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Dark Sky Preserve Program in Canada

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RASC Light Pollution Abatement Program²

Thank you for, once again, allowing me to present some of our work even though we can't attend in person.

During the Round Table Discussion, later today, you'll be considering the "way forward". I hope my presentation here will be helpful - in those discussions.



Abstract

Canada now has twelve Dark Sky Preserves designated by the Royal Astronomical Society of Canada (or the RASC). The rapid increase in the number of Canadian Preserves is, in part, due to the relative pristine environment in many Canadian parks. However it is also due to a national organization with active members - who encourage and nominate parks to become Preserves. The Program also benefits from a clear and rational lighting protocol that park managers can use to maintain their facilities and, in most cases, make improvements.



Last year I spoke about the development of the Lighting Protocol on which the Canadian Dark Sky Preserve Program is based. During its 10-year history, we have tightened up the Program and streamlined its implementation.

The Dark Sky Preserve Concept and definition has evolved from its beginning in 1999. This paper will present the 10-years of experience gained by the RASC that can be used in other jurisdictions at relatively little cost and volunteer effort. We'll concentrate on four current Dark Sky Preserves: the Torrance Barrens, MacDonal Park, Point Pelee and the Kejimikujik National Park.



Torrance Barrens

Dark Sky Preserves in Canada began with the efforts of Peter Goering and the creation of the Torrance Barrens Dark Sky Preserve. Throughout his life he had seen the contamination of the pristine skies over his family cottage. Unlike most people, he TOOK ON the challenge to stop the growth of light pollution in the area, and where possible, to reverse it.

¹ www.robertdick.ca

² <http://www.rasc.ca/lpa/index.shtml>



The Barrens is a good description for the place. The surface soil was scrapped away by the advance of glaciers about 30,000 years ago, exposing 2.5 billion year-old rock of the Precambrian Shield³. You can still see the large-scale striations across the region from the northwest to southeast.

Another reason for this unique ecosystem is geology. The ancient igneous granite of the north extends south into the region where it meets and mingles with the sedimentary rock of the south. For the want of a better term it's more generally referred to as "The Land Between". It extends from west from Ottawa to the eastern shores of the Great Lakes. The flora and fauna of these two integrated geological provinces live in a balance that is not found anywhere else in North America.



The uniqueness of this ecosystem was recognized by the Ontario Ministry of the Environment in 1997 resulting in the protection of a 2,000 ha portion of the Torrance Barrens as a Conservation Reserve.

The story of the Torrance Barrens Dark Sky Preserve⁴ is one of vision and persistence, but also a bit of naivety.



Peter's success was due to his gentle and persistent persuasion with a naively simple rationale that targeted the mandate of the Ontario Ministry of the Environment. The idea was kept simple so that it wouldn't impact the management and budget beyond the responsibility of low-level managers. So, it was politically "safe".



The Torrance Barrens was already a special place – but the reason is somewhat embarrassing. There was very little money to develop it! The parking lot is undulating bedrock and there is only one out-house (or natural toilet). There are only dirt paths through the park and there's no electricity service to the site, so it has no installed artificial lighting.

It was relatively small, and the sky was marred by the light of neighbouring municipalities. But local citizens liked the rural life over that of the highly urbanized City of Greater Toronto with its over 5-million people. So, it wasn't hard for Peter to influence urban planning in the cottage country to halt and even reverse light pollution in the local area.

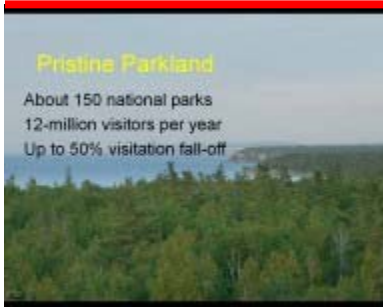
³ www.ontarioarchaeology.on.ca/summary/post.htm

⁴ www.muskokaheritage.org/natural/torrancebarrens.asp

Although the Torrance Barrens DSP was created to preserve the quality of the night sky, the logic that was used to convince Management was to preserve the ecological integrity of the area by protecting the nocturnal environment from artificial lighting. This rationale can be used for any Park in which wildlife is to be protected.

We were impressed with Peter's success and worked to expand the Dark Sky Preserve Program with help from our national RASC network of 4,000 members.

Beginning of the DSP Program



Canadian National parks are almost wilderness areas in their own right even with 12 million visitors, or 35% of the national population. However, during the last decade, the number of visitors to our National Parks has decreased. In a few cases the fall-off has been up to 50%⁵. Reduced attendance may have been due to the general reduction in travel during the early 2000s⁶. The National Park Agency was quite aware of this, but there didn't seem to be any easy solutions and decided more studies were necessary into attendance statistics⁷. Subsequent Department Publications were very general and programmatic, rather than with specific proposals⁸.

Early DSPs



An other example of an early DSP is from 2003 - the Provincial Conservation area "MacDonald Park" near the small city of Abbotsford in British Columbia. It's well under the light dome of the much larger Metropolitan area of Vancouver 50 km away with its population of 2.3 million people.



The rolling hills and Mountains around Abbotsford effectively shield the Park from urban lighting, even though Abottsford is only 10 km away.

One of the key spin-offs from the designation was Abottsford's new lighting policy and its influence on the City of Vancouver. With the encouragement of the Fraser Valley Astronomical Society (FVAS), the city adopted Full Cut-off light fixtures that reduced the light pollution. The result is protection for the Park well into the future. The media reports in Vancouver - about the Park's designation - increased popular support for better lighting.

⁵ Statistics Canada www.pc.gc.ca/eng/docs/pc/attend/table1.aspx?m=1, <http://dsp-psd.pwgsc.gc.ca/Collection/R62-332-2000E.pdf>,

⁶ Statistics Canada www.gdsourcing.com/works/TravelStatsCan.htm,

⁷ Parks Canada www.pc.gc.ca/docs/pc/rpts/rve-par/28/6_e.asp , www.mlm-home-business.net/travel/parks-canada-working-to-attract-more-visitors/

⁸ www.pc.gc.ca/eng/docs/pc/rpts/prior/tdm-toc.aspx



A second example of an early DSP is the Point Pelee National Park, in southern Ontario. It's the most southern point of Canada (1 degree closer to the equator than Lastovo)! There's a concentration of birds species during migration season where the peninsula juts out into Lake Ontario. The peninsula reduces the flight path for birds crossing the lake making it very popular place for bird watchers.



The sky of Point Pelee is not very good. Artificial sky glow is created by the light scattering in the lower 1,000 meters or so of the atmosphere so the flat topography of southern Ontario lets the sky glow be seen for hundreds of kilometres. In the early days of the Dark Sky Program, there was no lighting protocol or requirement to encourage neighbouring municipalities to restrict their lighting practices.

Pelee's main attraction for its designation was to promote light pollution abatement in nearby large urban centres. Recent progress has been made in the region with outdoor lighting policies and bylaws, but these were not direct spin-offs from the DSP.

The main lesson learned from these designations is based on the different outcomes from the MacDonal Park and Point Pelee designations. We decided to more clearly specify the municipal outreach components. And we clarified the extent of the public outreach activities to include the night environment.

A few officials in Parks Canada were interested in expanding the Park outreach programs to include stargazing. During meetings with them in 2005 we discussed the opportunity to make better use of their facilities by expanding their outreach activities after dark. Our political support for this nascent plan added weight to the efforts of those few employees.



In order for park managers to promote nighttime use as a policy, supporting documentation was needed that would provide rational guidance for outdoor lighting. I was asked to research and develop these guidelines, which were subsequently adopted in the spring of 2006. The lighting guidelines were based on the impact of artificial lighting on wildlife, which is based on the new field of scotobiology – or the study of the need for darkness. I spoke about this at last year's conference. It supports the hypothesis that artificial lighting changes the very nature of the environment. This was necessary because the Park mandate is focused on wildlife - not astronomy.

Prior to this Lighting Protocol, park managers had no guidance as to what lights should, or should not be installed. Further, although some managers knew that they should minimize artificial lighting, they had no concise scientific rationale on which to base a policy that would

come under criticism from lighting companies, park legal advisors and some visitors.

With a firm ecological basis to argue for minimal lighting, park managers readily accepted the guidelines, which could actually reduce the operational costs of their park. These same guidelines were then integrated into the RASC Dark Sky Preserve Program as its lighting protocol.

Since the designation of the Torrance Barrens Dark Sky Preserve in 1999, six Preserves were designated before the lighting protocol was established, so there was no guidance for those park managers to follow. There was no high-level policy against the installation of more lighting. Without this lighting protocol, we had to rely on the goodwill and political clout of park managers to keep the Preserve dark.

The lighting protocol opened the door for the designation of “real” and ‘lasting’ Dark Sky Preserves. Areas where artificial lighting is non-existent surrounded by a buffer zone with strict control over the illumination level, extent, duration and colour so as not to compromise the integrity of the Preserve and that actually improved the nocturnal environment for wildlife - and for astronomers.

With the promotion of the lighting guidelines coupled with the Dark Sky Preserve Program, RASC Centres across Canada began to play an active role by approaching park managers - convincing them to seek Dark Sky Preserve designations. The result was a number of high quality Preserves that were regulated by Park Officials and local RASC Centres.

Lessons have been learned with each designation. Vague wording and weak requirements were revised resulting in a second version of the Program documents in 2009.

The above narrative can be condensed into six lessons we learned during the development of the DSP Program. They all seem quite obvious now, but they were not self evident at the time.

- Use the Park Mandate,
- Keep the logic simple,
- Develop regional support and commitment,
- Use stargazing to extend park usage, which may increase park revenue
- Introduce night walk, or sound, programs, and
- Apply a lighting protocol.

Development DSP Program

7 Lessons Learned

- Use Park Mandate
- Keep logic simple
- Develop regional support/commitment
- Extend park use with stargazing
- Develop foundations of scotobiology
- Introduce night walk/sounds program
- Lighting protocol



Kejimkujik DSP⁹

“KE jim KU jik” National Park is the most recent Dark Sky Preserve, and the twelfth in Canada. It’s located in Nova Scotia¹⁰ - a relatively small province of 55,000 square kilometres and a population of about 1-million people. The park is a 38,112 ha (about 0.7% of the province) and its located a 2-hour drive southwest of Halifax (the provincial capital).



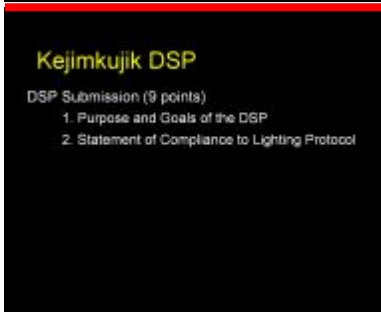
The Park has benefited from the experience of other managers in the national park system. In the remainder of this talk, I would like to walk you through the documentation they submitted. It shows the extent that the Park Agency has “bought into” Dark Sky Preserves with guidance from the RASC DSP Lighting Protocol¹¹.

The extensive commitment and sensitivity to the DSP Program is evident in the chapters of the Kejimkujik application.



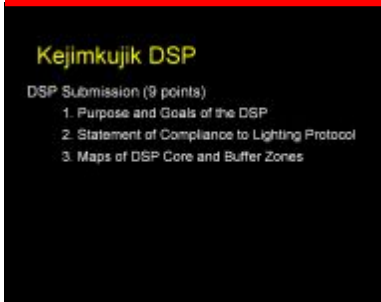
1. Purpose and Goals of the DSP

By explicitly stating the reason to become a Dark Sky Preserve, the Park, and the sponsoring Centre of the RASC, commit themselves to an on-going relationship to promote astronomy and light pollution abatement across the region. They recognize this is not a single achievement (a certificate to hang on an office wall), but the beginning of a new paradigm in Park Management.



2. Statement of Compliance to the Lighting Protocol

This requirement ensures they have read the lighting protocol and are prepared to implement it. If the Department of Public Works tries to illuminate a road that runs through the Preserve, the Park officials will make them stop. Sadly, this commitment was not in place in time for an earlier Dark sky Preserve.



3. Maps and Descriptions of the DSP Core and Buffer Zones

The maps defined the Core of the Dark Sky Preserve, and buffer areas. (The Core area for Kejimkujik is 90% of the 38,000 hectare Park and only 10% is needed as a buffer zone).

The best people to provide this information are the park personnel. This saves our volunteers a lot of work.

⁹ http://robertdick.ca/Kejimkujik_DSP.pdf

¹⁰ http://en.wikipedia.org/wiki/Nova_Scotia

¹¹ <http://www.rasc.ca/lpa/guidelines.shtml>

Kejimkujik DSP

DSP Submission (9 points)

1. Purpose and Goals of the DSP
2. Statement of Compliance to Lighting Protocol
3. Maps of DSP Core and Buffer Zones
4. Sky Quality Measurements

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Every park is different. They have large or small neighbouring towns, elevations vary, atmospheric quality differs, and vegetation and forestation are unique to each site. So, sky quality varies as well. These measurements are not used to judge a site; rather they are used to help document the sky quality so its improvement (or degradation) can be assessed in the future.

Kejimkujik DSP

DSP Submission (9 points)

1. Purpose and Goals of the DSP
2. Statement of Compliance to Lighting Protocol
3. Maps of DSP Core and Buffer Zones
4. Sky Quality Measurements
5. Existing Lighting Inventory

5. Existing Light Inventory

Some of our parks were established many decades ago and have lighting that no longer works and may even be forgotten by the staff.

This requirement has been used to make park officials aware of what they have. The location of some light fixtures has been a source of amusement for both the staff and the RASC. Some park lighting was found illuminating private properties (perhaps after a payment of a case of beer), and some fixtures were left behind on construction sites long after their need was over.

With the help of the RASC members, park officials performed a complete inventory of all light fixtures in the park and assessed them for their impact on the proposed Preserve and the Park wildlife.

Kejimkujik DSP

DSP Submission (9 points)

1. Purpose and Goals of the DSP
2. Statement of Compliance to Lighting Protocol
3. Maps of DSP Core and Buffer Zones
4. Sky Quality Measurements
5. Existing Lighting Inventory
6. Current Lighting Strategy

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No parks are perfect. Whether they need to remove or shield existing lighting, rework parking lots or building illumination – there should be a plan in place to improve or entrench the existing lighting plan. These changes should be spelled out with a realistic schedule.

In the Kejimkujik Preserve, non-compliant fixtures have been prioritized and scheduled for removal or replacement. Since this work requires some capital expenditures, we accept the schedule to have this work completed by the autumn of 2011 (a one year schedule that covered two fiscal years).

This section of the application also lets us create a list of solutions. We have learned many techniques from Park staff for lighting and navigation. For example they use white stone to cover pathways and applying white paint to the edge of stairways. These will save the cost of running power and maintaining fixtures. Starlight provides sufficient illumination. I have done this at my cottage for the last two decades. A single application of paint lasts 3 to 5 years.

The Dark Sky Preserve Program is not just for astronomers. Some parks may turn off all lighting when they host an astronomical event, but they turn them back on when it is over. This is of little benefit to wildlife, which is at the centre of the Park mandate. A real Dark Sky Preserve enforces the lighting protocol throughout the year. In doing so wildlife is able to adapt to the more limited human presence.



7. Public Outreach Strategy

One of the official reasons for a DSP is to increase visitors in the park. In order to catch the attention of perspective visitors there must be official night programs to compliment the daytime activities.

Kejimkujik has developed a detailed Public Outreach Plan to take advantage of its current facilities and to help visitors make the most of their stay. The main observing site is located in an area with a low horizon and year round access with basic toilet facilities. They plan to build an observatory for public outreach, and an area for visitors to set-up their own telescopes. I am working with the Park to carry astronomy outreach materials as free handouts or for sale.



8. Municipal Outreach Plan

As part of the Dark sky Preserve application, the Park has developed the support of neighbouring communities. Municipalities surrounding the Kejimkujik Preserve are implementing policies with full cut-off light fixtures and have lowered illumination levels to further reduce their impact on the Park. These policies will protect the integrity of the Park with little additional effort for at least several decades.



9. Photographic Record of the Park Sky

DSPs must be popularized if they are to be successful in our long-term goals of sensitizing our society to the use of artificial lighting. It's regrettable that we have to "protect" areas from light. This is like building a dome to protect us from air pollution.



The supporting panorama images showing the night sky at Kejimkujik indicate that the site is not perfect. However the support letters from the municipalities, like those under the present light domes, state their belief that the dark sky as a symbol to be cherished.

Epilogue

In time, perhaps a symbol of a sustainable community will be its absence on sky glow maps. (How dark is your area on Dr. Cinzano's plots?) The letters of support from Municipalities indicate how the Dark Sky Preserve Program is changing the way city planners think about light. It is no longer assumed to be benign, and urban lighting is slowly fading as a symbol of prosperity. Artificial lighting is starting to be viewed as a necessary evil that must be minimized through careful planning and engineering.

I hope I have left some time for questions ?

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