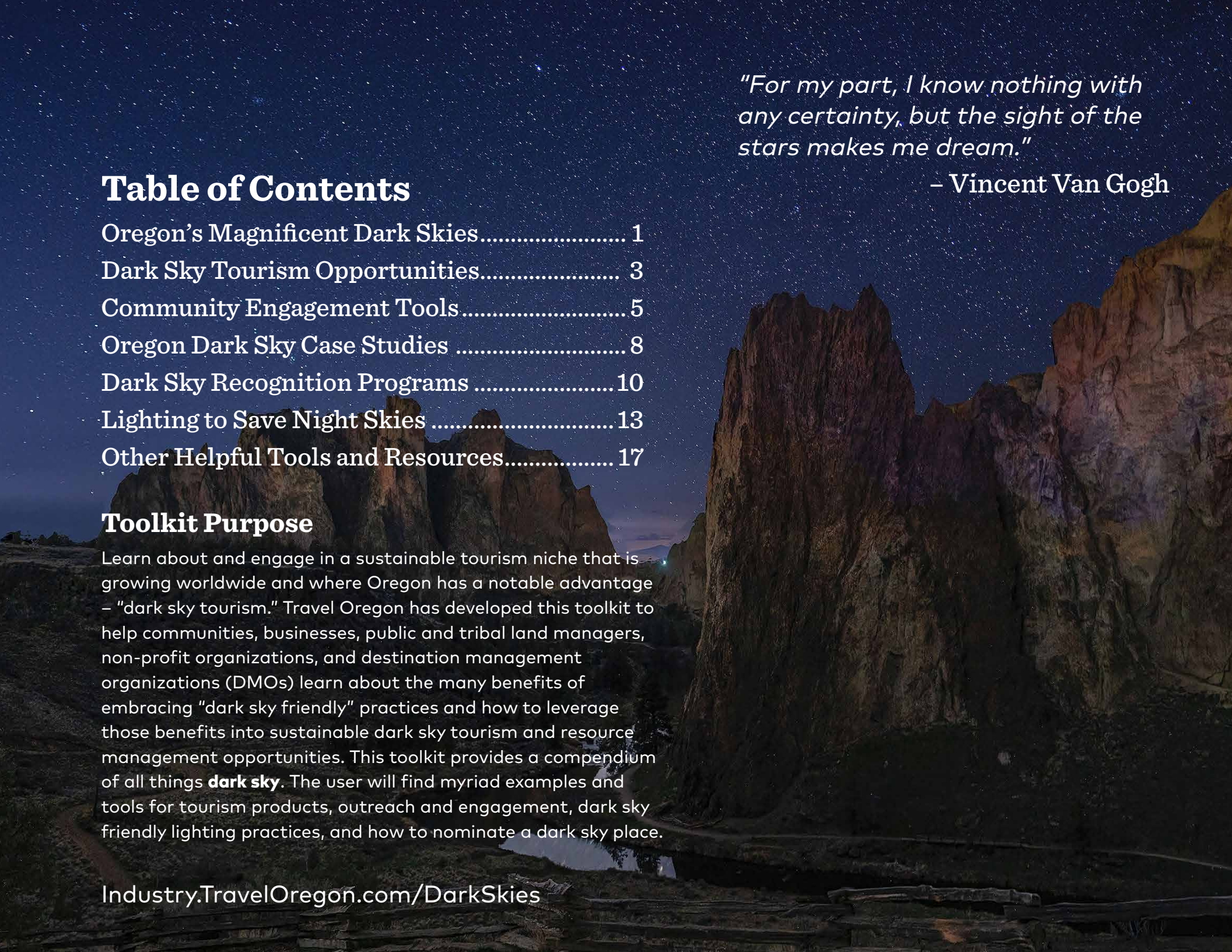




# OREGON Dark Sky TOURISM TOOLKIT

A night sky filled with stars, with a dark, rocky landscape in the foreground. The sky is a deep blue, and the stars are scattered across it. The landscape is dark and rugged, with some rocks and a small stream visible in the lower part of the image.

*"For my part, I know nothing with any certainty, but the sight of the stars makes me dream."*

– Vincent Van Gogh

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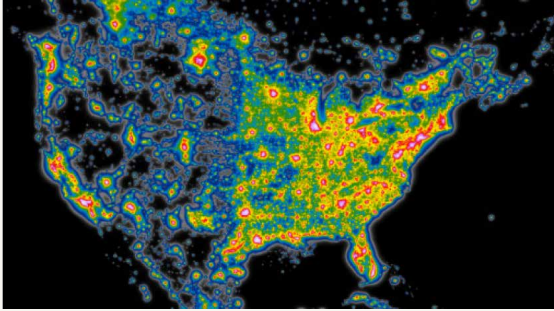
## Toolkit Purpose

Learn about and engage in a sustainable tourism niche that is growing worldwide and where Oregon has a notable advantage – "dark sky tourism." Travel Oregon has developed this toolkit to help communities, businesses, public and tribal land managers, non-profit organizations, and destination management organizations (DMOs) learn about the many benefits of embracing "dark sky friendly" practices and how to leverage those benefits into sustainable dark sky tourism and resource management opportunities. This toolkit provides a compendium of all things **dark sky**. The user will find myriad examples and tools for tourism products, outreach and engagement, dark sky friendly lighting practices, and how to nominate a dark sky place.

[Industry.TravelOregon.com/DarkSkies](https://Industry.TravelOregon.com/DarkSkies)

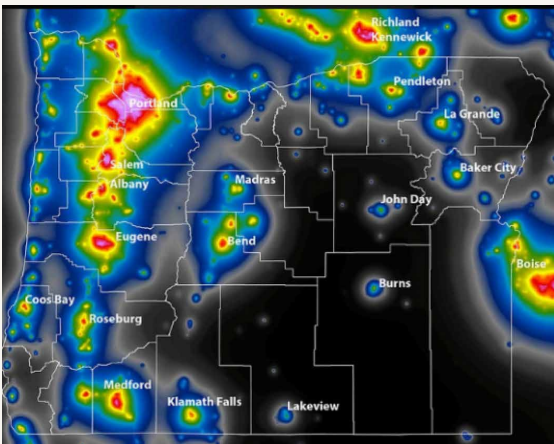
# 1. Oregon's Magnificent Dark Skies

## WHAT MAKES OREGON'S NIGHT SKIES SPECIAL?



Celebrating, protecting and visiting “dark sky” areas is a growing worldwide phenomenon – and that’s great news, because since the invention of electric streetlights and the use of artificial light at night (ALAN), we are losing the natural darkness of night literally at the

speed of light. In fact, it’s estimated that 80% of Americans and nearly 33% of all humanity can no longer see the Milky Way from home. Above us we have a vastly unlimited natural resource that has renewed itself on a daily basis for 4.5 billion years, yet the growing menace of light pollution, generated by often unnecessary or poorly designed ALAN, has turned the night and its starry companions into a scarce resource.



Unlike states east of the Mississippi River and our neighbors to the north and south, Oregon is fortunate to have an abundance of dark skies. In fact, much of Eastern Oregon comprises the majority of the largest and most pristine dark sky zone in the contiguous United States.

**Astrotourism** – Tourism that focuses on sky-related tourist activities, such as stargazing, astrophotography, chasing eclipses and auroras, and visiting facilities related to astronomy, like observatories and planetariums.

**Dark sky tourism** – Tourism that includes astrotourism and other special night-time activities, including moon-bathing, nocturnal creature guided tours, indigenous and cowboy storytelling, night sky inspired artistic events, and more.

## CELEBRATING AND PROTECTING DARK SKIES

Amateur astronomers have long gathered to celebrate Oregon’s magnificent skies. Founded in 1987, the annual **Oregon Star Party** (OSP), attracts up to 1,000 stargazers to the Ochoco National Forest 45 miles east of Prineville. OSP is considered to have the darkest skies of any major star party in the contiguous United States. Oregon astronomy and astrophotography enthusiasts have hailed the “Outback” of southeastern Oregon as the darkest skies they’ve ever observed and skies that set a new standard for what they once thought of as a dark sky.

Locations all over the world are celebrating and protecting their dark skies by nominating places under the International Dark-Sky Association’s (IDA) **International Dark Sky Places Program (IDSP)**. IDA is a non-profit organization recognized as an authority on light pollution, and it is the leading organization combating light pollution worldwide. At the time of this toolkit publication, IDA has certified **197** IDSPs worldwide. The number of nomination applications for dark sky place certifications is nearly doubling each year as dark sky awareness spreads and these places realize the economic benefit from sustainable **astrotourism**.

Since 2020, dark sky places have been nominated in Oregon with two locations in Central Oregon certified to date, with more nominations underway across the state.

## HOW DARK ARE OREGON'S SKIES?

There are many ways to measure the darkness of the night sky – from NASA satellites, to expensive all-sky land-based cameras, to stationery and hand-held sky quality meters (SQMs), to smart phone apps. However, there is a long-standing, equipment-free method for assessing night sky brightness known as the Bortle Dark-Sky Scale. First published by John Bortle in 2001, the Bortle Scale is based on a numerical scale of 1-9 and uses several visual observation criteria at a given location (e.g., visibility of certain deep space objects, details of the Milky Way band, and naked-eye limiting magnitude (NELM), the dimmest star magnitude seen without optical aids). The colors in the composite **Bortle Class** graphic are aimed to correspond with the colors shown in the **World Atlas of Artificial Night Sky Brightness** (Falchi et al, 2016) maps.

Map color code	Label	Sky Mag.	Naked Eye Limit Mag.	320mm Limit Mag.	M33 visible?	M31 visible?	Central Galaxy visible?	Zodiacal light visible?	Light Pollution	Clouds	Ground Objects
1	Excellent Dark Sky	22.00–21.99	≥7.6–8.0	>17	obvious	•	cast shadows	striking	airglow apparent	•	visible only as silhouettes
2	Average Dark Sky	21.99–21.89	7.0–7.49	16.5	easy with direct vision	•	appears highly structured	bright, faint yellow color	airglow faint	dark everywhere	large near objects vague
3	Rural Sky	21.89–21.69	6.5–6.99	16.0	easy with averted vision	•	complex structure	obvious	LP on horizon	dark overhead	large distant objects vague
4	Rural/Suburban Transition	21.69–20.49	6.0–6.49	15.5	difficult with averted vision	obvious	only large structures	halfway to zenith	low LP	lit in distance	distant large objects distinct
5	Suburban	20.49–19.50	5.5–5.99	14.5–15.0	•	easy with direct vision	washed out	faint	encircling LP	brighter than sky	•
6	Bright Suburban	19.50–18.94	5.0–5.49	14.0–15.0	•	easy with averted vision	visible only near zenith	•	LP to 35°	fairly bright	small close objects distinct
7	Suburban/Suburban Transition	18.94–18.38	4.5–4.99	14.0	•	difficult with averted vision	invisible	•	LP to zenith	brilliantly lit	•
8	City Sky	< 18.38	4.0–4.49	13	•	•	•	•	bright to 35°	•	headlines legible
9	Inner City Sky	•	≤ 4.0	•	•	•	•	•	bright at zenith	•	•

When the Bortle Scale was developed more than 20 years ago, an inner city Bortle Class of 9 was matched with a NELM of less than 4. Today, many large cities in the U.S. and elsewhere are limited to seeing stars with a NELM of 2 or less, which is fewer stars. That's because light pollution is now growing at twice the rate of population growth. For comparative reference, Portlanders living approximately 4 miles from downtown can see stars with a NELM of about 4.5 (about 200 stars). Without the adoption of better lighting practices, current trends could lead to stars being counted by the handful in Oregon's largest cities.

In comparison, people in remote areas of Eastern Oregon, an area relatively free from light pollution, can see celestial objects as well as their eyesight allows (on average about 4,500 stars at one time). It's so dark in some of these remote areas that the core region of our galaxy (Sagittarius) and nearby Scorpio cast a shadow on the ground.

Use this interactive [map](http://lightpollutionmap.info) to find the night sky quality and brightness trends at any location throughout the world. (The map is generated by a variety of satellite data overlays. By using some of the built-in tools, you can see the aerial layer under the light pollution data layer and reveal light sources). [lightpollutionmap.info](http://lightpollutionmap.info).

## WHAT IS LIGHT POLLUTION?

The IDA defines light pollution as “the inappropriate or excessive use of artificial light.” The use of ALAN has allowed modern society a 24/7 lifestyle that is likely here to stay. Even so, there are ways to design and apply ALAN to meet society's needs while also avoiding or minimizing the serious environmental consequences of light pollution for humans, wildlife and climate. Addressing outdoor light pollution can be as simple as using light appropriately – that is, only **where, when, and no brighter than is needed**. Outdoor lighting is often inefficient, overly bright, poorly targeted, improperly shielded, and, in many cases, completely unnecessary. This light, and the electricity used to create it, is wasted when light spills into the sky rather than focuses on actual objects and areas that people need illuminated. Even the darkest of Oregon's skies can be threatened by light traveling from areas with higher levels of light pollution like Boise, Idaho or Bend.

The zodiacal light – interplanetary dust as seen from the very dark skies of the Oregon Outback. (Recognized by the triangular beams of light before sunrise and found early spring and fall).



## 2. Dark Sky Tourism Opportunities

### DARK SKY TOURISM IS SUSTAINABLE TOURISM

Sustainable travel is a form of travel that aims to sustain or enhance the geographical character of a place — its environment, culture, aesthetics, heritage and the well-being of residents. Dark sky tourism checks all the sustainability boxes. It even disperses visitors geographically, seasonally, and over the course of a day. The positive environmental, cultural, and economic effects of dark sky tourism most often extend well beyond a given site. Dark sky tourism may even provide opportunities for regenerative tourism – that is, visitors may have a positive impact on a destination, eventually leaving it in a better condition than they found it.



Even in circumstances where businesses, communities and public and tribal land managers engage in dark sky friendly practices solely for environmental, energy cost savings, aesthetics, and/or cultural reasons, such actions are likely to organically lead to dark sky tourism. With dark skies becoming less commonplace in Oregon and most certainly less common elsewhere, any place sustaining or enhancing its nocturnal environment is bound to get noticed. Destinations that intentionally set out to establish dark sky tourism through their dark sky stewardship practices are practically assured success, especially if they partner with their local or regional DMO.

Travel Oregon encourages these three guiding principles for all forms of sustainable tourism. Learn more about sustainable travel in Oregon [here](#).

**PREPARE BEFORE YOU GO:** Make an informed plan, pack everything you need and check conditions before leaving.

**CARE WHILE YOU'RE THERE:** Be mindful of your surroundings, Leave No Trace and make wildfire prevention a priority.

**CONNECT WITH PEOPLE AND PLACES:** Take your time to learn, be welcoming and respectful, show your appreciation.

Sustainable dark sky tourism opportunities abound for tour guides, ranchers, RV park or short-term rental hosts, innkeepers, resort owners, outdoor gear and stargazing equipment stores, restaurants, small and mid-size communities, and land managers.

### TYPES OF DARK SKY TOURISM DESTINATIONS

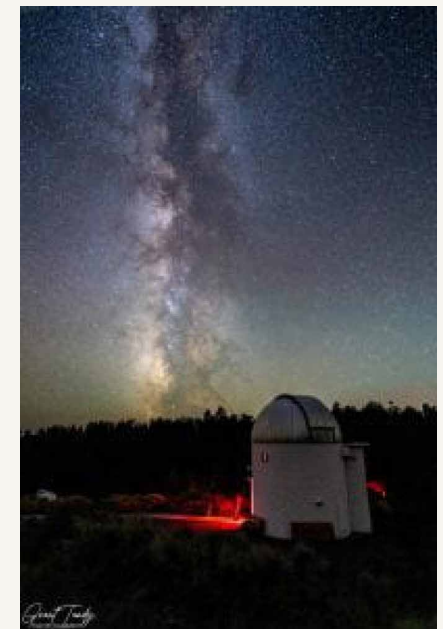
Dark sky tourism destinations in Oregon include: planetariums, observatories, Crater Lake National Park, national monuments, state parks, and IDA certified dark sky places. Destinations can also include communities, public lands and private resorts.

**Planetariums:** Kendall Planetarium at OMSI (Portland), Chemeketa Community College Planetarium (Hayesville), Eugene Science Center Planetarium, Mt. Hood Community College Planetarium Sky Theater (Gresham)

**Public Observatories:** Pine Mt. Observatory (La Pine), Oregon Observatory (Sunriver), Haggart Observatory (Clackamas), Worthy Hopservatory (Bend), and the soon to open Carlton Observatory (Carlton).

**IDA Certified Dark Sky Places:** Prineville Reservoir State Park (Dark Sky Park), Sunriver Resort (Development of Distinction)

**Space-Themed Attractions/Museums:** Evergreen Aviation and Space Museum (McMinnville), OMSI (Portland), and [Eugene Solar System Trail](#) where you can bike, run, walk, or skate along a 4.5-mile section (9 miles round trip) of paved path along the Willamette River discovering a scaled model of the sun and planets. Then you can visit Earth's closest star, Proxima Centauri, and its exoplanet, Proxima b, located at the Eugene Science Center. (These types



of scaled celestial models are catching on around the country and are a clever tourist attraction that any community might consider).

Destinations for reliable stargazing have night skies rated at Bortle 1-4 with frequently clear skies at high elevations with broad horizons. Destinations may include parks and other public land with nighttime programming, lodges, hotels, inns, RV parks, wineries, resorts and communities with dark sky friendly lighting. Oregon provides an abundance of reliable stargazing opportunities. After all, Oregon’s wet season typically occurs only from November through March and two-thirds of the state is relatively dry, classified as semi-arid, with large areas receiving no more than 12 inches of precipitation a year. Unlike other states with typical summer storms, July and August are usually dry months



across the state. It should be noted that in Oregon, like other western states, summers also mean wildfire season – which can start as early as July and last until late September. Depending on severity, smoke can impede clarity of Oregon’s darkest night skies.

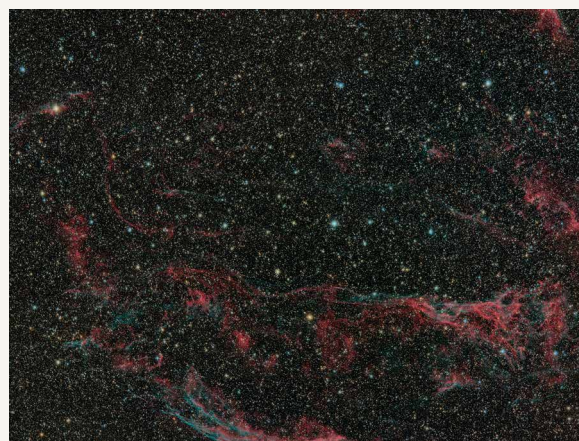
Destinations for dark sky

tourism more focused on nocturnal wildlife are generally found in wildlife refuges, public lands, nature centers, rural areas, and those places that include nighttime educational programming (e.g., Portland Audubon Nature Center).

## DARK SKY TOURISM PRODUCT TYPES

Other than planetariums, observatories and dark sky friendly lighting, there is little infrastructure necessary to support dark sky tourism. Equipment like telescopes and binoculars are often available to rent from libraries and outdoor gear stores. Local astronomy clubs and the Oregon Wildlife Society are great sources for finding professional and amateur astronomers and naturalists. Maps and guides of destinations/tours can be printed or made available online. Guided skiing, hiking and boating tours by day can often extend into the night with little more than charting a safe course and providing clients with glow sticks.

Product Types	Description/Examples
Star Parties	Usually held the 10 days of each month that the moon is below the horizon most of the night. Parties can be hosted at properties normally closed in the evenings like wineries, museums, wildlife refuges, and even downtowns. Sidewalk star parties can be held anywhere because the moon, Jupiter, and Saturn through a telescope can still create a spectacle.
Guided Tours	Full moon paddles, full moon nature walks, bat walks, owl walks, x-c skiing night tours, hiking night tours, nighttime garden tours ( <i>note: many flowers are most fragrant at night</i> ), night photography tours/instruction.
Astrophotography & Other Night Sky Photography	Astrophotography is an increasingly popular hobby and profession – from deep space imagery to nightscapes highlighting the Milky Way. Advanced nighttime cameras are making nighttime wildlife photography more popular as well.
Storytelling	Places promoting overnight stays can include nighttime storytelling to their portfolio of activities. Oregon has a rich history in cowboy poetry, ghost stories, and indigenous star lore stories.
Festivals	Solstice celebrations, comet celebrations, solar and lunar eclipse gatherings ( <i>note: there will be an annular eclipse through Oregon on October 14, 2023</i> ), new moon and full moon gatherings, migratory bird festivals (e.g., Harney County).



This photograph was taken from the pristine skies of Diamond, Oregon in Harney County. It’s the Veil Nebula, a cloud of heated and ionized gas in the constellation of Cygnus, or The Swan. It’s a remnant of an exploded star – aka supernova.

### 3. Community Engagement Tools

Like all sustainable tourism, dark sky tourism benefits increase when community-based networks are established and maintained. This not only increases tourism benefits, but also assures that any potential negative impacts from tourism are promptly addressed, minimized or avoided entirely. Whether a business, community, organization, or public land is just beginning to consider incorporating dark sky themes into their endeavors or if plans are ripe for pursuing a dark sky place nomination, it's important to build and maintain alliances, and outreach is an essential engagement tool.

Community participation in tourism helps to uphold the local culture, tradition, and Indigenous knowledge of the local people. It also helps in conservation of the environment and culture of the local community.

#### BUILDING AND MAINTAINING ALLIANCES

Until recently, Oregon was the state with the highest rate of **volunteerism in the U.S.** Even though we are now in third place (43.2%), it shows that our residents are largely vested in the betterment of our communities and landscapes. We do a great job of forming coalitions, alliances and networks to work together towards common goals. Regardless of where a dark sky initiative starts – whether by the outdoor recreation community, a local business, an environmental advocate, or a town councilor – it is ideal to build a partnership around the initiative and to hone in on a clear vision.

With 53% of Oregon owned by the federal government, with 92% of that total managed by the U.S. Forest Service (USFS), there are clearly dark sky tourism opportunities in Oregon beyond state parks. Be sure to consider lands beyond your project site when forming your partnership. The table below provides some suggestions of what types of stakeholders to consider when forging a dark sky partnership.

*“The ability for the Forest Service to work on a project often ends at the borders of the Forest, but the impact goes beyond that. For a gateway community, recreation on the forest has a huge impact in town--at hotels, businesses, restaurants, guides/outfitters, etc. At the end of the day, people who recreate on the forest might want to go back to the community for a beer, see a show, stay in a hotel, etc. Our eyes are open to more public-public and public-private partnerships.” – Toby Bloom, National Program Manager of Travel and Tourism & Interpretation, USFS*

Stakeholder Types	Stakeholder Entities
Local Officials/ Agencies	Town councilors, mayors, county commissioners, Metro commissioners, city managers, planning and development departments
State Agencies	Oregon Tourism Commission (dba Travel Oregon), Department of Energy, Business Development, Economic and Community Development Department, State Office of Outdoor Recreation, Governor’s Office
Public Land Management Agencies	Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, National Park Service, USDA Agricultural Research Service, Department of Forestry, Division of State Lands, Oregon Parks and Recreation Department, Department of Fish and Wildlife, county and municipal parks
Tribal Nations	Chiefs, chairpersons, tribal council members, department heads
Businesses and Business Proponents	Destination management organizations, chambers of commerce, entrepreneurship groups/business incubators, outdoor retail businesses, outdoor guides, other businesses (e.g., campgrounds, ranches, restaurants, breweries, artists, hotels/lodges)
Non-profits	Astronomical League astronomy clubs, local observatories, OMSI Kendall Planetarium, local land trusts, conservancies, conservation non-profits (incl. Bat Conservation International, Audubon chapters, IDA Oregon), outdoor recreation advocacy groups, regional alliance organizations, rotary clubs
Education Providers	Libraries, historical commissions, museums, State University Cooperative Extension, community colleges, high schools
Others	Other Oregon astronomy clubs, media outlets, lighting designers, philanthropies and foundations, private landowners

Once a broad partnership and clear vision are developed, the next step in the engagement process is to create a steering committee. Best practices suggest that initially these committees are small and focused, and comprised of committed members that broadly represent the stakeholder partnership and include well-connected, go-getting, reliable individuals. It’s also advantageous to identify a lead person or entity. Such committees should only expand as momentum and interest grows.

It’s through outreach efforts, as described below, that a partnership grows and becomes clearer in vision. Feedback from outreach efforts often leads to practical vision refinements and course corrections. Continued outreach efforts and feedback loops also help to sustain a partnership and the vision by increasing the recruitment pool of helpers necessary to carry the vision to fruition. As with

most projects, the longer the duration, the more likely the occurrence of member turnover. If the vision is nominating an International Dark Sky Place, the work isn't over after certification. The certification requires annual outreach, sky quality measurements and reporting to keep the certification valid. Likewise, if the vision is adopting an outdoor lighting ordinance, people will be needed to carry on outreach so that the ordinance is voluntarily enforced. Broad partnerships are needed for all types of dark sky initiatives. One or two champions of an IDSP nomination or an ordinance does not ensure a sustainable project.

## HOW CAN DMOS WORK WITH COMMUNITIES TO HELP DEVELOP AND PROMOTE SUSTAINABLE DARK SKY TOURISM?

The value of working with your local or regional DMO can't be overstated. Since dark sky stewardship efforts organically lead to dark sky tourism, what better

assistance can a partnership find than from that of an organization with expertise in developing and promoting sustainable destination tourism? Invite your local and/or regional DMO into your partnership at the start. A DMO can help you with grants to provide funds for branding your partnership, for setting up a website, and supporting an outreach program. A DMO is well networked and can help you with forging an alliance, product messaging, conducting community workshops and promotion.



## OUTREACH PROGRAM EXAMPLES

When conducting outreach, consider these messaging tips and consult the Outreach Table on the following page for examples of outreach activities to consider when building your outreach plan.

### Outreach Messaging Tips

1. Always state in positive terms the advantages of a new technology lighting and the cost/energy savings.
2. Focus on “dark sky preservation” versus “light pollution.”
3. Speak in terms of a community’s dark sky “legacy” and “heritage” and the many reasons to “celebrate and protect” dark skies.
4. Instill positivism in all messaging and impart a “can do” attitude.

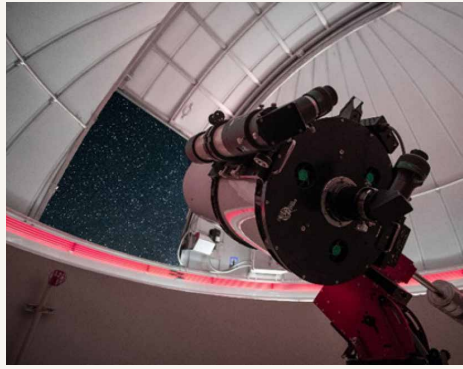




Outreach Activities	Description
Media coverage	Align with a local media outlet (e.g., newspapers, bloggers, television, radio) to help inform a community about your dark sky activities. This can be the start of a public outreach/education campaign.
Social media	Tapping into any town or regional Facebook group page or creating a new page helps solicit public support and builds awareness about dark skies at the earliest stages. It creates a positive public image for the dark sky group. Once your partnership is well-established, develop a website.
Community roundtables & workshops	These venues bring stakeholders to the table to learn more about your dark skies, your project, and to provide open discussion and feedback.
Dark sky friendly lighting tours	Host local business and political leaders, as well as public land managers, on a simple nighttime tour down any street or around any public facility to discuss and demonstrate IDA's five outdoor lighting principles and how they might be applied to improve lighting installations visited during the tour. Go <a href="#">here</a> for a simple handout sheet on dark sky friendly lighting.
Contests for photography, art, globe at night participation	Create contests for night sky photography, fine art, and participation in the <a href="#">Globe at Night</a> Program. These contests engage the community in celebrating the inspiration of the night sky. These contests can include the award of binoculars, small cash gift card, or something similar. The publicity alone that is associated with the contest is a form of outreach. These contests can include local schools as well.
Library outreach ideas	Libraries have become integral community spaces, especially in rural areas. They are not only wonderful places to borrow dark sky educational materials, hear a dark sky presentation, but they can help sponsor a larger dark sky outreach program, like a star party or movie screening. The libraries of Harney, Lake, and Malheur County and the City of Willamina have <i>Night Sky Adventure Kits</i> (or <i>Citizen Science: Measuring the Night Kits</i> ) available for loan. Some Oregon libraries even loan out telescopes and binoculars. Libraries are practical partners when doing educational outreach. The Friends of The Owyhee in Malheur County have teamed up with other county libraries to host a Star-gazing Webinar Series. Other libraries have partnered with astronomy clubs for star parties.
Dark sky themed film screenings with expert panel	There are several excellent videos about dark skies that both inspire and educate. <a href="#">Saving the Dark</a> by Sriram Murali is a one-hour film feature and the best among them. Sriram will soon be releasing another dark sky film. This film, available over YouTube, can be shown at eco-film festivals, libraries, local non-profit movie theaters, out on a public lawn under the stars during the summer, or virtually at a movie watch party over the Internet. Having a few dark sky advocates on a panel after the screening provides for further outreach and community dialogue.
Live and virtual star parties	Star parties are public outreach events enjoyed by folks of all ages. For some, seeing Saturn through a telescope for the first time is an awe-inspiring experience. Talk to a nearby astronomy club to seek volunteers for such as event. Set up a dark sky table in advance while waiting for night to fall. Not everyone can get out to a star party, but thanks to modern technology, the star party can come to everyone virtually. Here is an example of a star party seen by over 1,000 people on a <a href="#">Facebook Live/Zoom</a> event organized and curated by Dawn Nilson on behalf of the Basin and Range Dark Sky Cooperative. Such parties can be inter-regional and inter-state.
Dark sky tabling	Seek opportunities to do dark sky outreach by setting up an informational table or posters at school science fairs, community festivals, farmer's markets, star parties, and other venues where people gather. Informational brochures and postcards are available from IDA <a href="#">here</a> . Other materials to display might include fixtures approved through IDA's <a href="#">FSA</a> program.
Educational online videos	The pandemic has shown us how to do outreach virtually. An effective outreach tool is recording a video or hosting a live educational dark sky webinar and then making it available on a YouTube channel for subsequent viewing. Find an example <a href="#">here</a> .
Winter and summer solstice festivals	Solstice festivals afford an excellent opportunity to gather a community together in celebration of the mechanisms of the solar system. An astronomy club in Longview, Washington has partnered with others to create an annual, engaging festival that is enjoyed by the community. Contact Friends of Galileo Astronomy Club and learn more about the festival <a href="#">here</a> .
Dark sky themed art and literature	A starry sky is inspiring. Consider working with a community center, art gallery, music society, or poetry society to showcase an exhibit or event focused on dark sky art in all its forms.
The sky is the limit	Remember, when it comes to promoting dark skies, "the sky is the limit." Use your imagination.

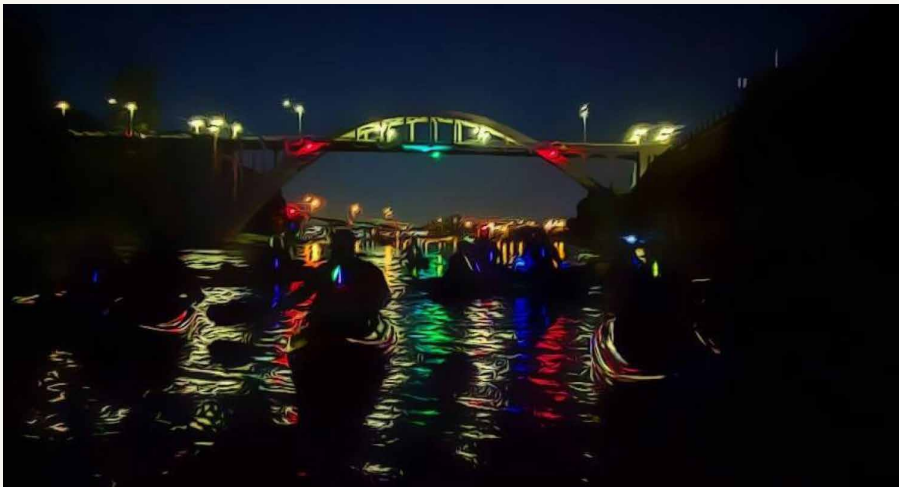
## 4. Oregon Dark Sky Case Studies

Below are several case studies that showcase opportunities to expand traditional tourism activities into the night or into those times of the year normally considered “off-season,” and/or focus on the importance of strategic partnerships and alliances, outreach programming and events, outdoor lighting ordinances, and the role of destination management organizations in making dark sky tourism successful.



### OREGON DARK SKY BUSINESS VENTURES

Given its proximity and semi-arid climate, Central Oregon has long been the outdoor recreational playground for visitors and residents seeking clear and dark skies. In the Bend area one can find two public observatories at very dark sky locations, community ordinances addressing dark sky friendly outdoor lighting, dark sky festivals, programs, guided nighttime cross country skiing, hiking, and boating tours, and even the “Hopservatory” at Worthy Brewery where visitors can pair their craft brews with a view of the stars.



A very dark sky is unnecessary to lure people to experience some of a night’s natural marvels – including a full moon. For example, eNRG Kayaking of Oregon City is a kayak school and touring company that leads full moon paddle tours near Willamette Falls just south of Portland. They also host evening concerts at Willamette Falls accessible to paddlers. Unlike some paddling outfitters in other states, eNRG aims for a small footprint and doesn’t illuminate boats by installing bright, white harmful LED lights directed into the water or sky. They encourage people not to use bright lights on the water and to instead safely enjoy the night illuminated by the moon. Everyone in the tour party is equipped with glow sticks for visibility.



Willamette Valley wineries like Chehalem, Stoller and Anne Amie appreciate the value-added opportunities of dark sky tourism. In partnership with OMSI and volunteers from Rose City Astronomers (RCA), an annual, sold-out star party occurs at one of the wine region’s many vineyards. The wineries attract potential new clients, make profitable use of their rural properties, and OMSI and Oregon’s largest astronomy club (the second largest in the nation) attend to their public outreach goals. OMSI doesn’t discriminate among beverages, microbreweries like Ecliptic Brewery of Portland also partner with OMSI and RCA to host star parties.

### DARK SKY PROMOTION AT OREGON RESORTS

Large resorts, such as Sunriver, Black Butte Ranch, and the soon to reopen Kahneeta Resort in Central Oregon, as well as moderate-size resorts like Silvies Ranch in Eastern Oregon and Summer Lake Hot Springs in Southern Oregon have done well by providing tourists comfortable accommodations that also provide an onsite nature experience. Keeping things as natural as possible, some degree of dark sky lighting practices are followed at these resorts to provide guests onsite stargazing opportunities as one of many site amenities. Smaller resorts, like Lake Simtustus Resort near Madras are also incorporating dark sky friendly lighting into their business model to capture the added value of dark sky tourism.

## CITIES HIGHLIGHTING DARK SKY TOURISM

Coastal towns, such as Cannon Beach, Manzanita, Yachats and Bandon have long attracted tourists lured by the charms of a quaint community focused on protecting and highlighting its natural amenities. Consistent with city codes that maintain an aesthetic and progressive community character, these cities also have outdoor lighting codes that address light pollution. They afford protections that other communities throughout the state have yet to adopt. Seaside, a developed coastal town, provides a fine example of adopting an outdoor lighting code that diminishes the effect of skyglow encroachment into surrounding areas of the coast. Dark sky ordinances are a proactive way for communities and counties to protect the night sky in and near their locales, and with those protections comes an opportunity to promote dark sky tourism.

## DARK SKY TOURISM AT PARKS AND MONUMENTS

Astronomical and wildlife nighttime programming at places like Prineville Reservoir, L.L. Stubb Stewart, Silver Falls State Parks, Oregon Caves National Monument, Newberry Crater and John Day Fossil Beds National Monuments benefit not only the parks and monuments themselves but the gateway communities near these public lands. Education regarding night sky amenities contributes to dark sky stewardship and promotes economic opportunities from dark sky tourism.

## OREGON OUTBACK DARK SKY SANCTUARY NOMINATION

Dark sky advocates, regional DMOs including Travel Southern Oregon and Eastern Oregon Visitors Association, community businesses and chambers of commerce, community officials, and tribal, federal, and state land managers have come together to form the Oregon Outback Dark Sky Network (ODSN). The ODSN is a voluntary grassroots initiative to build an alliance supporting a set of shared principles resulting in mutual community benefits and the long-term conservation of a starry night heritage in the Outback. The ultimate goal of the ODSN is to celebrate and protect the pristine skies of the Outback by nominating 11.4 million acres of mostly public land (85%) in Lake, Harney and Malheur counties as the world's largest International Dark Sky Sanctuary and the world's largest International Dark Sky Place of any kind.

The project currently involves more than 20 signatories of a Memorandum of Understanding and involves coordination with three counties, three Bureau of Land Management districts, two federal wildlife refuges, two ODFW wildlife areas, four state agencies, six federal agencies, two tribes, and several unincorporated

towns. The nomination isn't for a dark sky "reserve" because almost all of the land within the proposed "sanctuary" would be the reserve's "core" and the skies are significantly darker and the region more remote than that of most reserves. The project plans to move forward in three phases on a county/BLM District boundary basis, beginning with Lake County.

Outback gateway communities energize these efforts by loaning Night Sky Adventure Kits in public libraries, renting stargazing equipment at outdoor gear shops, selling cosmic cocktails/coffee beverages, hosting public star parties, dark sky workshops, film screenings of *Saving the Dark*, etc.



## 5. Dark Sky Recognition Programs

One of the best tools for promoting dark sky awareness and outdoor lighting best practices has been recognition programs like those developed by IDA. Recognition programs range from a simple merit award for home or business lighting to an IDA International Dark Sky Place. These recognitions are growing in number, thanks to the win-win benefits of dark sky tourism.

### DARK SKY FRIENDLY HOME & BUSINESS CERTIFICATION

Nominating an IDSP under IDA's program takes a lot of work and only eligible sites can apply. However, home and business recognition programs can still gain positive attention and results, especially if partnerships get involved. IDA has an online, self-audited, [Home or Business Certification Program](#) that follows four easy steps. Using the Five Principles for Responsible Outdoor Lighting, residents, businesses or organizations can make necessary modifications to their outdoor lighting to conform to the principles, then complete an online form to apply for recognition. Upon completion they download an IDA Dark Sky Friendly Home certificate. These certificates can be placed in windows to promote dark sky friendly practices.



Such a program can be broadened and promoted by cooperation of DMOs, chambers of commerce, public land managers, and non-profit organizations, creating opportunities for dark sky tourism. If there is sufficient interest, such efforts can be the building blocks for a potential IDSP nomination.

Using the IDA program as a foundation, a community partnership might consider the opportunity to create its own local recognition program. Local/regional programs have been effective in [Texas](#). A partnership might create its own branded certificate, possibly in the form of a decal, with imagery specific to the town, region, and possibly the state as the program grows. Businesses can display the decal in their windows, and/or other site signage and use it in their marketing materials. When several businesses and organizations join forces to exercise and promote dark sky friendly lighting practices, it gets attention by the press and dark sky tourists seeking the charms of such a place.

### IDA INTERNATIONAL DARK SKY PLACES PROGRAM (IDSP)

IDA Dark Sky Place certifications attract more visitors, provide public education about dark skies, bring economic benefits to surrounding communities, and promote night skies getting darker. IDA's [IDSP Program](#) is voluntary. IDA sites are nominated by others who submit an application prepared in accordance with established IDA guidelines. The application is then submitted to the IDA IDSP Program Director. Once the application is determined to be complete, a Dark Sky Places Committee (DSPC) reviews it. Finally, the nomination is reviewed and certified by the IDA Board. The [certification process](#) normally takes one to three years. There are currently five different types of IDSPs.

### IDSP TYPES

**International Dark Sky Communities** - Communities are legally organized cities and towns that adopt quality outdoor lighting ordinances and undertake efforts to educate residents about the importance of dark skies.

**International Dark Sky Parks** - Parks are publicly or privately-owned spaces protected for natural conservation that implement good outdoor lighting and provide dark sky programs for visitors.

**International Dark Sky Reserves** - Reserves consist of a dark "core" zone surrounded by a populated periphery where policy controls are enacted to protect the darkness of the core.

**International Dark Sky Sanctuaries** - Sanctuaries are the most remote (and often darkest) places in the world whose conservation state is most fragile.

**Urban Night Sky Places (UNSP)** - UNSPs are sites near or surrounded by large urban environs whose planning and design actively promote an authentic nighttime experience in the midst of significant artificial light at night, and that otherwise do not qualify for designation within any other International Dark Sky Places category.

### IDSP REQUIREMENTS

There are several basic requirements to be met before a site can be certified as an IDSP. These requirements vary depending on the type of IDSP. For example, dark sky communities and UNSPs don't require a minimum night sky quality level, while sanctuaries require the highest sky quality level among IDSP types. Some IDSPs require a Lighting Management Plan (LMP), whereas others require adoption of a dark sky or outdoor lighting ordinance.

## I. Project Boundary

All types of IDSPs must identify clear boundaries for the nomination site. For some IDSP types, a boundary is easily defined by a jurisdictional limit, like that of a community or park. For other types, like reserves, a boundary-setting process involves the participation of many stakeholders and may include using recognizable features like roads, county lines, federal or state land ownership boundaries, etc.

## II. Lighting Management Plans/Dark Sky or Outdoor Lighting Ordinances

A Lighting Management Plan (LMP) describes the outdoor lighting best practices and exceptions that will guide the new installation or retrofitting of lights for an IDSP. An example LMP for the Oregon Outback Dark Sky Sanctuary is [here](#) and the LMP for Prineville Reservoir Dark Sky Park in Oregon is [here](#). LMPs must meet the minimum requirements outlined by IDA's guidance document for the specific type of IDSP and must be consistent with any existing policies of the land manager. All the applications for certified dark sky places are on [IDA's webpage on IDSPs](#). Examples of other LMPs may be found in the applications found on the IDA website.

The elements of LMPs are generally the same lighting guidelines that go into [outdoor lighting ordinances](#) for municipal and county jurisdictions and they should follow IDA's five lighting principles. An effective ordinance should include: (1) clear definitions, (2) lighting standards, (3) exemptions, (4) procedures, (5) compliance methods, (6) enforcement, and (7) actions in case of violation. Go [here](#) for guidance on preparing outdoor lighting ordinances.

## III. Lighting Audits/Inventories

IDA has specific requirements for the data needed for a field-based light inventory, including fixture type, lamp lumens, bulb correlated color temperature, purpose of light, context and close-up fixture photos to name a few. The purpose of the inventory is to determine the extent that each fixture/lamp conforms to the LMP. An inventory helps identify if just bulbs need to be changed out, or if a fixture needs to be replaced or modified in such a way to be fully shielded and satisfy the LMP.

Spreadsheet inventories work well and can be used in the field with a hand-held, electronic device. Absent a hand-held device, [field forms](#) can be used to collect information that can be transferred later into a spreadsheet. Before conducting a detailed inventory, a [general audit](#) is a good starting place to determine the level of effort that may be required to conduct an inventory and to determine if applying for a dark sky place certification is practical. An example of a completed inventory for a single area within a proposed dark sky place is found [here](#) for download. A Dark Sky Assessment Guide prepared by the Utah Community Development Office is [here](#) and the Lighting Inventory Manual prepared specifically for the Outback Dark Sky Sanctuary nomination is found [here](#).



## IV. Night Sky Brightness (Sky Quality) Measurements

The methods for conducting a sky quality survey are found [here](#) on IDA's website as well as [here](#). The tools used in a sky quality survey range from visual observations using the Bortle Scale (described in Chapter 1), to using an app on a smartphone, to a [hand-held sky quality meter \(SQM-L\)](#), a [continuous sky quality meter \(SQM-LE/LU\)](#), all-sky cameras, to nightscape photographs. Continuous-recording SQMs are gaining in popularity because instead of a few "grab samples," the meters can be easily installed to read data as frequently as every 5 minutes. The results collect readings across all conditions, including clouds, smoke, moonlight, and daylight. These factors can then be excluded to get the most refined results. The Oregon Chapter of IDA manages the Oregon Skyglow Measurement Network Project with 35 continuous-recording SQMs around the state. Follow these links to learn how to [participate](#) in the Skyglow Project, [install](#) an SQM, and/or [download](#) data to the statewide program.

## V. Outreach Plan

One of the primary purposes of IDA's IDSP Program is educational outreach. Therefore, no application is complete without a description of outreach programs or events conducted to date within a proposed IDSP and a proposed outreach plan presuming certification. Some dark sky outreach program ideas are shared in Chapter 3.

## VI. Nomination Letter/Letters of Support

Find an [Oregon IDA Advocate](#) or IDA Chapter board member to prepare the nomination letter. Letters are addressed to the IDA Dark Sky Places Committee. Collect one to two-page letters of support from a broad range of stakeholders. Example letters of support for Prineville Reservoir Dark Sky Park are found [here](#).

### The following 12 steps are recommended for completing a nomination application for IDSP certification:

<b>STEP 1:</b>	Read IDA IDSP Guidelines and contact IDA
<b>STEP 2:</b>	Contact the lead official for the subject site
<b>STEP 3:</b>	Reach out to stakeholders and form a stakeholder group (see Chapter 3)
<b>STEP 4:</b>	Begin considering application logistics
<b>STEP 5:</b>	Develop and implement a community outreach campaign (see Chapter 3)
<b>STEP 6:</b>	Conduct lighting inventory
<b>STEP 7:</b>	Collect sky quality readings (if applicable)
<b>STEP 8:</b>	Establish Lighting Management Plan/ Lighting Ordinance
<b>STEP 9:</b>	Pursue funding and begin conducting light retrofits
<b>STEP 10:</b>	Host dark sky events
<b>STEP 11:</b>	Gather community "Letters of Support"
<b>STEP 12:</b>	Arrange materials and write application



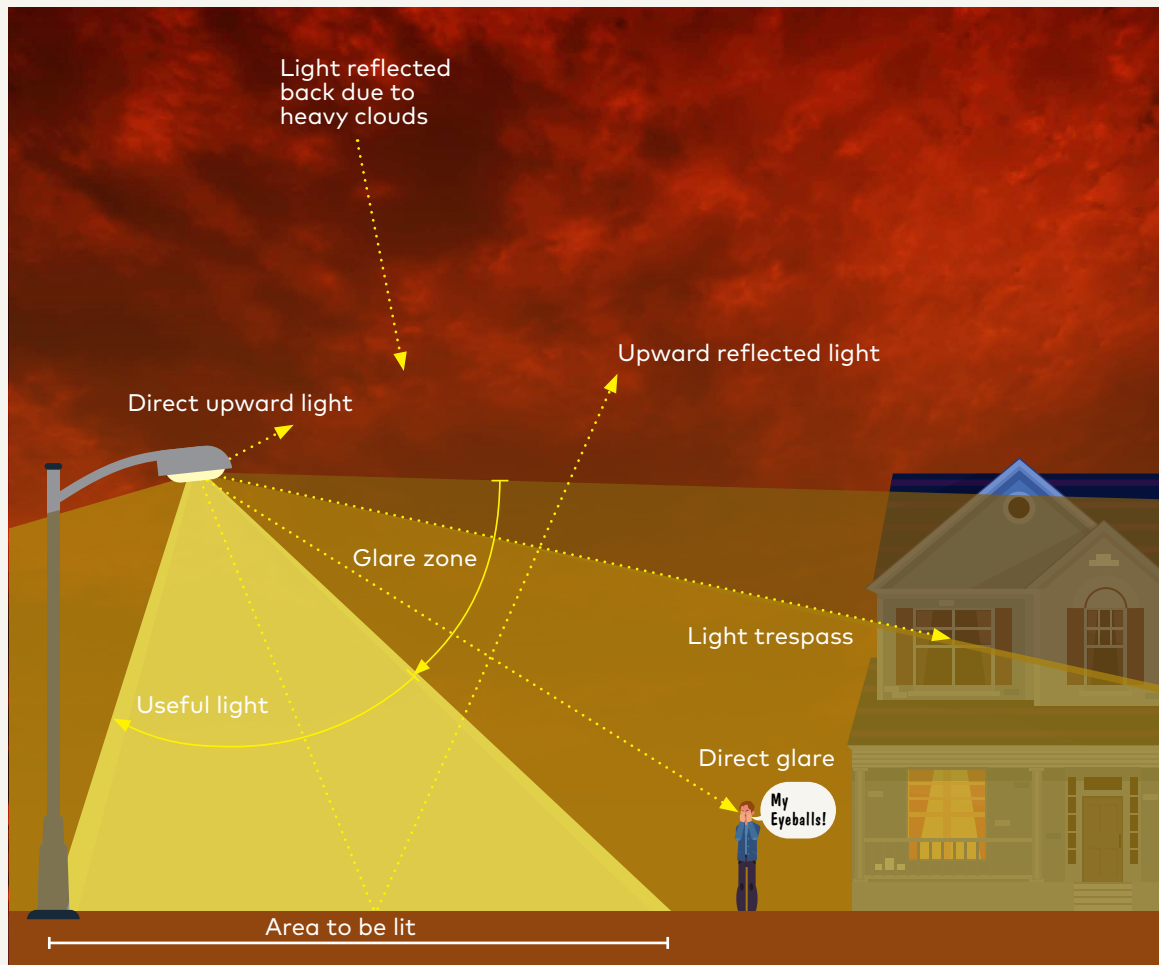
# 6. Lighting To Save Night Skies

## DARK SKY FRIENDLY LIGHTING

Dark sky friendly lighting is outdoor lighting that minimizes glare while reducing light trespass and skyglow. IDA provides objective, third-party certification for luminaires that are dark sky friendly via its program called the **Fixture Seal of Approval (FSA)**. All products approved in the program are required to be fully shielded and to minimize the amount of



blue light in the nighttime environment. Luminaires that satisfy the criteria will usually display the FSA logo on the packaging. IDA's [searchable FSA website](#) now has dozens of FSA fixtures to choose from. When choosing lamps for a fully shielded fixture, chose long-wave lighting (warmer — yellow to red) with a color temperature of no more than 2700 Kelvins. Consider lighting basics as a three-legged stool: (1) full shielding (orientation), (2) appropriate lighting levels (intensity and timing), and (3) color.



## LIGHT POLLUTION TERMS

**Skyglow** – brightening of the night sky over inhabited areas; can often be seen as a light dome from areas beyond the source

**Uplight** – upward directed/unshielded lights that contribute to skyglow

**Glare** – excessive brightness produced by overly bright and/or unshielded lights (Note: if a light makes you squint, that's glare)

**Light Trespass** – light emitted onto other properties, irritating neighbors, and adversely affecting the health and well-being of humans and wildlife

**Clutter** – bright, confusing and excessive groupings of light sources

**Blue-rich White Light** – light in shorter wavelengths of the light spectrum (between 380 nanometers and 520 nm) that is more susceptible to scatter and thus travel farther. Blue light is also the most disruptive to our nighttime environment because it mimics daylight, disrupting the hormone production and sleep cycles of both animals and humans.

**Fully shielded** – refers to fixtures that do not allow light above a 90-degree angle (full cut-off) and that keep lamps under a canopy or recessed so they are not visible beyond the horizontal angle.

**ALAN** – Artificial light at night that depending on design, may or may not create light pollution.

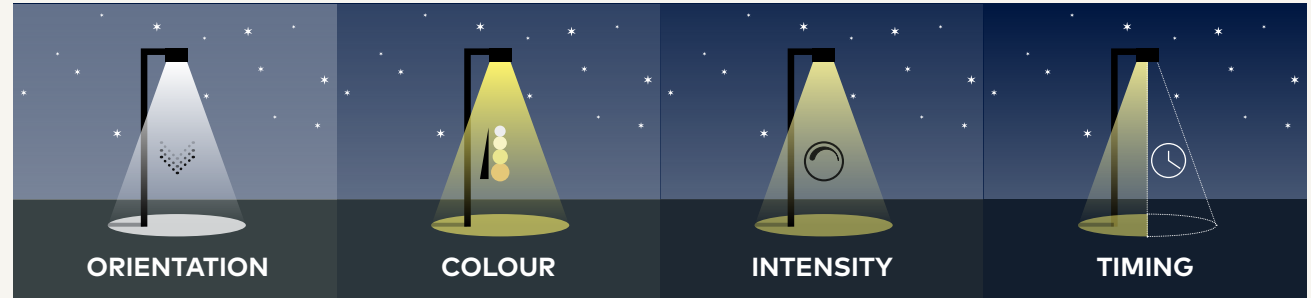
See the graphic to on right for a depiction of these outdoor lighting principles. Go [here](#) for more information on outdoor lighting basics. IDA's [info-card](#) on the five principles for outdoor lighting is a great engagement tool and can be ordered from IDA.

Outdoor lighting is intended to enhance safety and security at night. However, poor lighting design, particularly glare from overly bright and unshielded lights, can actually have the opposite effect. Good visibility is the primary lighting goal. Lighting that operates in tandem with the design of our eyes is the best solution.

## GOOD LIGHTING & NIGHT SKY STEWARDSHIP BENEFITS

Oregonians and those that visit our state cite its natural beauty, abundance of recreational opportunities, astounding biological and geographical diversity, and its accessibility to a cornucopia of excellent food and beverages as attractors. A natural night sky supports all these special attributes. Some of the more well-known adverse impacts of artificial light at night include:

- Upsetting circadian rhythms<sup>1</sup>
- Links to obesity, depression, sleep disorders, and heart disease<sup>2</sup>.
- Disturbance on mating behaviors in frogs, moths and fireflies, and directional confusion and demise of newly hatched sea turtles<sup>3</sup>.
- One billion annual deaths of migrating birds in North America that collide with buildings often as a side-effect of light pollution<sup>4</sup>.
- Diminished visibility of stars.



**LIGHT TO PROTECT THE NIGHT**  
Five Principles for Responsible Outdoor Lighting





<b>USEFUL</b>		<p><b>ALL LIGHT SHOULD HAVE A CLEAR PURPOSE</b></p> <p>Before installing or replacing a light, determine if light is needed. Consider how the use of light will impact the area, including wildlife and the environment. Consider using reflective paints or self-luminous markers for signs, curbs, and steps to reduce the need for permanently installed outdoor lighting.</p>
<b>TARGETED</b>		<p><b>LIGHT SHOULD BE DIRECTED ONLY TO WHERE NEEDED</b></p> <p>Use shielding and careful aiming to target the direction of the light beam so that it points downward and does not spill beyond where it is needed.</p>
<b>LOW LIGHT LEVELS</b>		<p><b>LIGHT SHOULD BE NO BRIGHTER THAN NECESSARY</b></p> <p>Use the lowest light level required. Be mindful of surface conditions as some surfaces may reflect more light into the night sky than intended.</p>
<b>CONTROLLED</b>		<p><b>LIGHT SHOULD BE USED ONLY WHEN IT IS USEFUL</b></p> <p>Use controls such as timers or motion detectors to ensure that light is available when it is needed, dimmed when possible, and turned off when not needed.</p>
<b>COLOR</b>		<p><b>USE WARMER COLOR LIGHTS WHERE POSSIBLE</b></p> <p>Limit the amount of shorter wavelength (blue-violet) light to the least amount needed.</p>



While life is extraordinarily adaptable, lighting changes have come quickly to species that have evolved with a bright day and a dark night. The good news is that with awareness and best outdoor lighting practices, the growing light pollution trend is reversible. There are many places across the globe that are reversing light pollution, and in the process they are reaping economic, environmental, and health and safety benefits.

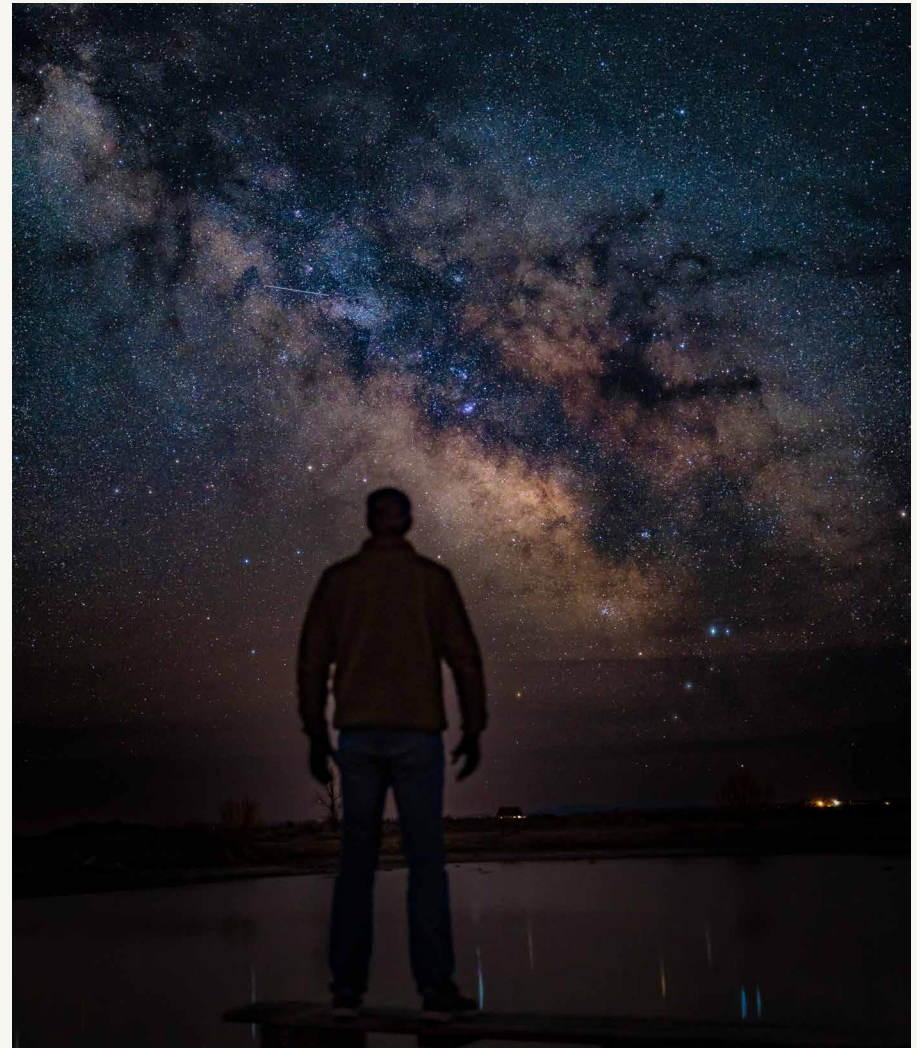
When the mainstream narrative of the decades-long environmental movement changed from environmental pollution to “ecosystem services,” there was a more positive shift in resource stewardship. Likewise, any dark sky messaging from parks, communities, businesses or organizations may be more effective when shifting the narrative from light pollution impacts to night sky stewardship benefits.

## SOCIOECONOMIC BENEFITS

A [2019 Missouri State University study](#) by Mitchell and Gallaway examined the economic impact of dark sky tourism on the Colorado Plateau economy. Its findings are relatable to Oregon locations. Since dark sky observation mostly occurs at night, tourists are far more likely to make overnight stays. On average, overnight visitors spend 3 times more than day-only visitors. With the typical off-season months associated with longer nights, dark sky areas have the ability to increase visitor counts year-round, leading to a more efficient use of local community and tourism-related resources.



Protecting dark skies doesn't just create dark sky tourism opportunities and support other outdoor recreation, it can also enhance property values, a community's sense of pride, and even benefit a location's bottom line by reducing energy waste.



The IDA estimates that at least 30% of all outdoor lighting in the U.S. is wasted. Dark sky friendly lighting avoids wasted light. That waste adds up to \$3.3 billion.

Agriculture and forestry are very important industries to Oregon's economy. Both industries are reliant on living systems and these systems are reliant on important pollinators like bees and moths – insects very susceptible to light pollution. Poor lighting can disrupt the growth cycles of trees and crops as well. Therefore, protecting dark skies is also fundamental in the production of healthy crops and sustainable forestlands.

## ENVIRONMENTAL BENEFITS

The same IDA estimate that 30% of outdoor light in the U.S. is wasted is associated with 21 million tons of carbon dioxide emission per year. Any reduction in wasted energy is consistent with Oregon Governor Executive Order **20-04**, which has the goal of reducing greenhouse gases to 45% below 1990 emissions levels by 2035 and at least 80% below 1990 levels by 2050.

Preserving naturally dark environments contributes to the conservation of species and their ecosystems in both urban and rural areas. After all, life on Earth evolved with a bright day and a dark night. This day and night cycle is encoded in the DNA of all plants and animals. Sustaining or restoring a natural dark night supports life-sustaining biological mechanisms including growth, foraging, mating, and breeding.



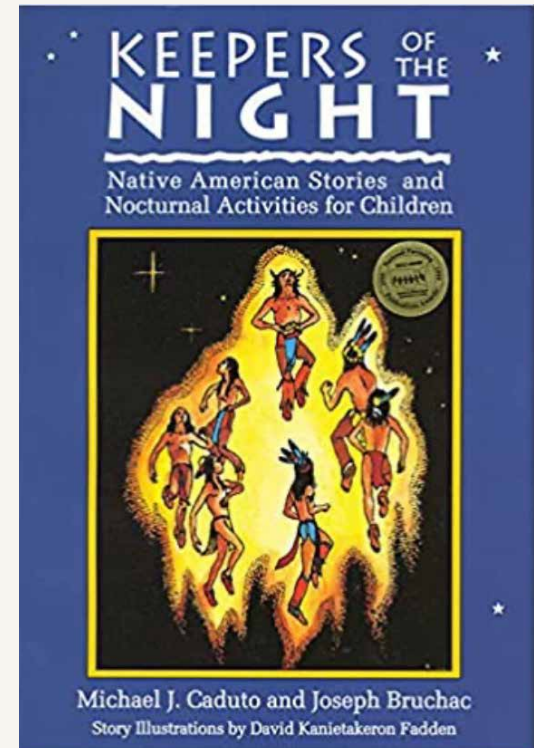
## HEALTH & SAFETY BENEFITS

Night sky friendly lighting also benefits people by improving nighttime visibility, reducing glare, and contributing to the safety, security and well-being of a community's residents.

A good example of exactly how good lighting provides better wayfinding and more security is shown in the photos to the right. The top photo shows an unshielded bright light that creates so much glare that it's not only hard to see the door stoop (i.e., the light's purpose), but the glare provides a good hideout for a possible intruder. A fully shielded light readily reveals the door threshold and someone in front of it. Studies are revealing that poor outdoor lighting can decrease personal safety by making victims and property more visible to criminals.

## CULTURAL BENEFITS

People have been looking up at the night sky in awe for millennia. Dark skies have inspired oral storytelling, poetry, literature, religion, science, philosophy, art, architecture, and music. While people in cities have experienced diminished star visibility over many decades, a starry dome overhead is a way of life for those in Oregon's rural areas. By conserving or restoring a dark sky and all its wonders, we protect Oregon's rich starry night legacy for generations to come, and with it the seeds of imagination and inspiration. We are hard-wired to be mesmerized by stars. Is it any wonder that as light pollution dims our starry views we replace the stars with artificial decorative lights across the landscape?



# 7. Other Helpful Tools and Resources

## TRAVEL OREGON RESOURCES

- **Dark Sky Tourism Resources**
- Sustainable Travel: <https://traveloregon.com/things-to-do/trip-ideas/sustainable-travel/>
- **The Power of Sustainable Tourism**
- **Oregon Tourism Studios**
- **Destination Management Studio**
- **Marketing Opportunities and Toolkits**
- **Oregon Tourism Stakeholder Engagement Survey Results, 2020**
- **2022 Governor’s Conference Dark Sky Tourism Breakout Session**
- **Matching Grants Program**
- **10 Year Strategic Vision**

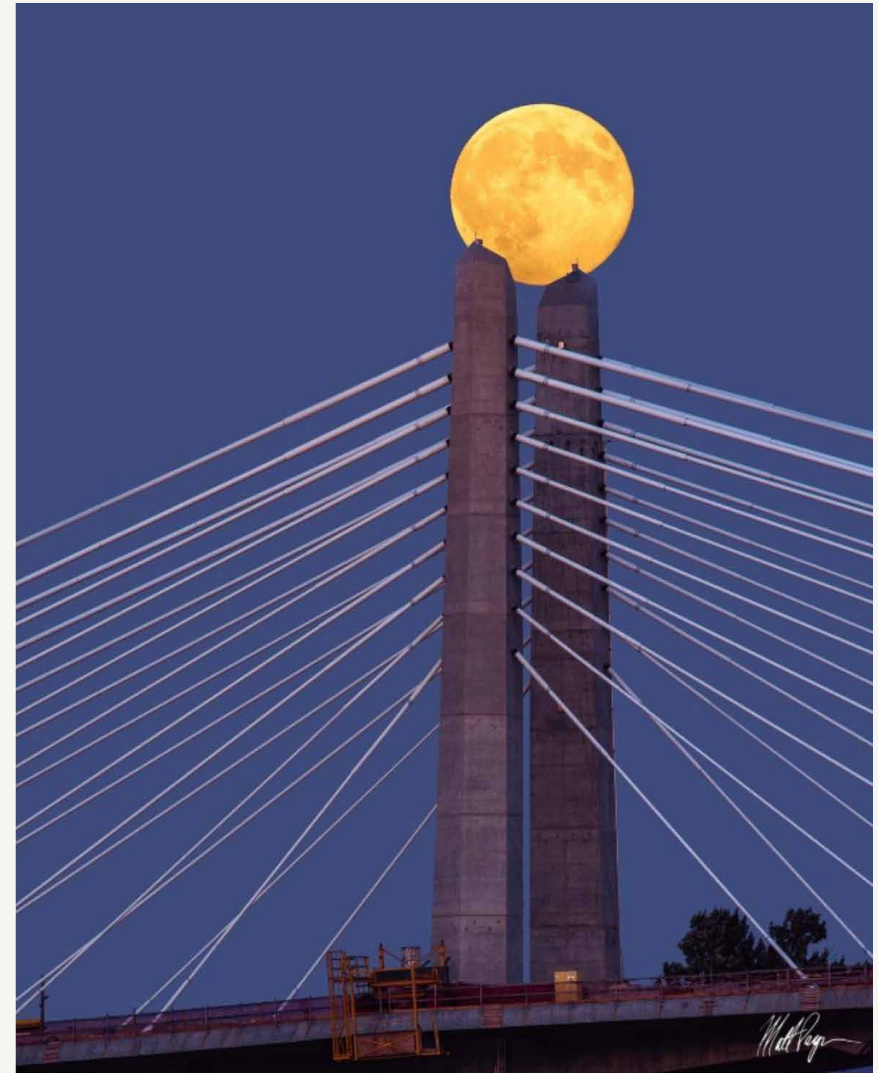
## OTHER RESOURCES

### General

- International Dark Sky Association: <http://www.darksky.org>
- Basin and Range Dark Sky Cooperative: <https://brdarkskies.org/>
- Western Night Sky Council: <https://cpdarkskies.org/the-western-night-skies-council/>
- IDA Oregon Chapter: [www.darkskyoregon.org](http://www.darkskyoregon.org)
- Illuminating Engineering Society (IES): <https://www.ies.org/standards/>

### Oregon Astronomy Clubs

- **Eugene Astronomical Society**, Springfield
- **Friends of Pine Mountain Observatory**, Eugene
- **Night Sky 45 Astronomy Club**, Salem
- **Rose City Astronomers**, Portland
- Southern Oregon Skywatchers, Medford
- Umpqua Amateur Astronomers, Roseburg, Paul Morgan, 541-673-1081
- **Sisters Astronomy Club**, Sisters
- **South Yamhill River Astronomy Club**, Willamina



### Oregon Observatories

- **Haggart Observatory**, Clackamas
- **Hopservatory**, Bend
- **Oregon Observatory**, Sunriver
- **Pine Mountain Observatory**, La Pine

## Lighting Ordinances

- **Public Policy & Lighting Ordinances:** guidance by IDA
- **IDA model lighting ordinance (MLO):** slightly outdated MLO, but helpful to get started.
- **Dark Sky Lighting Ordinance Walkthrough**

## Guidance on Nominating Dark Sky Communities

- **How to Start a Local Dark Skies Group:** a helpful “how-to” guide on how to start and sustain a dark sky community effort.
- **Dark Sky Assessment Guide:** dark sky evaluation tools and ideas.

## Lighting Considerations

- Watts-to-lumens free calculator:  
<http://www.rapidtables.com/calc/light/watt-to-lumen-calculator.htm>
- **IDA - LED Practical Guide:** Considerations and tradeoffs for choosing LED products for outdoor lighting applications.

## Measuring Night Sky Brightness

- **The new world atlas of artificial night sky brightness**
- Interactive light pollution mapping tool:  
<https://www.lightpollutionmap.info>
- **Learn about IDA Oregon’s Skyglow Network**
- **Globe at Night:** a citizen science night sky brightness program

## Books/Articles on Light Pollution

- **Nights are Getting Brighter and Earth is Paying the Price,** National Geographic, April 2019
- **Missing the Dark: Health Effects of Light Pollution,** EHP, 2009.
- **Light pollution: Environmental impact, health risks and facts,** LiveScience, April 2022.
- **AMA adopts guidance to reduce harm from high intensity street lights,** June 2016.
- **The effect of reduced street lighting on road casualties and crime in England and Wales: controlled interrupted time series analysis,** 2015
- **How much lighting is required to feel safe when walking through the streets at night?**
- **The Chicago Alley Lighting Project, Final Evaluation Report, April 2000**

- Book: Ecological Consequences of Artificial Night Lighting, Rich & Longcore, 2013
- **Rapid assessment of lamp spectrum to quantify ecological effects of light at night,** Longcore, et. al 2018.

## Citations

- **<sup>1</sup>Blue light at night and the disruption of circadian rhythms:** numerous scholarly articles found at the link
- **<sup>2</sup>Increased exposure to blue light at night and links to obesity, depression, sleep disorders, and heart disease:** numerous scholarly articles found at the link
- **<sup>3</sup>Light pollution’s disturbance on animal behaviors:** numerous scholarly articles found at the link



# Acknowledgements

**Content:** Dawn J. Nilson, Fibonacci Enterprises, IDA Delegate.

## Photography:

**Cover:** Comet NEOWISE at the Oregon Coast (Coos County) by Joey Hamilton. Under dark skies, comets of similar magnitude may be visible with the naked eye.

**Inside Cover:** Smith Rock State Park (Deschutes County) by Joey Hamilton.

**Page 2:** Zodiacal Light (Lake County), courtesy of Richard Berry. This phenomenon is only visible from very dark skies.

**Page 3:** The Milky Way over Crater Lake (Klamath County), courtesy of Jeremy M. White of the National Park Service. Note the orange glow at the bottom of the Milky Way that looks like sunset. Its skyglow from cities south of the park.

**Page 3:** Pine Mountain Observatory (Deschutes County), courtesy of Grant Tandy. This photo captures the “Great Rift” of the Milky Way which is looking toward the center core of our galaxy.

**Page 4:** The Veil Nebula (Harney County), courtesy of Jack Collins. The nebula is a large cloud of heated and ionized gas in the constellation of Cygnus. It’s a remnant of a supernova.

**Page 6:** Astrax (taken at the Oregon Governor’s Conference on Tourism in Sunriver, OR), courtesy of Hilary Sager. As the Lorax is an advocate for a healthy environment, the Astrax is a character created by Bob Hackett of Travel Southern Oregon to advocate for dark skies.

**Page 6:** Dark Sky Outreach Events, courtesy of Dawn J. Nilson. Events include film screenings of Saving the Dark by Sriram Murali in Portland and Lakeview, tabling events, sidewalk star party in Portland, and a demonstration on how to use a planisphere.

**Page 8:** The Hopservatory (Bend, Deschutes County), courtesy of Grant Tandy. This educational observatory is part of the Worthy Brewery complex and is open to the public.

**Page 8:** Moonlight Paddle Party on the Willamette River (Clackamas County), courtesy of Kurt Doettger of eNRG Kayaking.

**Page 9:** Milky Way over Haystack Rock at Cannon Beach (Clatsop County), courtesy of the Oregon Coast Visitors Association.

**Page 11:** Camping at Prineville Reservoir State Park (Crook County) by Joey Hamilton. This is Oregon’s first IDA-certified International Dark Sky Park.

**Page 12:** RCA Members at Star Party by Scott Frey. Note how only red lights are used by observers under dark skies to preserve night vision.

**Page 15:** Treasure Valley Skyglow as seen from Malheur Field Station (Harney County), courtesy of Michael McKeag.

**Page 15:** Man and the Milky Way (Harney County), courtesy of Brandon McMullen, bgmichaelimages.smugmug.com.

**Page 16:** Demonstration of Light Shielding, courtesy of the International Dark-Sky Association.

**Page 16:** Owl Face at Malheur National Wildlife Refuge (Harney County), courtesy of Peter Pearshall, USFWS.

**Page 17:** Oregon Star Party (Ochoco National Forest), courtesy of Dawn J. Nilson.

**Page 17:** Supermoon at Tilikum Crossing (Multnomah County) by Matt Payne.

**Page 18:** Star Trails, courtesy of Brett Schaerer (2019).

**Back Cover:** Night Sky Observing, courtesy of Kevin Moorfield. Once again, note the use of red lights inside and out to preserve night vision.

For more information contact: [Development@TravelOregon.com](mailto:Development@TravelOregon.com)

*"Learn to reverence night and to put away the vulgar fear of it, for, with the banishment of night from the experience of man, there vanishes as well a religious emotion, a poetic mood, which gives depth to the adventure of humanity. By day, space is one with the earth and with man it is his sun that is shining, his clouds that are floating past; at night, space is his no more."*

—Henry Beston, from *The Outermost House*, published 1928

TRAVEL



OREGON