



Nightfall in Glacier

A Journey Through the Dark Skies

Keeping the Park Dark: Facilitating Dark Sky Status in Glacier National Park - WPI

October 11, 2023

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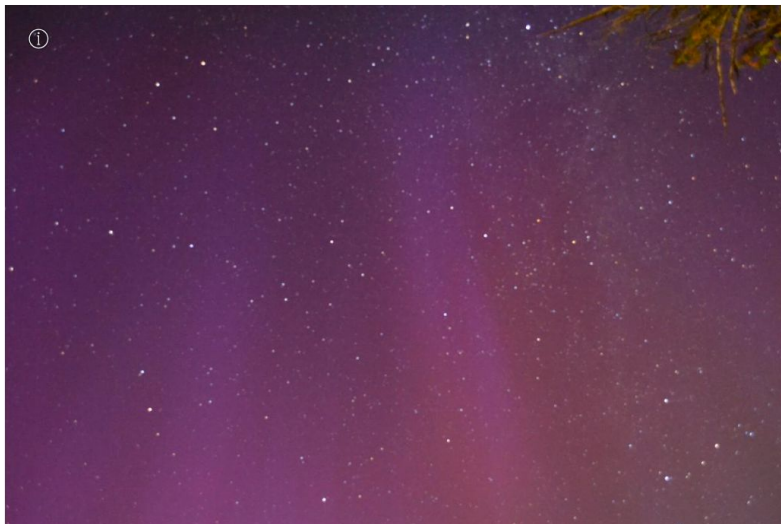
The Importance of Dark Skies

People have long appreciated the allure of the unpolluted sky in Waterton-Glacier International Peace Park. The dark sky is recognized as a cultural and historical resource. Indigenous peoples including the Blackfeet and Kootenai have cherished the dark sky for generations.

"I get this feeling that I'm standing in heaven."

Rising Wolf, a member of the Blackfeet tribe

(Carbaugh, D., & Grimshaw, E., 2021)



The northern lights at Lake McDonald in Glacier National Park

DarkSky International is motivated to uphold the **cultural, spiritual** and **recreational** value of the dark sky. The Association aims to limit light pollution by reducing unnecessary artificial light and by implementing dark sky-friendly lighting around the world.

DarkSky International

DarkSky International, formerly known as the International Dark Sky Association, is dedicated to protecting the night sky through their mission:

"To restore the nighttime environment and protect communities and wildlife from light pollution"(DarkSky International, 2023).



DarkSky International Logo

DarkSky

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International Dark Sky Parks

DarkSky International coordinates the International Dark Sky Park (IDSP) program, which recognizes parks around the world as **exceptional in protecting the night sky**. International Dark Sky Parks are defined as "publicly or privately owned conservation areas that implement good outdoor lighting and provide dark sky programs"(DarkSky International, 2023).



International Dark Sky Park Seal

To become an IDSP, a park must submit an application to DarkSky International and fulfill three core requirements:

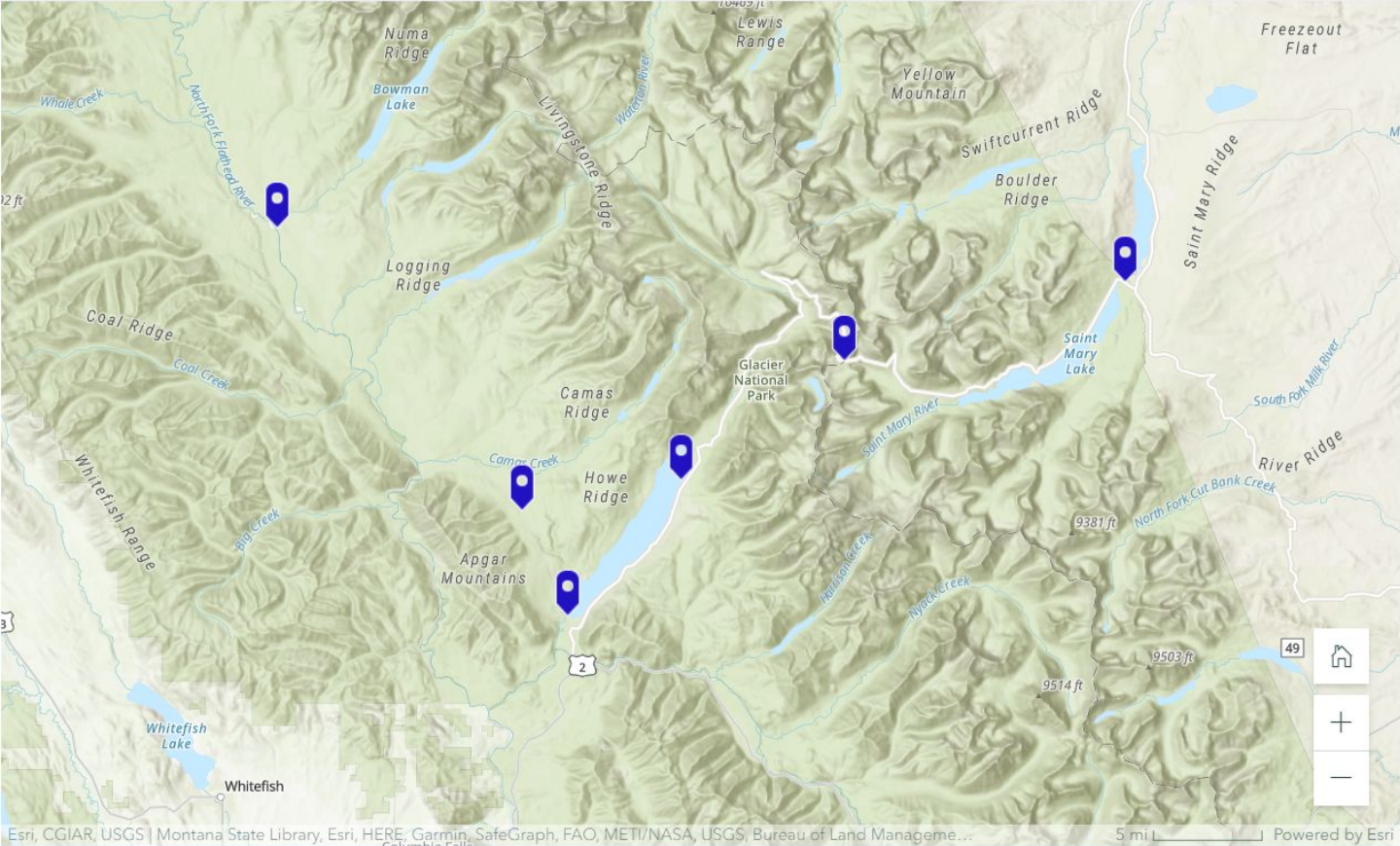
1. **Dark night skies**
2. **Responsible outdoor lighting**
3. **Educational and interpretive programs on the night sky**

After the application is accepted, an annual report is required to track the park's progress regarding the three requirements above. Glacier National Park received provisional International Dark Sky Park status in 2017 and full certification in 2021.

Measuring The Dark Sky



IDSP's "dark night skies" requirement means that Glacier National Park must measure the sky darkness at least once per year to affirm that the night sky is **staying dark or getting darker**. A **Sky Quality Meter with lens (SQM-L)** is a device that measures the darkness of the sky. The device measures sky quality such that the closer the reading is to 22 magnitudes per square arcsecond (mpsas), the darker the sky. To be an IDSP, the Park must have an overall measurement between 21.2 and 22 mpsas.



Apgar Village

The Apgar Visitor Center holds "Half the Park Happens After Dark." A program where volunteer astronomers speak about the Park's dark sky program, IDSP certification, importance of dark night skies, and a deep dive on a specific astronomical topic such as the moon. Then, astronomers guide a dark sky tour.

The Park takes annual sky quality measurements here. This year's (2023) measurement was 21.43 mpsas, an improvement from last year's (2022) measurement of 21.27 mpsas.

Huckleberry Trailhead

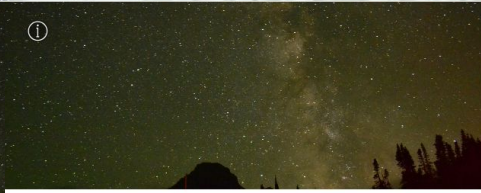
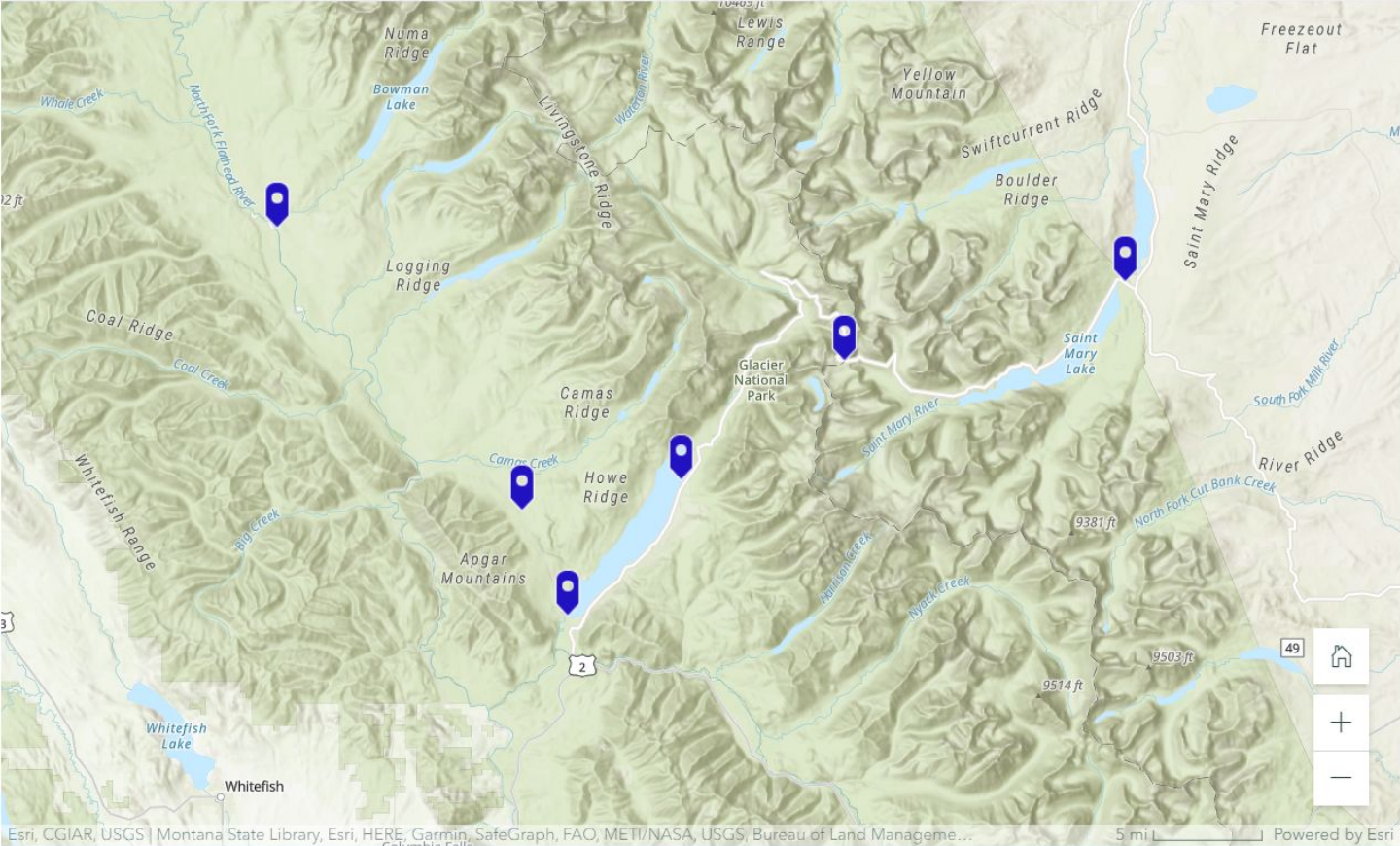
Huckleberry Trail is located between Polebridge and Apgar Village. It is a popular trail that leads to the Huckleberry lookout.

The Park takes annual sky quality measurements here. This year's (2023) measurement was 21.39 mpsas, a slight decrease from last year's (2022) measurement of 21.45 mpsas.

Polebridge

Polebridge is located in the northwest region of the Park. Here you can visit the Polebridge Mercantile.

The Park takes annual sky quality measurements here. This year's (2023) measurement was 21.36 mpsas, a slight decrease from last year's (2022) measurement of 21.39 mpsas.



Lake McDonald Lodge

In the northern part of Lake McDonald lies the Lake McDonald Lodge.

The Park takes annual sky quality measurements here. This year's (2023) measurement was 21.44 mpsas, a decrease from the last (2021) measurement of 21.66 mpsas.

Logan Pass

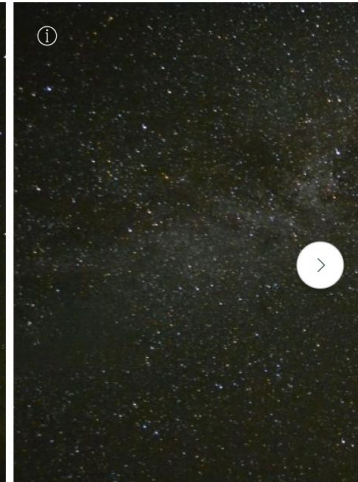
At Logan Pass Star Parties, volunteer astronomers talk about the constellations, planets, and galaxies visible in the dark sky above. Representatives of the Blackfeet tribe tell their Star Stories and astronomers focus telescopes on different planets, stars, and galaxies for viewing.

St. Mary

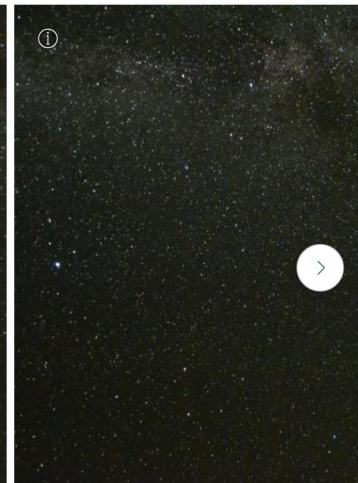
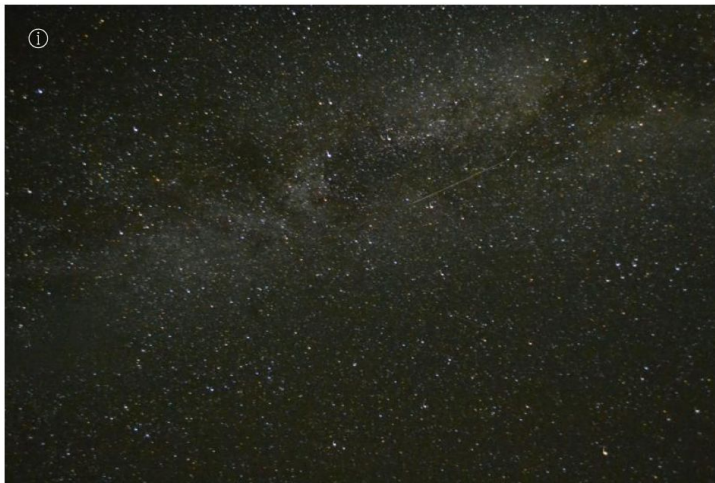
At the St. Mary Visitor Center, you can visit the Dusty Star Observatory and attend the "Half the Park Happens After Dark" program. The St. Mary Visitor Center holds many presentations on astronomical topics such as the Fermi Paradox, Deadly Stars, and Venus.



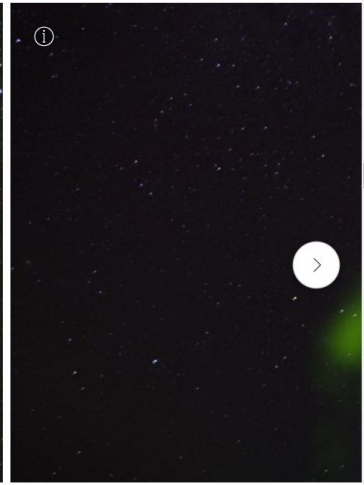
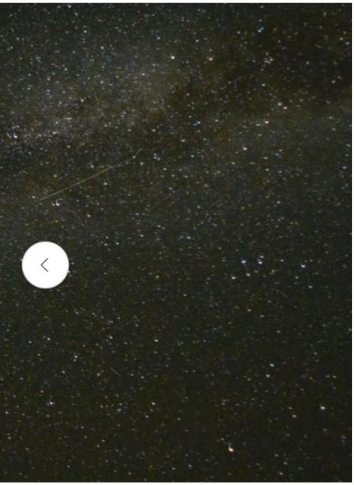
Glacier National Parks Dark Skies



Glacier National Parks Dark Skies



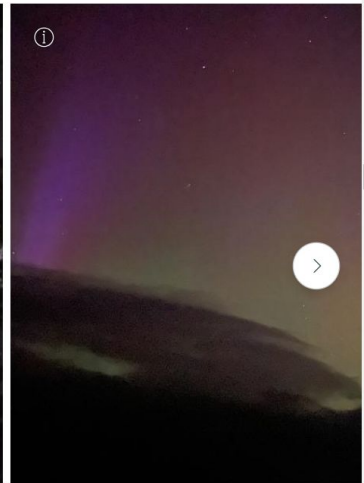
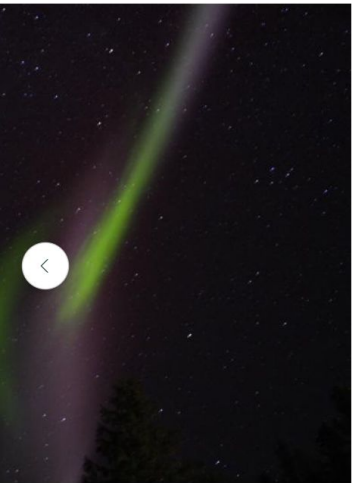
Glacier National Parks Dark Skies



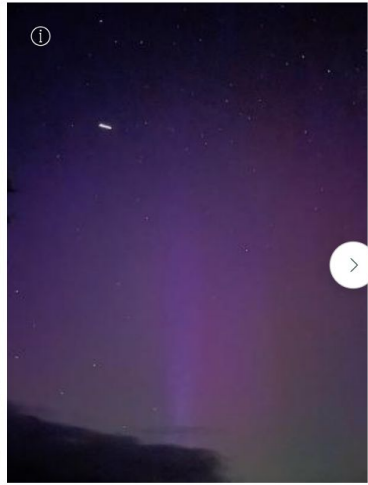
Glacier National Parks Dark Skies



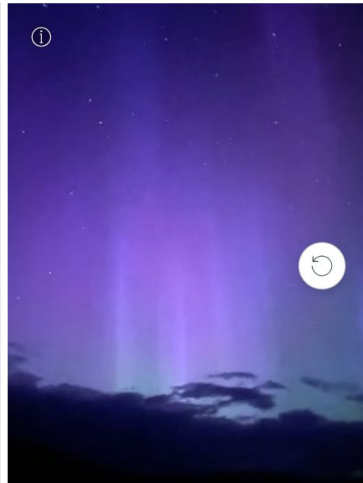
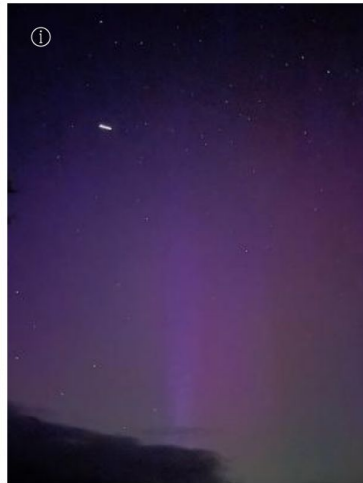
Glacier National Parks Dark Skies



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Light Pollution

Light pollution is defined as the

“brightening of the night sky, mostly over urban areas, due to electric lights of cars, street lamps, offices, factories, outdoor advertising, and buildings” (National Geographic Society, 2022).

Light pollution causes natural sources of light, such as stars, to be drowned out by artificial sources. Aside from obscuring star visibility in the night sky, light pollution negatively affects human health and wildlife behavior.

The circadian clock, or the natural day/night cycle, is disrupted by light pollution. In humans this is linked to many health disorders in humane health life and heltsuch as **obesity, depression, sleep disorders, diabetes, and breast cancer.**

For wildlife, light pollution affects natural behaviors including foraging, migration, reproduction, and communication. Nocturnal animals need darkness to conceal, hunt, reproduce and navigate - all processes light pollution can interfere with.

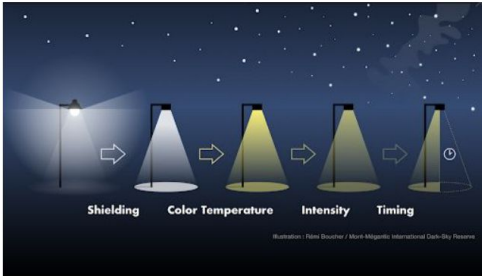


A 2003 electrical blackout in the Northeast of the U.S. affected 55 million people. It also showed us what we're missing in our normally light polluted environments. Credit: Todd Carlson

An image demonstrating the effects of light pollution on the night sky (DarkSky International, 2023)



Dark Sky Compliant Lights



Demonstrating the effects of shielding, the CCT of the bulb, brightness, and the luminaire control (if the light had a timer).

DarkSky International provides guidelines on what makes a light fixture dark sky compliant. DarkSky International requires that fixtures in IDSPs are:

- Fully shielded
- Warm-colored
- On task

A fully shielded fixture prevents light from escaping to the sides or above.

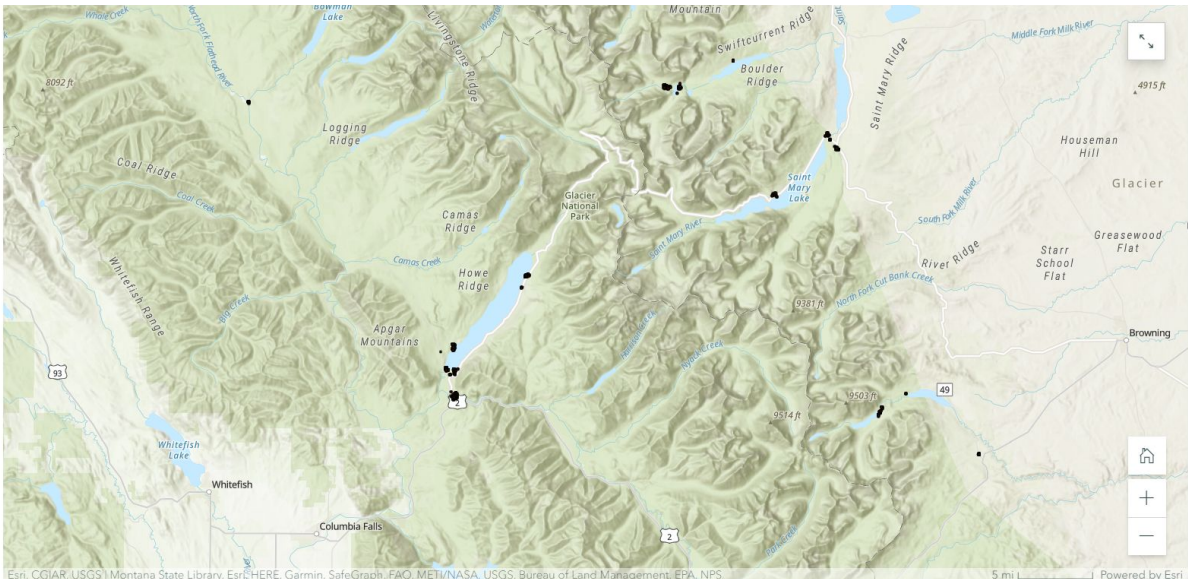
DarkSky International requires light bulbs to have a **correlated color temperature (CCT)** of **less than 3000 Kelvin [K]**, which produces yellow to amber colored light. Glacier National Park is aiming to replace all lights with warmer colored lights that have a CCT of **less than 2700K**.

On Task Lighting

A compliant light must be on task. A light's task describes its **purpose**, such as lighting a roadway, parking area, egress, or pathway. The control of the luminaire is **how a lighting fixture turns on and off**; a switch, motion sensor, timer, or photo sensor. The luminaire control must make sure the light is only on when necessary. Trespass occurs when a light fixture **illuminates an area not essential to its task**.



Below is a map of Glacier National Park's lighting inventory displaying the locations of outdoor light fixtures and their attributes. There is also a link to the **lighting inventory dashboard** where you can see the Park's current compliance. The dashboard is an element of the Park's ArcGIS lighting inventory system. Using different functions in the dashboard, you can filter and analyze the data by specific attributes or by location.



Map of Glacier National Park Outdoor Lights

Importance of Retrofits

Non-compliant lighting causes light pollution, obscuring the view of the Milky Way and other celestial objects. Thus, working towards 100% compliant lighting by replacing and retrofitting lights is fundamental to preserving Glacier National Park's dark sky.



The dark sky at a Logan Pass Star Party



Importance of Electricians

Electricians and facilities workers who replace light bulbs and fixtures are at the **forefront of reversing light pollution** in Glacier National Park.

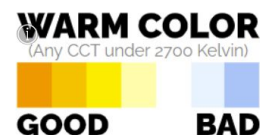
Next time you see an electrician or facilities worker, thank them for their work preserving the night sky!

How Can I Keep the Park Dark?

- **Check your outdoor light fixtures**
 - Is the light fixture necessary?
 - Is the light fixture on only when I need it to be?
 - Is the light fixture fully shielded/directing light only downwards?



- **When changing light bulbs, verify the compliance of the bulb**
 - Is your light shielded, only emitting light downwards?
 - Does this light have a warm amber to yellow color (CCT of 2700K or less)?



- **Going backpacking? Take an SQM and measure the dark sky!**
 - Check out the "Dark Sky Watch" program



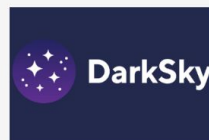
Want to Know More?

See these resources!

DarkSky International

DarkSky International restores the nighttime environment and protects communities from the harmful effects of light pollution...

<https://darksky.org>



Partners - Glacier National Park (U.S. National Park Ser...

Glacier National Park Volunteer Associates non-profit partner with no paid staff. Their mission is "to bring together people interested in th...

<https://www.nps.gov>



Night Sky - Glacier National Park (U.S. National Park S...

Dark night skies are environments undisturbed by light and air pollution. Dark night skies have natural, cultural, and scenic...

<https://www.nps.gov>



Night Skies - (U.S. National Park Service)

The night sky has inspired us for generations. Nighttime views and environments are among the critical park features the National Park...

<https://www.nps.gov>



Unihedron

The Unihedron CapSelector provides an inexpensive way to tune a VLF loop over a wide range (120 - 5510 pF) of capacitances. It...

<http://www.unihedron.com>



Light Pollution - National Geographic Society

People all over the world are living under the nighttime glow of artificial light, and it is causing big problems for humans, wildlife, a...

<https://education.nationalgeographic.org>



Acknowledgements

- **Glacier Institute**
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Photography Credits

Dark Sky Photos - Matthew Catuccio

Dark Sky Photos - James Kiefer

Dark Sky Photos - Jonathan Wessler

Apgar Northern Lights Timelapse - Jeffrey Whelehon
(Instagram: jeffrey_wheels)

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