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“HALF THE PARK IS AFTER DARK’’

Dark Sky Parks and Reserves: New Concepts and Tools to Grant Nature Heritage Status

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"Half the park is after dark".

Dark sky parks and reserves: New concepts and tools to grant nature heritage status

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ABSTRACT.— **"Half the park is after dark". Dark sky parks and reserves: new concepts and tools to grant nature heritage status.— There currently exists 44 dark sky parks and reserves (also known as "starlight reserves". Rarely created from nothing, they are often founded within already protected spaces (natural monuments, national parks, biosphere reserves...) whose protective measures are thus increased to include starry skies and nocturnal environments. Parks encompass the area in its entirety whereas reserves designate a core protected area within a larger space. Their creation illustrates the emergence of new forms of protection and the development of natural heritage whose concepts are rapidly spreading throughout European countries.**

DARK SKY PARK, DARK SKY RESERVE, LIGHT POLLUTION, WILDERNESS

RÉSUMÉ.— **Il existe aujourd'hui dans le monde 44 parcs et réserves de ciel étoilé labellisés sous les appellations anglophones « *dark sky park* », « *dark sky reserve* » ou « *starlight reserve* ». Très rarement créés ex-nihilo, ces parcs et réserves sont le plus souvent délimités dans le périmètre d'espaces déjà protégés (monument naturel, parc national, réserve de biosphère...) dont ils élargissent la portée des mesures de protection pour y inclure le ciel étoilé et l'environnement nocturne. Leur création illustre l'émergence de nouvelles formes de protection et de mise en valeur du patrimoine naturel dont les concepts se diffusent assez rapidement dans les pays européens.**

CIEL ÉTOILÉ, PARC, POLLUTION LUMINEUSE, RÉSERVE, *WILDERNESS*

Introduction

The slogan "Half the park is after dark" can be read on a series of posters created for U.S. national parks by the astronomer, artist, and photographer Tyler Nordgren (2010). This invitation to rediscover the landscapes of Yosemite, Yellowstone, the Natural Bridges or the Grand Canyon in the "dark light that falls from the stars" (Corneille, Le Cid (1636, IV, 3, Rodrigue) illustrates the emergence of new forms of protection and development of natural heritage, whose concepts are spreading quite rapidly throughout European countries (photo 1).

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There currently exists 44 dark sky parks and reserves, also known as "starlight reserves". The year 2013 was a peak year with 13 new dark sky places designation. Rarely created from nothing, they are founded within observatories and more often within already protected spaces (natural monuments, national parks, biosphere reserves...) whose protective measures are thus increased to include dark sky and nocturnal environments. Since the late 2000s, the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Union for Conservation of Nature (IUCN) monitor and support the creation of these "dark sky places", thus justifying our interest in such initiatives and, as we shall see, in their underlying heritage process. Indeed, since the launch of certification programs for "dark sky parks" and "dark sky reserves" in the mid-2000s and in the context of an "all-round inflation" (Heinich, 2009), the possibility of adding dark skies to the World Heritage list has become self-evident. As we shall see, this remains true even though the approach that theoretically posited the status did not resist long to UNESCO's refocusing.

Photo 1/ See the Milky Way

To help promote U.S. national park's dark sky protection programs, Tyler Nordgren created a series of posters modeled after the Works Progress Administration (WPA) art of the 1930s under the New Deal. Poster reprint with the gracious permission of the author.

Based on research undertaken since 2009 as part of the International Dark Sky Reserve of the Pic du Midi and the IUCN's Dark Skies Advisory Group (DSAG)[1], this paper offers an exclusive overview of the creation of dark sky parks and reserves across the globe. We begin by outlining the context from which emerged these new protective measures and their genealogy; showing how they gradually gained autonomy from scientific astronomy issues, from which they were born. We then discuss the process of granting heritage status to dark skies as part of its "routes" and "trajectory" (Reynard et al., 2011). Finally, in the last section, we present two examples of how natural heritage and dark skies interact.

The recent evolution of concepts of dark sky protection

Internationally, dark sky parks and reserves are part of a protective system for dark skies and night environments, which are expanding and becoming more commonplace. Typically, according to Samuel Depraz's typology criteria (2008), these systems can be either in-situ or ex-situ protective measures with specific goals (protecting an astronomical observatory from light pollution). More recently, these goals have become more generic: associating the protection of dark skies with that of the night environment, independently of the existence of an observatory.

1. Advisory group on dark skies.

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In 1958, in the United States, Flagstaff (Arizona) was the first city in the world to have adopted legislation to drastically reduce light pollution. In 1973, legislation was adopted for the entire state of Arizona. Thus, between 1958 and 1990, following the example of Flagstaff and Tucson, 33 cities and 11 counties in Arizona adopted measures to limit light haloes due to streetlights. Since, similar regulations were developed in California, (San Diego county – 1985), Hawaii, as well as in Australia, and New South Wales (Murdin, 1992). Protective measures are always established near astronomical observatories: Lowell Observatory in Flagstaff, Kitt Peak Observatory in Tucson, Mount Palomar Observatory in San Diego, and Mauna Kea in Hawaii.

Today, certain European countries such as Slovenia, Italy, and Spain have implemented calibrated measures limiting light pollution on all or part of their territory. It is only relatively recently that France has launched similar initiatives with the Grenelle Laws 1 and 2. Decree No. 2011-831. These laws on the prevention and limitation of light pollution, published in July 2011, stipulate their goals by introducing more restrictive measures within classified or protected natural areas and in the perimeter of astronomical observation sites (article R 583-4). These sites can be used for either scientific or amateur purposes, as long as they are emblematic of activities carried out on the site.

From protection zones for astronomical observatories...

As in situ protective systems, dark sky parks and reserves are heirs of astronomical observatories' protection zones. Indeed, the protection of dark skies, and therefore the fight against light pollution, was long the exclusive concern of professional astronomers, constituting a major goal in the preservation of their scientific observation activities. Historically located at the heart of the cities (Toulouse, Paris, Berlin, London, Rome...), astronomical observatories soon suffered from light pollution linked to the development of public and private lighting. During the twentieth century, many of them had to move from their location to the outskirts of populated areas, where they were quickly confronted with the same problems due to urban growth. Thus, to avoid light pollution due to the expansion of the Eternal City, the Vatican observatory, located in the heart of the papal city since the second half of the sixteenth century, had to be moved for the first time in 1930 to Castel Gandolfo, 35 miles south of Rome, and then to Mount Graham, Arizona, in the early 1980s.[2]

While most major observatories are now located in desert areas (the Atacama Desert in Chile), high mountains (Mauna Kea, Pic du Midi de Bigorre), or in very sparsely populated areas, those which have remained in the vicinity of urban areas are surrounded by conservation areas, with radii that can span several kilometers. Ten observatories in the world benefit from such zones. The largest areas surround the North American observatories (McDonald, Kitt Peaks, Mount Palomar, Mount Hopkins), they cover several hundred square kilometers with radii ranging from 40 to over 90 km.

... to "Starlight" Reserves

Since the early 1990s, and especially since the 2000s, new concepts for the protection of dark skies have emerged. The goal is no longer only to preserve visual and instrumental access to the sky, for purely scientific use; it also takes into account "starlight" as a real environmental bonus, whose protection and development can allow the existence of different forms of tourism that aim to be just as sustainable.

2. Source: http://www.vaticanobservatory.org (last consulted 11/2011).

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Two North American associations, the Royal Astronomical Society of Canada (RASC) and especially the International Dark-Sky Association (IDA) in the United States created certification for dark sky parks and reserves that are now partially included in the Starlight Foundation program (2009a) launched in 2007 with the support of UNESCO and the International Astronomical Union (IAU). The certification programs of these three organizations aim to recognize local commitments to fight light pollution and to identify and preserve sites characterized by the quality of the night sky. The aim is to protect both the night sky as well as the environment, and to promote associated values: scientific (astronomy), environmental (impact of light pollution on biodiversity), landscape (revelation of nocturnal celestial landscapes), or cultural (secular multifaceted relationship between societies and dark sky).

With different geographic scopes, the programs complete each other by offering a complete range of certifications suitable for different types of sites. The International Dark-Sky Association has defined three categories of area protection and dark sky development, including "park" and "international reserve"; the Royal Astronomical Society of Canada has established three categories, among which is the "astronomical urban park"; and the Starlight Foundation has established six categories, including "Starlight heritage site" and "Starlight landscape" (table 1). Thus, possible dark sky sites that could potentially become certified parks and reserves are no longer necessarily and solely located near active observatories. Possible sites could be natural areas that are already protected, iconic landscapes, urban parks, as well as former scientific institutions that played a significant role in the history of modern astronomy, and even archaeological sites associated with an ancient conception of the firmament, as listed in a recent report by the International Council on Monuments and Sites (Ruggles, Cotte, 2010).

Even though RASC and IDA certifications also aim to develop tourism in Dark Sky parks and reserves (IDA, 2007) by promoting novel ways to practice astronomy (such as "wilderness astronomy"), it is within the Starlight Foundation program that

Table 1/ Geographical scope and variations of the major certifications of Dark Sky parks and reserves

Organism	Geographic scope of certifications	Variations of certification	Number awarded in February 2014
	National (Canada)	Dark Sky Reserve, Dark Sky Preserve Urban Star Park	15 2
International Dark-Sky Association (IDA)	International	International Dark Sky Park International Dark Sky Reserve International Dark Sky Community	15 8 6
Starlight Fondation	International	Starlight Heritage sites Starlight Astronomy sites Starlight Natural sites Starlight Landscapes Starlight Oases – human habitats Mixted Starlight sites Tourism Destination	8 4

Source: Dark Skies Advisory Group of the International Union for the Conservation of Nature (2013), data obtained on September 1, 2013.

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the goals and sustainability of developing tourism are the most explicitly and precisely developed. In 2009, under the auspices of the World Tourism Organization, the Starlight Foundation set up a certification system "to ensure the quality of tourism experiences involving the nightscapes, the view of stars and the cosmos and the related scientific, cultural and environmental knowledge" (Starlight Foundation, 2009b). This development process, as defined by Stéphane Héritier (2006), is also related to the emergence of a real "territorial resource" (Gumuchian, Pecqueur, 2007) for the development of a new brand of tourism: astronomy-based tourism. As there is no official definition or label, we propose the following definition: astronomy-based tourism or "astro-tourism" (Hanel, 2010) or "scientific tourism in connection with astronomy" (Bumat, 2009, 2010) is a form of tourism in which the motivation to travel is the possibility to visit scientific institutions, the practice of astronomy in places equipped for this purpose and/or protected from light pollution, celestial events (lunar and solar eclipses, aurora borealis, meteor showers), contemplative discovery of nightscapes and sites that testify to an ancient conception of the firmament. Astro-tourists are either (more or less experienced) amateur astronomers or tourists in search of new sensory and cognitive experiences related to open air activities. Thus, depending on the places and practices to which it is associated, astronomy-based tourism can be considered a variation of the different forms of tourism at whose crossroads it is located: scientific tourism, natural tourism, cultural tourism.

Table 2/ Dark sky parks and reserves in the world

Country	Dark Sky parks and reserves already created
Canada	16
United States	12
Spain	6
United Kingdom	4
Hungary	2
Czech Republic	2
Poland	2
Slovakia	2
Germany	2
France	1
Portugal	1
Ireland	1
Chile	1
New Zealand	1
Namibia	1
Total	54

Source: Dark Skies Advisory Group de l'Uicn (2014), data from February, 2014.

Dark sky parks and reserves in the world

The regular monitoring of RASC, IDA, and the Starlight Foundation certification programs provided the data for this section. They were completed and cross-checked with those exchanged with David Welch, head of the IUCN's Dark Skies Advisory Group (DSAG). According to the last update in February,2014, the 54 identified dark sky parks and reserves are located in fifteen countries worldwide (table 2).

Compared to the history of protected natural areas and that of protective measures for cultural and natural heritage, the model of dark sky parks and reserves is relatively recent. It was inaugurated in the United States in 1993 with the creation of the Hudson Lake Dark Sky Preserve in Michigan. A second park was created in 1999 in Torrance Barrens, Canada. The majority of parks and reserves listed in the IUCN's Dark Skies Advisory Group database were not created before the late 2000s.Tracking their creation shows an acceleration at the end of the period and notably, the impact of the International Year of Astronomy, organized in 2009, on the number of certifications (11) and the appearance of the first projects on the old continent. With 27 designations, the three last years confirm the global and European tendencies. The concept has successfully spread regardless of the precise certification.

Though the majority of existing dark sky parks and reserves are still located in North America (28 out of 54), on the four most recent (2014) three are European (two designations in Germany, and one in Ireland). Among those certified since 2011 are the national parks and biosphere reserves of Montfragüe, La Rioja, Fuerteventura, and La Palma in Spain and the International Dark Sky

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reserves in Brecon Beacons and Exmoor in the United Kingdom.Exmoor is the first reserve in Europe and second in the world created with this status. Its certification was announced on October 9, 2011. Unlike the International Dark Sky Reserve of the Mont-Mégantic National Park (Québec) surrounding an observatory, the Exmoor National Park harbors no professional or amateur astronomy equipment. The press release issued by the authorities of the Exmoor National Park reflects the tourism goals that were targeted when obtaining this international distinction, which is increasingly coveted. The end of the year 2013 was also marked by the designation of Pic du Midi International Dark Sky Reserve in Pyrenees Mountains (France). Its boundaries encompass a world class observatory and several cultural and natural sites of interest in the Pyrenees national park, Néouvielle National Nature Reserve, Pyrénées-Mont Perdu and part of Chemins de St-Jacques en France UNESCO World Heritage Sites. This designation stems from two different rationales: one in which there is a close link between dark sky places and astronomy, and one that clearly shows the new links between protecting the dank skies and the nocturnal environment or a specific cultural context.

The process of granting heritage status to dark skies

In 2009, to commemorate the 500th anniversary of Galileo's discoveries, the creation of the International Year of Astronomy (AMA09) was the chance to organize a global celebration of astronomy and its contributions to society and culture. Apart from raising awareness around scientific research and the discipline in general, one of AMA09's goals was to "facilitate the preservation and protection of our global cultural and natural heritage of dark skies and historical astronomical sites, through the awareness of the importance and preservation of the dark skies and astronomical sites for the natural environment and human heritage."[3] Suddenly the night sky, a timeless object, whose very nature detaches it from any danger inflicted by humans and societies, attained the status of a heritage to preserve and protect. This revealed a hitherto discreet process that was nonetheless intrinsically linked to the emergence of new concepts of dark sky protection. As we saw earlier, this process, launched in the 1990s, but especially in 2000 by an international network of associations, launched a full-fledged heritage making system. Even though it appears to have been acquired, the dark sky's heritage status still raises many questions in terms of approaches and definitions, hence the need to decrypt it in order to grasp both its subtleties and ambiguities.

The invention of the heritage status of dark skies

The peculiarities and difficulties of granting heritage status to dark skies are inherent in the very nature of the object itself. A dark sky cannot be defined by a single parameter. It lies at the crossroads of several types of interactions with societies. This multidimensional identity can thus be determined by the stance of man, perceiving the dark sky by "trajection" (Berque, 1990): a double perception of the environment, both physical and phenomenal with three "volumes" to understand simultaneously (Antoine et al, 2002):

• "a reality determined by natural conditions (biophysical dimension)" (ibidem): when they are not masked by halos of urban light, the sky's natural lights send us the image of stars and other celestial objects visible to the naked eye or through instruments (nebulae and galaxies, the Milky Way, the moon, etc.);

3. Source: http://www.astronomy2009.org/static/archives/brochures/pdfsm/iya2009_brochure_4.pdf

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• "a place of collective memory (cultural dimension)": secular mediation between societies and the sky have produced a strong cultural heritage, an "artialisation" (Roger, 1997), perceptible through religious beliefs, cave paintings such as the Navajo Star Ceilings, megalithic ensembles such as Stonehenge, or architectural monuments like the Jantar Mantar in Jaipur[4];
• and, finally, "a phenomenal perception (subjective dimension)": each individual composes his vision of the dark sky according to his or her own subjectivity.

This definition should not overlook the fundamental differences between the dark sky and the terrestrial landscape: its immutability and limitless alterity. From the ground, "trajection" transforms our vision of the dark sky. However, this interaction, which offered a presence and a new dimension to man's position on earth, has considerably deteriorated, falling victim to modernity. The growing artificialisation of the relationship between man and the environment and the exponential increase in light pollution have transformed the night sky into an exotic, abstract object, a virtual, other place that is the privilege of remote places at the edge of ecumene where the largest observatories have taken refuge.

According to Pierre-Antoine Landel (2007), the heritage process is divided into two major phases. First is the invention or the selection of objects to assimilate to a heritage, generating a multiplicity of "aesthetic, artistic, historical, economic, social values" (Greffe, 1990). However, it is not enough to invent or select a heritage for the object in question to immediately acquire the status. The different players step in during the second phase to confer upon the chosen object a true identity, even institutionalizing it through rigorous expertise and classification. The dark sky currently falls somewhere between these two steps.

Since the early 1990s, the International Dark-Sky Association (IDA) has tried to include the night sky in the list of world heritage, affirming and linking it to natural and cultural values through its confrontation with light pollution. With exceptionally effective communication and awareness raising strategies (publications, events, development of a worldwide network of players, creating certification), the IDA has designed and delivered an invented heritage status for dark skies, at the crossroads between nature and culture. However, IDA has faced two interrelated obstacles, which has prevented the night sky from truly being identified with heritage. The first is the process's focus on the dark sky instead of its mediation with human societies, which inevitably leads to the second issue: the impossibility of actually granting heritage status to an object that is beyond reach. Therefore, the night sky as heritage has been tacitly recognized, even though the recognition stands alone amidst a relative void.

In 2007, the Starlight conference in La Palma entitled "In Defence of the Quality of the Night Sky and the Right to Observe the Stars" was held mainly in order to address this illusory status. Its goal was to recognize the different values of the night sky, to protect and enhance them with reserves, and to request UNESCO to include the night sky on the World Heritage List. UNESCO answered with a declaration in 2007 that there was no criterion that would allow the night sky and celestial objects to be considered under the 1972 World Heritage Convention; as the Convention was designed to recognize the interaction between humans and nature and the fundamental need to preserve the balance between the two. To overcome the difficulties posed by the definition, the "International Workshop and Expert Meeting on Starlight Reserves and World Heritage – scientific, cultural, and environmental values," was held on

4. For details and a complete list, see Clive Ruggles and Michel Cotte (2010).

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March 10 and 11, 2009 in Fuerteventura in the Canaries. This effort to reach a compromise led to the recognition of the requirements and guidelines for Starlight Reserves as "additional values" for future astronomical sites that could be included on UNESCO's World Heritage List.

The dark sky as an intrinsic dimension of cultural and natural heritage

In 2008, independently from the Starlight initiative, UNESCO and the IAU launched the "Astronomy and World Heritage" program to grant heritage status to astronomy sites. The International Council on Monuments and Sites (ICOMOS) was given the responsibility of identifying and inventorying sites that could be included in the World Heritage List (Ruggle, Clotte, 2010). The identification of these future sites was a prime opportunity for the Starlight Foundation. The dark sky, intrinsically linked to these sites, appears to be a gap in the heritage process initiated by UNESCO. Indeed overlooking the sky's importance and values in this approach to cultural and material heritage is equivalent to only partially evaluating the interaction between humans and nature, which is the very basis of ancient and modern, common and scientific astronomy practices.

To overcome the tensions and difficulties linked to the definition, UNESCO and the Starlight Foundation implemented a compromise by recognizing that the sky is a "invaluable, natural human resource" in a context where its observation by humans is increasingly threatened by light and air pollution. As for Starlight Reserves, they would reinforce the future astronomical heritage as a tourist medium that would convey scientific, cultural and environmental values.

In the end, it is through its association with existing heritage that the dark sky acquired a status. In other words, it is a medium, an additional resource interacting with natural and cultural heritage. Thus, we will have to address a genuine reconfiguration, fusing the statuses. This logic is clearly expressed in two combinations.

The first is an association of the dark sky with cultural heritage: the dark sky is not part of cultural heritage, however, it can be associated with the astronomical heritage of the pre-telescopic, modern era because it is an integral part of its origin.

The second is the association of the dark sky with nature and the eponymous heritage: the dark sky is not threatened, but the deterioration of its image refers to a degradation of the nighttime environment, of nature in general, and it becomes an additional symbol of the breach in the relationship between man and nature.

Two examples of interactions between the dark sky and natural heritage

Having the dark sky enter into the list of natural heritage indicates certainly more than a simple extension of the category. Strictly speaking, this is more like a full "nocturnisation" that echoes the nearly complete "diurnisation" of urban nights as described by the geographer Luc Gwiazdzinski (2005). Already in 2002, in an issue of Territoires 2020, DATAR's scientific journal devoted to territories and foresight, the author imagined the creation of night reserves and parks, areas of darkness and silence in which urbanites could come to relax and meditate, far from all the light and noise pollution. As we have shown, only ten years later, what Luc Gwiazdzinski had presented as a utopia, has indeed become a reality. In fact, this should not be a surprising trend because there is an underlying logic. Since the nineteenth century, the history of protected natural areas has often been marked by protectionist responses to areas that are spatially and temporally

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removed from the city, areas that are figuratively, a "compensatory elsewhere" (Piolle, 1993). The search of fresh air, true nature, wilderness, has been increased by the search for darkness and starlight.

Nocturnal celestial landscapes ... "see the milky way in..."

The dark sky and even the Milky Way were certainly still visible in urban skies during the second half of the nineteenth century. Engravings in astronomy books of the period (Guillemin, 1877) and certain paintings by Van Gogh demonstrate this (Van Heugten et al., 2008). Today, over two thirds of the population of the United States, half of the European Union's, and one fifth of the world population have lost the capacity to see with the naked eye the heavenly environment in which we live (Cinzano et al., 2001). In the early twenty-first century, the sight of the dark sky with the diversity of its stellar forms has thus become a rarity that eminently deserves "to be made into heritage" (Di Meo, 2007) and it is undoubtedly generating what Nathalie Heinich (2009) calls a "heritage granting emotion".

This dimension is particularly significant in the emergence and mediation of two new landscape concepts: the nocturnal skyscape and the natural lightscape. The first was developed in the context of the Starlight Foundation. It is the subject of one of the six types of "Starlight Reserve" certification (table 1). The second is used by the Night Sky Team of the National Park Service (NPS), the federal agency responsible for the management of US national parks. Though these two landscape concepts are associated with the recognition of the ecological and cultural dimensions of the dark sky, they are also fully linked to the experience of nature offered to visitors of protected spaces. The vision of the dark sky is a vector of the experience of spatial and temporal otherness of the night and of chronos (natural time) compared to the day, which remains strongly influenced by the rhythms of tempus, or "anthropic time" as defined by Claude and Georges Bertrand (2002).

In the process studied here of granting heritage status to the night sky, the landscape approach is the most successful form of coverage of the various links in the "heritage chain" (Rautenberg, 2003; Heinich, 2009), and, in particular, if we observe current systems at work in the North American dark sky parks and reserves.[5]

The links of "knowledge" of "restoration and recovery" and "mediation" are now fully developed and integrated into the management of already certified protected areas (Natural Bridges, Death Valley, Jasper, Cypress Hill...) or who plan to be (Lava Beds, Great Basin...).

In the parks of the western United States, the Night Sky Team is responsible for metrology and the monitoring of the quality of the night sky. "Dark rangers" organize astronomy evenings and develop interpretive activities. These activities are accompanied by several types of graphic media, illustration or photography, that help reveal the "dark side" (Parcs Canada, 2011) of national parks. Regardless of the destination of such images (logo, poster), the construction of night skies inevitably relies on these "exogenous mediators" (Héritier, 2006), often incorporating the shapes of daytime landscape and geo-symbols already identified as such: the stone arches of Natural Bridges, Bryce Canyon's hoodoos, Death Valley sand dunes, the yuccas in Joshua Tree Park, and the backdrop of Pyramid Island in Jasper National Park, to name a few.

Lavishly illustrated, Tyler Nordgren's book (2010), subtitled "A guide to astronomy in the national parks," is at the heart of this approach. This in-situ and in-visu

5. Certain programs to discover dark skies are relatively old and were created prior to this study. For example, the Bryce Canyon National Park (Utah) launched a program at the end of the 1960s. Its history, told in "A Canyon Alight with Stars", can be read on the National Park Service website.

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artialisation, to borrow Alain Roger's distinctions (1997), is both classic and, in this case, essential. There will always be a lag between the immediate visual perception of heavenly landscapes and their photographic record, which requires exposures of varying lengths to capture the colors of the Milky Way or star trails. This artialisation also reflects the implementation of trails and the identification of sites recommended for observing the night sky ("dark sky viewing site" or "stargazing sites," depending on the different designations). Still in their infancy, these initiatives have nonetheless been developed in the Yosemite National Park in the United States, in Jasper Park in Canada, and in Europe in the Galloway Forest (Scotland) and Exmoor (England) National Parks.

Observing the dark sky: a new way to experience wilderness

Fabienne Joliet and Peter Jacobs (2009) describe the iterative process of building a sense of wilderness that combines the naturalness of a given space and the cognitive experience that is the result. Stéphane Héritier (2006) demonstrated the role of the "wilderness experience" in the practices of visitors to western Canada's national parks including Jasper (Alberta).This national park was certified Dark Sky Reserve in 2011. Because of its size (10 878 km ^{2}, equivalent to the surface area of Jamaica, it is currently the largest reserve of this type in the world. Backing a certification policy strongly supported by the Royal Astronomical Society of Canada (RASC), Parcs Canada has recently begun to promote a new form of practical astronomy: "Wilderness astronomy" (Parks Canada, 2011). This practice eschews the conventional equipment of the amateur astronomer, which was heavy, cumbersome, and unsuited to roaming observations. It favors naked eye astronomy or observations with only few instruments. "Wilderness astronomy" is presented as "a new way to see Canada's wild spaces" (ibid.). It combines the discovery of nightscapes with the discovery of the astronomical knowledge of native populations. While helping to strengthen the attractiveness of protected areas by "highlighting the originality of experiences available to visitors" (Héritier, 2006), this practice in fact is aligned with representations of wilderness. Indeed, there are two kinds of specific characteristics and values that appear in the criteria for choosing nightscapes. They can be purely aesthetic in their association between the dark sky and landscapes; a perfect illustration is Tyler Nordgren's 2010 publication, cited above. However, they can also be considered an indicator of the naturalness of night skyscapes and, by extension, the spaces that compose them. This is demonstrated by the work of Dan Duriscoe (2001) of the National Park Service's Night Sky Team.

Indeed, from the horizon to the zenith, the density of the sky' stellation is a visual indicator of the absence of light pollution (photo 2). Conversely, increasing the artificial brightness of the background sky has led to a proportional decrease in contrast that helps distinguish diffuse celestial objects such as the Milky Way, or even objects with little light such as the zodiacal light.[6]

6. Zodiacal light is "caused by sunlight scattered by dust present in the solar system. It is so faint, much fainter than the Milky Way, that zodiacal light is only visible on a moonless night, with no light pollution, in a very pure sky." (Beaudoin, 2011).

Photo 2/ The Milky Way

The Milky Way above the Vignemale peak, at the heart of the Pyrenees National Park, in the core zone of Pic du Midi. Photo by Nicolas Bourgeois, 2011.

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It is the capacity to see these diffuse celestial objects that confers upon the dark sky its quality and purity. Therefore, with strong darkness, as in the heart of dark sky parks and reserves whose boundaries exclude the presence of permanent sources of light, we can consider that the artificial lights diffused by the halos of bright spaces (urbanized areas) have the same impact on natural heritage that other damaging processes of human origins have on fauna, flora or daytime landscapes. They alter the sense of virgin and wild nature that is offered when visiting such areas. When the air is exceptionally clear, the way atmospheric light scatters results in halos created by artificial lighting to be seen tens or even hundreds of kilometers away (Cinzano et al., 2001). Therefore, visually speaking, the traces of artificial lights, which also define in a certain fashion the limits of the ecumene, push further away those areas that could potentially be lit only by natural light. Given the rate of urbanization in the countries of the northern hemisphere, there remain few intrinsically dark areas in this part of the planet. In the main zone of the current distribution of dark sky parks and reserves, they are limited to the American West (Great Plains, Rocky Mountains, Great Basin) and the northern parts of North American and Europe.

Conclusion

The 2000s were influenced by the emergence of a new category of protected areas: dark sky parks and reserves. There are currently 44 in the world and there is strong evidence indicating their numbers will continue to grow in coming years, especially in France. Our purpose here was to examine the creation of these dark sky parks and reserves in terms of the concepts and tools used in making natural heritage status; the same concept and tools they seem to be renewing. As a recent extension of natural and cultural heritage, the dark sky and nightscapes offer more than simply an extension of the categories. Indeed, although natural areas that have become "dark sky places" are at polar opposites of a growing artificiality, both share the process of the "frontier line" that was observed spatially and temporally by Luc Gwiazdzinski (2005) in the conquest of urban nights. Thus, paraphrasing the author, it is perhaps possible to state that the night is becoming a "formidable challenge" for natural areas, "a last frontier, a territory to clear", but also, as Luc Bureau would have it (1997), a space-time in which our "enlightened civilization" could try to explore its dark side.

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