

Michelle Eddy

From: Amber Harrison <amber@darksky.org>
Sent: Thursday, March 9, 2023 11:09 AM
To: Michelle Eddy
Subject: Town of Blue River - Dark Sky Community inquiry

Follow Up Flag: Follow up
Flag Status: Flagged

Michelle,

My name is Amber Harrison, I am the Dark Sky Places Program Associate with the International Dark-Sky Association. I am responding to your inquiry about getting the town of Blue River, Colorado certified as an International Dark Sky Community (IDSC). I reviewed your pre-application inquiry to see if your site meets the eligibility requirement for the IDSC certification.

According to the [2018 IDSC Guidelines](#), the sole eligibility requirement for IDSCs is that - *the Community must have some type of legal organization that is officially recognized by outside groups. This can be in the form of a town, city, municipality, or other legally organized community (such as urban neighborhoods and subdivisions), but need not be an incorporated entity. Unincorporated or otherwise informally organized communities are eligible for IDSC status if their governing jurisdictions enact public policy consistent with the requirements of "Minimum Requirements For All Communities" that are legally binding in at least the territory of the Community.*

Since Blue River is recognized as a town and has its own council, it meets this requirement. As you can see in the Guidelines document, there are several components involved to apply as an IDSC. I have summarized the guidelines for you below.

The following must be included in each application:

1) A sky brightness measurement program must be established and maintained either by the Community or by a public or private entity (e.g., university, research center, IDA chapter, astronomy club, etc.) to follow the evolution of light pollution in the IDSC (pg. 7, #6).

2) Develop and approve a quality comprehensive lighting ordinance. This document will need to include the minimum standards for permanent lighting installations that are listed on pages 4-6.

Once your application is initiated, it is advisable that you work with us on ensuring that the existing lighting ordinance/policy and on-going projects meet all of the requirements as you move forward with the IDSC application.

3) Communities are not required to submit a lighting inventory; however, you will need to identify and retrofit publicly owned lighting to conform with the new ordinance, as stated by the following (pg. 6, #2):

Community commitment to dark skies and quality lighting as shown by:

A) City owned lighting conforming with, or committed to conforming with, the lighting policy (if the latter, a detailed plan with a timeline for completion in no more than five (5) years), AND

B) Municipal support of dark skies and quality lighting as demonstrated by official publications, flyers, public service announcements, funding of lighting upgrades, etc.

4) In addition to city lighting conforming with the ordinance, one of the requirements is to show success in light pollution control as demonstrated by at least one of the following (pg 7, #5):

A) Examples of a number of construction projects appropriate to the Community population and amount of new construction and renovation activity, built under the lighting policy and demonstrating its effective application, OR

B) Alternative evidence of success in light pollution control, to be discussed with the International Dark Sky Places Program Manager for compliance.

Essentially, this requirement encourages privately owned properties to volunteer and demonstrate that they understand and are willing to abide by the lighting ordinance. Examples of projects can include businesses, restaurants, gas stations, schools, fire stations, etc. Note that these projects are different from the required changes that will need to be made to public lighting described in #3 above. The [5 Principles for Responsible Outdoor Lighting](#) is a helpful tool to help educate the public as you move forward.

5) In addition to taking action to reduce light pollution in your community, we also work with our Places to advocate and promote their dark skies externally. This can be done with at least one of the following (pg. 7, #4):

A) Planning and execution of at least two (2) community dark sky awareness events per year. This may be organized through a local astronomy club, municipality, school, etc.

B) Inclusion of dark sky awareness documents (IDA brochures or Community-created brochures) with other Community informational documents for residents and visitors.

C) Inclusion of dark sky education in Community schools and curriculum.

Some other smaller items to include in the application are:

1. Map of the Community clearly indicating its legal boundaries, and basic factual information about the Community.
2. Letter of nomination support by IDA qualified nominator and elected representatives of the Community.
3. Broad support for dark skies from a wide range of community organizations such as chambers of commerce, local electrical utilities, IDA chapters, lighting retailers, homeowners associations, and others.

[This infographic](#) describes the basic steps of the application process. If you have not already, I would also suggest reviewing the existing IDSCs applications available on our IDSC page to get familiar with the requirements and know what to expect in the application itself. We would be happy to address any immediate questions via Zoom, phone, or email before moving forward with initiating your application.

Once you feel good about the process and are ready to participate in our Places Program, the next step will be to submit the [one-time \\$250 application fee](#). This fee secures your position in our program and you will have access to all of IDA's resources and guidance from us as necessary. This includes feedback such as reviewing policies, portions of the nomination as you write them, having Zoom or conference calls to explain the logistics or problem-solving issues your community might be experiencing, etc.

Become an IDA Member:

Lastly, you also said you were interested in learning more about becoming a Member. Our Dark Sky Network is more focused on reversing the impacts of light pollution. The dark sky is a cherished resource, and awareness of its peril is spreading fast. Our members are individuals, companies, and foundations that support IDA's solutions to eradicate light pollution and advocate for better lighting solutions. Our members help us get

these solutions recognized and adopted in communities across the globe. You can help support the International Dark-Sky Association by:

Joining our Monthly Sustaining membership for as little as \$10/month by becoming a Nighthawk Member

Giving to our bi-annual fundraising drives or joining as an annual member for as little as \$25/annually

All members receive a welcome package, a car magnet, and great information to share with family and friends.

IDA Advocate Program:

Additionally, you mentioned you were interested in learning more about our Advocate Program. IDA's Advocate Network is a global community united in its efforts to protect the night from light pollution. This would be especially pertinent to you, as the Network will help you connect with local volunteers who might be interested in an opportunity to help support your efforts in applying for the IDSP certification, such as outreach events and monitoring night sky quality. The process to become an Advocate is simple. Fill out this form, and we will invite you to one of our regular IDA Light Pollution 101 Trainings. After attending this training, you will be invited to join IDA's global communication platform, be given access to exclusive advocate resources, and invited to join additional monthly advocate trainings on various aspects of light pollution and dark sky conservation.

Please let me know if you have any questions. I look forward to working with you and your team and learning more about your community.

Amber Harrison
Dark Sky Places Program Associate
International Dark-Sky Association
amber@darksky.org
+1 (520) 347-6363 Ext. 103

INTERNATIONAL DARK-SKY ASSOCIATION

5049 E Broadway Blvd, Suite 105 - Tucson, AZ 85711-3646 USA - +1 520-293-3198 - www.darksky.org

*TO PRESERVE AND PROTECT THE NIGHTTIME ENVIRONMENT AND OUR HERITAGE OF DARK SKIES THROUGH
ENVIRONMENTALLY RESPONSIBLE OUTDOOR LIGHTING*



INTERNATIONAL DARK SKY COMMUNITIES

International Dark Sky Community Program Guidelines

June 2018

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DEFINITION OF AN INTERNATIONAL DARK SKY COMMUNITY

An International Dark Sky Community (IDSC) is town, city, municipality or other similar political entity that has shown exceptional dedication to the preservation of the night sky through the implementation and enforcement of quality lighting policies, dark-sky education, and citizen support of the ideal of dark skies.

GOALS FOR IDSC CREATION

- To identify communities with exceptional commitment to and success in pursuing dark sky preservation and restoration, and their promotion of quality outdoor lighting
- To promote improved outdoor nighttime quality of life for residents and visitors
- To support protection of human health, nocturnal habitats, public enjoyment of the night sky and its heritage, and/or areas ideal for professional and amateur astronomy
- To provide local, national, and international recognition for such communities
- To promote the ideals of the International Dark-Sky Association (IDA) by encouraging communities to identify dark skies as a valuable community asset and aspiration

DESIGNATION BENEFITS

Achieving this designation brings recognition of the efforts made by the Community government, residents, and public and private organizations to protect the night sky and the nocturnal environment dependent on it. The IDSC designation enhances awareness of dark-sky matters on the part of Community residents and visitors.

Designation as an IDSC entitles the Community to display the International Dark Sky Community logo in official publications, promotions, signs at entrances or within the Community, and retain the use of this logo by other groups within the Community when identifying the area itself¹. IDA will promote and highlight ongoing Community ef-

¹ For instance, a Community can identify itself as *“Flagstaff, the world’s first IDA Dark Sky Community”* or other words to the same effect, or an organization within the Community can state *“located in Flagstaff, an IDA Dark Sky Community”*.

forts to protect night skies, and will maintain pages identifying and describing all IDSCs on its website.

ELIGIBILITY

The Community must have some type of legal organization that is officially recognized by outside groups. This can be in the form of a town, city, municipality, or other legally organized community (such as urban neighborhoods and subdivisions), but need not be an incorporated entity. Unincorporated or otherwise informally organized communities are eligible for IDSC status if their governing jurisdictions enact public policy consistent with the requirements of “Minimum Requirements For All Communities” (below) that are legally binding in at least the territory of the Community.

MINIMUM REQUIREMENTS FOR ALL COMMUNITIES

- 1) A quality comprehensive lighting policy like the IDA/IES Model Lighting Ordinance² (MLO) that includes all of the following minimum standards for permanent lighting installations^{3,4}:
 - A) Full shielding⁵ of all lighting fixtures over 1000 initial lamp lumens⁶
 - B) A limit on the emission of short-wavelength light through one of the following restrictions:
 - i) The correlated color temperature (CCT) of lamps must not exceed 3000 Kelvins; **OR**

² <http://www.darksky.org/our-work/public-policy/mlo/>

³ More information on developing a lighting policy may be found on the IDA website.

⁴ Lighting required by law under the authority of any legal jurisdiction higher than that of the Community may be formally exempted from the requirements of this section.

⁵ “Fully shielded” is defined as a light source screened and its light directed in such a way that none is emitted above the horizontal plane passing through its lowest light-emitting part.

⁶ “Initial lamp lumens” is defined as the number of lumens of light emitted by a lamp when new and not counting any depreciation of output due to the age of the lamp. This information can be found in manufacturer data sheets.

- ii) Allowed lighting must not emit more than 25% of its total spectral power at wavelengths < 550 nanometers; **OR**
 - iii) The scotopic-to-photopic (S/P) ratio of allowed lighting must not exceed 1.3
- C) A restriction on the total amount of unshielded lighting, such as a limit on lumens per net acre or a total site lumen allowance in unshielded fixtures (or equivalent wattages)
- D) A policy to address over-lighting, such as lumens per net acre caps (irrespective of shielding state) or maximum illuminance specifications
- E) Regulations of new installations of publicly-owned outdoor lighting:
 - i) A provision that clearly indicates where, when, and under what circumstances new publicly owned outdoor lighting, including street lighting, is warranted and will be permitted; **AND**
 - ii) A provision that requires that adaptive controls⁷ and/or curfews⁸ be employed in all future installations of public outdoor lighting
- F) Restrictions on the installation and operation of illuminated signs⁹:
 - i) Luminance levels for operation between sunset and sunrise shall not exceed 100 nits (100 candelas per square meter) as measured under conditions of a full white display; **AND**
 - ii) Sign illumination shall be extinguished completely one (1) hour after sunset, and remain off until one (1) hour before sunrise; **AND**

⁷ “Adaptive controls” is defined as devices such as timers, motion-sensors, and light-sensitive switches used to actively regulate the emission of light from light fixtures.

⁸ “Curfew” is defined as a period of time at night during which lighting must be significantly dimmed in output or extinguished in accordance with an expected decrease in human presence.

⁹ “Illuminated sign” is defined as any informational or advertising sign that is illuminated by either internal or external means. Descriptive terms are adjusted here accordingly according to the type of illumination.

- iii) The luminous/illuminated surface area of an individual sign shall not exceed 200 square feet (18.6 square meters)
- G) Outdoor recreational and/or athletic field lighting may be exempted from the strict shielding and short-wavelength emission requirements above provided that all of the following conditions are met:
 - i) Illuminating Engineering Society (IES) lighting guidelines (RP-6) are followed according to the appropriate class of play
 - ii) Field lighting is provided exclusively for illumination of the surface of play and viewing stands, and not for any other applications
 - iii) Illuminance levels must be adjustable based on the task (e.g., active play vs. field maintenance)
 - iv) Off-site impacts of the lighting will be limited to the greatest practical extent possible
 - v) A strict curfew requirement (e.g., lights must be extinguished by 10pm/2200h or one hour after the end of play, whichever is later) is observed
 - vi) Timers must be installed to prevent lights being left on accidentally overnight by automatically extinguishing them
- H) Affects an amortization period, applicable to **ALL** publicly **AND** privately owned lighting, to end not more than ten (10) years from the effective date of the outdoor lighting policy, after which all non-conforming lighting extant at the time of enactment must be brought into compliance with the policy.
- 2) Community commitment to dark skies and quality lighting as shown by:
 - A) City owned lighting conforming with, or committed to conforming with, the lighting policy (if the latter, a detailed plan with a timeline for completion in no more than five (5) years), **AND**

- B) Municipal support of dark skies and quality lighting as demonstrated by city publications, flyers, public service announcements, funding of lighting upgrades, etc.
- 3) Broad support for dark skies from a wide range of community organizations such as chambers of commerce, local electrical utilities, IDA chapters, lighting retailers, homeowners associations, and others.
- 4) Community commitment to dark skies and education as shown by at least one of the following:
 - A) Planning and execution of at least two (2) community dark sky awareness events¹⁰ per year. This may be organized through a local astronomy club, municipality, school, etc.
 - B) Inclusion of dark sky awareness documents (IDA brochures or Community-created brochures) with other Community informational documents for residents and visitors.
 - C) Inclusion of dark sky education in Community schools and curriculum.
- 5) Success in light pollution control as demonstrated by at least one of the following:
 - A) Examples of a number of construction projects appropriate to the Community population and amount of new construction and renovation activity, built under the lighting policy and demonstrating its effective application
 - B) Alternative evidence of success in light pollution control, to be discussed with the International Dark Sky Places Program Manager for compliance.
- 6) A sky brightness measurement program must be established and maintained either by the Community or by a public or private entity (e.g., university, research center, IDA chapter, astronomy club, etc.) to follow the evolution of light pollution in the IDSC. Applicants are encouraged, but not required, to submit their measurements

¹⁰ Note that astronomy education events such as star parties do NOT qualify as “community dark sky awareness events” unless the presentation explicitly includes a message relating to dark skies and outdoor lighting.

to the citizen science projects such as My Sky At Night (myskyatnight.com) and Globe At Night (globeatnight.org).

- 7) Once established, the Community must erect and maintain appropriate signage indicating the International Dark Sky Community designation along a roadway entrance, along a footpath entrance if no roadway exists, a public gathering place such as a square or common, or at a municipal government center such as a city or town hall. If approved by IDA, language as an alternative to “International Dark Sky Community” may appear on the signage and in Community communications regarding the IDSC status. Once the sign is erected, a photograph documenting it must be taken and sent to IDA along with a description of its location.

PROVISIONAL STATUS

In some cases, a Community interested in the program may lack all of the resources required to achieve a designation outright. If resource unavailability otherwise hinders the progress of a Community’s application, that Community may apply for and be granted Provisional status at the discretion of the IDA Board of Directors. Provisional status recognizes the Community’s ongoing work to become an International Dark Sky Community and is intended as a leverage point to successfully enable actions such as lighting upgrades/retrofits.

Provisional status expires after three (3) years. At any time before the end of this period, a Community may reapply for full status. Material submitted for the removal of Provisional status may be an addendum to the initial application as long as the material includes a current assessment of the goals, outreach efforts, and lighting policy listed in the original application and clearly demonstrates that any program requirements left unmet at receipt of the Provisional status have been satisfied.

To be considered for Provisional status, send a nomination package to IDA that includes all of the following information:

- 1) Documented intent to create and support an IDA Dark Sky Community
- 2) An enacted and legally effective outdoor lighting policy, and summary of outreach efforts to date
- 3) A description of the circumstances that currently prevent the Community from meeting the minimum Dark Sky Community requirements
- 4) An action plan describing steps the aspiring Community will take to meet all program requirements in the specified Provisional status period

IDSC APPLICATION PROCESS

NOMINATION

The nomination may be initiated by an IDA qualified nominator¹¹ who has personally reviewed a Community's outdoor lighting and commitment to night sky preservation. Nominators are encouraged to correspond with IDA staff and the Community throughout this process. In addition, the application must include evidence, such as in the form of a letter of support, from the Community government (mayor, council, etc.) consenting to the nomination for IDSC status.

STEPS FOR APPLICANT

1. Make initial contact with IDA by phone or email to discuss the process and receive recommendations, followed by continued communications to update IDA staff on progress and receive continued assistance.
2. Designate a formal point of contact (POC) person, such as a project manager, and provide their telephone number, address and email address to IDA staff. Before and after designation, any changes to this POC, or their information, must be communicated to IDA immediately in order to ensure accurate communication at all times.
3. Obtain a letter of nomination from a qualified IDA member nominator, as well as a supporting letter from elected representatives of the Community, such as the mayor and/or council of a municipality. Solicit additional letters of support from Community organizations, clubs, groups, universities, etc.
4. Upon completion, send the application to IDA staff for review of the document at least one month before the chosen submission deadline date. IDA staff will confirm that the application is complete and ready for submission or return it with suggestions for improvements.
5. Submit the final application packet electronically in PDF and/or Microsoft Word (.doc) format to IDA staff for formal review. Submit in plenty of time for IDA staff

¹¹ An "IDA qualified nominator" is defined here as an individual or organization holding an IDA membership in good standing at the time that the IDSC application is submitted. The Community itself may join IDA as an organizational member and self-nominate.

to review and prepare your application to make the bi-monthly deadline that you prefer, as found on the IDA website. Requests to rush applications will **NOT** be honored; planning ahead is essential if the Community wishes to meet a specific deadline.

TO BE INCLUDED IN IDSC APPLICATION PACKAGE

1. Map of the Community clearly indicating its legal boundaries, and basic factual information about the Community
2. Letter of nomination support by IDA qualified nominator and elected representatives of the Community such as the mayor and/or council
3. The Community's lighting policy, meeting the minimum requirements as stated in the "Minimum Requirements For All Communities" section
4. Documentation of examples of Community commitment and construction/renovation projects demonstrating effective application of the lighting policy
5. Proposed alternative wording for a IDSC (e.g. Dark Sky Village, Starry Sky City, etc.), if desired, with a justification for the request

IDA REVIEW PROCESS

Six (6) application submission deadlines occur in each calendar year, commencing in January and continuing every other month. Before the Community's final application is submitted, it is highly recommended that the Community be in regular communication with the International Dark Sky Places Program Manager to perfect the application by the next application deadline.

The International Dark Sky Places Manager will forward applications to the IDA Dark Sky Places Committee (DSPC) for review. DSPC review lags the submission dates by one two-month cycle. The total elapsed time between deadline and final IDSC designation approval is approximately ten (10) weeks.

Endorsement of applications by the DSPC is by a 2/3 supermajority vote; otherwise, the DSPC will return applications with reasons for denial of an endorsement and specific recommendations for improvement. If endorsed, the applicants will be notified and the International Dark Sky Places Program Manager will present the application to the IDA Board of Directors (BOD) for final review and approval. A ten (10)-calendar-day

waiting period then commences during which the Board of Directors has the right to deny IDSC status should it determine that any problems with the application exist.

If the BOD registers no objection within the ten-calendar-day waiting period, the IDSC designation is considered immediately awarded by IDA. The Community has the right to choose when the designation is made public, but it must organize the announcement to be made at the same time as the IDA public notice unless otherwise agreed by both parties. Along with the announcement notice, IDA will publish the Community's application on its website; by submitting the application, the Community acknowledges in advance that the application will be made publicly available. If an application is denied final approval by the IDA BOD, a letter will be sent to the applicant outlining elements of the application that need improvement along with specific recommendations for ways to remedy any problems the BOD identifies. Applications may be resubmitted for future consideration after remediation is complete. Resubmitted applications will be considered without prejudice.

IDA realizes that certain circumstances surrounding an IDSC application may cause some potential authors of letters of support (or opposition) to feel uneasy about publicly declaring their opinions about the IDA designation. In the interest of providing the DSPC with as full a picture of Community sentiment about applications as possible, certain letters may be suppressed from online publication if it is felt that making the letters publicly available will subject their authors to retaliation or harassment. A prospective IDSC seeking this protection for letter-writers must make a formal written request. The International Dark Sky Places Program Manager must approve suppression of publication of any part of an application. Note that suppression of online publication does not prevent either the DSPC or the IDA BOD from reading all submitted letters.

POST-DESIGNATION REVIEW AND MAINTENANCE

The IDSC designation is not awarded in perpetuity. Rather, it is subject to regular review by IDA and possible revocation if the minimum program requirements are not maintained. More details may be found in the "Reassessment of IDSC designation" section below.

To ensure that Communities remain exemplary in their protection and restoration of natural nighttime darkness, IDA will periodically reevaluate each site in the International Dark Sky Places Program. This is done to confirm that the Community continues to meet the minimum requirements and is making adequate progress toward LMP compliance goals outlined in this document.

Each designated IDSC must submit to IDA a written report of its activities related to the maintenance of its designation on or before 1 October of each calendar year. The report is a short (typically less than ten-page) synopsis of the Community's activities and initiatives during the intervening year¹². The report should include dates and brief descriptions of any interpretive events, lighting retrofit projects, outreach efforts, etc. Samples of printed materials and press articles should also be included, if available.

Annual reports should not be burdensome to produce, as they are intended as a compilation of information accumulated throughout the year. Annual reports and supporting documentation must be submitted electronically to the International Dark Sky Places Program Manager in either PDF or Microsoft Word format. If the annual report is not received by IDA in a timely fashion, IDA may suspend the site's IDSC status until the annual reporting requirement has been met (see the following section). On or about 1 August and 1 September of each year, the International Dark Sky Places Program Manager will remind local contacts at each IDSC of the pending 1 October annual report submission deadline.

A designated IDSC is exempt from the annual reporting requirement in the calendar year in which the IDA designation was awarded. If the designation is received after 1 October of a given calendar year, the IDSC's first annual report to IDA will be due on 1 October of the following calendar year.

REASSESSMENT OF IDSC DESIGNATIONS

From time to time, IDA receives comments from visitors to Communities that raise concerns about the veracity and timeliness of information provided to IDA by site administrators. IDA may, at its discretion, investigate claims in which it is alleged that IDSCs are not adhering to commitments made to IDA and to the public in their applications to the Program. This section details the IDA procedure for carrying out such investigations, and the rights of IDSCs in such matters.

An allegation of impropriety concerning any of the elements of participation in the Program outlined in this document is subject to IDA investigation and potential remedial action including temporary suspension and/or permanent revocation of the IDSC designation. IDA staff shall perform due diligence in gathering facts concerning such allegations it deems credible, and will prepare a report of its findings for consideration by the DSPC. The DSPC commits to weighing the evidence fairly and impartially, and to

¹² Examples of acceptable annual reports are available on the individual IDSC pages on the IDA website.

seek to resolve disputes whenever possible through dialog. A Community subject to an investigation shall be notified in a timely manner and solicited for evidence contrary to the specifics of the allegation at hand. The Community will be given an opportunity to correct any deficiencies with regard to the Program guidelines established by the IDA investigation within a reasonable time period to be prescribed by the DSPC.

Failure to achieve consensus through these means risks a DSPC recommendation for suspension or revocation of the IDSC designation. If made, such a recommendation will be forwarded to the IDA Board of Directors for formal ratification before coming into force. The Board's decision on any disciplinary matters involving an IDSC shall be considered definitive and binding.

Any IDSC so investigated has the right to review the allegations against it and all factual information collected by IDA pertinent to the allegations.

REINSTATEMENT FOLLOWING SUSPENSION

If the DSPC recommends a suspension of a Community's IDSC designation and the Board ratifies the suspension, the Community administration shall be immediately notified. The status of a suspended IDSC shall be changed to "Provisional" in all IDA communications until the designation is reinstated or revoked; however, the process of obtaining reinstatement of a designation is not the same as that outlined in the "Provisional Status" section of these guidelines.

To obtain reinstatement of a suspended designation, the IDSC must provide evidence to the DSPC's satisfaction that the specific issues identified by the DSPC as grounds for the suspension have been corrected and that all Program guidelines are once again met. The DSPC will consider the evidence presented by the IDSC and render a judgment to either:

- Accept the reinstatement petition, **OR**
- Reject the petition and recommend revocation, **OR**
- Return the petition with further instructions and a defined deadline for a IDSC response.

REVOCATION

A suspension left unresolved after one (1) year from the date of the Board's assent to the suspension automatically becomes a permanent revocation. Revocation entails removal of the IDSC from IDA's roll of approved International Dark Sky Places, and from mention on the IDA website and in member and external communications. IDA reserves the right to take legal action against any former IDSC whose designation is duly revoked but continues to use the IDA name/logo in advertising, communications,

and/or signage.



Town of Blue River Memorandum

TO: Mayor Babich & Members of the Board of Trustees

FROM: Town Manager Michelle Eddy

DATE: January 12, 2023

SUBJECT: **International Dark Skies Information/Application**

Background

Over the last several months, resident Martie Semmer has provided educational information to the Board of Trustees concerning dark skies and the potential to apply for an International Dark Skies designation. The Board of Trustees requested time to review the requirements and application process. The following information is summarized from the International Dark Sky Communities Program Guidelines which is also included in this report with a copy of the pre application. The Towns of Westcliff, Silver Cliff, Norwood, Ridgeway, Crestone, Naturita, and Nucla are designated dark sky communities in Colorado.

International Dark Sky Communities Program Guidelines

The following is not all inclusive and it is recommended the Board of Trustees review the entire document. [International Dark Sky Association - International Dark-Sky Association](#); [International Dark-sky Association Colorado - IDA Colorado chapter](#)

Definition:

An International Dark Sky Community (IDSC) is town, city, municipality or other similar political entity that has show exceptional dedication to the preservation of the night sky through the implementation and enforcement of quality lighting policies, dark-sky education, and citizen support of the ideal of dark skies.

Designation Benefits:

Achieving this designation brings recognition of the efforts made by the Community government, residents, and public and private organizations to protect the night sky and the nocturnal environment dependent on it. The IDSC designation enhances awareness of dark-sky matters on the part of Community residents and visitors.

Minimum Requirements:

1. A quality comprehensive lighting policy like the IDA/IES Model Lighting Ordinance (MLO) that includes all of the following minimum standards for permanent lighting installations:
 - a. Full shielding of all lighting fixtures over 1,000 initial lamp lumens
 - b. A limit on the emission of short-wavelength light through one of the following restrictions:
 - i. The correlated color temperature (CCT) of lamps must not exceed 2000 Kelvins; or

- ii. Allowed lighting must not emit more than 25% of its total spectral power at wavelengths <55 nanometers; or
 - iii. The scotopic-to-photopic (S/P) ratio of allowed lighting must not exceed 1.3.
 - c. A restriction on the total amount of unshielded lighting, such as a limit on lumens per net acre or a total site lumen allowance in unshielded fixtures (or equivalent wattages)
 - d. A policy to address over-lighting, such as lumens per net acre caps (irrespective of shielding state) or maximum illuminance specifications
 - e. Regulations of new installations of publicly-owned outdoor lighting:
 - i. A provision that clearly indicates where, when and under what circumstances a new publicly owned outdoor lighting, including street lighting, is warranted and will be permitted; AND
 - ii. A provision that requires that adaptive controls and/or curfews be employed in all future installations of public outdoor lighting.
 - f. Restrictions on the installation and operation of illuminated signs:
 - i. Luminance levels for operation between sunset and sunrise shall not exceed 100 nits (100 candelas per square meter) as measured under conditions of a full white display; AND
 - ii. Sign illumination shall be extinguished completely one (1) hour after sunset, and remain off until one (1) hour before sunrise; AND
 - iii. The luminous/illuminated surface area of an individual sign shall not exceed 200 square feet (18.6 square meters)
 - g. Outdoor recreational and/or athletic field lighting may be exempted from the strict shielding and short-wavelength emission requirements above provided that all of the following conditions are met:
 - i. Illuminating Engineering Society (IES) lighting guidelines (RP-6) are followed according to the appropriate class of play
 - ii. Field lighting is provided exclusively for illumination of the surface of play and viewing stand, and not for any other applications
 - iii. Illuminance levels must be adjustable based on the task (e.g., active play vs. field maintenance)
 - iv. Off-site impacts of the lighting will be limited to the greatest practical extent possible
 - v. A strict curfew requirement (e.g., lights must be extinguished by 10 p.m./2200h or one hour after the end of play, whichever is later) is observed
 - vi. Timbers must be installed to prevent lights being left on accidentally overnight by automatically extinguishing them
 - h. Affects an amortization period, applicable to ALL publicly AND privately owned lighting, to end not more than ten (10) years from the effective date of the outdoor lighting policy, after which all non-conforming lighting extant at the time of enactment must be brought into compliance with the policy.
- 2. Community Commitment to dark skies and quality light as shown by:
 - a. City owned lighting conforming with, or committed to conforming with the lighting policy (if the latter, a detailed plan with a timeline for completion in no more than five (5) years), AND
 - b. Municipal support of dark skies and quality lighting as demonstrated by city publications, flyers, public service announcements, funding of lighting upgrades, etc.
- 3. Broad support for dark skies from a wide range of community organizations such as chambers of commerce, local electrical utilities, IDA chapters, lighting retailers, homeowners associations and others.
- 4. Community Commitment to dark skies and education as shown by at least one of the following:
 - a. Planning and executive of at least two (2) community dark sky awareness events per

- year. This may be organized through a local astronomy club, municipality, school, etc.
- b. Inclusion of dark sky awareness documents (IDA brochures or Community created brochures) with other Community informational documents for residents and visitors.
 - c. Inclusion of dark sky education in Community schools and curriculum.
5. Success in light pollution control as demonstrated by at least one of the following:
 - a. Examples of a number of construction projects appropriate to the Community population and amount to new construction and renovation activity, built under the lighting policy and demonstrating its effective application
 - b. Alternative evidence of success in light pollution control, to be discussed with the International Dark Sky Places Program Manager for compliance.
 6. A sky brightness measurement program must be established and maintained either by the Community or by a public or private entity (e.g., university, research center, IDA chapter, astronomy club, etc.) to follow the evolution of light pollution in the IDSC. Applicants are encouraged, but not required, to submit their measurements to the citizen science projects such as My Sky At Night (myskyatnight.com) and Globe At Night (globeatnight.org).
 7. Once established, the Community must erect and maintain appropriate signage indicating the International Dark Sky Community designation along a roadway entrance, along a footpath entrance if no roadway exists, a public gather place such as a square or common, or at a municipal government center such as a city or town hall. If approved by IDA, language as an alternative to “International Dark Sky Community” may appear on the signage and in Community communications regarding the IDSC status. Once the sign is erected, a photograph documenting it must be taken and sent to IDA along with a description of its location.

Pre-Application:

Included in this packet.

Staff Recommendations:

In evaluating the requirements and information provided in the guidelines, it is recommending the project be referred to the Citizen Advisory Committee.

Considerations for the Committee:

- Evaluation of current natural night sky ordinance (attached)
- Conduct an assessment of the current lighting situation within the Town utilizing the assessment forms provided within the International Dark Skies Program Guidelines including tools to be obtained and provided by the Town.
- Conduct a survey of the town residents to determine need, desire and interest from the residents to pursue the designation. Residents will be informed of the process and requirements if a designation is sought.
- Consider and provide recommendations for enforcement.
- Provide a report with recommendations and survey results to the Board of Trustees by May.

TOWN OF BLUE RIVER, COLORADO

ORDINANCE NO. 2020-11

**AN ORDINANCE OF THE TOWN OF BLUE RIVER, COLORADO
AMENDING CHAPTER 16 OF THE TOWN CODE CONCERNING OUTDOOR
LIGHTING**

WHEREAS, pursuant to Article 23, Title 31 of the Colorado Revised Statutes, the Town of Blue River (“Town”) has authority to regulate the development of land within the Town for the purposes of promoting the public health, safety, convenience, and the general welfare of the community; and

WHEREAS, pursuant to Ordinance No. 18-5, the Town adopted Design Standards to guide the design and aesthetics of new development within the Town and the Town’s Design Standards address exterior and landscape lighting; and

WHEREAS, the Town Board of Trustees desires to amend the Design Standards to implement reasonable lighting standards in an effort to protect the natural mountain environment and enhance the quality of residential neighborhoods and the quiet enjoyment of owners; and

NOW, THEREFORE, THE BOARD OF TRUSTEES OF THE TOWN OF BLUE RIVER, COLORADO, ORDAINS:

Section 1. Amendment of Section 16-15-10 of the Town Code. Chapter 16, Section 16-15-10 shall be amended by the deletion of the term “Architectural” from subsections (a) and (b) so that subsection (a) and (b) of such section reads as follows:

- (a) The Design Guidelines, originally promulgated August 2015 and updated December 2018, by the Town of Blue River, Colorado, is hereby adopted by reference as if fully set out in this Article.
- (b) No person at any time shall construct, reconstruct, refinish, alter or maintain any improvement upon any property within the Town of Blue River, or make any change in the natural or existing surface, drainage or plant life thereof, without compliance with the Design Guidelines, as adopted and as they may be amended.

Section 2. Amendment of Design Guidelines adopted by Ordinance No. 18-5. The Design Guidelines adopted by the Town by Ordinance No. 18-5 are hereby amended by the repeal of Section VII (D) pertaining to Exterior and Landscape Lighting which section (D) shall read in full as follows

D. Exterior and Landscape Lighting.

- 1. Purpose. The purpose of this section is to provide regulations for outdoor lighting that will: (i) minimize adverse impacts of human-made light sources that cause light trespass and obtrusive light onto neighboring development and vacant land; (ii) curtail light pollution, reduce skyglow and improve the nighttime environment; and (iii) help protect the well-being of humans, wildlife, vegetation, the overall ecosystem and natural environment from the adverse effects of human-made artificial night lighting.

2. Definitions.

- a. *Fully shielded* means that the lighting fixture is constructed in such a manner that all light emitted by the fixture, either directly from the lamp or a diffusing element, or indirectly by reflection or refraction from any part of the luminaire, is projected below the horizontal plane of the fixture.
- b. *Lamp* means a bulb, element, or device used to convert electricity into light, consisting of a source of illumination (e.g. an electric filament or one or more LEDs) enclosed within a transparent or translucent shell, typically but not always having a rounded shape and designed to be fitted into a luminaire.
- c. *Light pollution* means the adverse effect of man-made light, including but not limited to glare, or light trespass due to excessive or unnecessary lighting, or artificial light that unnecessarily diminishes the ability to view the night sky or its disruptive to flora and fauna.
- d. *Light trespass* means light projected across property lines or into the public right-of-way when it is not required or permitted to do so.
- e. *Luminaire* means a fixture designed to direct, control, distribute or emit light whether powered by an external electric energy source, photovoltaic source, or battery.
- f. *Outdoor* means at any location outside of the interior walls of a structure or away from any structure.
- g. *Unshielded fixture* means a lighting fixture which, as designed or installed, emits all or part of the light above the lowest part of the light source.
- h. *Up-lighting* or *up-light* means the placement and use of a luminaire to direct light in an upward fashion.

3. Applicability, nonconformities, and exemptions.

- a. **Applicability and Nonconformities.** Except as described below, all luminaires and lamps installed or replaced after August 1, 2020, shall comply with these requirements. This includes, but is not limited to, new luminaires, replacement luminaires, or lamps whether attached to structures, poles, the earth, or any other location. Luminaires and lamps installed prior to August 1, 2020, shall be deemed nonconforming and lawfully permitted until such time that the luminaire or lamp is repaired and replaced. It shall be a presumption in any enforcement of this section that the luminaire or lamp was installed after August 1, 2020, which presumption shall be the obligation of the owner of property to provide sufficient evidence that a luminaire or lamp is exempt from the requirements of this Section VII(D).

- b. Exemptions. The following are not regulated by this section:
 - i. Lighting installed by local or state government within the public right-of-way or easement for the principal purpose of illuminating roads and highways or providing for traffic safety and direction.
 - ii. One luminaire for each residential property using light of less than sixty (60) watts designed to illuminate a property address sign.
 - iii. Temporary lighting for construction sites for the purpose of safety.
 - iv. Temporary seasonal or holiday lighting provided that individual lamps are less than 25 lumens (by way of example, a C7 medium sized colored (not clear) holiday light produces less than 25 lumens).
 - v. Lighting that is only used under emergency conditions.
 - vi. Lighting expressly required by law or regulation or authorized by special permit or site plan approval issued by the Town.

4. General Requirements.

- a. All outdoor luminaires shall be fully shielded so that the light produced by the luminaire does not trespass on neighboring properties. A practical way to determine if a luminaire will conform to this provision is to not allow light to escape above a horizontal plane running through the lowest point of the luminaire and that the lamp element of the luminaire is not visible when viewed from above or from the side of the luminaire.
- b. A luminaire shall be placed and shielded as to prevent the light emitted by the luminaire from being cast beyond the property lines of the light source.
- c. All metal halide and fluorescent fixtures shall be fully filtered and enclosed with glass, acrylic, or translucent enclosures so that the lamp of the luminaire is not directly visible from any location.
- d. Luminaires using mercury vapor lamps or lighting source are prohibited.
- e. Spotlights and other types of security lighting (floodlights) shall be designed and located to prevent view of the floodlight's lamp or lighting source except where the view is made directly from the area intended to be illuminated. Floodlights shall not cast light outside of the property boundaries of the floodlight source. All floodlights shall be controlled through a motion detection mechanism calibrated to not illuminate due to the motion of branches caused by wind or weather and not to illuminate longer than five (5) minutes when activated.
- f. Uplighting of building facades, landscaping features, trees, vegetation or to draw visual attention is prohibited.

g. Blinking, flashing, rotating or moving lights are prohibited.

Section 3. Severability. Should any one or more sections or provisions of this Ordinance be judicially determined invalid or unenforceable, such judgment shall not affect, impair or invalidate the remaining provisions of this Ordinance, the intention being that the various sections and provisions are severable.

Section 4. Repeal. Any and all ordinances or codes or parts thereof in conflict or inconsistent herewith are, to the extent of such conflict or inconsistency, hereby repealed; provided, however, that the repeal of any such ordinance or code or part thereof shall not revive any other section or part of any ordinance or code heretofore repealed or superseded and this repeal shall not affect or prevent the prosecution or punishment of any person for any act done or committed in violation of any ordinance hereby repealed prior to the effective date of this Ordinance.

Section 5. Minor Revision or Correction Authorized. The Town Manager, in consultation with the Town Attorney, is authorized to make minor revisions or corrections to the codified version of the provisions of this Ordinance provided that such revisions or corrections are grammatical, typographical, or non-substantive and do not alter or change the meaning and intent of this Ordinance.

Section 6 Effective Date. The provisions of this Ordinance shall become effective thirty (30) days after publication following final passage.

INTRODUCED AND READ at a regular meeting of the Board of Trustees of the Town of Blue River, Colorado, held on the ____ day of _____, 2020.

AMENDED ON SECOND READING, PASSED, ADOPTED AND ORDERED PUBLISHED at a regular meeting of the Board of Trustees of the Town of Blue River, Colorado, held on the ____ day of _____, 2020.

Mayor

ATTEST:

APPROVED AS TO FORM:

Town Clerk

Town Attorney

Published in the Summit County Journal _____, 2020.

Citizen Advisory Committee Night Sky Assessment

*Please note this is a high level, non-scientific review and not for official measuring purposes. The purpose of the review will be to provide a basic level assessment of night sky lighting levels and/or challenges within the Town of Blue River. This is a resident perspective only. An official, more in-depth assessment will be conducted at a later date if desired by the Board of Trustees.

Subdivision: _____

Lighting Levels: (check one)

- Excellent:** Area is completely dark and the night sky is visible in all areas.
- Good:** Lights that are on are shielded and downward, fully shielded. Lights are on motion sensors and limited to small areas of the property. Lighting is generally soft and not bright. The night sky is visible in most areas.
- Okay:** Porch lights are on and some are not shielded. Bistro lights are left on with no activity outside but are soft in color and not excessive. Lighting is generally soft. The night sky is difficult to see in some areas.
- Poor:** Lights are not shielded; bright and left on. The area is bright. The night sky is not visible in most areas.

Notes:

Provide any comments on the subdivision. Include positive as well as areas of improvements/suggestions.

GUIDANCE & BEST PRACTICES

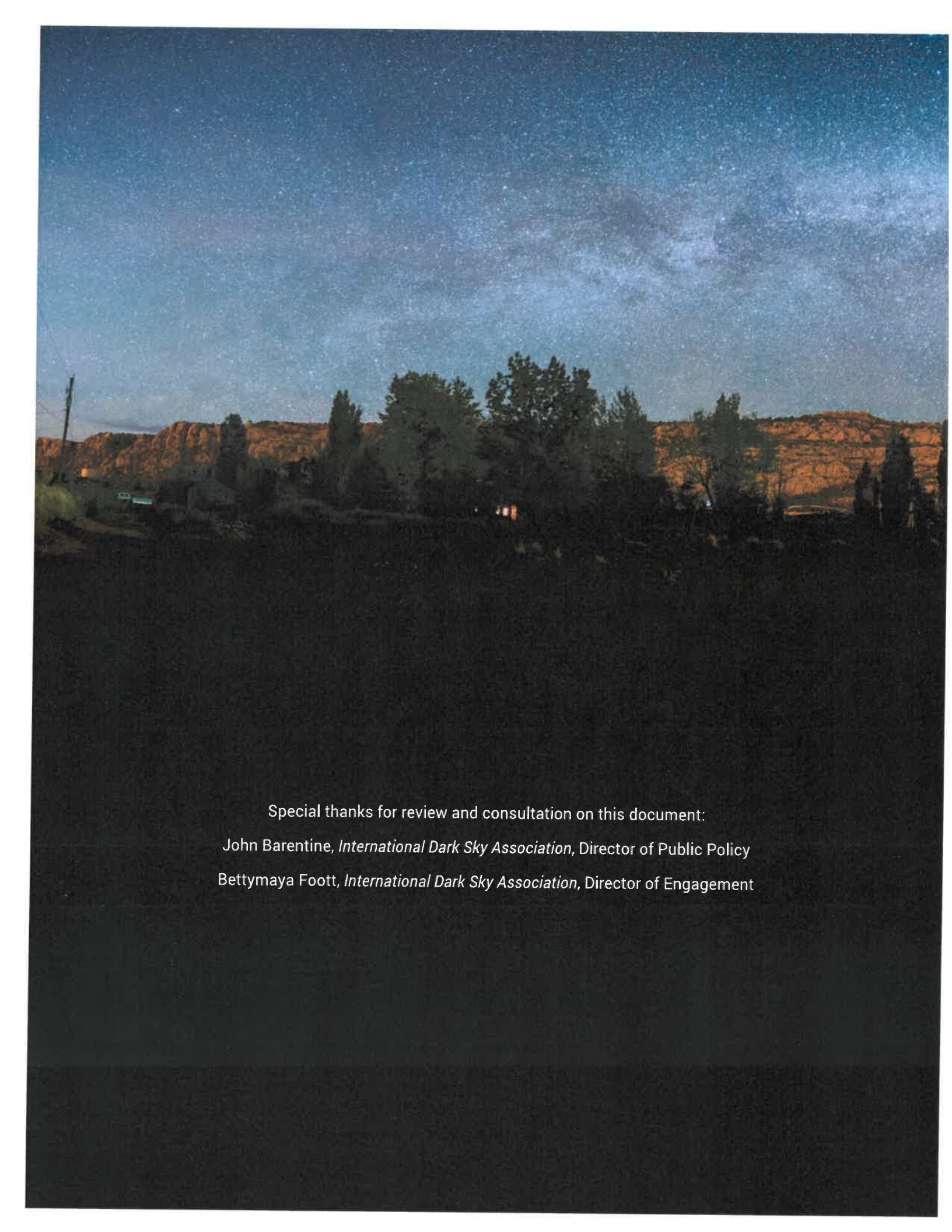
DARK SKY PLANNING

AN INTRODUCTION FOR LOCAL LEADERS



WORKFORCE SERVICES
HOUSING & COMMUNITY DEVELOPMENT
COMMUNITY DEVELOPMENT OFFICE



A night sky photograph showing the Milky Way galaxy over a dark landscape with trees and hills. The sky is a deep blue, and the Milky Way is visible as a bright, hazy band of light. The landscape below is dark, with silhouettes of trees and hills. A few small lights are visible in the distance.

Special thanks for review and consultation on this document:

John Barentine, *International Dark Sky Association*, Director of Public Policy

Bettymaya Foott, *International Dark Sky Association*, Director of Engagement




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INTRO

“Appreciation for dark skies is entering the social consciousness.

Light pollution is one of the only types of pollution that’s completely and immediately reversible. I don’t think we’ll realize the value of seeing the Milky Way, until it’s gone.”

**Bettymaya Foott,
International Dark Sky
Association, Director of
Engagement¹**

THE DISAPPEARING NIGHT

When we think of natural resources, few of us think of darkness. Centuries ago, when human settlements were relatively free of artificial lighting, the moon and stars dominated the night sky. Street lighting as we know it began approximately 300 years ago with oil lamps placed on wooden poles. By the 19th century, gas lamps came into use and by the 20th century the utilization of artificial electric lamps was widely spread.

Advances in lighting technology have slowly flooded our world with light, and city nightscapes are now dominated by the artificial lighting of buildings, streets, signs, parking lots and open spaces. The stars and constellations are outshone by the light emanating from human development and even the brightest constellations are no longer fully visible to residents in and around large cities whose artificial glow can be seen from over 200 miles away.² While artificial lights are important for safety, sense of security, and navigation, light pollution results when lighting is excessive or inappropriately used.³

3000 BC
CANDLES



1700s
OIL LAMPS

1790s
GAS LIGHTING

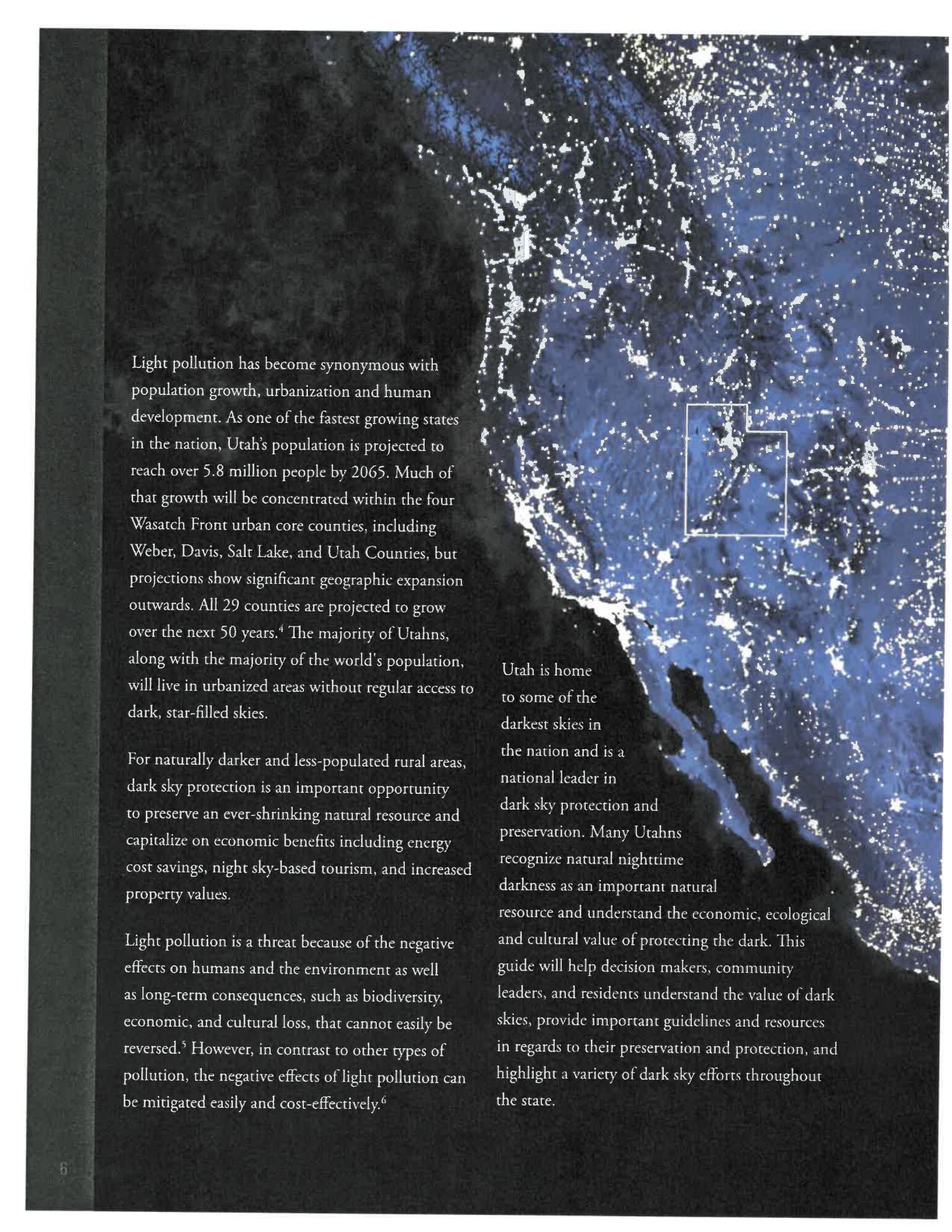


1880s
ELECTRIC LIGHTING



1960s
LED LIGHTING



A satellite night view of the United States, showing city lights and urban areas. The state of Utah is highlighted with a white rectangular box. The rest of the country is shown in shades of blue and white, representing light pollution from cities and towns.

Light pollution has become synonymous with population growth, urbanization and human development. As one of the fastest growing states in the nation, Utah's population is projected to reach over 5.8 million people by 2065. Much of that growth will be concentrated within the four Wasatch Front urban core counties, including Weber, Davis, Salt Lake, and Utah Counties, but projections show significant geographic expansion outwards. All 29 counties are projected to grow over the next 50 years.⁴ The majority of Utahns, along with the majority of the world's population, will live in urbanized areas without regular access to dark, star-filled skies.

For naturally darker and less-populated rural areas, dark sky protection is an important opportunity to preserve an ever-shrinking natural resource and capitalize on economic benefits including energy cost savings, night sky-based tourism, and increased property values.

Light pollution is a threat because of the negative effects on humans and the environment as well as long-term consequences, such as biodiversity, economic, and cultural loss, that cannot easily be reversed.⁵ However, in contrast to other types of pollution, the negative effects of light pollution can be mitigated easily and cost-effectively.⁶

Utah is home to some of the darkest skies in the nation and is a national leader in dark sky protection and preservation. Many Utahns recognize natural nighttime darkness as an important natural resource and understand the economic, ecological and cultural value of protecting the dark. This guide will help decision makers, community leaders, and residents understand the value of dark skies, provide important guidelines and resources in regards to their preservation and protection, and highlight a variety of dark sky efforts throughout the state.





THE BASICS OF DARK SKIES

LIGHT POLLUTION

Most of us think of light pollution as the inability to see the stars from within a city but it includes other things such as glare on roadways at night, or unwelcome light from a neighbor's porch light falling into a bedroom window making it difficult to sleep. These are all aspects of light pollution that are related to legitimate uses of light at night, but create consequences that are unintended and usually considered to be intrusive.

The International Dark-Sky Association (IDA), the leading non-profit organization dedicated to preserving night skies, defines light pollution as, "any adverse or unintended effect of the use of artificial light at night, including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste."⁷ Today light pollution is a growing, global problem and is the result of poor lighting design and simple over use.

The ability to recognize poor lighting design and determine whether lighting is appropriate or excessive is the first step towards choosing appropriate solutions. For a more in-depth guide on identifying light pollution look for the **Dark Sky Assessment Guide: Evaluation Methods, Tools, & Resources** available at cpdarkskies/resources. For a quick overview of light pollution watch "What is Light Pollution" available at <https://vimeo.com/325249584>

TYPES OF LIGHT POLLUTION



LIGHT TRESPASS When light falls where it is not wanted or needed. Use fully shielded light fixtures whenever possible.



GLARE Intense and blinding light that reduces visibility and causes discomfort. Direct light downwards and use the lowest adequate light intensity.



CLUTTER Excessive groupings of light sources that are bright and confusing. Only direct lighting onto desired areas and avoid excessive lighting.



SKYGLOW The brightening of the night sky over inhabited areas. Use fully shielded light fixtures, direct light downwards, use the lowest adequate light intensity, and optimize lighting placement.

DARK SKY LIGHTING BASICS

Raising the awareness of local decision-makers and the general public about light pollution-related issues can contribute significantly to a general acceptance of (or even demand for) lighting policies and regulations.⁹ Effective policies and regulations come from an understanding of proper lighting design standards. These basic design standards can be described as a “three-legged stool”¹⁰ and form the basis for dark-sky-friendly lighting and policy decisions.



The “Three-legged stool”

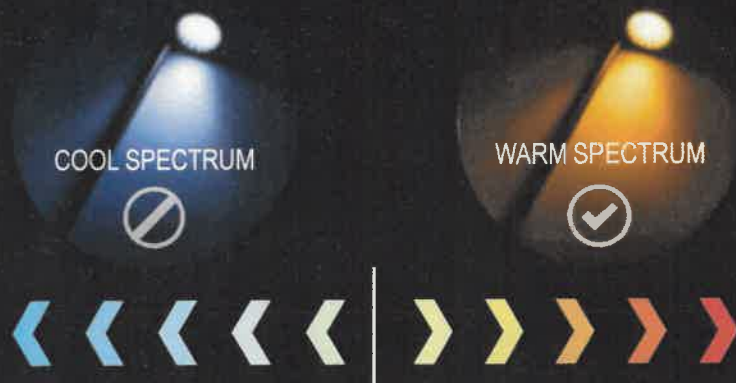
1- SHIELDING OF FIXTURES Downward pointing, fully shielded lighting keeps unwanted light from escaping into surrounding areas and the sky above. They direct the light onto the desired areas and limit glare. Outdoor lighting should be “fully shielded,” meaning no light emitted above a 90 degree angle. The more directed towards the intended subject, the better. Fully shielded lighting can be purchased or retrofitted.



“Generally, use lighting where it’s needed, when it’s needed, and only as bright as needed.”

2- AMOUNT OF LIGHT Outdoor lighting can easily become excessive. Limiting the total amount of installed lighting can help reduce light pollution. Designing for the appropriate amount of lighting includes shining lights down instead of up, directing light only onto desired areas, and using the lowest adequate bulb intensity. Timers, motion sensors, dimmer switches, and turning lights off when not in use can all contribute to darker skies, and in many cases, reduce municipal and property owner electrical costs.

3- LIGHTING COLOR The color of the light is important as well. Blue-rich lighting brightens the night sky more than warm colored lighting and researchers are beginning to connect blue light emission to negative health effects in people and greater problems for wildlife. The IDA recommends using warm, amber-colored lighting with a color temperature of 3000 Kelvin or less. Look at product packaging to determine color temperature.



ESSENTIAL TAKEAWAYS

- **LIGHT ONLY WHAT YOU NEED:** Use fully shielded fixtures. Shine lights down, not up. Direct lighting at desired areas. Be strategic with lighting and only use it where needed.
- **LIGHT ONLY WHEN YOU NEED:** Install timers, motion sensors, and dimmer switches, and turn off lights when not in use.
- **LIGHT ONLY HOW MUCH YOU NEED:** Use the right amount of light. Save electricity by using the lowest adequate wattage bulbs. Too much light is wasteful, impairs vision, and can be costly.
- **LIGHT ONLY HOW YOU NEED:** Use long-wavelength lights with a red or yellow tint to minimize negative health effects. Use warmer colored bulbs, like yellow or amber instead of white. Avoid bluish light, which is known to have a variety of negative effects.



THE VALUE OF DARKNESS ECONOMIC

LIGHT EMITTING DIODES (LEDS)

LEDs are essentially very small light bulbs that fit into an electrical circuit. In many communities, LEDs are replacing conventional high-intensity discharge (HID) lamp types for outdoor lighting. The improved quality and lower prices make LEDs a very efficient alternative to HID lamps, but the central deficiency of early generation LEDs is that they emit an excessive amount of blue light.¹⁵ Outdoor lighting with high blue content is more likely to contribute to light pollution, increase glare and compromise human vision. Blue light at night has also been shown to adversely affect human health and wildlife behavior.¹⁶ Today, a new generation of 3,000 K “warmer color” LED products are available.

ENERGY SAVINGS

Some of the most persuasive arguments for improved lighting management are economic. Globally, outdoor lighting makes up approximately eight percent of global energy use with about 60 percent of that wasted as unneeded, overlit or poorly aimed lighting.¹² In the United States, approximately one-third of all lighting is wasted, and estimates suggest that nearly \$7 billion dollars of energy is wasted as light pollution annually.¹³ For every \$100 spent operating a dusk-to-dawn light fixture, \$45 is wasted on light that never reaches the ground.¹⁴

Cities are now realizing the benefits of eliminating this energy waste through higher-quality, better-designed lighting. Today there are many energy efficient lighting alternatives that, when combined with proper design, can significantly reduce energy costs. **The IDA provides outdoor lighting basics** on their website, as well as information on where to find energy efficient and dark-sky friendly lighting. Visit www.darksky.org/lighting/lighting-basics for more information.

"... The bottom line for planners and elected officials is what's good for dark skies also saves money, by making sure light is used most efficiently—including the most effective ways to improve public safety."

John Barentine, IDA Director of Public Policy¹¹

RETURN ON INVESTMENT (ROI)

The benefits of using more energy efficient lighting such as Light Emitting Diodes (LEDs) and adaptive lighting can be assessed through a Return on Investment (ROI) analysis. The following is a general overview of a city's ROI when investing in more energy efficient lighting and controls.

$$\text{Simple ROI} = \frac{(\text{Gain} - \text{Cost})}{\text{Cost}} \times 100$$

Formula:

For an LED retrofit of 97,500 street lights we would assume the following to define the ROI:

Gain from Investment

1. Luminaire life will be 20 years
2. 50% reduction in power consumption: \$3.25m x 20 years = \$32.5m
3. Maintenance costs will be reduced by 60 percent as the majority of these costs are for re-lamping - \$3.54m x 20 years = \$35.5m
4. Total gain \$32.5m + \$35.5m = \$68m plus a factor of 1.2 to include power cost rise and increase labor costs = \$81.6M

Cost of Investment

1. Assume luminaire cost of \$500
2. Assume installation of \$60
3. Total cost \$560 x 97,500 = \$54.6m

$$\text{Simple ROI} = \frac{(\$81.6\text{m} - \$54.6\text{m})}{\$54.6\text{m}} \times 100 = 49.4\%$$

The simple ROI from an LED retrofit would be approximately 50 percent. These costs and ROI are approximate and would require extensive study and evaluation to define further. The ROI should be considered an order of magnitude at best and will need to be verified by individual cities.

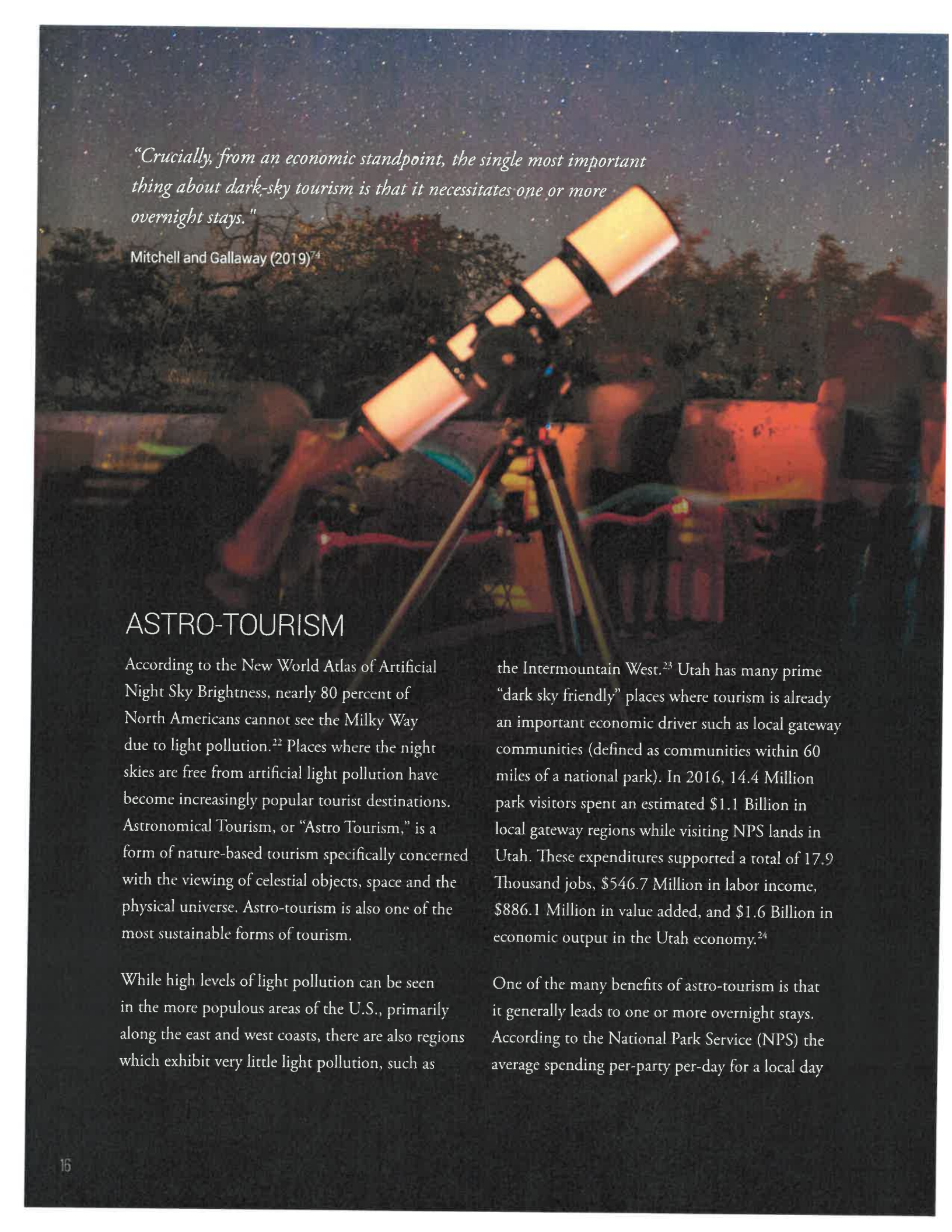
PROPERTY VALUE

Light trespass, the unwanted or unneeded invasion of light, is an issue because it interferes with a property owner's private enjoyment and use of his or her own land. Commercial property owners also face problems when outside light sources interfere with their business such as drive-in theaters, apartment complexes or other business entities. For the scientific world, light pollution disrupts and limits research conducted in astronomical observatories.¹⁸

Dark skies can also enhance property values due to the scarcity of dark, starry skies. In select Western real estate listings, dark skies are even being used as a key selling point. Sedona, AZ for example, enjoys higher property values from being proactive about preserving dark skies. A recent Sedona property description

included, "Private sunbathing during day - incredible red rock views and Dark Sky telescope observations at night!"¹⁹ In Colorado, a new development called Summit Sky Ranch is building dark-sky preservation standards into the community's overall design, including streetlights and an observatory. Home prices start around \$600,000 compared to Denver's median home price of \$350,000. Incorporating dark sky ordinances into their design has contributed to the new development's overall attractiveness to potential buyers.²⁰





"Crucially, from an economic standpoint, the single most important thing about dark-sky tourism is that it necessitates one or more overnight stays."

Mitchell and Gallaway (2019)⁷⁴


ASTRO-TOURISM

According to the New World Atlas of Artificial Night Sky Brightness, nearly 80 percent of North Americans cannot see the Milky Way due to light pollution.²² Places where the night skies are free from artificial light pollution have become increasingly popular tourist destinations. Astronomical Tourism, or "Astro Tourism," is a form of nature-based tourism specifically concerned with the viewing of celestial objects, space and the physical universe. Astro-tourism is also one of the most sustainable forms of tourism.

While high levels of light pollution can be seen in the more populous areas of the U.S., primarily along the east and west coasts, there are also regions which exhibit very little light pollution, such as

the Intermountain West.²³ Utah has many prime "dark sky friendly" places where tourism is already an important economic driver such as local gateway communities (defined as communities within 60 miles of a national park). In 2016, 14.4 Million park visitors spent an estimated \$1.1 Billion in local gateway regions while visiting NPS lands in Utah. These expenditures supported a total of 17.9 Thousand jobs, \$546.7 Million in labor income, \$886.1 Million in value added, and \$1.6 Billion in economic output in the Utah economy.²⁴

One of the many benefits of astro-tourism is that it generally leads to one or more overnight stays. According to the National Park Service (NPS) the average spending per-party per-day for a local day



trip is \$40.63. This price rises to over \$430 for parties staying overnight in an NPS lodge and a little over \$290 for those staying in motels outside parks. One study suggested that, “from an economic standpoint, the single most important thing about dark-sky tourism is that it necessitates one or more overnight stays.”²⁵ Overnight stays naturally lead to increased spending by visitors and astro-tourism programs and activities increase the incentive to stay overnight.²⁶

In addition, astro-tourism can increase the number of visitors during the off-peak seasons since it is not a seasonally dependent activity. In fact, night sky viewing in winter is often better because of longer nights and greater clarity. More sustained

periods of tourism activity ultimately provide local businesses with a steadier source of income and allow for a more efficient use of park and community resources.²⁷ Astro-tourism combined with dark sky designations, programs, and proactive planning efforts can attract new visitors and added revenue. In Utah, state parks managers have found that changing to night sky-enhancing fixtures and bulbs brings significant benefits to their parks’ wildlife species, visitor experiences and revenue streams.²⁸

A person is silhouetted against a vast, starry night sky. The Milky Way galaxy is visible, stretching across the upper half of the frame. The sky transitions from a deep blue at the top to a warm orange glow near the horizon, where a faint light source is visible. The foreground consists of dark, rocky terrain.

ASTRO-TOURISM IN BRYCE CANYON

A 2011 study²⁹ of astro-tourism in Bryce Canyon National Park found that a dark sky can be an important resource for a natural park—especially when combined with dark sky programming. Bryce Canyon National Park offers a variety of astronomy and night sky programs, and during the 2010 fiscal year 14,552 park visitors participated in one or more of Bryce Canyon's night sky activities and 146,847 park visitors stayed overnight.

In 2016, over 5.5 million people visited an International Dark Sky Park or a park within the International Dark Sky Places Program accreditation process in Utah. Based on statistics from the

Bryce Canyon study, of those 5.5 million people a potential of 61,500 visitors would have participated in astronomy related programming (if available) and approximately 621,875 visitors would have stayed overnight. Data also suggest that park visitors will seek out dark sky parks more frequently than they have done in previous years.³⁰ For national and state parks that have dark skies as a natural resource, astro-tourism represents an opportunity to expand park visitation—especially as dark skies become scarcer throughout the world.

“Having internationally recognized dark skies bolsters our ability to attract more visitors and offer more night programming which results in more people enjoying our parks at more times of the day.”

Fred Hayes, Former Utah State Parks Director²¹

Annual Park Recreation Visitation
BRYCE CANYON NATIONAL PARK 1979–2017



Data Source: National Park Service



CIRCADIAN DISRUPTION

One of the results of light pollution is increased exposure to both indoor and outdoor artificial light-at-night (ALAN). Scientists are just beginning to understand the negative impacts that excessive nighttime light exposure can have on human health. The circadian clock, or 24-hour day/night cycle, affects important physiologic processes in almost all organisms. Disruption of these important biological processes are associated with sleep-wake disorders, psychiatric disorders, cardiovascular diseases, immunological disorders, metabolic disorders, obesity and cancer progression. Studies show that the circadian system is most sensitive to short wavelengths, such as blue-rich light emitted from LED lighting at night time.³¹

Light-emitting diode (LED) lighting is transforming the way we light our cities and towns while drastically improving how we use energy and light outdoor spaces at night. However, with these advances in technology comes an obligation to manage these changes responsibly and sustainably.³⁴

AMA GUIDANCE TO REDUCE LED STREET

LIGHTING Many communities are adopting LED lighting without an understanding of proper lighting design and engineering features. In June of 2016 the American Medical Association (AMA) released an official policy statement³² about street lighting: warm it and dim it. The AMA recognizes the detrimental human and environmental effects of blue-rich white light specifically related to high-

intensity LED lighting design. In addition to its ill effects on human health, the blue light increases nighttime glare, discomfort and visual disability, and heightens safety concerns for drivers and pedestrians. The AMA encourages communities to limit blue light, use proper shielding to minimize glare, and to utilize the ability of LED lighting to be dimmed for off-peak time periods³³.

SAFETY

One of the main goals of night lighting is to increase safety, however, “bright” lighting does not necessarily mean “safer” lighting. Bright, glaring lights create sharp contrast between light and darkness, making the area outside of the illuminated area difficult to see. Sharp contrasts between light and darkness also create deep shadows that offer concealment. Additionally, nighttime glare from bright, blue-rich street lights heightens safety concerns, driver discomfort and visual impairment.

There is a strong tendency to light up property in the name of safety and security—especially in smaller towns. In fact, relative to their populations, small towns actually emit more light per capita than their urban counterparts. Most people believe that more, brighter light at night improves safety, but there is no scientific evidence to support this popular opinion.³⁵ The appropriate use of “dark-sky friendly” lighting will actually improve overall safety.³⁶ Lower lighting levels, warmer light temperatures, and better coverage are safer lighting methods.



Bright, unshielded lights can increase visual impairment at night.



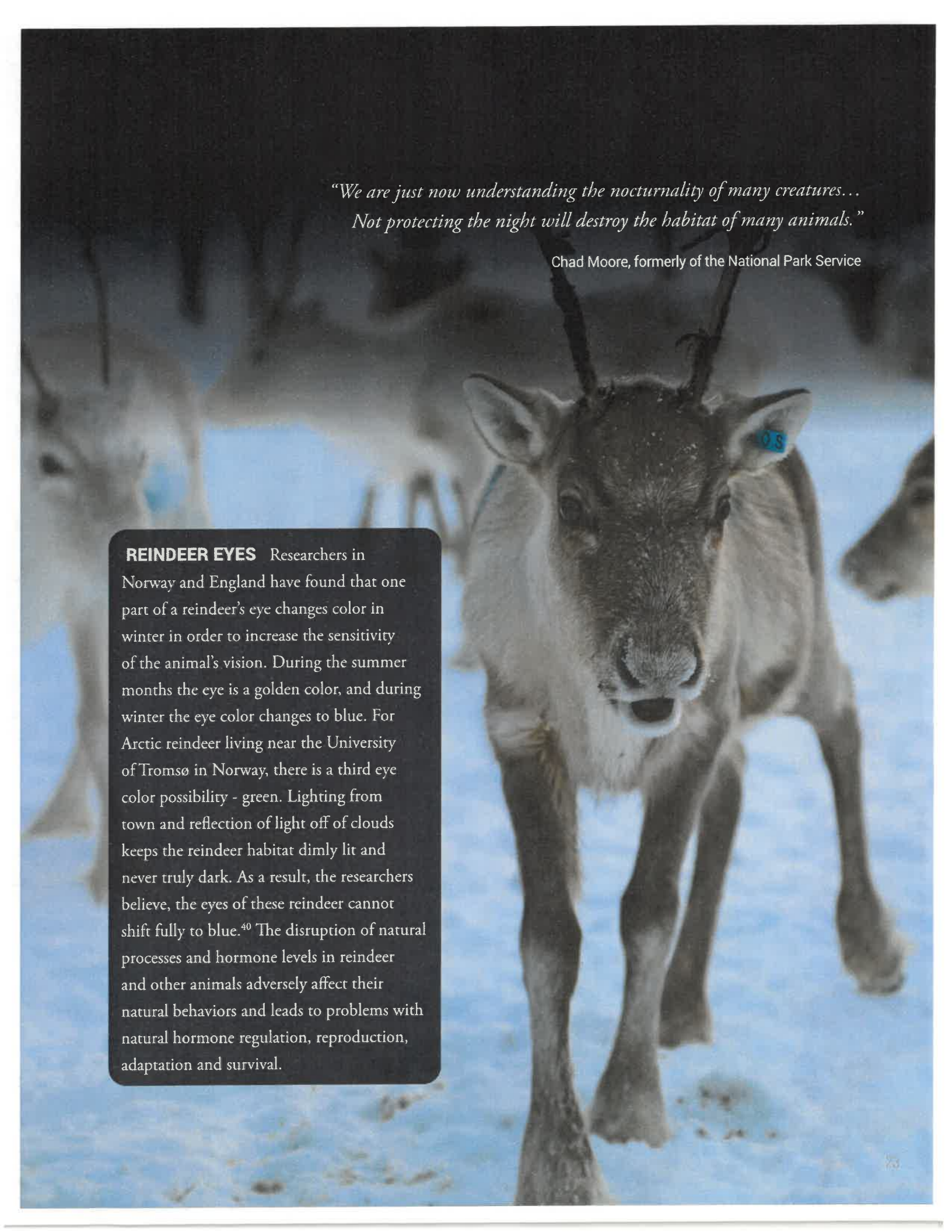
Images: George Fleener

NATURAL ECOSYSTEMS

Humans are not the only ones who are adversely affected by light pollution. Wildlife and other organisms use natural light as both a resource and a source of information about their environment.³⁷ Artificial light disrupts these natural processes and cues in both plants and animals. Prolonged exposure to artificial lighting prevents trees from adjusting to changing seasons and can alter behaviors, foraging areas, and breeding cycles for insects, turtles, birds, fish, reptiles and other wildlife species.³⁸ Ecosystems are complex networks of interacting organisms; when one species is disturbed by light pollution, the chain of an entire habitat can be harmed.

Migrant birds, especially nocturnal migrants, are vulnerable to fatal light attraction to artificial lights. Nocturnal migrants naturally use constellations and celestial cues as a way to guide their flight pattern but today's abundant artificial lights confuse the birds. Each year countless birds are being killed by either flying off course or colliding with buildings. Artificial lighting on the beach can fatally misguide baby sea turtles as they make their way back to the sea. Newly hatched turtles are naturally attracted to light, but when they are confused by artificial light emanating from nearby cities, they wander lost on the beach and are eaten by waiting predators.³⁹





*"We are just now understanding the nocturnality of many creatures...
Not protecting the night will destroy the habitat of many animals."*

Chad Moore, formerly of the National Park Service

REINDEER EYES Researchers in Norway and England have found that one part of a reindeer's eye changes color in winter in order to increase the sensitivity of the animal's vision. During the summer months the eye is a golden color, and during winter the eye color changes to blue. For Arctic reindeer living near the University of Tromsø in Norway, there is a third eye color possibility - green. Lighting from town and reflection of light off of clouds keeps the reindeer habitat dimly lit and never truly dark. As a result, the researchers believe, the eyes of these reindeer cannot shift fully to blue.⁴⁰ The disruption of natural processes and hormone levels in reindeer and other animals adversely affect their natural behaviors and leads to problems with natural hormone regulation, reproduction, adaptation and survival.



THE VALUE OF DARKNESS CULTURAL

HERITAGE AND RURAL CHARACTER

Star gazing has been a human pastime since ancient times. The ancients interpreted constellations and arrangements of the stars and planets that they saw in the night sky to have important meaning for themselves and their families. Similarly, night skies were important to the Native Americans and early settlers. As light pollution becomes more prevalent, the ability of humans to view and enjoy the night sky diminishes. This has subtle but significant cultural impacts, especially for future generations.^{42 43}

Communities recognize, appreciate, and work to protect their unique and beautiful night skies often from a cultural, value-based perspective.

The Utah Community Development Office recently assisted the Town of Leeds in conducting a community-wide survey, and without any prompting, several respondents mentioned dark skies specifically.

TOWN OF LEEDS SURVEY RESPONSES

Question A: What two things do you appreciate most about living in your community?

Responses:

- No street lights so I can see the night sky - yay!
- Views by day and night sky
- The “quietness” and dark conditions in town that make the night sky very unique in a great way.
- See night stars/ lack of light pollution
- Peace and quiet, dark nights
- Low light pollution
- Dark skies / beautiful views

Question B: How do you think leadership and the community can best address the two things you would like to change ?

Responses:

- Discourage excess lights (uplit homes) we want to see stars at night, not bright lights
- Lights! Use downward facing shields on all outdoor lights (dark skies initiative)

Question C: Please describe your desired future for your community in one sentence.

Response:

- Would like to see Silver Reef area west of freeway remain bedroom community with open space and see stars at night

AN INTERVIEW WITH DANIEL BULLETT'S SPECIAL PROJECTS DIRECTOR, KAIBAB BAND OF PAIUTE INDIANS

How would you describe your community?

- Words to describe my reservation are remote, quiet, untouched, and just plain wonderful. We are a 30-minute drive to the grocery store and a one hour drive to the nearest Walmart. There are certain sections on the reservation where new constructions are permitted but the rest of the 122,000 acres remains untouched. The Paiute are caretakers of the land because we come from the land, live off the land, and then go back to the land. Preserving things at ground level also preserves things at sky level and the two are very much connected.

Why is dark sky conservation important to your community?

- For the tribe it is different than for cities and towns in many ways. We see “sky” conversation as a teaching tool to help us reconnect with songs, stories, dances and the spirituality of what the dark night really means to my Paiute people. Our songs, stories and dances connect us to our surroundings both during the day and night. We look at conservation of the sky through a cultural connectedness aspect which incorporates many different things. A more modern aspect is that we do have a lighting ordinance which affects all new construction on the reservation. The ordinance applies to our new RV park, billboard signs, and tribal homes.

Learn more about the world's first **IDA Dark Sky Nation** at <https://www.darksky.org/the-worlds-first-ida-dark-sky-nation/>

Dark skies matter to many diverse communities and cultures throughout the Intermountain West. However, an appreciation for the night sky is not enough to protect it; action must be taken. The following section discusses how to plan for dark skies, the International Dark Sky Places Program, and how to build momentum in your community.

What is your community doing about dark sky conservation?

- Since our 2015 designation we have been uncovering songs, stories and dances related to the night sky. The songs, stories and dances are structured around our Bighorn Sheep to which we have songs and dances that have not been done since the 40's and stories that have not been told since the 50's.
- This year we will be teaching our youth the dances, songs, and stories. It has been a four-year struggle to relearn and find people willing to put their time into helping teach a forgotten, important piece of our culture that was considered lost until the [dark sky] designation happened.

What do you need to be successful?

- A core group of people willing to commit time and energy into all that needs to be done to make events, classes, or projects happen in fun and friendly ways.

What advice would you share with another community?

- Paiutes have a saying “one person speaks, one person listens. Many people speak, many people listen.” So, in other words, one person can not do it alone and it will take many people to help spread the word of the importance of dark sky conservation.




PLAN- NING FOR DARK SKIES

Planning and community effort are essential to accomplish a sustained reduction of light pollution and conservation of the night sky.⁴⁴ Just as with other types of land use planning, planning for dark skies includes administrative code (the how) and zoning (the where).

OUTDOOR LIGHTING CODE

The principal purpose of most lighting regulation is to limit light pollution, promote energy conservation, regulate outdoor lighting fixtures, and to create a unifying, community-wide approach to outdoor lighting. The more effective your lighting code, the more successful your reduction of light pollution. Note that lighting codes can be enacted at different governmental levels—from state (most general), to county, or community and even down to a development project or neighborhood (most specific).⁴⁵



EFFECTIVE ORDINANCES INCLUDE⁴⁶

- Definitions
- Standards
- Exemptions
- Procedures
- Compliance methods
- Enforcement
- Actions in cases of violation

The IDA, in partnership with the Illuminating Engineering Society of North America (IES), jointly designed a **Model Lighting Ordinance (MLO)**⁴⁷ to address the need for strong, consistent outdoor lighting regulation in North America. An additional resource for model lighting code is the **Pattern Outdoor Lighting Code v2.0**⁴⁸ recommended by the Flagstaff Dark Sky Coalition. For good, general guidance and background for effectively tailoring a lighting code to meet local priorities, see the **IDA Outdoor Lighting Code Handbook**.⁴⁹

For a breakdown of what a lighting ordinance is, the different formats it may take, links to example ordinances, and best practices see **Lighting Ordinance Walkthrough**.

LIGHTING ZONES

Lighting zones define areas where general conditions related to lighting uses are sufficiently different to merit some differences in lighting standards in the lighting code.⁵⁰ Lighting zones can be approached in three ways:

LAND-USE ZONING APPROACH Also referred to as Euclidean Zoning, the Land-use Zoning approach is based on the concept of single-use zones. With this approach, lighting code is tied closely to the different land-use zoning categories (such as heavy commercial or single-family detached residential).

RELATIONSHIP AND PROXIMITY APPROACH

Lighting zones can be based on relation to or proximity to a particular resource (such as an observatory or park. These kinds of overlay zones are also common around airports, though primarily for airport safety considerations).

COMBINED APPROACH A third option combines the land-use zoning and relationship/proximity approaches. Commercial zoning near an observatory would be considered one lighting zone, whereas in an urban surrounding the same commercial zoning would be considered a different lighting zone.



OVERLAY ZONING Lighting zones are often defined as overlay zones. Overlay zoning is a regulatory tool that creates a special zoning district placed over an existing base zone(s) which identifies special provisions in addition to those in the underlying base zone.⁵¹ This means that the lighting zones “overlay” but are different from land-use zoning. This makes it easier to integrate lighting code into existing ordinances or codes and cross-reference to other applicable codes and ordinances such as electrical code, sign code or planning ordinances. After deciding upon an approach, the IDA recommends the use of five outdoor lighting zones for codes and ordinances.⁵³

LZ0: No ambient lighting—areas where the natural environment will be seriously or adversely affected.

LZ1: Low ambient lighting—areas where the natural environment might be adversely affected by lighting.

LZ2: Moderate ambient lighting—areas where lighting may typically be used for safety, security and convenience but it is not necessarily uniform or continuous.

LZ3: Moderately high ambient lighting—areas where lighting is generally desired for safety, security and convenience and is usually uniform and continuous.

LZ4: High ambient lighting—Lighting is considered generally necessary for safety, security and convenience.

For greater detail on the five recommended lighting zones see the **Joint IDA-IESNA Model Lighting Ordinance (MLO) User’s Guide**.

LIGHTING CODE ENFORCEMENT All code, including lighting code, requires enforcement. Lighting code enforcement is essential to achieving a sustained reduction of light pollution and conservation of the night sky. Communities should adopt an enforcement framework and strategy that outlines their intended means of enforcing the code. Enforcement methods vary significantly based on a community’s size, resources, culture and needs. Enforcement strategies that match capacity and community culture will be most successful.⁵⁴

Typical lighting code enforcement may require:

1. Redirection of the luminaire
2. Shielding of the light source
3. Redesign or relocation of the luminaire
4. Replacement of the luminaire with a conforming luminaire
5. Removal of the luminaire
6. Penalties such as fines

“Regulation at the state level is necessary to ensure that minimum standards are met across the state. It is important to have these minimum standards, but it is also important to give local areas a chance to formulate their own additional rules and regulations.”

Andrea L. Johnson



THE INTERNATIONAL DARK SKY PLACES PROGRAM

An important part of dark sky planning in the Intermountain West is the International Dark Sky Places Program. The Dark Sky Places Program was started in 2001 by the IDA to encourage parks and communities around the world to preserve and protect dark skies through responsible lighting policies and education. The International Dark Sky Places Program offers five types of designations.⁵⁵

1. International Dark Sky 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.
2. International Dark Sky Parks are publicly or privately-owned spaces protected for natural conservation that implement good outdoor lighting and provide dark sky programs for visitors.
3. International Dark Sky Reserves consist of a dark “core” zone surrounded by a populated periphery where policy controls are enacted to protect the darkness of the core.
4. International Dark Sky Sanctuaries are the most remote (and often darkest) places in the world, whose conservation states are most fragile.
5. Dark Sky Developments of Distinction recognize subdivisions, master planned communities and unincorporated neighborhoods and townships whose planning actively promotes a more natural night sky but does not qualify them for the International Dark Sky Community designation.

The International Dark Sky Places Program also offers independent, third-party certification under a transparent, no-fee based evaluation process.

For more information and how to apply visit:

www.darksky.org/idsp/



Building momentum for local municipal policy initiatives requires action from leaders, citizens and other stakeholders. The following are actions taken by municipalities that have successfully limited light pollution and adopted dark sky policies and regulations.

HOW CAN WE BUILD MOMENTUM?

COMMIT Commitment means making dark sky preservation a priority and becoming actively involved.

EDUCATE AND SHARE INFORMATION

Without an understanding of why light pollution is a problem and what the benefits of preserving dark skies are, it can be difficult to gain community support. Educate leaders, planners, local governments and individuals about light pollution. Talk openly about the problem and address concerns.

PERFORM A DARK SKY ASSESSMENT

A dark sky assessment identifies problem areas and provides benchmarks for determining the effectiveness of lighting improvements and energy savings. For more information, tools and resources on performing an assessment see **Dark Sky Assessment Guide**.

SURVEY A survey is a great tool for gauging people's understanding about dark skies as well as their opinion. A survey can highlight common concerns, common questions and common values. Use a survey to gauge public interest and support.

CREATE AN ACTION PLAN You eat an elephant one bite at a time. Establish realistic goals and objectives and follow a timeline. Organization and collaboration are key.

DEMONSTRATE ENERGY COST SAVINGS

Calculating potential energy savings and payback for upgrade conversions is an effective way to gain support and to illustrate the benefits of energy-efficient lighting.

FORM A SUPPORT GROUP Forming a dark sky coalition or interest group will unite stakeholders and community members and build support around shared goals. Involve the IDA, a dark sky interest group, or astronomy club and let them know of your efforts and goals. Talk to and involve your local energy provider. For a case study on the topic visit: <https://www.darkskiicolorado.org/newdarkskiessgroup>

RAISE FUNDS Cost is a common barrier to local initiatives and planning efforts. Options include raising money through crowd-sourcing and promotion. Many organizations, institutes, student groups and government agencies are able to provide support and guidance for free or at a minimal cost. Your local energy provider may be willing to decrease rates on certain lighting types and help with lighting conversions. For recommendations on creating a strategic donation plan visit: <https://www.darkskiescolorado.org/strategic-donation-plan>

ADOPT LIGHTING CODE AND DARK SKY BEST PRACTICES Lighting code establishes lighting design standards. The more effective your lighting code, the more successful your reduction of light pollution and sustained dark sky conservation.

ADOPT PROPER LIGHTING DESIGN STANDARDS Replace or retrofit existing lighting so that it follows dark sky lighting basics. Talking to your local energy provider will be key to determining what is feasible and to create a plan. If funds are tight, work in phases by assigning priority to different areas, such as main street or public facilities. Lighting design standards will be an important part of your lighting code.

ENFORCE DARK SKY PROTECTION Develop a plan for enforcing lighting code and make provision for future updates and improvements to your code. Enforcement is key!

PROMOTE A "DARK-SKY" CULTURE AND BRANDING Is your community known for something? If not, a dark sky designation presents an opportunity to create a unique brand and culture. A unique culture and brand can be the mechanisms that attracts new residents, visitors and businesses to an area.

THINK REGIONALLY, BUT ACT LOCALLY Dark sky preservation is inherently a regional issue. One municipality or park can make a significant difference, but efforts to minimize light pollution will be far more effective if regionalism is recognized and efforts expand beyond one location's boundaries.

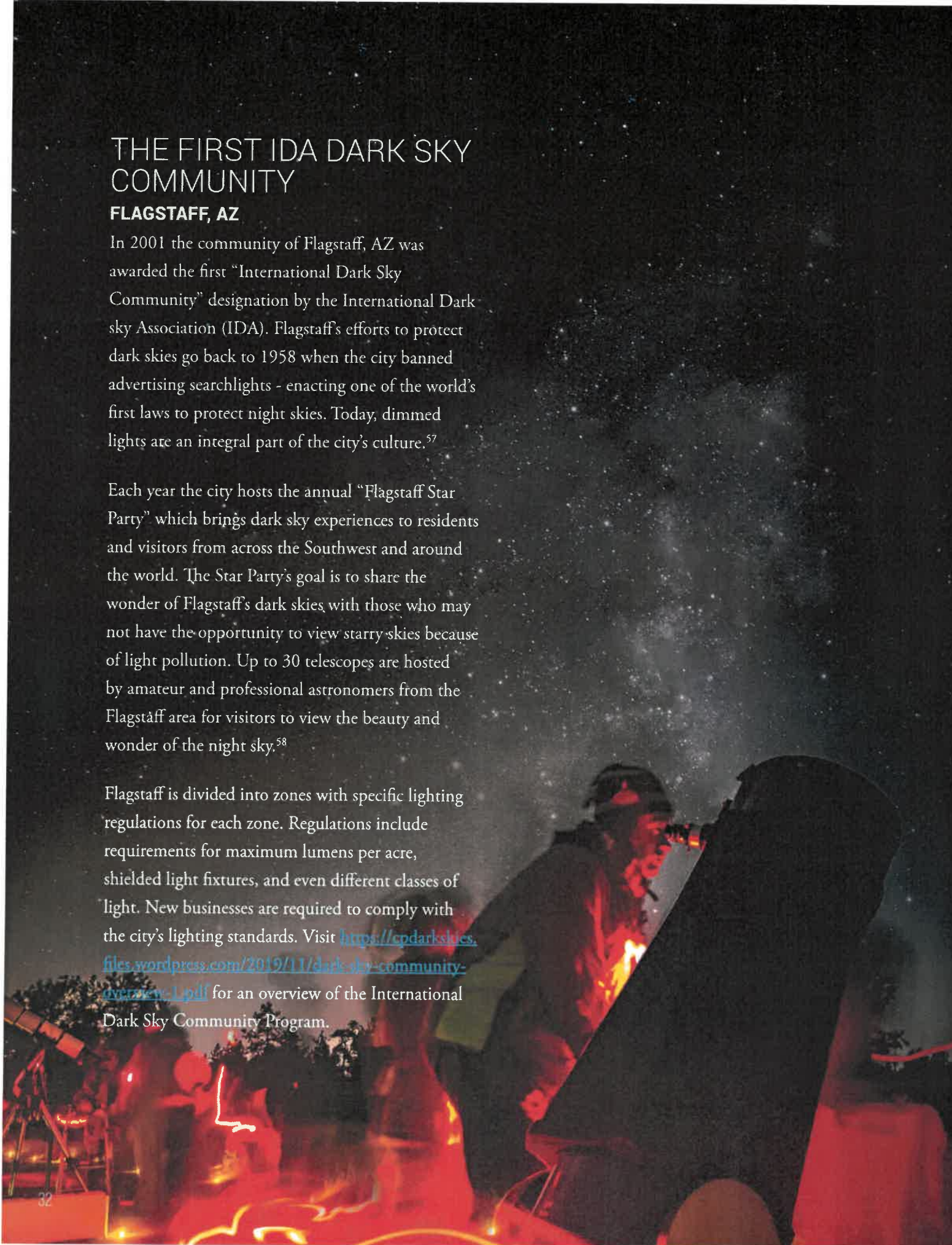
THE FIRST IDA DARK SKY COMMUNITY

FLAGSTAFF, AZ

In 2001 the community of Flagstaff, AZ was awarded the first “International Dark Sky Community” designation by the International Dark sky Association (IDA). Flagstaff’s efforts to protect dark skies go back to 1958 when the city banned advertising searchlights - enacting one of the world’s first laws to protect night skies. Today, dimmed lights are an integral part of the city’s culture.⁵⁷

Each year the city hosts the annual “Flagstaff Star Party” which brings dark sky experiences to residents and visitors from across the Southwest and around the world. The Star Party’s goal is to share the wonder of Flagstaff’s dark skies with those who may not have the opportunity to view starry skies because of light pollution. Up to 30 telescopes are hosted by amateur and professional astronomers from the Flagstaff area for visitors to view the beauty and wonder of the night sky.⁵⁸

Flagstaff is divided into zones with specific lighting regulations for each zone. Regulations include requirements for maximum lumens per acre, shielded light fixtures, and even different classes of light. New businesses are required to comply with the city’s lighting standards. Visit <https://cpdarkskies.files.wordpress.com/2019/11/dark-sky-community-overview-1.pdf> for an overview of the International Dark Sky Community Program.





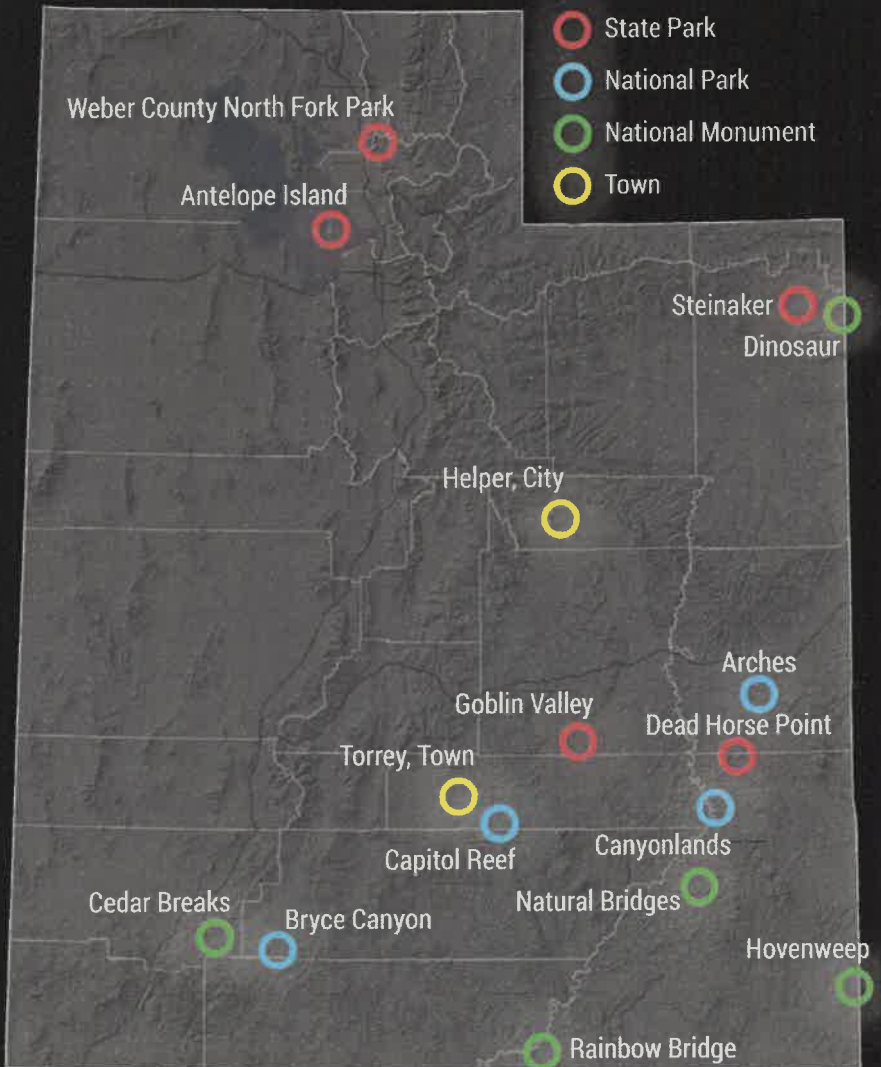
Utah leads the world with fourteen certified International Dark Sky Parks, two International Dark Sky Communities (Torrey - January 12, 2018 and Helper - April 1, 2020), and multiple parks and communities currently working through the accreditation process. The number of Utah designations continues to grow as more parks and communities enter into the International Dark Sky Places Program.⁵⁶

DARK SKY PARKS IN UTAH

- Antelope Island State Park
- Arches National Park
- Bryce Canyon National Park
- Canyonlands National Park
- Capitol Reef National Park
- Cedar Breaks National Monument
- Dead Horse Point State Park
- Dinosaur National Monument
- Goblin Valley State Park
- Hovenweep National Monument
- Natural Bridges National Monument
- Rainbow Bridge National Monument
- Steinaker State Park
- Weber County North Fork Park

DARK SKY COMMUNITIES

- Helper
- Torrey



Data Sources: National Park Service and International Dark Sky Association

BRYCE CANYON - PARKS NEED PROGRAMS

A dark sky can be an important resource for a national or state park that is free from light pollution. Bryce Canyon National Park (BCNP) offers close to 59 different astronomy programs per year including solar observing, educational multimedia presentations in the evening, night sky viewing and full moon hikes. Visitors to the park can take part in any of these activities.

In a 2009 survey of BCNP visitors, 67 percent indicated that they learned about one or more park topics with 56 percent indicating that they learned about “night skies/astronomy.” Of those who learned about night skies/astronomy, 21 indicated that their learning improved a lot and 38 percent indicated that their learning had improved somewhat. When asked to rate the importance of protecting park attributes and resources, 47 percent indicated “Dark, starry night sky” as important.⁶⁰

OGDEN VALLEY - GETTING AHEAD OF GROWTH

Ogden Valley is home to the Weber County North Fork International Dark Sky Park, which was designated in 2015. The Weber County North Fork Park is unique from other Dark Sky Parks due to its urban adjacency, intense focus on wildlife, extensive outreach program, and innovative public art exhibitions incorporating dark sky themes.⁶¹

Ogden Valley began protecting dark skies in 2000 when Weber County commissioners approved a lighting ordinance for the upper Ogden Valley. Today with growth projections of 20,000 new homes in the next 20 years, dark sky protection is a priority. By getting ahead of growth, Ogden Valley has been able to put protections in place that will preserve and protect their dark sky even when future growth and development occur.⁶²

IVINS - ALL ABOUT INITIATIVE

The “Ivins Night Sky Initiative” was started in January 2019 and is a 100% volunteer, not for profit, citizen organization. The mission of the Ivins Night Sky Initiative is to improve, preserve, and protect the night sky over Ivins and the town's heritage of dark skies through environmentally responsible outdoor lighting, and to serve as a resource for city officials, residents, and businesses.

Situated beneath iconic Big Red Mountain, Ivins is home to the Tuacahn Center for the Arts, the Center for the Arts at Kayenta, Red Mountain Resort and Spa, Movara Fitness Resort, Coyote Gulch Art Village, the Crescent Moon Inn, the Southern Utah Veterans Home, Rocky Vista University, the Tuacahn High School for the Performing Arts, and Vista School. Although Ivins is gaining in popularity as a center for tourism, the city is first and foremost a peaceful family and retirement friendly bedroom community with pockets of agriculture.

TORREY - BECOMING A DARK SKY COMMUNITY

When her view of the stars surrounding Capitol Reef National Park became obstructed by excessive artificial light, Torrey resident Mary Bedingfieldsmith found out what her small town could do to curb light pollution. Today, Torrey is Utah's first International Dark Sky Community.

In order to make a change, Bedingfieldsmith began talking to neighbors and met with town officials with a proposal. The proposal demonstrated how the municipality would save more than \$900 in lighting costs each year and how funds to install new lighting would be raised by Mary's group. By speaking to people on an individual level and assuring residents that no one would be forced to replace existing lighting, Mary was able to reach a consensus.⁶³

On March 15, 2017, ten old high pressure sodium street lights were replaced with new, warm-white LED lights that direct illumination onto the roadway rather than into the sky. True to Mary's proposal, friends and residents of Torrey were able to fund the replacements raising over \$18,000 via an online campaign.

"Torrey has proven its commitment to protecting this resource for the benefit of both its residents and national park visitors [visiting Capitol Reef National Park]."

Former IDA Executive Director, J. Scott Feierabend

"When we talk individually, we can discuss specific lighting needs and what can be done to get there. Without individuals and associations working together, the last remaining dark areas on the planet could well disappear without anyone noticing."

Mary Bedingfieldsmith

Garkane Energy and The Entrada Institute also played significant roles in the project. Garkane Energy decreased the rate renters pay for street and security lights that are switched to the new dark-sky friendly LED lights. In addition, Garkane Energy linemen spent many hours installing the new lights and taking down the old ones.⁶⁴

The Entrada Institute is an arts and education center with a goal of fostering community-based economic development in Wayne County and the surrounding region. Through the Institute's dark sky initiative, Torrey's project was promoted to members and patrons and an additional \$7,000 was raised.⁶⁵

On January 12, 2018 Torrey became Utah's first International Dark Sky Community. Torrey is also the first national park gateway community to earn the designation, according to the IDA.⁶⁶ In order to maintain its International Dark Sky Community status, Torrey must continue to preserve its night sky through education and awareness materials, dark sky events, exhibits and programs.⁶⁷

HELPER - TAKING INVENTORY

Helper, Utah is one of the first cities in the nation to have a thorough inventory of public light fixtures. With help from a team of University of Utah students and a representative from the Consortium for Dark Skies/Colorado Plateau Dark Sky Cooperative, Helper documented the number of public light fixtures, which lights are on all night, how high each street lamp and security light stands, and whether the light is fully shielded, partially shielded or unshielded. There is also information on available illumination levels and where each light falls on the visible light spectrum. Information collected during a lighting inventory provides benchmarks for determining the effectiveness of future lighting improvements and energy savings. Helper's thorough inventory will help the community monitor success and to know where improvements need to be made.⁶⁸

Many other communities and places throughout Utah are making efforts to reduce light pollution and protect the night sky, including Boulder, Eagle Mountain, Virgin, Bryce Canyon City, Eden, Moab, Rockville, Kanab, Heber City, Park City, Garden City, Bluff and others. Even though efforts almost always begin with a small group of individuals, those efforts create a framework and a positive example for other communities, states and countries to follow.

MOAB DARK SKIES

Founded June 29, 2016, Moab Dark Skies is a group dedicated to promoting the appreciation and conservation of Moab's dark skies. The impetus for the group's formation was the desire to engage community support around the appeal for Arches National Park to receive the International Dark Sky Designation in 2018. Since then, activities facilitated by the group have become much more holistic.⁶⁹

Members of the Moab Dark Skies group recently performed an audit of publicly owned light fixtures in Moab. Based on findings, the City of Moab could save nearly \$16,000 per year by upgrading streetlights, exterior building lights, and shielding fixtures. Aside from labor costs, the return on investment time for this capital improvement project is estimated to be just over two years. The City Council has allocated funding in their 2018-2019 budget to make the recommended changes.⁷⁰

Today the Moab Dark Skies' goals are to:⁷¹

- Maintain and preserve the dark skies in the Moab region.
- Encourage night-sky-friendly lighting for municipal, business and private use.
- Increase public awareness of the unique resource in Moab's dark skies.
- Provide dark sky educational opportunities and events for the community.

THE UTAH DARK SKIES INITIATIVE

The Utah Dark Sky Initiative is a collaborative group of stakeholders committed to promoting Dark Sky efforts in the state of Utah by: educating decision makers, community leaders, and the public about the value of dark skies, and by providing support for outreach, sky-quality monitoring, and lighting ordinance authorship to equip communities as stewards of Dark Sky preservation, restoration, and protection.

Initiative members include:

- The Utah Community Development Office
- The International Dark Sky Association
- Utah State Parks
- Utah Office of Tourism
- The Colorado Plateau Dark Sky Cooperative
- The Consortium for Dark Sky Studies
- Other committed agencies

Contact the Utah Community Development Office for more information about the initiative, how to become involved, and for additional dark sky tools and resources: **(801) 436-0133** or **community@utah.gov**

The Initiative's objectives are:

Objective 1: Establish a statewide "dark-sky-network" between Initiative stakeholders in order to coordinate efforts, communicate effectively, share resources and information, and provide mutual support.

Objective 2: Increase awareness of light pollution's impacts by educating target audiences about the significant economic, human health, ecological, and safety benefits of preserving dark skies, as well as the cultural and heritage implications of restoring our citizens' access to starry nights.

Objective 3: Support and create actionable dark sky tools, guides, and resources.

Objective 4: Connect communities with the appropriate tools, resources, programs, and agencies based on their specific needs and goals.

Objective 5: Facilitate trainings and provide technical assistance, where feasible, to build the capacity of communities to build and enact their own dark-sky preservation plans.

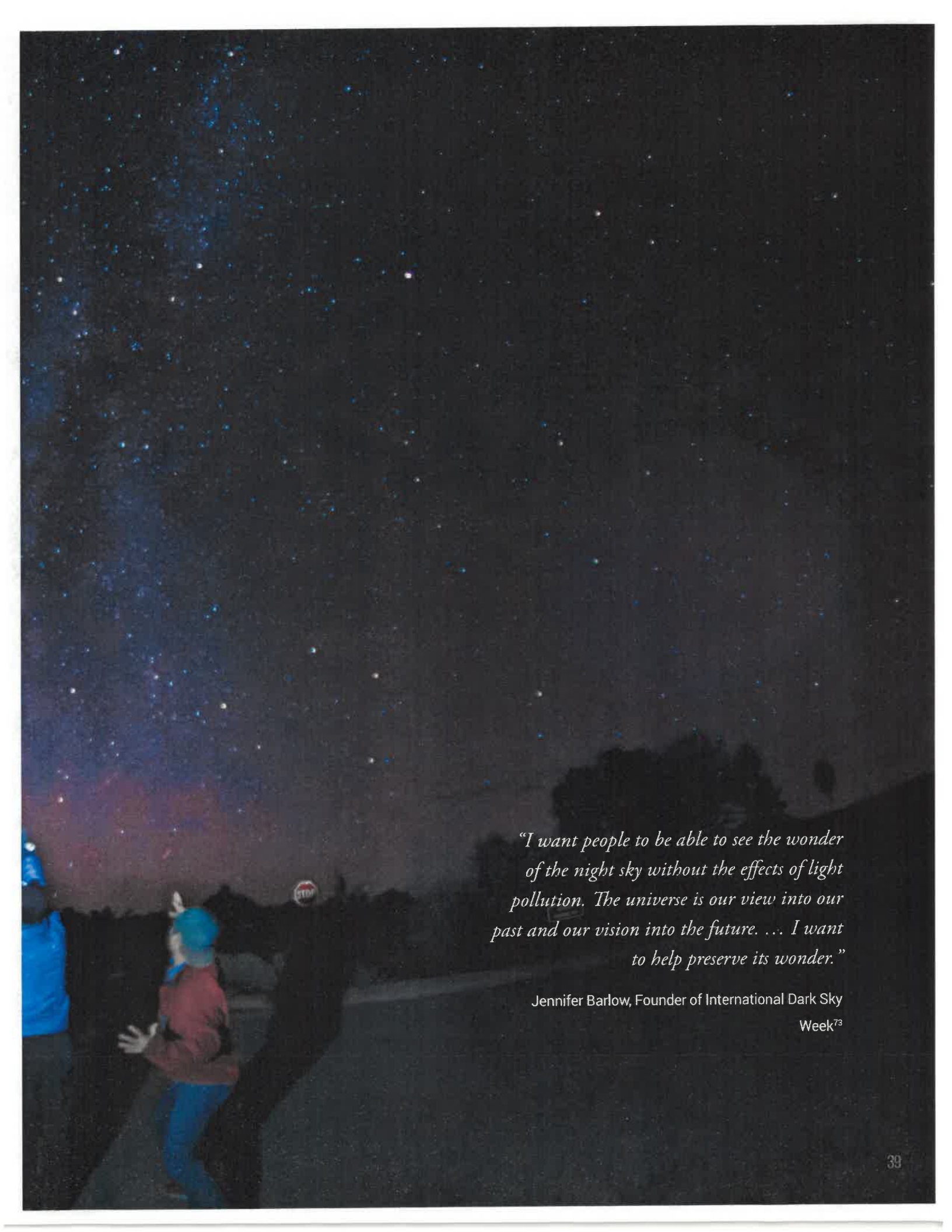


“This symbol, composed of a hive of stars, transposes our beehive symbol to a new and grand level as we enter our second century as a group of people living in a place where we can still see, with our own eyes, the beautiful and dim features of the starry universe.”

House Bill 140, 1996 ⁷²

In Utah, as in all places, how dim the stars become will depend on the value we place on dark sky protection. If reducing light pollution becomes a priority, municipal policy initiatives to protect the night sky will follow. Those initiatives will require community involvement, action and education in order to produce effective lighting plans. Proactively preserving and protecting dark skies gives Utah the opportunity to become the dark sky capital of the world.

The people and places that recognize dark skies as a valuable resource understand the numerous benefits that come from dark sky protection, which include the conservation of energy, money savings, increased tourism, improved human health, safety and wellbeing, protection of ecosystems, and the preservation of culture and heritage. Fortunately, the decision to protect the night sky can be made today. This important decision will maintain “the beautiful and dim features of the starry universe” for us and the generations who follow.



"I want people to be able to see the wonder of the night sky without the effects of light pollution. The universe is our view into our past and our vision into the future. ... I want to help preserve its wonder."

Jennifer Barlow, Founder of International Dark Sky Week⁷³



NEED
HELP?

THE INTERNATIONAL DARK SKY

ASSOCIATION (IDA) is the recognized authority on light pollution and is the leading organization combating light pollution worldwide. The IDA runs the International Dark Sky Places Program.

Contact:

(520) 293-3198

<http://www.darksky.org>

THE IDA UTAH CHAPTER is Utah's local base for the International Dark Sky Association. IDA chapters organize events such as dark sky festivals, conferences and star parties while working to educate their communities and government officials about the importance of protecting night skies, eco-friendly outdoor lighting, and much more.

Contact:

darkskyut@gmail.com

<https://utah.darksky.ngo/>

THE COLORADO PLATEAU DARK SKY

COOPERATIVE aims to voluntarily link communities, tribes, businesses, state agencies, federal agencies and citizens in a collaborative effort to celebrate the view of the cosmos, minimize the impact of outdoor lighting, and ultimately restore natural darkness the area.

Contact:

Aubrey Larsen, Coordinator

(435) 213-7026

darkskycooperative@gmail.com

<https://cpdarkskies.org/>



THE BASIN AND RANGE DARK SKY

COOPERATIVE is a newly formed dark sky cooperative that serves the Pacific West region by coordinating efforts, communicating effectively, sharing resources and information, and providing mutual support.

Contact:

Ashley Pipkin, Coordinator

(702) 293-8847

brdarkskies@gmail.com

<https://brdarkskies.org/>



THE CONSORTIUM FOR DARK SKY STUDIES

was founded in 2015 at the University of Utah. The Consortium for Dark Sky Studies (CDSS) is dedicated to the discovery, development, communication and application of knowledge across a wide range of disciplines and professional fields pertaining to the quality of night skies, growing light pollution and the varied human, animal and environmental responses to the “disappearing dark.”

Contact:

daniel.l.mendoza@gmail.com

<http://www.darksystudies.org/>

THE UTAH STATE PARKS DARK SKY

INITIATIVE helps to guide Utah's state parks through the application and accreditation process to become International Dark Sky Parks.

Contact:

Justina Parsons-Bernstein, Heritage,
Interpretation and ADA Resources Coordinator
jparsonbernstein@utah.gov or (801) 538-7428
<https://stateparks.utah.gov/resources/utah-state-parks-dark-sky-initiative/>

THE NATIONAL PARK SERVICE

protects nighttime views and environments and other critical park features. Night sky protection enhances qualities of solitude and undeveloped wilderness character that animals depend on for survival, park visitors seek for connections, and many cultural-historical parks require for preservation. NPS recognizes a naturally dark night sky as more than a scenic canvas; it is part of a complex ecosystem that supports both natural and cultural resources.

Contact:

Karen Trevino, Natural Sounds and Night Skies
Division Chief
<https://www.nps.gov/orgs/1050/index.htm>

THE UTAH OFFICE OF TOURISM provides detailed information about Utah's unique dark sky destinations and guidance on implementing "dark sky-tourism" as a community development strategy.

Contact:

Flint Timmins, Destination Development
Specialist
fdtimmins@utah.gov or (801) 538.1394
<https://www.visitutah.com/places-to-go/dark-sky-parks/>

THE ENTRADA INSTITUTE serves the public as an arts and education center to promote public understanding and appreciation of the arts, the natural, historical, and traditional cultural heritage of the high desert Colorado Plateau, and to foster community-based economic development in Wayne County, Utah and the surrounding region. This nonprofit organization also supports artists, writers, scholars and scientists in their development of new works.

Contact:

info@entradainstitute.org
<http://www.entradainstitute.org/>

UTAH'S COMMUNITY DEVELOPMENT

OFFICE (CDO) supports community development by facilitating coordination between stakeholders, delivering training and tools, and providing planning and technical assistance. The CDO's vision is resilient communities that are self-reliant, self-determined and prepared for the future. The CDO supports a state-wide dark sky initiative.

Contact:

(801) 438-0133
community@utah.gov
<https://jobs.utah.gov/housing/community/index.html>

APPEN- DIX

LIGHTING CODE, ORDINANCES, AND ZONING

Flagstaff Dark Skies Coalition - Outdoor Lighting Codes

Hub of information, resources, and links
<http://www.flagstaffdarkskies.org/dark-sky-solutions/dark-sky-solutions-2/outdoor-lighting-codes/>

Pattern Outdoor Lighting Code (POLC) - 2010

Defines practical and effective measures by which the obtrusive aspects of outdoor light usage can be reduced, while preserving safety, security, and the nighttime use and enjoyment of property.

<http://www.flagstaffdarkskies.org/wp-content/uploads/2015/10/CBL-POLC-standard-v2.0.pdf>

Modeling lighting ordinances - dark sky impacts

Analysis of the light pollution control effectiveness of the IDA-IES Model Lighting Ordinance and the IDA Pattern Outdoor Lighting Code

<http://www.flagstaffdarkskies.org/model-lighting-ordinances-dark-sky-impacts/>

IDA Lighting Code Handbook - 2002

This Handbook discusses issues relative to outdoor lighting codes, their effectiveness, implementation, and enforcement.

http://www.flagstaffdarkskies.org/wp-content/uploads/2013/02/IDA-Outdoor-Lighting-Code-Handbook-Version-1_14.pdf

IDA Model Lighting Ordinance (MLO) - 2011

This Model Lighting Ordinance (MLO) is the result of extensive efforts by the International Dark Sky Association (IDA) and the Illuminating Engineering Society of North America (IES). Among its features is the use of lighting zones (LZO-4) which allow each governing body to vary the stringency of lighting restrictions according to the sensitivity of the area as well as accommodating community intent.

http://www.darksky.org/wp-content/uploads/bsk-pdf-manager/16_MLO_FINAL_JUNE2011.PDF
The MLO is best adopted as an "overlay zoning" ordinance"

IDA Recommended Lighting Zones

IDA suggested lighting zones for codes and ordinances

<https://www.darksky.org/our-work/lighting/public-policy/model-lighting-laws-policy/lighting-zones/>

IDA - Lighting for Policy Makers

Arguments for why you municipality should be concerned about light pollution.

<http://www.darksky.org/lighting/policy-makers/>

Lighting Ordinance Walkthrough

A breakdown of what a lighting ordinance is, the different formats it may take, links to example ordinances, and best practices

<https://utah.maps.arcgis.com/apps/MapSeries/index>

LIGHTING CODE EXAMPLES

Multiple Lighting Ordinance Examples

Links to example code from multiple communities like Torrey, UT; Springdale, UT; Jackson, WY; and Kanab, UT.

<http://darkskestudies.org/lighting-ordinances/>

Flagstaff Outdoor Lighting Code

Example code from Flagstaff, AZ

<https://www.flagstaff.az.gov/3698/Dark-Sky-City>

Eagle Mountain Lighting Code

Eagle Mountains Outdoor Lighting Standards

<http://www.codepublishing.com/UT/EagleMountain/html/EagleMountain17/EagleMountain1756.html>

Torrey General Plan

General Goals (pg. 8): Land Use addresses the following areas of critical concern: private Land use, public Land use, municipal property, annexation, zoning, water usage, ordinances, town signage, trees, lighting, noise, animal control and the preservation of the aesthetic values of the town, such as the dark night sky and viewsheds.

Zoning (pg. 11): A commercial district should be established to encourage the central location of all businesses and preserve the residential community structure, including the reduction of sound and light pollution in areas away from the Town's core commercial area. The establishment of such district should also include definitions of appropriate commercial and industrial uses.

Preservation of Aesthetic Values, Noise and Light (pg. 15)

Appendix C - Analysis of 2013 Citizen Survey (pg. 33): There are aspects of life in Torrey we don't like. High on that list are bright, glaring lights. Fifteen respondents felt strongly enough about that to comment. The Saddlery was often cited specifically but also the "junction." Next on the "don't like" list are yards with junk and trash. Ten people mentioned that. Noise and dust from ATV traffic was the complaint of seven respondents and barking dogs were the complaint of six. Other complaints mentioned the wind and isolation from shopping and medical services.

<http://www.torreyutah.gov/applications/PlanningZoningGeneralPlan.pdf>

Torrey Sign Ordinance

An ordinance providing for the construction and implementation of signs within the city limits of Torrey Town

<http://www.torreyutah.gov/applications/tto/SignOrd2015.pdf>

Helper Municipal Code

Example lighting code.

<https://www.codenpublishing.com/UT/Helper/#!/html/Helper18/Helper1897.html>

Springdale

Example lighting code.

<https://www.springdaletown.com/AgendaCenter/ViewFile/Agenda/02012017-329?packet=true>

Additional code examples

Telluride, Steamboat Springs, Springdale, Ogden Valley, Ketchum, Jackson, Breckenridge, and Aspen.

<https://drive.google.com/open?id=0B1CVKfshW7jPMzd5MXU5TUhpZ28>

FINDING ENERGY EFFICIENT AND DARK SKY FRIENDLY LIGHTING

IES Standards

The IES is an accredited Standards Development Organization (SDO) that develops its standards using American National Standards Institute (ANSI) approved procedures.

<https://www.ies.org/standards/>

IDA - Find Dark Sky Friendly Lighting

IDA's Fixture Seal of Approval program certifies outdoor lighting fixtures as being Dark Sky Friendly, meaning that they minimize glare while reducing light trespass and skyglow.

<http://www.darksky.org/fsa/fsa-products/>

IDA - LED Practical Guide

Considerations and tradeoffs for choosing LED products for outdoor lighting applications.

<http://www.darksky.org/lighting/led-guide/>

DOE - Outdoor Area Lighting

This document reviews the major design and specification concerns for outdoor area lighting, and discusses the potential for LED luminaires to save energy while providing high quality lighting for outdoor areas.

https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/outdoor_area_lighting.pdf

DOE - Outdoor Lighting Resources

DOE offers a variety of resources to guide municipalities, utilities, and others in their evaluation of LED street lighting products.

<https://energy.gov/eere/ssl/outdoor-lighting-resources>

DOE - Toolkit: Outdoor Lighting

Includes an outdoor lighting decision tree tool, outdoor lighting challenges and solutions pathways report, OLA partner summary table, and lessons learned.

<https://energy.gov/eere/ssl/downloads/toolkit-outdoor-lighting>

DOE - Outdoor Lighting Accelerator Partner Summary Table

This is how they did it: pathways to energy savings with street lights.

<https://betterbuildingssolutioncenter.energy.gov/outdoor-lighting/partner-summary-table>

ADDITIONAL RESOURCES

DOE - Retrofit Financial Analysis Tool

Property owners, city and other government agencies, utilities, and energy efficiency organizations can use this tool to compute annualized energy and energy-cost savings, maintenance savings, greenhouse gas reductions, net present value, and simple payback associated with potential lighting upgrades.

<https://energy.gov/eere/ssl/retrofit-financial-analysis-tool>

Utah CDO Dark Sky Assessment Guide

The initial groundwork for a dark sky designation is establishing the current status. This worksheet guides users through several evaluation methods which could be used for a general assessment of dark-sky-friendly lighting.

<https://www.darksky.org/wp-content/uploads/bks-pdf-manager/2019/06/Dark-Sky-Assessment-Guide-Update-6-11-19.pdf>

Colorado Plateau Dark Sky Cooperative

General tools and resources.

<https://cpdarkskies.org/resources/>

Dark Skies of the West Mountain Valley

Light pollution resources.

<https://www.darkskiescalifornia.org/links>

IDA - Electronic Messaging Centers

EMC Guidelines to provide planners, lighting designers, architects, biologists, government officials, and the general public with solutions for EMCs, both on and off premises, that minimize harm to the natural night and even reduce sky brightness when replacing poorly designed lit signs and billboards.

<https://www.darksky.org/our-work/lighting/lighting-for-industry/emc/>

IDA - Home Lighting

A step-by-step guide to conduct an outdoor lighting assessment around your house, apartment building, property line, business, community center, wherever, to evaluate the impact of your light on the night.

<https://www.darksky.org/our-work/lighting/lighting-for-citizens/residentialbusiness-lighting/>

TERMS & ACRO- NYMS

CLUTTER Bright, confusing and excessive groupings of light sources.

COLOR SPECTRUM Refers to the portion of the electromagnetic spectrum that is visible to the human eye.

DARK SKY Denoting or located in a place where the darkness of the night sky is relatively free of interference from artificial light.

FOOT CANDLE A uniform point source of light of one candle and equal to one lumen per square foot.

FULLY SHIELDED A fixture that allows no emission above a horizontal plane passing through the lowest light-emitting or light-reflecting part of the fixture.

GLARE Excessive brightness that causes visual discomfort.

KELVIN A measurement unit for light's "warmness" or "coolness."

LIGHT TRESPASS Light falling where it is not intended or needed.

LUMEN A measurement unit for the brightness from a light source.

LUMINAIRE A complete lighting unit that usually includes the fixture, ballasts, and lamps.

REFLECTION Light redirected back into the sky off of surfaces that are being illuminated.

SPECTRUM Referring to light it is the group of different colors (red, orange, yellow, green, blue, indigo, and violet) seen when light passes through a prism.

SKYGLOW Brightening of the night sky over inhabited areas.

IDA International Dark Sky Association

IES Illuminating Engineering Society

POLC Pattern Outdoor Lighting Code

MLO Model Lighting Ordinance

DOE Department of Energy

BUG Backlight-Uplight-Glare rating system for luminaires

LED Light-emitting diode

OLA Outdoor Lighting Accelerator

WORKS CITED

- 1 Foott, Bettymaya, "Embracing the Night." cpdarkskies.org. December 6, 2017.
- 2 Hoerger, Jacob. (2016) Missing the Night Sky. The New Atlantis, Number 48, Winter 2016, pp. 115-131.
- 3 IDA in Partnership with NOAO, NSF, and IYA Dark Skies Awareness."Introduction to Outdoor Lighting." July 2016. PowerPoint file
- 4 Kem C. Gardner Policy Institute Utah's Long-Term Demographic and Economic Projections Summary. July 2017.
- 5 Falchi et al. (2016). The new world atlas of artificial night sky brightness. Science Advances 10 June 2016: Vol. 2, no. 6, e1600377.
- 6 Gaston KJ, Davies TW, Bennie J, Hopkins J. Reducing the ecological consequences of night-time light pollution: options and developments. Fernandez-Juricic E, ed. The Journal of Applied Ecology. 2012;49(6):1256-1266. doi:10.1111/j.1365-2664.2012.02212.x.
- 7 Bryson et al. (2014) Planning for Dark Skies: Lighting Ordinances in the Intermountain West. Weber State University. pp. 213-223.
- 8 International Dark Sky Association. Light Pollution. darksky.org/light-pollution. 2016.
- 9 Aubrecht et al. (2010). Lighting governance for protected areas and beyond - Identifying the urgent need for sustainable management of artificial light at night. Retrieved from: <https://earthzine.org/2010/12/20/lighting-governance-for-protected-areas-and-beyond-identifying-the-urgent-need-for-sustainable-management-of-artificial-light-at-night/>
- 10 Luginbuhl and Hall. (2017, September). How Flagstaff is preserving Dark Skies. Astronomy, 55-59. Retrieved from: <http://www.astronomy.com>
- 11 Barentine, John IDA Director of Conservation
- 12 Bryson et al. (2014). Planning for Dark Skies: Lighting Ordinances in the Intermountain West. Weber State University. pp. 213-223.
- 13 Gallaway, Olsen, and Mitchell. (2010). The economics of global light pollution. Missouri State University. Ecological Economics 69: 658-665.
- 14 City of Ketchum. Dark Sky Educational Pamphlet. June 2001.
- 15 International Dark Sky Association. LED: Why 3000 K or Less. Retrieved from: <http://www.darksky.org/lighting/3k/>
- 16 International Dark Sky Association. (2015) New IDA LED Lighting Practical Guide. Retrieved from: <http://www.darksky.org/the-promise-and-challenges-of-led-lighting-a-practical-guide/>
- 17 City of Edmonton. Light Efficient Community Policy. DMD & Associates Ltd. April 29, 2013.
- 18 Johnson, Andrea. Blinded by the Light: Addressing the Growing Light Pollution Problem. Texas A&M Journal of Property Law, Vol. 2, Issue 3 (2015), pp. 461-480.
- 19 Trulia Real Estate Listing. Sedona, AZ. Dec. 2017
- 20 Ellis, Carole VanSickle. (2017). Light Pollution, Stargazing, and Your Retirement RE Portfolio. Retrieved from: <https://thinkrealty.com/light-pollution-stargazing-retirement-re-portfolio/>
- 21 Hayes, Fred. (2018) S.C.R. 2 Concurrent Resolution Encouraging the Use of Shielded Light Fixtures on Outdoor Lights. Prepared by Utah State Parks, January 2018.
- 22 Falchi et al. (2016). The new world atlas of artificial night sky brightness. Science Advances 10 June 2016: Vol. 2, no. 6, e1600377.
- 23 Bryson et al. (2014). Planning for Dark Skies: Lighting Ordinances in the Intermountain West. Weber State University. pp. 213-223.
- 24 Cullinane Thomas, C., and L. Koontz. 2017. 2016 National Park Visitor Spending Effects: Economic contributions to local communities, states, and the nation. Natural Resource Report NPS/NRSS/EQD/NRR-2017/1421. National Park Service, Fort Collins, Colorado. Retrieved from: https://www.nps.gov/nature/customcf/NPS_Data_Visualization/docs/2016_VSE.pdf
- 25 Mitchell and Gallaway. (2016) Estimating the Potential Economic Value of the Night Skies Above the Colorado Plateau. Missouri State University. Retrieved from: https://www.cityofpage.org/images/council_mtg_pdfs/2016/July/July27wsminpt.2.pdf
- 26 Mitchell and Gallaway. (2016) Estimating the Potential Economic Value of the Night Skies Above the Colorado Plateau. Missouri State University. Retrieved from: https://www.cityofpage.org/images/council_mtg_pdfs/2016/July/July27wsminpt.2.pdf
- 27 Mitchell and Gallaway. (2016) Estimating the Potential Economic Value of the Night Skies Above the Colorado Plateau. Missouri State University. Retrieved from: https://www.cityofpage.org/images/council_mtg_pdfs/2016/July/July27wsminpt.2.pdf
- 28 Hayes, Fred. (2018) S.C.R. 2 Concurrent Resolution Encouraging the Use of Shielded Light Fixtures on Outdoor Lights. Prepared by Utah State Parks, January 2018.
- 29 Collison, Frederick M., and Kevin Poe (2013) "Astronomical Tourism": The Astronomy and Dark Sky Program at Bryce Canyon National Park. Tourism

- Management Perspectives . July 2013
DOI: 10.1016/j.tmp.2013.01.002. retrieved
from:[https://www.researchgate.net/
publication/257743472_Astronomical_
Tourism_The_Astronomy_and_Dark_Sky_
Program_at_Bryce_Canyon_National_Park](https://www.researchgate.net/publication/257743472_Astronomical_Tourism_The_Astronomy_and_Dark_Sky_Program_at_Bryce_Canyon_National_Park)
- 30 Cullinane Thomas, C., and L. Koontz. 2017. 2016 national park visitor spending effects: Economic contributions to local communities, states, and the nation. Natural Resource Report NPS/NRSS/EQD/NRR-2017/1421. National Park Service, Fort Collins, Colorado. Retrieved from: [https://www.nps.gov/nature/customcf/
NPS_Data_Visualization/docs/2016_VSE.
pdf](https://www.nps.gov/nature/customcf/NPS_Data_Visualization/docs/2016_VSE.pdf)
- 31 Zubidat and Haim. (2017). Artificial light-at-night - a novel lifestyle risk factor for metabolic disorder and cancer morbidity. *Basic Clin Physiol Pharmacol.* 28(4): 295 -313.
- 32 American Medical Association. (2016). AMA Adopts Guidance to Reduce Harm from High Intensity Street Lights [Press release]. Retrieved from: [https://www.ama-
assn.org/ama-adopts-guidance-reduce-
harm-high-intensity-street-lights](https://www.ama-assn.org/ama-adopts-guidance-reduce-harm-high-intensity-street-lights)
- 33 Stevens, Richard. (2016) Doctors issue warning about LED streetlights. Retrieved from: [http://www.cnn.com/2016/06/21/
health/led-streetlights-ama/index.html](http://www.cnn.com/2016/06/21/health/led-streetlights-ama/index.html)
- 34 International Dark Sky Association. (2016) New IDA LED The Promise and Challenges of LED Lighting: A Practical Guide. Retrieved from: [http://www.darksky.
org/wp-content/uploads/bsk-pdf-manager/
IDA_LED_handout_48.pdf](http://www.darksky.org/wp-content/uploads/bsk-pdf-manager/IDA_LED_handout_48.pdf)
- 35 Steinbach R, Perkins C, Tompson L, et al. *J Epidemiol Community Health* Published Online First: [1 February 2018] doi:10.1136/jech-2015-206012
- 36 House, Dawn. (2017). Southern Utah town has starring role in dark-sky movement. *Salt Lake Tribune*. Retrieved from: [http://archive.sltrib.com/article.
php?id=5133034&itype=CMSID](http://archive.sltrib.com/article.php?id=5133034&itype=CMSID)
- 37 Gaston, K. J., Bennie, J., Davies, T. W. and Hopkins, J. (2013), The ecological impacts of nighttime light pollution: a mechanistic appraisal. *Biol Rev*, 88: 912-927. Doi: 10.1111/brv.12036. Retrieved from: [http://onlinelibrary.wiley.com/
doi/10.1111/brv.12036/full](http://onlinelibrary.wiley.com/doi/10.1111/brv.12036/full)
- 38 Chepesiuk R. Missing the Dark: Health Effects of Light Pollution. *Environmental Health Perspectives.* 2009;117(1):A20-A27.
- 39 Johnson, A. L. (2015). Blinded by the light: Addressing the growing light pollution problem. *Texas A&M Journal of Property Law* 2(3), 461-480.
- 40 Zielinski, Sarah. (2013, October) Reindeer eyes change color in winter darkness. *Science News*. Retrieved from: [https://www.sciencenews.org/blog/wild-
things/reindeer-eyes-change-color-winter-
darkness](https://www.sciencenews.org/blog/wild-things/reindeer-eyes-change-color-winter-darkness)
- 41 Declaration in Defense of the Night Sky and the Right to Starlight. Proceedings, Starlight 2007 Conference. United Nations Educational, Scientific and Cultural Organization General Conference. Paris. 2005.
- 42 Smith, Malcom (2009, February). Time to turn off the lights. *Nature*. Retrieved from: [http://www.readcube.com/
articles/10.1038/457027a](http://www.readcube.com/articles/10.1038/457027a)
- 43 The Starlight Initiative a Common Heritage. International Initiative in Defence of the Quality of the Night Sky and the Right to Observed the Stars. Starlight Initiative Instituto de astrofísica de canarias (IAC), 2007.
- 44 Bryson et al. (2014). Planning for Dark Skies: Lighting Ordinances in the Intermountain West. Weber State University. pp. 213-223.
- 45 International Dark Sky Association. Outdoor Lighting Code Handbook ver. 1.14. 2002.
- 46 Johnson, Andrea. Blinded by the Light: Addressing the Growing Light Pollution Problem. *Texas A&M Journal of Property Law*, Vol. 2, Issue 3 (2015), pp, 461-480.
- 47 Joint IDA-IESNA Model Outdoor Lighting Ordinance. Model Lighting Ordinance - User's Guide. 2011. Retrieved from: [http://www.darksky.org/wp-content/
uploads/bsk-pdf-manager/16_MLO_FINAL_
JUNE2011.PDF](http://www.darksky.org/wp-content/uploads/bsk-pdf-manager/16_MLO_FINAL_JUNE2011.PDF)
- 48 Luginbuhl, Christian B., Pattern Outdoor Lighting Code (USA) Standard ver. 2.0. 2010. Retrieved from: [http://www.
flagstaffdarkskies.org/WPdev/wp-content/
uploads/2015/10/CBL-POLC-standard-
v2.0.pdf](http://www.flagstaffdarkskies.org/WPdev/wp-content/uploads/2015/10/CBL-POLC-standard-v2.0.pdf)
- 49 International Dark Sky Association. Outdoor Lighting Code Handbook ver. 1.14. 2002.
- 50 International Dark Sky Association. Outdoor Lighting Code Handbook ver. 1.14. 2002.
- 51 Miskowiak, Douglas and Linda Stoll. (2006) Planning Implementation Tools Overlay Zoning. Center for Land Use Education. Retrieved from: [https://
www.uwsp.edu/cnr-ap/clue/Documents/
PlanImplementation/Overlay_Zoning.pdf](https://www.uwsp.edu/cnr-ap/clue/Documents/PlanImplementation/Overlay_Zoning.pdf)
- 52 Joint IDA-IESNA Model Outdoor Lighting Ordinance. Model Lighting Ordinance - User's Guide. 2011. Retrieved from: [http://www.darksky.org/wp-content/
uploads/bsk-pdf-manager/16_MLO_FINAL_
JUNE2011.PDF](http://www.darksky.org/wp-content/uploads/bsk-pdf-manager/16_MLO_FINAL_JUNE2011.PDF)
- 53 Joint IDA-IESNA Model Outdoor Lighting Ordinance. Model Lighting Ordinance - User's Guide. 2011. Retrieved from: [http://www.darksky.org/wp-content/
uploads/bsk-pdf-manager/16_MLO_FINAL_
JUNE2011.PDF](http://www.darksky.org/wp-content/uploads/bsk-pdf-manager/16_MLO_FINAL_JUNE2011.PDF)
- 54 Community Development Office. Code Enforcement: Recommendations for Small Towns. Retrieved from: [http://
www.ruralplanning.org/assets/code_
enforcement-web.pdf](http://www.ruralplanning.org/assets/code_enforcement-web.pdf)
- 55 International Dark Sky Association. International Dark Sky Places. Retrieved from: <http://www.darksky.org/idsp/>
- 56 The Consortium for Dark Sky Studies at the University of Utah. The Great Western Starry Way: From Glacier to Grand Canyon. 2017

57 Luginbuhl, Christian and Jeffrey Hall. (2017, September). How Flagstaff is preserving Dark Skies. Astronomy.pp. 56-59. Kalmbach Publishing Co.

58 Luginbuhl, Christian and Jeffrey Hall. (2017, September). How Flagstaff is preserving Dark Skies. Astronomy.pp. 56-59. Kalmbach Publishing Co.

59 National Park Service. Bryce Canyon Astronomy & Night Sky Programs. 2018. Retrieved from: <https://www.nps.gov/brca/planyourvisit/astromyprograms.htm>

60 Collison, Fredrick. (2012) Astronomical Tourism: An often Overlooked Sustainable Tourism Segment. School of Travel Industry Management University of Hawai'i at Manoa. Retrieved from: <https://scholarworks.gvsu.edu/cgi/viewcontent.cgi?article=1003&context=glhtec>

61 International Dark Sky Association. Weber County North Fork park (U.S). Retrieved from: <http://www.darksky.org/idsp/parks/northforkpark/>

62 Standard-Examiner Editorial Board. (July, 2017) Darkness is Worth Protecting in the Upper Ogden Valley. Retrieved from: <http://darksystudies.org/news/2017/7/7/darkness-is-worth-protecting-in-the-upper-ogden-valley>

63 House, Dawn. (April, 2017). Southern Utah town has starring role in dark-sky movement. The Salt Lake Tribune. Retrieved from: <http://archive.sltrib.com/article.php?id=5133034&itype=CMSID>

64 Bedingfieldsmith, Mary. (April, 2017) New Street Lights Come to Torrey. The Insider. Retrived from:<http://www.insiderutah.com/2017/04/19/new-street-lights-come-torrey/>

65 House, Dawn. (April, 2017). Southern Utah town has starring role in dark-sky movement. The Salt Lake Tribune. Retrieved from: <http://archive.sltrib.com/article.php?id=5133034&itype=CMSID>

66 House, Dawn. (April, 2017). Southern Utah town has starring role in dark-sky movement. The Salt Lake Tribune. Retrieved from: <http://archive.sltrib.com/article.php?id=5133034&itype=CMSID>

67 International Dark Sky Association. (January, 2018) Town of Torrey Earns Utah's First International Dark Sky Community Designation. Retrieved from: <http://www.darksky.org/town-of-torrey-earns-utahs-first-international-dark-sky-community-designation/>

68 Serfustini, John. (June, 2017) Helper as Heart of Darkness? Could be a good idea. Sun Advocate. Retrieved from: <http://darksystudies.org/news/2017/6/9/helper-as-heart-of-darkness-could-be-good-idea>

69 Bien, Madeleine. (August, 2017). Dark Skies Over Utah. National Park Foundation. Retrieved from: <https://www.nationalparks.org/connect/blog/dark-skies-over-utah>

70 Levine, Zacharia. (2018) .The Economics of Dark Skies. Happenings.

71 Moab Dark Skies. (2016) Goals. Retrieved from: https://www.facebook.com/pg/moabdarksies/about/?ref=page_internal

72 Bryson et al. (2014). Planning for Dark Skies: Lighting Ordinances in the Intermountain West. Weber State University. pp. 213-223.

73 International Dark Sky Association. (December, 2017). International Dark Sky Week 2018. Retrieved from: <http://www.darksky.org/dark-sky-week-2018/>

74 Mitchell, D. and Gallaway, T. (2019), "Dark sky tourism: economic impacts on the Colorado Plateau Economy, USA", Tourism Review, Vol. 74 No. 4, pp. 930-942. <https://doi.org/10.1108/TR-10-2018-0146>

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COVER Moab Bridge, Bettymaya Foott

TOC Moab Utah House, Bettymaya Foott

PG 3 Fairyland Canyon, Adam Derewecki

PG 6 Earth at Night, NASA

PG 8 Streetlight, Morguefile

PG 10 Lights, Pixabay

PG 12 Street at night, Pixabay

PG 14 Cabin, Kelly Lacy

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PG 42 Dark home, pxhere.com

PG 44 Goblin Valley scope, Bettymaya Foott

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For more resources, visit ruralplanning.org/toolbox and cpdarkskies.org

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*community@utah.gov • 801-468-0133
darkskycooperative@gmail.com • 435-213-7026*