

# Jasper Dark Sky Preserve

## 4th International Dark Sky Park Symposium

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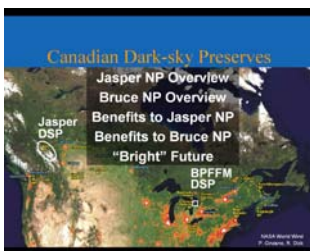


Initially, the Royal Astronomical Society of Canada's Dark-sky Preserve (RASC-DSP) Program was used between 2000-2007 to increase public awareness of light pollution issues. It has since evolved into a more proactive political instrument. The most recent Dark Sky Preserve is the Jasper National Park in Alberta – the largest easily accessible park in Canada. And at 1.1-million hectares, it's the largest internationally recognized Dark-sky site in the world<sup>1</sup>.



There are now 13 Preserves in Canada with a total area of 1.3-million hectares. All but five of these have areas in excess of 16,000 hectares, and only 2 are smaller than 2,000 hectares. There are also many other parks across the country showing interest in dark-sky designations. So, we expect to more than double the protected area in the next few years.

A principle reason for Dark-sky Preserves is to protect and promote large areas against artificial light at night. Has Dark-sky Preserves been successful, and if so, how have they made a difference? Of course, I think they have.



We will review the new Jasper Dark-sky Preserve, and the Bruce Peninsula Preserve, which was created in 2009, as case studies into how the Program can preserve the nocturnal environment of a park, how it can affect outdoor lighting in the region, and how it can be used to promote astronomy to the general public<sup>23</sup>.

When the Parks Canada Guideline for Outdoor Lighting (GOL) was adopted in 2008, a nation-wide guideline became available to protect existing park facilities and to guide the development of new parks in the future. It acknowledges the impact of artificial light on the ecological integrity of the natural environment, and it also initiated a review of park lighting, which is leading to the removal or retrofitting of existing light fixtures. It provides a system-wide policy to counter pressures to increase artificial light at night (ALAN) within the park system. As a result, neighbouring municipalities that create sky glow over the parks are being "encouraged" to adopt "dark-sky friendly" lighting policies.

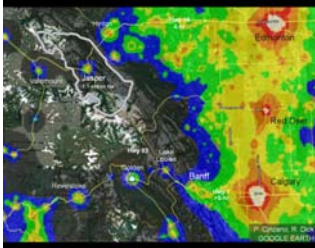
<sup>1</sup> IUCN-DSWG, Available at [www.darkskeeparks.org/docs/DSP%20world%20list\\_March2011.pdf](http://www.darkskeeparks.org/docs/DSP%20world%20list_March2011.pdf). Accessed on May 15, 2011

<sup>2</sup> The Dark Side of Jasper National Park. Available at: [www.pc.gc.ca/eng/pn-np/ab/jasper/ne/ne10.aspx](http://www.pc.gc.ca/eng/pn-np/ab/jasper/ne/ne10.aspx). Accessed May 15, 2011

<sup>3</sup> Natural Heritage. Available at: [www.pc.gc.ca/eng/nature/astronom.aspx](http://www.pc.gc.ca/eng/nature/astronom.aspx). Accessed May 15, 2011

## Jasper National Park Overview

The mandate of Canada's National Park System is to ensure the ecological integrity of diverse environments representing the entire country. In 1979, this role took dominance over the human recreational priority with which it shared since 1885<sup>4</sup>.



Jasper is a UNESCO World Heritage Site and one of the largest National Parks in Canada with over a million hectares. It's one of the most accessible and highly visited parks in the Canadian Park system, welcoming about 1.8-million people each year<sup>5</sup>. It's located northwest of the Banff National Park (NP) and can be reached by driving west of Calgary along Hwy-1 (the Trans Canada Highway) to the Town of Banff, then north long the provincial Hwy-93 to Jasper for a total distance of 415 km or 5¼ hours. Or you can get there from Edmonton by driving west along Hwy-16 (about 360 km or 4 hours).

## Bruce Peninsula and Fathom Five Marine National Park Overview



The "Bruce" National Park is located in Ontario on the shores of Lake Huron in the Great Lake system of North America, and it's a 4-hour drive north of Toronto, Canada's most populous City<sup>6</sup>. It's a relatively new park that was formed in 1987<sup>7</sup>. With almost 17-thousand ha<sup>8</sup>, it's relatively small compared to Jasper, but it's within a major North American bird migratory route from Northern Canada to the Caribbean and South America.



The principal industry of the peninsula is agriculture and eco-tourism. Its topography is relatively flat with a geology, flora and fauna the sets it apart from most of Ontario. Off the north shore of the peninsula is the Fathom Five Marine National Park, which is a favourite destination for scuba divers who come to explore the many ships that succumbed to the violent storms and treacherous waters of the area.

## RASC Dark Sky Preserve Program



The RASC is a national organization with about 4,000 members that speak with a united voice against light pollution from 29-centres across the country. The Dark-sky Preserve Program was developed over the last decade or so to help protect some of the best astronomical observing sites in Canada and to provide an instrument to promote the reduction of urban sky glow. The four main documents that support this Program, and that for Urban Star Parks are available from the

<sup>4</sup> [http://en.wikipedia.org/wiki/National\\_parks\\_of\\_Canada](http://en.wikipedia.org/wiki/National_parks_of_Canada)

<sup>5</sup> Jasper National Park Visitation, 2004-2008

<sup>6</sup> [http://en.wikipedia.org/wiki/List\\_of\\_cities\\_in\\_North\\_America#Canada](http://en.wikipedia.org/wiki/List_of_cities_in_North_America#Canada)

<sup>7</sup> [www.thebrucepeninsula.com/bpnp.html](http://www.thebrucepeninsula.com/bpnp.html)

<sup>8</sup> Dark Sky Preserve Application to Royal Astronomical Society of Canada, Feb 2009

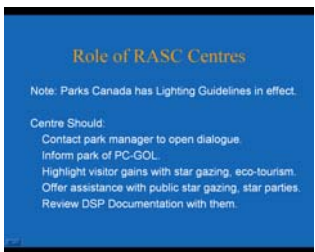
RASC web site: two documents for Dark-sky Preserves, and a similar pair for Urban Star Parks.



The lighting protocol of the Program is based on the Parks Canada Guideline for Outdoor Lighting (GOL), which defines the four main principals of the RASC Light Pollution Abatement (LPA) Program, which are that artificial outdoor lighting shall minimize:

- the extent of illumination,
- the level of illumination,
- the duration of illumination, and
- the blue content in the illumination.

Critics will note that this is not a prohibition on artificial lighting. However the context of these limits is critical to their interpretation. The section on the control of lighting in the Guideline states that there shall be no artificial lighting, unless shown necessary by the park manager. The rationalization for acceptable artificial light is based on the priority given to the natural environment, so the starting point for park artificial lighting is “zero light”.

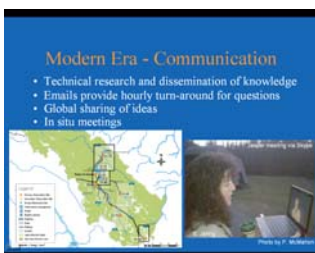


For this Program to be effective at reducing light pollution, the current state of outdoor lighting must be surveyed. In the cases for all previous Preserves, park officials were surprised to learn how many light fixtures were in their park. Some had been erected decades ago for a specific job, but weren't removed after the work was done. Virtually all these older fixtures weren't shielded.

These surveys are time-consuming so local RASC members, and local environmental groups have assisted the park's staff in completing these surveys. It is, after all, in their best interests.

Generally these groups also volunteered their time to help with outreach activities by conducting interpretation programs and public star gazing sessions for visitors, while they make use of the park for their own projects. This productive and co-operative relationship is important to proving the resolve of these groups to the park managers, and proving the viability of birding and stargazing as eco-tourism programs that park management can then leverage to increase the number of park visitors.

The RASC uses its talent and experience to advise park officials on the appropriate strategies and light fixtures that would be cost effective yet would minimize their impact on the environment. This help and information is appreciated by the Park staff.

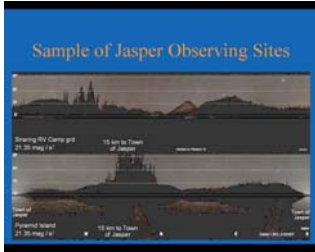


Modern technology is helpful when assessing a Park as a Dark-sky Preserve. Plotted maps and Sky Quality Meter data can only show so much. It's much more revealing to see the proposed observing sites. During the Skype link shown on

this slide, I was able to get a better feel for the observing sites and make suggestions to saving thousands of dollars.

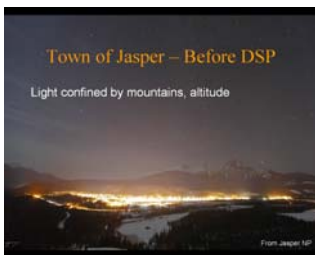


Daytime panoramas are pretty, but only tell half the tale. The topography alters the expression of the urban sky glow, for better or worse. Although this observing site is 8-kilometers from the small Town of Jasper, the lights significantly affect the observing site because we are looking along the valley. The SQM reading was only 20.1 magnitudes /sq. arc second. This reduced its rank to a secondary observing site.



Doubling that distance puts the lights below the mountains. Jasper’s sky glow is still visible in this relatively long exposure but the sky is 21.35 magnitudes. This is called the “Snaring Camp Ground” and it’s also secondary observing site. Below it is the panorama of the Pyramid Island Site. It’s a primary site because of the sky quality, excellent access and nearby accommodations.

### Changes to Jasper National Park



The Jasper National Park’s mountainous location has helped preserved its natural environment. But since its creation in 1907, there have been private, commercial and municipal developments within the Park<sup>9</sup>. As these increased over the last century they’ve made the Park more attractive as a tourist destination, but these have also claimed an environmental toll on the Park.

Clearly, the Town of Jasper has lighting issues, but the Jasper Dark-sky Preserve designation has resulted in a number of strategic changes to the town’s lighting policies. The Town of Jasper and its commercial sector recognize the importance of the Park’s designation.

The National Park system has experienced a drop in visitors over the past decade. Jasper and a number of other Parks in the National System, as well as private and commercial parks want to take advantage of the growth in eco-tourism to boost their revenues. The concept of dark skies and the nocturnal ecology is being promoted as another experience to attract visitors.

### Lighting

A RASC has identified two general zones in a Dark-sky Preserve that reflect the need for public access and services within its borders. There’s a core area with little or no artificial lighting. This is surrounded by a buffer zone in which limited lighting may be permitted.

**Re-lamping**

Core of DSP has NO lighting & none is permitted

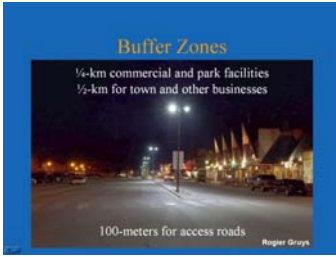
Parks Canada

- East and west gate – convert to FCO
- Road and hwy lighting – convert to FCO
- Buildings – covers on windows after dark
- Campground lighting – remove or shield
- Abandoned facilities – remove fixtures

### Dark-sky Preserve Core

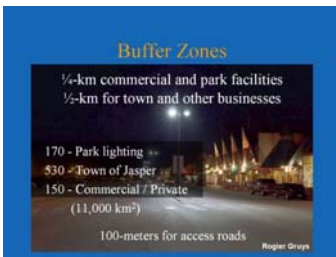
The Dark-sky Preserve core is the area from where no artificial lighting is visible, even though some sky glow may be evident on the horizon. It takes advantage of surrounding bushes, trees and hills to block the direct view of light fixtures.

<sup>9</sup> [www.jasernationalpark.com/](http://www.jasernationalpark.com/)



*Dark-sky Preserve Buffer Zones*

Buffer zones border access roads, constructed park facilities, some commercial establishments and the Town of Jasper. Only 3% of the park is classified as a buffer zone<sup>10</sup> because of the natural shielding by topography and the extensive forested landscape. Although most of the commercial establishments don't currently have dark-sky compliant light fixtures, some of the major contributors to light pollution are re-lamping their offending fixtures (such as the Jasper Park Lodge and power stations), and they're adopting operating procedures, such as curfews, to reduce the use of artificial lighting when it's not needed (such as the CN Railway yards).



The number of existing light fixtures can be listed by their owners<sup>11</sup>.

Park Lighting	170
Town of Jasper (Municipal)	530
Commercial/Private	150

Given the extent of the park (11,000 km<sup>2</sup>) these are actually very low numbers! These lights have been assessed and prioritized for shielding, replacement or removal. Other sources not in this list are either low-wattage lights, fixtures controlled with motion detectors or ones that are already well shielded.

Corrective action for commercial and private owners is voluntary. However as part of the lease agreement for the properties inside park boundaries, they must comply in order for their leases to be renewed.

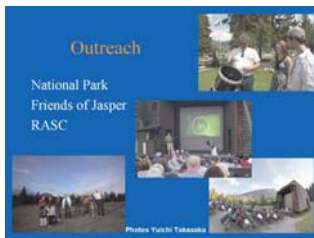
*Visitor Experience*

The benefits of choosing a Provincial or National Park to host a Dark-sky Preserve are access, their existing infrastructures, outreach programs and facilities.

*Access*

Jasper is generally accessible throughout the year, though some roads to the more remote areas aren't maintained in winter. Some facilities are provided - even in winter for the more hearty visitors - such as serviced campgrounds, lodges and visitor centres.

<sup>10</sup> Dark Sky Preserve Application to Royal Astronomical Society of Canada, Feb 2009, Section 1.0  
<sup>11</sup> *ibid.*, Section 6.0



## Outreach

Public outreach is a multifaceted activity: with knowledge, emotion and behaviour based objectives<sup>12</sup>. The Jasper NP has a well-developed set of interpretive programs on wildlife, ecology and the environment and it's now increasing its sky interpretive programs that include western and aboriginal information and stories. The park staff has been trained in providing interpretive star gazing tours and offer astronomy programs to visitors in the main campground, which hosts 70,000 visitors per year.

Park programs take advantage of volunteers (for example the Friends of Jasper and the RASC). General programs include topics on the historical context of some sites within the park borders, wildlife, the mountain environment, as well as naked eye astronomy during “Moon walks” on which visitors are introduced to the sounds, if not the sights, of the nocturnal wildlife.

There are facilities and activities for groups. One example is the Palisades Stewardship Education Centre with meeting rooms and a dormitory, which can be used by visiting groups of up to 50. They can also provide telescopes.

The Park promotes its wildlife and astronomy programs and schedules, as well as its Dark –sky Preserve designation, on their web site and more actively through their expanded park marketing campaigns.

The Park has already taken advantage of the promotional aspects of its designation by reaping the benefits of media coverage of their Designation Ceremony and an article about the Preserve in the Canadian Geographic Magazine that was published in time for families to start planning their summer vacations.

## Bruce Peninsula and Fathom-five Marine National Park

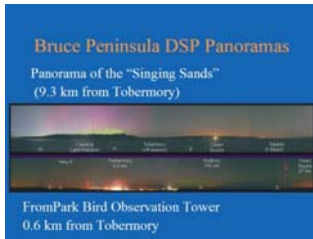


The Bruce Peninsula National Park was designated as Dark-sky Preserve in 2009 and over the past two years they have been implementing their long-term program of removing or replacing outdoor lighting to improve and protect the region well into the future.



Although the northern Bruce Peninsula is sparsely populated (about 4,000 people), during the last century municipal, commercial and private lighting practices have not respected the night environment. A ferry port lights up the north shore of the peninsula and its sky glow was visible over hundreds of square kilometres. Also, spotted across the peninsula are dust-to-dawn security lighting and outdoor household lights.

<sup>12</sup> *ibid.*, Section 7.1



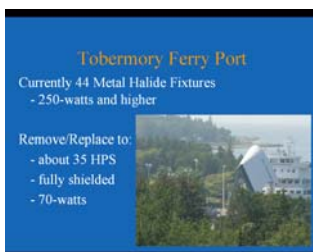
There are four sources of lighting on the Bruce Peninsula: municipal and commercial lighting, the ferry port, and outdoor lighting at private homes and farms. This slide shows two views of the Northern Bruce Peninsula. The top panorama is from a dark site less than 10-km from Tobermory. The lower one is a panorama from the bird observation tower less than a kilometre from the Town.

The Municipality, with the Town of Tobermory as the main urban centre has 228 light fixtures. Many of these have been in service for over 30-years and reflect the era of inexpensive electricity and wasteful lighting practice of the mid to late 20<sup>th</sup> century. Although the National Park has no formal influence over the municipality, the Dark-sky Preserve Designation has attracted the attention of local environmental groups and they've started applying pressure to further reduce the sky glow across the peninsula, from outside the Park boundaries.

One of these, the Bruce Peninsula Biosphere Association has been awarded a government grant to leverage the Dark-sky Preserve to improve the nocturnal environment of the northern half of the peninsula. With the assistance of the RASC, and myself they are contacting homeowners to shield, replace or turn off their outdoor lighting when it is no longer needed. Commercial properties will be advised on how to better illuminate their premises without the excessive glare that's typical of most establishments. One of the selling points for this community effort is to create a more unified lighting and navigational scheme for the Town, rather than the current haphazard style with glare.

Homeowners across the northern half of the peninsula are being canvassed and informed about the problems of nighttime illumination and the benefits of shielded fixtures. The Association has received a grant to help retrofit private outdoor lighting in order to promote the reduction of light pollution.

Following their commitment that was made for the Dark-sky Preserve Designation, the Municipality has already retro-fitted 37% of their inventory and expects the rest to be retrofitted within 3-years. We are guiding the municipality towards an economical yet effective lighting policy.



The Port Authority has 44 metal halide fixtures, each consuming 250-watts or more and at least one is 1-kilowatt! All these fixtures have been surveyed and will be replaced with 70-watts HPS full cut-off units, and the removal of redundant fixtures.

Previously, all the port lights were kept on throughout the night all year round, even though most activity occurred during the day and never in winter. Only two ferries have been scheduled to arrive after sunset, which only need shoreline lighting for less than an hour per arrival.

Most of their operational cost savings will come from keeping the lights off until a ship approaches the port. They have also realized that reducing their wattage and using shielded fixtures will reduce the complaints about the glare from the surrounding municipality. Since the current fixtures were installed in 1975, it has been successfully argued that it is time for them to be replaced with modern fixtures that will virtually eliminate the glare across the Town and reduce the electricity costs to 10% of current levels while increasing the visibility and safety of the area and the equipment.

They're using a more thoughtful approach to lighting and signage. They will apply white paint to the equipment along the shore that will eliminate the unshielded lighting while increasing the visibility of hazards, and port safety. They will also restrict the light from shining into the relatively shallow infralittoral zone in the water around the port. This will reduce the contamination in the waters of the Fathom Five Marine National Park off the northern shore of the peninsula.



## Summary

Most long established Canadian parks were developed around a central town (the Town of Jasper, and Tobermory for the Northern Bruce Peninsula). All of these pre-dated any concerns about outdoor lighting. The watershed of becoming a Dark-sky Preserve is a policy of light pollution abatement that will affect the lighting policies of facilities within the Park and influence the policies in communities beyond the park borders.

The establishment of a Dark Sky Preserve has far reaching benefits for the associated Parks, and the surrounding regions. This has not been by luck. Rather, we are consciously applying our current understanding of how artificial light and the diurnal cycle of light and darkness are critical to maintaining the ecology of a balanced environment (scotobiology).

The Canadian Dark-sky Preserve Program simply raises this awareness to the consciousness of enlightened community leaders. Everyone benefits from Dark-sky Preserves as shown in these two examples. Those who illuminate will save on the rising cost of energy. The community will live in a town with little or no glare that is both attractive and safe. And the wildlife can go about its business as it has for thousands of years. And of course astronomers can enjoy the night sky relatively close to their homes.

**2997 Words**