** shielded. This helps with light trespassing and reduces glare.

Some additional items to think about for outdoor (artificial) lighting are: **duration the light is on** (i.e. minimizing the time lights are on, motion activated), **color temperature** (e.g. 3000K or less), and **lumens**.

These factors are in the [guidelines provided by the International Dark-Sky Association \(IDA\)](#), which we are working with to designate an International Dark Sky Park at the top of the Keweenaw. They have helped us with our lighting guidelines at the Keweenaw Mountain Lodge, our overall [lighting management plan](#), and providing [light management workshops \(dark-sky compliant lighting, outdoor lighting basics\)](#).

The IDA was happy to see the current lighting requirements in the county's zoning ordinance (the 5 clauses). In addition to the 5 clauses, we pay attention to the duration that our lights are on, the color temperature, and lumens. We still are able to provide wayfinding lighting, and provide safety to our guests with our lighting management plan.

If one is interested in the change in the lighting in the Keweenaw peninsula between 2012 and 2021, one can visit: [Light Pollution Map: Keweenaw Peninsula](#)

- **Communication Towers**

It is good to see section 10.12.6 regarding communication towers in the ordinances. That said, it would be good to revisit this section of the ordinance to ensure that there is a balance between **mobile communication coverage, law enforcement / first-responder network**, and the **viewshed that the Keweenaw is known for**.

Thank you for considering reviewing and improving these two topics in the county's zoning ordinances. Please let me know if you have any questions about my comments.

Regards,

John Mueller

--

Keweenaw Mountain Lodge*"A historic wilderness resort at the top of the Keweenaw"*

14252 US Hwy 41
Copper Harbor, Michigan 49918

<https://keweenawmountainlodge.com>