Royal Astronomical Society of Canada

Dark-Sky Site
Application Requirements

Adopted by the RASC
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Written by
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1.0 SCOPE

This document provides the information necessary to assess the suitability of a site for a Preserve Designation. It describes the application procedure and states the contents of the Application.

The RASC recognizes the value of volunteers in establishing a Preserve. These Application Requirements will minimize administrative work for Park managers, local astronomy groups and the RASC.

The Royal Astronomical Society of Canada (RASC) is a national astronomy organization established in 1868 devoted to the promotion of astronomy and allied sciences. In this capacity, the RASC encourages the protection of the quality of the night sky by minimizing light pollution.

Currently, both urban and rural sites are contaminated by sky glow from artificial lighting. Sites with very dark skies without this sky glow are generally far from urban centres and are therefore less accessible to astronomers and the public. Some dark sites are remote with few resources for active outreach programs. These are called Nocturnal Preserves. There are also sites within, or close to, urban areas that are not consider "dark", but provide good access to the public. These are called Urban Star Parks. All three designations are herein referred to as Preserves.

The goal of the RASC Dark-Sky Program is to promote the reduction in light pollution, demonstrate low-impact lighting practices, improve the nocturnal environment for wildlife, protect and expand dark observing sites for astronomy and provide accessible locations for the general public to experience the naturally dark night sky.

By promoting the use of these protected areas after dark, Preserves should see increased support from the public and usage during non-peak hours.

2.0 BACKGROUND

There is a growing need to identify and protect accessible areas that permit the public, novice stargazers and astronomers to enjoy the night sky. There is also a growing need to identify these areas and protect them from light pollution.

The goal of this RASC Program is to increase the quality and accessibility of dark observing sites and preserve the ecology.

Preserves shall be accessible to the public and all lighting fixtures within its borders comply with the RASC Guidelines for Outdoor Lighting (https://rasc.ca/dark-sky-site-guidelines/RASC-GOL_2018.PDF)

Humans and wildlife are affected by light pollution. Many living creatures have evolved to require a day-night contrast to synchronize their biological rhythms. These organisms have adapted to variations in night illumination from a dark sky to the brightness of a full Moon. In contrast, illumination levels in typical urban areas far exceed the brightness of the Moon. Unfortunately public parks are usually illuminated based on "best practice" for urban areas.

The environmental impact of artificial lighting has been studied for many years. This research concludes that light can pollute the environment and fundamentally change the ecosystem and impact the health and survival of wildlife.

2.1 Applicable Documents

IESNA RP-08
RASC Guidelines for Outdoor Lighting (RASC-GOL)

2.2 Acronyms

ALAN Artificial light at night
DSP Dark-Sky Preserve
GOL RASC Guidelines for Outdoor Lighting
IESNA Illumination Engineering Society of North America
NP Nocturnal Preserve
RASC Royal Astronomical Society of Canada
USP Urban Star Park

2.3 Definitions

Application - The document submitted by the Management of the proposed Preserve

Applicant - the Management authority of the Preserve

Buffer Zone - the region within the Preserve under control of the Preserve Manager. The Buffer is designed to prevent glare and light trespass from shining into the Core area. There may be more than one buffer zone in the Preserve

Core - the region under control of the Preserve Manager surrounded by the Buffer Zone. There may be more than on core in the Preserve.

Dark Time – a period after which scheduled outdoor activity has ended and visitors are expected to minimize their activity to permit other visitors to sleep.

Dark-Sky Preserve - the region that includes the DSP Buffer Zone and DSP Core that is under a single management with authority over policy, outdoor lighting and land use.

Filter – filters the spectral components <500 nm from light to produce amber illumination

Glare Zone - sector between the horizon (90º from nadir) and 10º below the horizon.

Illumination - The amount of light in lumens that shines onto a surface area of 1square meter (lumens/m^2, or Lux)

LPA - light pollution abatement

Luminaire - The assembly of the enclosure, lamp, optics, power supply and controls

Luminance - The amount of emitted light from a light source (cd/m^2)

Nocturnal Preserve - the region that includes the NP Buffer Zone and NP Core that is under a single management with authority over policy, outdoor lighting and land use.

Observing Site - An area promoted as a good place to observe the sky. There may be several observing sites.

Photobiology – the study of the effects of light on biological systems

Photopic Vision – vision based on cone cells that have evolved for daytime vision and high illumination levels. Their peak sensitivity is at 555 nm.

Preserve - An area under single management that is to be designated by the RASC as a Dark-Sky Preserve™, Nocturnal Preserve™ or Urban Star Park™

Scotobiology – the study of the biological need for periods of darkness

Scotopic Vision - vision based on rod cells that have evolved for night vision and low illumination levels. Their peak sensitivity is at 505 nm.

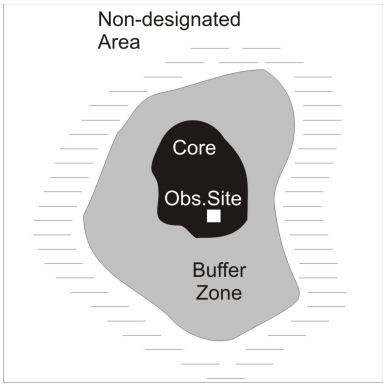
Sky Quality Meter – a light meter designed specifically to measure a value for the brightness of the night sky.

Urban Star Park - the region that includes the USP Buffer Zone and NP Core that is under a single management with authority over policy, outdoor lighting and land use.

Zenith - A point directly overhead, or 90° up from the horizon.

3.0 Management Requirements

The Preserve shall be under the management of a single entity to ensure full adherence to these Requirements and the RASC-GOL.



A Preserve is a protected area with a Core and a Buffer Zone. The Buffer Zone prevents light from outside the Preserve from reaching the Core area. The Manager of the Preserve identifies specific observing sites for night observing.

The establishment of a Preserve is a partnership between the Management, local stargazers and astronomers, and neighbouring municipalities, and it requires their active support. There are four principal requirements for a Preserve: compliance to the RASC-GOL, accessibility, quality of the night sky and in the case of a DSP and USP, an active outreach program.

3.1 Outdoor Lighting

The RASC-GOL respects and protects the need for naturally dark nights, yet it allows sufficient lighting for safety and navigation in the Preserve.

These Guidelines define the spectrum (colour), brightness (illumination), shielding (extent of light) and the schedule (timing) that artificial light is used. These Guidelines free to be downloaded from the RASC website (https://rasc.ca/dark-sky-site-guidelines/RASC-GOL_2018.PDF).

The Applicant shall ensure that all lighting in the Preserve complies with the RASC-GOL. Non-compliant lighting shall be reported in the appropriate section of the Application with the reasons for lack of compliance. The Applicant shall also provide a schedule for all non-compliant luminaires to reach compliance.

If the Applicant believes specific luminaires cannot be compliant, an explanation shall be included in the Application. The RASC may choose to waive or amend any of these guidelines for a specific application provided that the integrity of the Preserve programme is not jeopardized.

3.2 Accessibility

The Applicant must ensure the core area remains accessible after the end of twilight. This will require that gates and parking lots remain open for visitors.

There shall be appropriate signage to help visitors navigate the Core of the Preserve . This signage shall conform to the RASC-GOL.

3.3 Quality of a Dark Sky

The illumination by artificial lighting in a Core and Buffer Zone shall comply with the RASC-GOL.

All artificial lighting within the Core shall not affect the natural quality of the night sky in terms of diffuse sky glow, luminance (glare) and illumination (surface brightness). Any artificial lighting within the Core shall not exceed the luminance of natural sources (e.g. Venus). And, the extent of the artificial luminance and illumination shall be restricted so as to limit the area of illumination to only areas where needed for permitted human activity.

Sky quality readings shall be used to assess the darkness of the sky above the Preserve. However a brightness measurement of the zenith will give only a partial indication of the quality of the sky because it provides no indication of sky glow on the horizon. Currently, the only form of documentation for recording the sky glow on the horizon is with descriptions by experienced observers and images of the horizon.

The sky quality shall be periodically measured with a SQM (Unihedron, Inc.) and recorded with images of the night horizon. These shall be submitted to the RASC-LPA Committee every two years to assess the improvement in the sky resulting from improved lighting in the Preserve and outreach to neighbouring urban areas.

3.4 Outreach Programs

Management of the Preserve shall develop and manage two outreach programs designed for public and municipal outreach.

Public outreach is for the visiting public and will consist of raising awareness of stargazing as an activity. Knowledgeable staff or members of local astronomy clubs or organizations may provide this activity. Topics may include, bust should not be limited to mythology, star tours, telescope observation or indoor presentations.

In addition, the outreach will include raising awareness of the night ecology. This may entail walking tours after dark, experiencing sounds of the night and night wildlife and the explanation of how artificial lighting affects the ecology.

If volunteers are used by Management to assist in public outreach activities, a Memorandum Of Understanding shall be signed by all parties stating the terms of the voluntary service. See Appendix B for a suggested draft of a MOU.

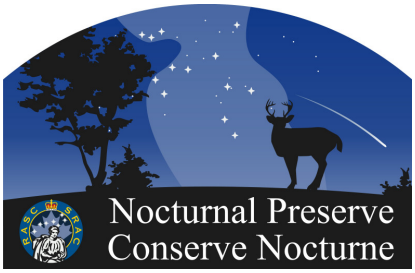
Municipal outreach is to protect the Preserve from light pollution from neighbouring areas and municipalities. Management shall encourage the reduction the light pollution that is visible from the Preserve. This is an investment to protect the ecological integrity of the Preserve.

3.5 Nomination Process

The Manager of a proposed Preserve may submit Applications for consideration. Managers shall submit to the RASC the documentation listed in Table 4.0 and defined on Chapter 4, and other materials that may be requested by the RASC to help them judge the suitability of the proposed Preserve.

The RASC will acknowledge the receipt of the Application and will review it in a timely manner. Comments and questions will be transmitted to the Manager of the proposed Preserve. The decision of the RASC will be communicated to the Manager within two weeks of the decision.

Upon the award of the Designation, the Preserve should display a sign identifying it as a RASC DSP, USP or NP. The RASC-DSP will be provided logo graphic for use of the Preserve on their signage and communiqué at their discretion.



3.6 Naming of Preserve

The name of the Preserve shall be determined by the RASC in consolation with the Applicant. Generally, the Preserve will be named after the geographical region.

In the case of existing Parks, the Preserve will be given the name of the park. In most cases, one organization may have taken the lead in the nomination process. In recognition of this initiative and effort, this organization may be included.

3.7 Bi-Annual Reporting

A Biennial Report (once every 2-years) is required from the Manager of the Preserve to help the RASC monitor and promote the Preserve and it will be used to improve the Dark-Sky Site Program.

3.6 Revision to Designation

It may become necessary to review the Preserve designation due to changes in priorities of any signatory of the MOU, or changes in the lighting within or beyond the Preserve boundaries, or policies regarding access and lighting by the Management.

If the Preserve is deemed to be no longer viable by the sponsors of the Park or the RASC, the Designation will be rescinded and a letter will notify the Manager. The Park will be required to remove signage referring to the Preserve Designation and the Park shall no longer promote itself as a Preserve.

4.0 APPLICATION REQUIREMENTS

This chapter presents the required content in the Preserve Application. This information will also be used to document the initial characteristics of the proposed Preserve in terms of the quality of the night sky, luminaires and lighting policies in the municipalities in the region. It will also be used to provide a benchmark against which future improvements or degradation can be assessed.

It should also be noted that the establishment of the Preserve is based on its current merits and should reflect the current state of the site, not the future of the site. As such, the Proposed Preserve should be compliant to the GOL. The lighting protocol is published in a separate document (RASC-GOL).

The Preserve may be expanded in the future as more area becomes compliant to the GOL.

There are ten sections to the Application listed in Table 4.0. This information locates, defines, describes and documents the Preserve. This information will help the RASC assess the status of the current property, the sky quality and the state of the outdoor lighting and will be used in promoting the Preserve to other organizations and the public. It will also be used as a baseline to compare future state of the Preserve.

Entries in this table will be described in the following sections.

Table 4.0 Preserve Nomination Documentation List

1) Statement of compliance to the RASC-GOL
2) Location and description of the proposed Preserve
3) Zenith sky quality measurements (location of reading marked on map)
4) Public outreach plan (education)
5) Municipal outreach plan
6) Existing light fixture inventory
7) Lighting plan
8) Images of Preserve's observing sites for day and night
9) Memorandum of Understanding between all partners
10) Letters of support and commitment from neighbouring municipalities

4.1 Statement of Compliance to GOL

This section assesses the Applicants understanding of the RASC-GOL and its readiness to become a Preserve. The GOL was developed to minimize the contamination of the area by artificial lighting. It addresses the needs of wildlife and astronomers.

State whether the proposed Preserve is compliant to the GOL. The application should be specific about the non-compliances with reference to the outdoor luminaire inventory. The basis for the acceptance will vary depending on the total application. The RASC may choose to waive or amend any sections of the GOL for a specific application provided that the integrity of the Preserve Programme is not jeopardized.

4.2 Scale Map of Preserve and Surroundings

Where is the proposed Preserve? The RASC requires sufficiently detailed scaled and labelled maps and directions to promote the Preserve. These maps must show the regional context of the Preserve and the boundaries between the Buffer Zone and the Core. It should plot the location of observing sites, including access roads, campgrounds, if any, and other facilities that are mentioned in the Application. Additional larger scaled maps of areas within the Preserve may be used to provide more detail.

4.3 Zenith Sky Quality Measurements

The RASC and experienced observers will use the sky quality measurements, obtained with the Unihedron Sky Quality Meter, to rate the quality of the observing site(s). The locations where these readings were taken should be marked on a map of the Preserve. These readings may be listed in a table with cross-references to their location. There shall be dates and times when these readings were made since they will vary by time night and season. These reading will also be used to benchmark sky glow in the area. Subsequent annual readings will document improvements over time.

4.4 Public Outreach

The RASC Preserve Program is primarily and educational Program to promote astronomy and to increase awareness of the nocturnal environment. Visitors to the Preserve may not be aware of these topics and will benefit from the experience. The DSP shall be open after dark to encourage the use of the site for stargazing, astronomy and night walks so visitors can experience the night.

Literature should be made available to the public during these sessions and in kiosks (if available) during the daytime. Astronomy and light pollution information may be obtained from the RASC on a cost recovery basis.

There is a list of night programs the DSP may offer the public. It includes, but is not limited to the promotion of a healthy nocturnal environment and the relationship between the skylore of the First Nations and other cultures. Reference may be made to the new science of scotobiology and how it is changing our awareness of our need for periods of darkness. Management is encouraged to contact other DSPs for more ideas. Every Preserve is different, so some programs may be more appropriate than others.

4.5 Municipal Outreach

Urban growth outside Park boundaries can severely contaminate the night sky over the Preserve with artificial sky glow. An active Municipal Outreach Program is needed to protect the Preserve from increases in urban sky glow, and to improve the quality of the night sky into the future.

Managers, with the support and assistance of local astronomy groups and scotobiologists, should give presentations to neighbouring municipalities to promote the use of full cut-off fixtures, low colour temperature lighting and low illumination levels in order to protect and improve the quality of the night sky over the Preserve. Advice and digital files of presentation materials may be obtained from the RASC.

Repeated reminders of the adverse impact of outdoor lighting on the environment and human health are more effective than a single mention of it in the media. Therefore, Managers and local partners should regularly raise the issue of light pollution in the local and regional media and in the business community.

4.6 Existing Luminaire Inventory

This is perhaps the most time consuming part of the Application, but it is also one of the most important.

Light fixtures are regularly installed but rarely removed. They have been installed prior to any understanding of the impact they have on the night ecology. Site may have accumulated dozens or hundreds of outdoor lights - many of which no longer necessary.

This information should be presented in tabular form (MS-Exel for example). It should include the location, quantity, wattage, shielding and lamp type (colour, HPS, LED, etc.) for all outdoor luminaires in the Buffer and Core areas of the Preserve. The luminaires should be plotted and referenced on supporting maps. This inventory must be up-dated and submitted to the RASC every 2-years.

4.7 Lighting Plan

This section presents the plan and schedule to make all luminaires compliant with the GOL. All non-conforming lighting fixtures should be removed, replaced, or modified. This work should be scheduled before the end of the next fiscal year. Explanations for the submitted schedule and delayed compliance should be included in this section.

4.8 Images of Proposed Preserve

There should be daytime and night panoramas (stitched together from a series of images) of the Observing Site showing the cardinal directions, tree line, bushes, buildings, etc.

There are two purposes for these images. They will be used for promotion of the site on the RASC web page. They will show potential visitors what the site looks like.

A night panorama will also document the existence of sky glow around the horizon. They will be used as a benchmark to which future images can be compared to show improvement or degradation of the site. The day and light panoramas should be presented with the same scale so they can be compared.

4.9 Memorandum of Understanding

If the Preserve Staff are not familiar with stargazing or the nocturnal wildlife, the Management should reach out to local astronomy and wildlife groups to help in this endeavour. The Preserve should actively advertise these activities. Letters of interest in partnering with the Preserve should be included in the Application. A Memorandum of Understanding (MOU) between the Management of the Preserve Management and the volunteers should be used to clarify expectations and avoid disagreements (APPENDIX B).

4.10 Letters of Support and Commitment

Te future protection of the Preserve depends on the policies of neighbours. The Applicant should solicit from neighbouring municipalities letters of support and commitment to reducing the light pollution.

- Their support may be in the form of committing to only use:
- FCO or fully shielded luminaires
- 3000K or less Colour temperature lamps
- Lowest practical illumination levels (low-limits of the IESNA (RP-08)

The municipalities should be encouraged to entrench these commitments in their lighting policy and bylaws.

Partners in the region may also be called upon to support the Preserve with contributions to the outreach activities and public promotion of the Preserve. Letters from these groups should be included citing this support and commitment.

4.11 Biennial Report

The Manager of the Preserve shall submit this Report so that the RASC may monitor the site and outreach activities. It should be submitted to the RASC National Office on the second anniversary of the designation, and every two years there after.

The contents of the Report shall include the following.

1) Name, title and contact information of the Preserve Manager. This will typically be the Superintendent of a National or Provincial Park, or the owner or manager of a commercial park.

Rationale: The management personnel may change as they continue along their career path. The RASC requires the current contact person responsible for the Preserve for communication on matters concerning the Preserve.

2) The revised audit of outdoor luminaires in the Preserve.

Rationale: The original Application contained a table of all outdoor lighting in the Preserve. These luminaires, and any others that were added should be monitored. This can be an edited version of the spreadsheet file that was submitted in the original application. Generally after two years from the Designation, all initially non-compliant luminaires should have been modified, removed or replace with compliant luminaires. Luminaires that remain non-compliant should be highlighted with the reason for continued non-compliance.

3) Sky Quality Readings. The quality of the sky is measured with a Sky Quality Meter (SQM, Unihedron, Inc.).

The SQM measures the brightness of the sky at the zenith. If left uncontrolled this sky glow generally increases with the increase in light pollution within a Park and from neighbouring municipalities. Comparing measurements at least every two years will show the success of the Preserve in protecting the night environment.

To allow direct comparisons over time, readings should be made at the Observing site(s) and other areas that were measured in the original Application.

3) List and describe of Public Outreach Activities for night ecology and astronomy.

This should include the nature of the outreach event(s) and an estimate of the number of visitors taking part in the event(s) and the dates. It should also describe activities of volunteers in their outreach programs. If the event is regularly scheduled, then they may be collapsed into a single entry and identified as recurring. The RASC will use this information to help guide the development of outreach resources that could be made available to Preserves to assist in the user experience.

4) List and describe Municipal Outreach Activities that concern light pollution.

Municipalities play a significant role in maintaining the ecological integrity of a Preserve. Neighbouring municipalities may economically benefit from the Preserve, so it is in the best interests of both parties to have semi-regular communications and meetings. However municipal officials may not know or understand the needs of the Park.

The Preserve Manager is required to meet with neighbours to ensure the protection of the night environment in the park. The report on these meetings should highlight the discussions on outdoor lighting that may shine into the Park (glare or light trespass) or over the park as sky glow. (If sky glow over the urban area is visible from the Preserve, then it is affecting both the ecology of the Preserve and the user experience. of the wilderness area.)

5) Annual Reports

Include, or provide a link to the Park's preceding Annual Reports to their provincial or federal agencies. Commercial parks should provide a copy of their Preserve-related activity (with proprietary material removed) that may form part of their Commercial Annual Report.

5.0 REFERENCES

RASC Guidelines for Outdoor Lighting
(https://rasc.ca/dark-sky-site-guidelines/RASC-GOL_2018.PDF)

Illumination Engineering Society of North America (IESNA)
IESNA Lighting Handbook, 10th edition

APPENDIX A - Scotobiology

STUDY OF THE BIOLOGICAL NEED FOR PERIODS OF DARKNESS

An outline for public information prepared by Dr. R.G.S. Bidwell, Wallace, NS, 2008

What is Scotobiology?

The concept of scotobiology as a science was developed at a conference on light pollution held in Muskoka, Ontario, in 2003. It was recognised that the underlying principle was the deleterious effect of light pollution on the operation of biological systems, ranging from their biochemistry and physiology to their social behaviour. Scotobiology is the study of biological systems that require nightly darkness for their effective performance; systems that are inhibited or prevented from operating by light.

Why is Scotobiology important?

Virtually all biological systems evolved in an environment of alternating light and darkness. Furthermore, the light/dark periods in temperate zones vary with the seasons. Organisms have evolved to use the variations in the length of day and night to integrate their physiological and social behaviour with the seasons. Many organisms measure specifically the length of the night, and light pollution may prevent them from determining the season, with serious or deadly consequences. For this reason light pollution is recognised as being a major component of global pollution, and scotobiology, the study of its specific effects on organisms, has now become an important branch of biological research.

Summary of specific scotobiological responses

Insects: Insects tend to fly towards light. Light pollution thus causes insects to concentrate around bright lights at night with several serious consequences. First, they become easy prey for birds and predacious insects. Insect numbers are reduced by their disorientation and death around lights, and also because they are concentrated where natural predators have an unnatural advantage to capture them. This reduction in insect populations has been found to affect the populations of animals not strongly attracted to light, including frogs, salamanders, bats, some birds and small mammals. In addition, the mating and breeding habits of some insects require darkness, so that light pollution can interfere or prohibit normal reproduction. Finally, the migration habits and paths of many insects are affected by light pollution with resulting population depletion. The huge piles of dead insects such as mayflies that are found under streetlights in springtime give some idea of the extent of damage such lights can cause.

Birds: Many birds are powerfully attracted to lights, and over a hundred million birds die from collisions with illuminated structures in North America alone every year. The actual loss of bird populations is hard to calculate, but it is significantly large. Furthermore, as with insects, bird migration patterns may be affected by light pollution because the birds may become disoriented and unable to follow their normal flight paths. Finally, the concentration of birds around lights also encourages animals and birds of prey that feed on smaller birds, resulting in still further reductions in the population numbers of migrating birds.

Animals: The behaviour of many animals is seriously affected by light pollution. Mating, hunting and feeding habits of wolves and other large animals are altered, with resulting decreases in population. Salamanders, frogs and other amphibians, many of which are already under serious threat from chemical pollution, are subject to impacts from even low levels of artificial night lighting on their physiology, ecology, behaviour and evolution. It is very likely that the behaviour of many if not most of our wild animals is similarly and negatively affected by even low levels of light pollution.

Plants: Plants are seriously affected by light pollution. Probably the most important aspects of a plant's reaction to and interpretation of darkness are expressed in its developmental behaviour: flowering, dormancy and the onset of senescence. The plant's ability to measure and respond to day length is crucial in enabling it to dovetail its developmental behaviour with the seasons. We are all aware of "long-day" and "short-day" plants. What is not so widely known is that plants do not measure or react to the length of the day. Instead, they measure and respond to night length, i.e. the duration of darkness. So short-day plants really require long nights, and should properly be called long-night plants. The problem for short-day/long-night plants arises from the fact that if they are illuminated briefly during a long night, they interpret the event as if they had experienced two short nights, rather than one long night with an interruption. As a result, their flowering and developmental patterns may be completely interrupted. Short-day plants normally bloom in the fall, as the days shorten, and they respond to the lengthening nights to initiate the onset of flowering. As the nights further lengthen, they begin a period of dormancy, which enables them to withstand the rigours of winter. Thus, if the nights are interrupted by light pollution, the consequences can be severe or deadly. Furthermore, the effect of successive experiences of nightly illumination is cumulative. It follows that light pollution, particularly if it is repetitive on a nightly basis, can seriously affect the development, flowering and dormancy – and so the very existence – of short-day (long-night) plants.

Human Health: Humans, like other animals, are affected by nightly light pollution, and human health is more severely affected by light pollution than is generally realised. Human hormone regulation, physiology and behaviour evolved in a diurnal pattern of day and night. The normal operation of wake/sleep cycles, hormone cycles, the immune system and other biochemical behaviour, depends on the daily alternation of light and dark, and may be severely damaged by nighttime illumination. It has been shown that the human immune system works more strongly during the day to produce antibodies that protect the body against microbial invasion, which is normally more likely to occur during the activities of the day. At night the immune system switches from a defensive to a repair mode, and killer cells then become more active in attacking tumours as well as infections that may not have been successfully prevented during the day. Light pollution may thus compromise the operation of human hormone and immune systems leading to increased incidence of cancer and other diseases, as well as to other physical as well as psychological disorders including mental illness, psychiatric instability, and such problems as seasonal depression (SAD). This means that even turning on a night-light or bedside lamp may have negative effects on a person's health. This may have little relevance to light pollution in parks, but it is important to note that bright lights in camp-sites may be unhealthy to humans as well as to the wildlife inhabitants of the park.

Sociology: Human sociology is affected by light pollution. It is now commonplace to be concerned by the fact that few people alive today have had the opportunity to experience the glory of the night sky. This is sad for citizens of "advanced" or wealthy countries, but it is a serious loss of the cultural heritage of aboriginal peoples and those who live (or lived) under natural and unpolluted conditions. The darkness of the night and the ability to commune with the natural beauty of the moon and stars and the glories of the aurora are necessary for the well-being and sociological wholeness of native peoples all over the world. Most of those who live in places like Canada and the United States of America can no longer experience the wholeness of dark skies. Parks that emphasise dark skies are thus an essential part of our human and environmental heritage.

Astronomy: It hardly needs to be mentioned that astronomy depends on dark skies and the virtual absence of light pollution. Both the importance and cost of astronomical research to our present society are very high, and are as important as environmental concerns for the control of light pollution.

Prospects for abatement of light pollution: the importance of public opinion

Public pressure is the surest way to reduce light pollution. This will assist releasing more funds for basic research in scotobiology, and for helping to develop legislation to control light pollution if that is found to be necessary. Light pollution can be controlled by reducing unnecessary lighting, focussing required lighting where needed rather than shining it in every direction, and the use of directional light shades where appropriate. Lower levels of illumination are often advantageous, and have been found to provide better safety and protection for pedestrians than the normally used bright streetlights. All these approaches are already being developed and put to use, but the continued application of public pressure is essential to reduce not only the actual light pollution and the cost in dollars for unnecessary lights, but also to reduce the environmental pollution that results from making the electricity to power them. Anything that can be done to stimulate public appreciation of the dangers and costs of light pollution will be well worth the effort.

If there are further questions about scotobiology, please call:
Dr. R.G.S. (Tony) Bidwell: (902) 257-2035; or e-mail: ts@ns.sympatico.ca
Robert Dick, Canadian Scotobiology Group 613-283-7815, rdick@csbg.ca

APPENDIX B - Memorandum of Understanding

These are two samples for MOUs

MEMORANDUM OF UNDERSTANDING

This agreement is between:

_____	_____	_____
Responsible Authority for the Facility Provider	Organization	Date

and

_____	_____	_____
Responsible Authority for the Outreach Contributor	Organization	Date

The Outreach Contributor agrees to provide outreach assistance to Facility Provider at a mutually agreed upon schedule and location.

In return for providing public outreach assistance from Outreach Contributor, the Facility Provider agrees to provide free access to the facility and campgrounds to the Outreach Contributors providing outreach assistance for the duration of the activity plus at least one night to prevent the need for late night travel.

The Facility Provider agrees to compensate the Outreach Contributor for travel expenses (gas and food) accrued in the course of providing the outreach assistance.

This Memorandum of Understanding (MOU) shall remain in effect if one or both a managing officers are replaced. This MOU shall be dissolved with mutual consent of both organizations.

If this MOU is dissolved, the Royal Astronomical Society of Canada shall be notified within one month of the dissolution so they may re-assess the Preserve designation.

It is the responsibility of the Facility Provider to promote the outreach event, and provide the following:

A suitable site,
Electric power,
Public facilities,

and to inform the Outreach contributor what items will be supplied for the event.

The volunteers may promote the RASC and provide handouts to the public.

MEMORANDUM OF UNDERSTANDING

MANAGING AUTHORITY OF DSP (FACILITY PROVIDER)

-and-

ASTRONOMY SERVICE PROVIDER (OUTREACH CONTRIBUTOR)

This agreement is made this _____ day of _____, 2017
WHEREAS, The FACILITY PROVIDER has applied to become designated as a Dark-Sky Preserve (DSP) by the Royal Astronomical Society of Canada, and
AND WHEREAS, a Memorandum of Understanding (MOU) between the FACILITY PROVIDER and the OUTREACH CONTRIBUTOR will outline the roles and responsibilities of the parties in order to become and maintain the DSP designation,
NOW, THEREFORE, BE IT RESOLVED THAT the FACILITY PROVIDER and the OUTREACH CONTRIBUTOR, collectively referred to as the "parties", agree as follows:

1. Purpose.
The purpose of this MOU is to articulate the role and responsibilities between the parties in the accomplishment of adhering to the protocols of the RASC's DSP Program as laid out in the Guidelines for Outdoor Light in DSPs (RASC-DSP-GOL) in order to maintain the OUTREACH CONTRIBUTOR's designation of the FACILITY PROVIDER as a DSP.

2. Statement of Mutual Benefit and Interests.
The parties recognize the importance of an exceptional dedication to the preservation of the night sky through the implementation and enforcement of quality lighting codes, dark-sky education, and citizen support for dark skies, and that achieving designation as a DSP provides many benefits to wildlife and the community including preservation of the night sky and reductions in night time light pollution.

3. Duties of the Parties.
The parties agree to work together to maintain the DSP designation and to uphold the tenets of dark-sky policies as described by the RASC's DSP Program as laid out in the Guidelines for Outdoor Light in DSPs (RASC-DSP-GOL).

4. General Provisions.
The parties agree to the following:

- The parties will consult on all installations of new outdoor lighting fixtures, retrofit and replacement or relocation of all existing outdoor lighting fixtures or increases in light intensity of any existing outdoor lighting fixtures on FACILITY PROVIDER properties;
- The parties will consult with the RASC Light Pollution Abatement Committee when determining proper adaptive controls and curfews on outdoor lighting fixtures where appropriate.
- The parties will work together to support dark skies and good lighting in public communications promoting the concepts of dark skies and good lighting.

- The parties shall work together to maintain a commitment to providing dark-sky education programs by:
  - Planning and execution of at least two community dark sky awareness events per year;
  - Inclusion of dark-sky awareness documents with other community informational documents ` that are made available to FACILITY PROVIDER volunteers and visitors;
  - Developing and presenting dark-sky events with activities tailored for school groups visiting the FACILITY PROVIDER and within its outreach programs.
- The parties shall work together to investigate and the possibility of establishing and maintaining a sky-brightness measurement program which might include the installation of light monitoring devices.
- The parties shall work together to prepare an annual report with basic information on the effects of the DSP designation on wildlife on the FACILITY PROVIDER.

5. MOU Effective Date and Termination.

This MOU between the parties takes effect upon the signature of both parties. The parties agree that January 1 shall be considered the "Anniversary Date" of this MOU. The MOU should be renewed annually on the Anniversary Date unless either party provides notice of termination to the other by September 30 of the prior year.

FACILITY PROVIDER Management Authority	OUTREACH CONTRIBUTOR
_____	_____
CEO	CEO

APPENDIX C - Sample Table Current Luminaire Inventory

LOCATION	WATTAGE	No. UNITS	SHIELDING	LAMP	Comments
Administration					
Front door	125	3	Unshielded	HPS	To be replaced with FCO 2W Amber LED
Perimeter Lighting	3	5	FCO	amber LED	wallpacks (EcoLight)
	35	2		LPS	not working
Maintenance Compound	100		Unshielded.	HPS	Replace with FCO in next maintenance cycle
Garage		1	Not shielded	Incandescent	To be replaced in next maintenance cycle
Campground	100	2	Not shielded	HPS	Replaced before this camping season
Showers	5	2	FCO	White LED	To be filtered this camping season
Toilet	2		FCO	Amber LED	
#1 Parking Lot	125	1		HPS	Currently burned out and will be replaced with FCO Amber LED
Access Roads	50			HPS	Use for special event only - safety
Gate Kiosk	35	1	FCO	HPS	

NOTES:
All shall be made to comply before the current camping season unless otherwise stated.

Current maintenance cycle - April 2013-November 2013
Next maintenance cycle - April 2014-November 2013