Astronomy Tourism in Dark Sky Places

A Winston Churchill Travelling Fellowship Report

Steve Owens
August - September 2011
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This report details the work I carried out between August and October 2011, during my Winston Churchill Travelling Fellowship. The aim of my fellowship was to study astronomy tourism at each of the seven existing International Dark Sky Places in North America.

I spent at least two days and nights in each Dark Sky Place (in most cases three nights, and occasionally longer) and during that time I met with those individuals who were responsible in getting the dark sky status for their area, as well as others who were involved in the astronomy or tourism industries. I conducted interviews with thirty people in total throughout my fellowship.

During my travels I posted updates on my blog at darkskydiary.co.uk, as well as tweeting regularly at @darksyman. This allowed me to recorded my experiences as I went along, greatly improving my ability to recall my experiences at a later date.
A bit about me

I am an astronomer and professional science communicator. After studying Astronomy and Physics at the University of Glasgow 1993-2000 I worked at Glasgow Science Centre from 2001-2008, running the planetarium there from 2004-2008. I was the UK Co-ordinator for the International Year of Astronomy 2009, since when I have been freelance, working as a dark skies consultant and delivering astronomy events for tourism businesses near dark sky place.

In 2009 I led on the establishment of the UK’s first International Dark Sky Park in Galloway Forest, and then on the setting up of the world’s first dark sky island in Sark in the Channel Islands in January 2011. I also worked as a consultant on the successful bid from Exmoor National Park to become Europe’s first International Dark Sky Reserve in October 2011.

Why dark sky tourism?

The purpose in each of these three places getting international recognition for the quality of their night skies (and for their commitment to mitigating the effects of light pollution and thereby minimising the deterioration of those skies) has been to increase winter - off-season - dark sky tourism in the surrounding areas.

Prior to 2009, while astronomy tourism wasn’t unknown, it was largely limited to aurora-hunting and eclipse chasing, events that are best looked for outside the UK. With the media attention around the success of Galloway Forest Dark Sky Park there began a new focus in attracting visitors to the dark areas of the UK, so that they can see amazing sights virtually on their doorsteps.

In the three dark sky seasons since gaining the status (effectively the dark sky season in the UK begins in September and ends in April - between May and August skies are too bright to see much of what attracts people to dark sky places) Galloway Forest Park has seen a marked increase in winter tourism. While formal evaluation of economic benefits are limited there are good anecdotal evidence from businesses and communities around the park that the status - and the publicity created by it - is increasing winter tourism income. Sark and Exmoor, while only gaining their statuses recently - seem to be showing the same same pattern.
The International Dark-sky Association

The International Dark-Sky Association (IDA) is a U.S.-based non-profit organization incorporated in 1988 by founders Dr. David Crawford, a professional astronomer, and Dr. Timothy Hunter, a medical doctor/amateur astronomer.

The mission of the IDA is:

“to preserve and protect the nighttime environment and our heritage of dark skies through environmentally responsible outdoor lighting.”

The IDA now has 58 chapters in 16 countries, and their membership now stands in the thousands. Their staff headquarters are in Tucson, Arizona.

Measuring Dark Skies

Throughout this report I will refer to measurements taken on a device called a Sky Quality Metre (SQM). These simple light-metres - about the size of a deck of cards - can be used to measure the total brightness overhead and convert that into a measurement of sky brightness in standard units - magnitudes per square arcsecond. (Magnitudes are the standard way of recording brightness of objects in astronomy, the lower the number the brighter an object is; arcseconds are a measure of angle on the sky, one arcsecond being 1/3600 of a degree).

Using an SQM to measure sky brightness in a city you might record around 16, maybe lower. In suburban areas it would read around 18-19. Rural areas would register around 20, while dark sky places would be as dark as 21+. In a place free from man-made light pollution the only light would come from the stars and the sky, and in such places the limit of the device is reached, around 22.
International Dark Sky Places

One of the major projects within the IDA is their International Dark Sky Places programme. Their website states:

“IDA takes great pride in its efforts to protect our natural nightscapes. Yet night sky protection starts locally, with a dedicated group of citizens. Through our International Dark Sky Places program, IDA and its partners certify locations with exceptional nightscapes as International Dark Sky Communities (IDSC), International Dark Sky Parks (IDSP), and International Dark Sky Reserves (IDSR).

“These locations serve as reminders that with quality outdoor lighting, the extraordinary wonders of the nighttime sky and night environment are just as much a part of our lifestyle and history as are the daylight hours. In fact, without the inspiration from night sky objects, much of the world’s history, art, culture, music, and literature would not have been created. IDSPlaces celebrate this rich heritage with innovative outreach programs meant to inspire others to cherish the sky.”

At the time of my Winston Churchill Travelling Fellowship there were 11 International Dark Sky Places worldwide:

- Flagstaff IDSC (2001)
- Natural Bridges IDSP (2006)
- Cherry Springs IDSP (2008)
- Mont Megantic IDSR (2008)
- Borrego Springs IDSC (2008)
- Galloway Forest IDSP (2009)
- Zselic Landscape IDSP (2009)
- Clayton Lake IDSP (2010)
- Goldendale Observatory IDSP (2010)
- Geauga Observatory Park IDSP (2011)
- Sark IDSC (2011)

Since returning from my travels a further five International Dark Sky Places have been established:

- Hortogaby National Park IDSP (2011)
- Exmoor National Park IDSR (2011)
- The Headlands of Emmett County IDSP (2011)
- Homer Glen IDSC (2012)
- Big Bend National Park IDSP (2012)

It was my intention to visit all eight of the North American International Dark Sky Places on my fellowship but regretably I had to miss out Goldendale Observatory in Washington State, the only one which didn’t lie on a convenient NE-SW axis across the continent.
Travel Itinerary

My travelling fellowship spanned six weeks in total, from 22 August until 03 October 2011. During that time I travelled across North America, diagonally from north-east to south-west.

Map showing the seven International Dark Sky Places I visited during my WCMT travelling fellowship

<table>
<thead>
<tr>
<th>Date</th>
<th>Outward Flight</th>
<th>Internal Flight/Drive</th>
<th>Location</th>
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<tbody>
<tr>
<td>22 August 2011</td>
<td>Glasgow - Montreal</td>
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<td>Mont Megantic International Dark Sky Reserve, Quebec</td>
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<td>23-26 August</td>
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<tr>
<td>27 August</td>
<td>Outward flight</td>
<td>Internal flight</td>
<td>Mont Megantic - Cleveland</td>
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<td>27-29 August</td>
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<td>Drive</td>
<td>Geauga Observatory International Dark Sky Park, Ohio</td>
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<td>30 August</td>
<td>Outward flight</td>
<td>Internal flight</td>
<td>Geauga - Cherry Springs</td>
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<td>30 August - 01 September</td>
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<td>Drive</td>
<td>Cherry Springs International Dark Sky Park, Pennsylvania</td>
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<td>02 September</td>
<td>Outward flight</td>
<td>Internal flight</td>
<td>Pittsburg - Amarillo</td>
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<td>03 September</td>
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<td>Drive</td>
<td>Amarillo - Clayton Lake</td>
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<td>04-05 September</td>
<td>Outward flight</td>
<td>Internal Flight/Drive</td>
<td>Clayton Lake International Dark Sky Park</td>
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<td>Drive</td>
<td>Amarillo - Tucson</td>
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<td>07 September</td>
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<td>Drive</td>
<td>Tucson, Headquarters of the IDA</td>
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<td>Tucson - Flagstaff</td>
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<td>09-10 September</td>
<td>Outward flight</td>
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<td>Flagstaff International Dark Sky Community</td>
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<td>10-11 September</td>
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<td>Flagstaff - Natural Bridges Park</td>
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<td>12-20 September</td>
<td>Outward Flight/Drive</td>
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<td>Natural Bridges International Dark Sky Park and Canyonlands</td>
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<td>21-22 September</td>
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<td>Drive</td>
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<td>23-24 September</td>
<td>Outward flight</td>
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<td>Flagstaff International Dark Sky Community (again)</td>
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<td>Flagstaff - San Diego</td>
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<td>26-29 September</td>
<td>Outward flight</td>
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<td>Borrego Springs International Dark Sky Community</td>
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<td>30 September</td>
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<td>San Diego - San Luis Obispo</td>
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<td>Outward flight</td>
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<td>03 October</td>
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<td>Return flight</td>
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<td>Los Angeles - Glasgow</td>
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Stop 1:
Mont Megantic
International Dark Sky Reserve

The Galactic Centre from the summit of Mont Megantic

Situated a few hours east of Montreal in the Quebec province of eastern Canada, Mont Megantic National Park is home to a research observatory, a public observatory, and the ASTROlab science centre. In 2008 it was named by the International Dark-skies Association (IDA) as the world’s first International Dark Sky Reserve (IDSR).

This designation differs from the similarly named International Dark Sky Park (IDSP) designation in that the IDSR was introduced to allow parks that did not fit in to the US national park model to still aspire towards IDA status; that is, the IDSPs were created to apply to large parks under federal control with no population within the park boundary; the IDSR status is intended for parks who want to work with their surrounding communities towards darker skies for all.

And this is exactly what Mont Megantic National Park did, and in 2008 it was announced as the world’s first (and - at the time of my visit - only) International Dark Sky Reserve (since my fellowship Exmoor National Park has become Europe’s first - and the world’s second - IDSR).

Astronomy Tourism at Mont Megantic IDSR

Mont Megantic IDSR has a range of incredible resources for astronomy tourism, including the ASTROlab science centre, a public observatory, and a professional observatory with a 1.6m scope which is sometimes opened to the public to use.

The ASTROlab runs astronomy events every Friday night over the summer, including a visit to the ASTROlab, observing at the public observatory (weather permitting) and a tour of the professional observatory.
Each of these resources existed long before the IDSR status was conferred: the professional observatory was built in 1979; the ASTROlab and the public observatory in the 1980s. It was in part to protect the dark skies which these facilities rely on that the IDSR status was granted.

However there are two main differences between Mont Megantic IDSR and any dark sky places in the UK. They are: there is already a well-established winter tourism sector in the area, based around snow sports, and so astronomy tourism isn’t offering to fill an otherwise empty season, as it does in the UK; and it is possible to run astronomy events at Mont Megantic during summer months, unlike the UK, due to Mont Megantic being around 5-10° further south than the UK.

These factors mean that tourism seems to have been far less of a driver in creating the IDSR at Mont Megantic than it is in the UK, where it is really the sole reason, and the driving force in persuading the community around any dark sky place that there are larger benefits than those that accrue to astronomers.

During my visit to Mont Megantic I stayed at the incredible Haut Bois Dormant in Notre Dam des Bois, just a few miles from the park, run by the delightful Julie Demers. The entire length of the road running through Notre Dam des Bois was festooned with flags advertising the IDSR, and inside the guest house the IDSR was similarly promoted. However speaking to Julie it seems like the astronomy tourism sector is still to grow to its full potential. One limiting factor seems to be the fact that organised astronomy events are only run on Friday nights, and for the rest of the week you’re on your own.

During my visit I met with four people involved in a variety of ways in astronomy tourism at the park. My visit was arranged by Pierre Brosseau, the communications manager at the ASTROlab, who explained a little of the philosophy behind the creation of the IDSR, which he suggested – as did others – was more to do with fact that it was the “right thing to do” and not as much about generating money for the local economy through tourism.
I was also given a guided tour of the professional observatory by Robert Lamontange, the executive director of the observatory, and later that night by Bernard Malenfant, chairman of the board, and founder of the Astronomy Super Festival, who had been there as long as the observatory (legend has it he came in the box with the primary mirror).

The next day I met with Tania Pinard, the Megantic area tourism officer who took me on a tour of businesses that use astronomy to attract visitors in innovative ways, including the Spa Le Montagnais, which offers stargazing from outdoors hot tubs during the Perseid Meteor Shower!

Later that afternoon I met with Sebastien Giguere, the head of education at ASTROlab, who gave me a wealth of information about the public programme within the IDSR.

**Dark Sky Survey of Mont Megantic IDSR**

On my final night at the park I went to the top of the mountain and took some SQM readings of the sky, as well as some astrophotos to gauge just how dark the sky is. The SQM reading average of six readings was 21.4, very similar to Galloway Forest Dark Sky Park and Sark Dark Sky Island. I repeated this reading in the back garden of the Haut Bois Dormant in Notre Dam Des Bois town, and the reading was 21.3, not appreciably different! The Milky Way stood out prominently in both locations, and could be seen all the way to the horizon.

*All-sky photograph taken from Mont Megantic Observatory  
(Canon 5D, Sigma 8mm Fish-eye lens, f/3.5, 180s, ISO 1000)*
Stop 2:  
Geauga Observatory Park  
International Dark Sky Park

Situated only 45 minutes east of Cleveland, Geauga Park District is home to 20 separate parks in Geauga County, Ohio, the largest one of which is also the most recent: Observatory Park.

Observatory Park

This 1100 acre recreation park is home to a brand new observatory and astronomy complex, designed to encourage local schools education, and public astronomy.

The construction of this site was nearing completion during my visit, having been planned since 2004, and in 2008 the International Dark-skies Association awarded it provisional dark sky park status, a status that just before my visit was upgraded to full International Dark Sky Park status.

I was guided round the spectacular Observatory Park by Kathleen Hanes, their Dark Sky Coordinator, Tom Curtin, their Executive Director, and Bill Murmann, a local amateur astronomer, and shown all of the amazing brand new facilities that will soon be used by local schools and visitors to the park.

Moon Phase Exhibit

Some of the highlights include:

• a solar system trail (to scale) covering one mile around the perimeter of the observing field (help for which I discovered was given to Geauga District by Armagh Observatory in Northern Ireland)
• a fully-fitted observatory with 25" scope
• five concrete platforms with electric hook-ups for setting up portable scopes outdoors
• a human sundial
• winter and summer solstice sunrise alignments
• proposed “stonehenge” stones marking the direction to specific stars in different seasons
• a good-sized teaching room complete with planetarium dome sunk into the ceiling

In the afternoon I met with the fundraising team, who have, incredibly, raised much of the money for this development through private donations.

My final meeting was with Terry McGowan of the IDA, who gave lots of useful insight into the lighting regulations at Observatory Park.

Astronomy Tourism at Geauga Observatory Dark Sky Park

With such a new facility, the park is still working out exactly what it means for the local tourism community, but one slight snag (in terms of the park generating revenue for the local county) is the lack of places to stay overnight near Geauga. We had to stay in the next county, albeit only twenty minutes drive from the park.

My sense is that the park will thrive on its education programme, which was the real reason for its creation, and that tourism may not feature too heavily, which is a great shame given how stunning a place it is.
Stop 3:
Cherry Springs
International Dark Sky Park

Cherry Springs State Park sits in rural Pennsylvania, in the middle of the 1000 square kilometre Susquehannock State Forest, 700m above sea level, and as such is very dark indeed. Much of the park was built by members of the Civilian Conservation Corps during the great depression of the 1930s, and over the years it has gained fame amongst Pennsylvania residents as one of their most popular parks.

My visit was arranged by Chip Harrison, the park operations manager, who first stumbled upon the idea of a dark sky park back in 1997. While patrolling the park late one night he chanced upon an astronomer, Gary Honis, who had set his scope up in what is now the astronomy field. Rather than ask him to leave (parks close at sunset) Chip asked him why he’d come to that specific site, and Gary told him that, using a light pollution map of the eastern US, this spot was the very darkest place he could find.

Inspired by this, Chip worked with astronomers to protect those dark skies, and in 2000 Pennsylvania named it a dark sky park, the designation became more formal in 2008 when it was declared as the world’s second International Dark Sky Park by the IDA.

The astronomy field now sports electric hook-up sites, rentable telescope domes, landscaping and tree planting to block headlights, and attracts thousands of astronomers each year, most of them during two major star parties: the Black Forest Star Party, sponsored by the Central Pennsylvania Observers...

I arrived at the park just days after the Black Forest Star party closed, but there were some astronomers still on the field, and it was a delight to meet them, including Gary Honis, whom Chip had first met 14 years ago.

The local community seems to relish their unique status, with restaurants and hotels displaying “astronomers welcome” signs, but perhaps the most impressive work has been done by the Cherry Springs Dark Sky Fund, headed up by Chip’s wife Maxine. They work on fundraising through private donations and to date have received tens of thousands of dollars worth of money, much from visiting amateur astronomers, which has allowed them to develop the astronomy field, as well as a public stargazing field across the road where weekly stargazing sessions are held on Friday and Saturday nights.

These astronomy nights are hosted by park ranger Greg, who’s enthusiasm is evident. Just prior to my visit they had 500+ people turn up for one of these evenings, far more than they could cope with, but which demonstrates the need for such a programme.

**Dark Sky Survey of Cherry Springs IDSP**

The night I spent stargazing there was a little hazy and the SQM read 21.4 but I have been assured that they regularly get readings of 21.9, with a naked-eye limiting magnitude of 7.2.
Stop 4:
Clayton Lake
International Dark Sky Park

Clayton Lake Dark Sky Park was the fourth International Dark Sky Place on my tour, and so far the most remote. Nestled in NE New Mexico, about 15 miles from the town of Clayton, this small park has long attracted astronomers to its dark skies.

Local high school principal Terrell Jones told me: “I’ve been bringing school kids out here for over twenty years to see the dark skies; it was a way of getting more kids interested in taking science, and of keeping the physics class running. We asked their parents to come with them, and lots of the parents – most of them ranchers who you’d have thought wouldn’t have been interested – wanted to learn more.”

One such parent was Art Grine, Clayton’s barber. So taken was he with the wonders of the cosmos that he and his wife enrolled in Terrell Jones’ astronomy night class course, and he’s now president of the newly-formed Clayton Astronomy Club, which looks after the small observatory at Star Point, within the dark sky park. Art’s passions for astronomy – although he’s only been doing it for a few years – is evident, and his infectious enthusiasm is one of the main driving forces behind the success of the dark sky park.

Tourism seems to be a big part of the reasoning behind the dark sky park; much like Mont Megantic Dark Sky Reserve the streets of Clayton are festooned with flags promoting astronomy, the local “what’s on” guide features dark skies prominently, and the local hotels actively promote it. After the observatory was installed and the astronomy club set up, they ran monthly astronomy star parties at the site, and applied for and were awarded Dark Sky Park status (Gold Tier) in 2010.
Since then they’ve continued to thrive on the dark sky status. Visitors to the park get sent to Art the Astrobarber who unfailingly arranges a time for them to see through the telescope, of which he is rightly proud.

One satisfying story of light pollution mitigation comes from the local prison, the North East New Mexico Detention Facility, which opened in 2008, after the Clayton Lake observatory was built. The lights of the new prison were too bright and badly installed, and a new light dome appeared on the horizon of Clayton Lake. Terrell Jones and Art Grine visited the prison governor to ask whether he might instal shields on the lights, and brought with them an example shielding fixture. So persuasive were they that the governor had the inmates manufacture shields for all the offending lights, and so the light-dome was removed.

**Dark Sky Survey of Clayton Lake IDSP**

The skies above Clayton Lake are really dark, some of the darkest I’ve seen, with SQM readings of 21.6, and very little sky glow evident anywhere.
Stop 5:
Flagstaff
International Dark Sky Community

Flagstaff is a city with a long connection to astronomy. It was dubbed “the Skylight City” in the 1890s, and the Lowell Observatory, cited on Mars Hill just west of the town, was established in 1894. Six decades later the United States Naval Observatory was set up five miles outside the town. As a result, light pollution has long been a concern in Flagstaff.

In fact, in 1958 Flagstaff adopted the first lighting ordinances to prevent the rapid deterioration of the night sky for astronomical research:

ORDINANCE NO. 440
AN ORDINANCE DEFINING SEARCH LIGHTS IN THE CITY OF FLAGSTAFF, PROHIBITING THE USE OF CERTAIN COMMERCIAL SEARCH LIGHTS IN THE CITY LIMITS OF FLAGSTAFF, ARIZONA AND PRESCRIBING A PENALTY THEREFOR AND DECLARING AN EMERGENCY

BE IT ORDAINED by the Mayor and Common Council of the City of Flagstaff as follows, to-wit:
1. It is hereby declared to be unlawful for any person or persons to operate within the City Limits of the City of Flagstaff any incandescent or arc-type search light, beacon light or similar lighting device designed to and capable or projecting a beam of light into the sky for a distance of an excess of one half (1/2) mile.
2. The provisions of this Ordinance shall not apply to emergency search lights or beacons or search lights or beacons pursuant to public authority.
3. The provisions of this Ordinance shall not be construed to prohibit the use of short-range open type, wide angle stationary floodlights not capable of projecting a beam of light in excess of one half (1/2) mile.
4. Any person violating any provisions of this Ordinance shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine of not to exceed $300.00 or imprisonment in the City Jail not to exceed (90) days, or both such fine and punishment.
5. In order to protect and preserve the public health, safety, and welfare, it is necessary that this Ordinance become immediately effective and it is hereby declared to be an emergency measure to become effective upon posting and publishing according to law.

PASSED AND ADOPTED by the Mayor and Common Council of the City of Flagstaff, this 15th, day of April, 1958.
Thirty years later astronomer Chris Luginbuhl led new, comprehensive city- and county-wide ordinances. Ever since then a dedicated and enthusiastic team of community activists have been combating the increasing problem of light pollution that comes with an expanding city.

Today’s dark sky defenders are the Flagstaff Dark Skies Coalition (founded in 1999), many of whom I met on my two visits to the city, including two leading lights in the fight for dark skies, Dark Skies Coalition founders astronomer Chris Luginbuhl and community organiser Lance Diskan.

Flagstaff Dark Skies Coalition spread the word

Indeed Lance moved to Flagstaff so that his children – born in Los Angeles – could see the stars: “One of the things we required when we had children was that they be able to see the stars,” he says. “We wanted them to have the unlimited imaginative potential that comes from looking at the stars. Part of being human is looking up at the stars and being awestruck.” Lance has completed a masters thesis entitled: “The Night Sky in Human Culture”.

Flagstaff was awarded International Dark Sky Community (IDSC) status by the IDA in October 2001, and indeed it was Flagstaff’s unique history of lighting controls that inspired the IDA to form this designation in the first place. It wasn’t for another five years that the IDSParks programme expanded the family of dark sky places into larger parks.

During my two visits to Flagstaff in my traveling fellowship (on 8-10 Sep and again on 23-24 Sep) I met with members of the Flagstaff Dark Skies Coalition, learned of the community activism, was given a night-time tour of the good (and the still-present bad) lighting, visited Lowell Observatory, went stargazing and saw the Milky Way in a city centre (!), took a day-trip to the nearby Meteor Crater, and attended the opening night of the 2011 Celebration of the Night.

The latter is the fourth such event, which seeks to promote dark skies across a wide range of events and programmes. The opening event I attended was the public unveiling of the excellent Nightscapes IV exhibition of artworks inspired by the night, and by dark skies.

Throughout my visits I got a real sense that Flagstaff is leading the world, not just in lighting controls, but in engaging the local communities in the city to make them feel ownership of the wonderful resource they have overhead every clear night.

The fact that I could see the Milky Way from a small park in the middle of a city of 66,000 attests to the success of their mission, but it is an ongoing battle. Even in this enlightened (pardon the pun) city, there are poor lights that cause glare, trespass and skyglow, and which have to be constantly
monitored and reported. And the resources of the volunteers in the Dark Skies Coalition are stretched very thin dealing with this problem.

Astronomer Chris Luginbuhl put it very well in conversation with me. “I get caught up in lighting controls, and drafting lighting ordinances, but I’m not interested in lighting; I’m interested in nighting”.

**Dark Sky Survey of Flagstaff IDSC**

Measuring sky brightness with an SQM from Buffalo Park in Flagstaff resulted in readings of 20.5, excellent for a city, and corresponding to a Bortle Class of 4, which normally you would only get at the rural / suburban transition. Just a few miles east of the city in the KOA campground the sky was even darker, reading 21.4.
Stop 6:
Natural Bridges National Monument
International Dark Sky Park

The skies above Natural Bridges are amongst the darkest in the USA, and the only skies that have been rated as Bortle Class 2.

And the park has been taking advantage of this unique status ever since. Astronomy forms a major focus of what the park now does, with a twice-weekly stargazing programme utilising an 11” Schmidt-Cassegrain and a 24” Dobsonian telescope, allowing visitors to gaze far into the depths of space.

The astronomy programme is run by ranger Gordon Gower, a retired English and history teacher with a burning 50-year passion for astronomy. Graham described the programme to me; the laser tour of the constellations, the telescope viewing, the light pollution demos. These are all offered to the guests staying in the campground, and according to Gordon every Wednesday and Thursday night when the programme runs, the campground empties. “Many of the people that come to Natural Bridges National Monument don’t know about our dark sky status,” says Gordon, “but they are amazed at how clear and bright the Milky Way appears from here.”

The small visitors centre is decked with astronomy posters and books, and both of the park’s telescopes are on prominent display. There are even plans to build a small roll-off roof observatory on the site.

Natural Bridges National Monument,
International Dark Sky Park

The custom-built Dobsonian telescope
Naturally, the lights in the park are all exemplary, downlighting and adding no unwanted pollution to the park’s skies. For the past five years Natural Bridges has inspired parks around the world – including Galloway Forest Dark Sky Park in Scotland, which I helped set up in 2009 – and as of April 2012 there are ten such parks, and the number is growing every year. Thanks to the IDA, the National Park Service and Natural Bridges National Monument, areas of our planet are being protected against light pollution, and truly dark skies are being preserved for all to enjoy.

Dark Sky Survey of Natural Bridges National Monument IDSP

All-sky photograph taken from Natural Bridges
(Canon 5D, Sigma 8mm Fish-eye lens, f/3.5, 180s, ISO 1000)

The image above was taken before the end of astronomical twilight, and so a small amount of sunlight is still present in the sky in the east (top left of the image), but it’s worth showing for the meteor that I managed to capture, which is on the right hand side of the image, crossing the longer aeroplane trail.

Using the SQM I was able to measure a sky brightness (after astronomical twilight) of 21.6. This is very dark indeed (need it be said?), but still higher than it should be, due to the Milky Way which was directly overhead when I took the reading, and adds its own light pollution!
Stop 7: 
Borrego Springs
International Dark Sky Community

The final stop on my dark sky places odyssey was the desert community of Borrego Springs in southern California, smack bang in the centre of the Anza-Borrego Desert State Park, the largest state park in the “lower 48” states.

In 2008 the IDA designated Borrego Springs as an International Dark Sky Community, the second in the world after Flagstaff, and the first in California. This designation recognises the fact that the night sky above Borrego is very dark indeed (considering that they are less than 100 miles from the suburbs of Los Angeles) as well as the community-led efforts to minimise the effects of light pollution.

The town was settled in the 1930s, and there is a small community there still (pop 2500 ish) that live in Borrego Springs year-round. However the soaring summer temperatures (May – Sep the average high temp is above 38°C, and can reach as high as 49°C in mid summer) mean that many residents only winter there from Oct till Apr.

The town’s main economy is tourism, with four golf courses, an annual wildflowers display, and winter migrating birds all attracting tourists to the pleasant 20°C average mid winter temperatures. Dark skies tourism is starting to flourish in the town, with the Nightfall festival in its 18th year, and many other tourism businesses are starting to take note of the potential to expand their winter season.

During my visit to Borrego Springs the dark skies coalition, chaired by Betsy Knaak of the Anza-Borrego Desert Natural History Association, asked me to host a workshop for local tourism businesses, as well as a public evening talk (both were sold out), and a school talk to over 120 primary school kids. The interest in dark skies from across the community it staggering.
Indeed of all the places I have visited on this traveling fellowship, Borrego Springs reminds me most of the model for dark skies tourism that works so well back home in the UK’s dark sky places, such as Galloway Forest Dark Sky Park, and Sark Dark Sky Island. That is: the designation is achieved by a local group of activists; the local tourism businesses then use the dark skies to attract visitors in the “off-season”; and the astronomy activities are run by a small group of local astronomers. In the case of Borrego Springs their go-to guy for dark sky tourism events is the astronomer, writer and photographer Dennis Mammana.

I was lucky enough to go stargazing with Dennis and take some photos of the night sky. The evening when we were out was far from ideal: often a marine layer sits over San Diego and blocks out much of its light but on this evening the light domes of this city, and others, were evident.

Dennis was almost apologetic, comparing their skies unfavourably with some of the other incredibly dark places I had visited on my trip, but the comparison is unfair. Borrego Springs is not in the middle of nowhere; it’s a mere two hours drive away from Los Angeles, southern California, and north-west Mexico, with tens of millions of people within easy reach of a stunning night sky.

The opportunities for Borrego Springs are huge, and I hope that what they are doing will feed back to what we’re trying to achieve in the UK, and vice versa, as a perfect model for dark sky tourism.

**Dark Sky Survey of Borrego Springs IDSC**

I obtained an SQM reading of 20.25, admittedly not as dark as the other places I had monitored on my trip, but still very dark, and the IDA recognises that a Dark Sky Place needs an exceptional night sky *relative to the population that it serves*, which in the case of southern California is a huge population.

*All-sky photograph taken from Borrego Springs
(Canon 5D, Sigma 8mm Fish-eye lens, f/3.5, 180s, ISO 1000)*

In the image above, the light dome in the top of the image (SE) is from the large city of Mexicali. The light dome in the lower right of the image (N) is from Palm Springs, the light in the lower part of the image (NW) is from Los Angeles, and the light in the left hand side of the image (SW) is from San Diego.
Conclusions

The sheer volume of information gathered during my travelling fellowship meant that much of it took some time to sink in, but in the six month since I returned I have found my experiences informing my engagement with other sites looking to achieve International Dark Sky Status.

At the time of writing this report I am working with four other potential dark sky places in the UK, and one overseas: Brecon Beacons National Park; Northumberland National Park; Loch Lomond and the Trossachs National Park; the island community of North Ronaldsay in Orkney; and the Island of Saint Helena in the South Atlantic.

The lessons I learned from the diverse range of International Dark Sky Places I visited during my travelling fellowship can be distilled into four key points:

• The process of gaining International Dark Sky status is best achieved by a small group of local advocates, with knowledge of local issues, working in co-operation with other area organisations or communities to further their goals. Community activism is key; when the lighting regulations that go hand-in-hand with dark sky status seem to be dictated to a community from above they will often fail; those that are driven by interest within a community will more likely succeed.

• There are a number of factors that can act as drivers for International Dark Sky status in any given area. Economical factors include: saving local agencies money in lighting when less light is wasted in illuminating the night sky; generation of income in a local area through astronomy tourism. Environmental factors include: reduction on carbon emissions as a result of using less energy in lighting; preservation of the wildlife, especially nocturnal animals, that can be adversely impacted by light at night. More academic factors include: preservation of dark skies to permit professional observatories to continue research; education of local school communities in astronomy, one of the subjects most likely to inspire students to further their science studies. Any of these factors can individually by used by local advocates to drive dark sky status.

• Astronomy tourism is a powerful driver in those areas that meet any of a number of specific criteria: a dark sky resource of regional, national or international value (as represented by the IDA dark sky status for example); proximity to a large population of urban or suburban residents who live in areas where light pollution makes stargazing less possible; a quiet tourism “off-season” when numbers of tourists drop from on-season highs, which coincides with a good stargazing season (i.e. when the sky is not too bright late into the evening so that stargazing events can be run during socially acceptable hours); and a local group of passionate amateur astronomers willing to support the demand from visitors looking to engage in stargazing activities.

• Infrastructure is important in supporting astronomy tourism in an area, but it needn’t mean massive financial investment. In some cases an existing research observatory can inspire IDSP status in the area around it; in other cases the IDSP status comes first and the infrastructure follows: from large fields kitted out for star camps to roll-off roof observatories, from planetariums to laser-guided outdoor stargazing with a few portable telescopes.
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