

Lighting and Dark Sky Regulations

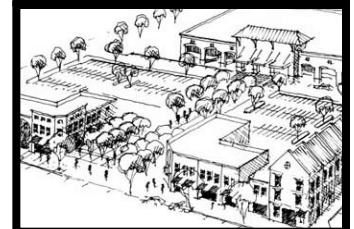
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Land Use Clinic



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School of Law & College of Environment and Design



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I. Introduction

Thousands of lighting ordinances are currently in force in the United States.¹ The purposes of these ordinances vary; some are designed to preserve the integrity of the night sky for astronomers,² some seek to maintain community character,³ others limit lighting that may disturb wildlife activities,⁴ and still others cite a range of purposes.⁵

The International Dark-Sky Association (IDA) is a non-profit organization that “seeks to preserve dark skies worldwide for the benefit of society by promoting good outdoor lighting practices and educating the public on the rewards of preserving the stars.”⁶ Recently, the IDA released a set of brief guidelines for communities interested in enacting lighting regulations.⁷ A more comprehensive model

1 *Art of the Ordinance: Community Lighting Regulations, 70 Nightscape* (The Int’l Dark-Sky Ass’n, Tucson, Ariz.) at 7 (2007). See also The International Dark-Sky Association, Policy/Programs, Lighting Ordinances, Directory of Lighting Ordinances, <http://www.darksky.org/mc/page.do?sitePageId=58882> (last visited Apr. 10, 2008) (providing links to ordinances throughout the United States).

2 See, e.g. Cherokee County, Ga., Outdoor Lighting and Road Glare Ordinance (July 10, 2001).

3 See, e.g. *Model Lighting Section for Zoning Ordinances* (Pa. Outdoor Lighting Council 2008).

4 See, e.g. Sarasota County, Fla., Marine Turtle Protection Ordinance (Dec. 14, 2004).

5 See, e.g. *Model Lighting Section for Zoning Ordinances and Cherokee County, Ga., Outdoor Lighting and Road Glare Ordinance*.

6 The International Dark-Sky Association, About IDA, History, <http://www.nextrionet.com/mc/page.do?sitePageId=56414&orgId=idsa> (last visited May 8, 2008).

7 *Lighting Regulations 101: Simple Guidelines for Lighting Regulations, 70 Nightscape* (The Int’l Dark-Sky Ass’n, Tucson, Ariz.) at 11 (2007).

lighting ordinance is in the development process and is not publicly available yet.⁸

This memo: (1) explains and summarizes several examples of approaches to lighting control, including the IDA’s guidelines, a model lighting ordinance by another organization, and two lighting ordinances from counties in the United States; and (2) assesses and evaluates the IDA guidelines and other approaches.

II. Approaches to Lighting Regulation

The IDA offers guidelines for regulating lighting that are appropriate for “small communities, urban neighborhoods, [and] subdivisions.”⁹ On the other hand, the model lighting ordinance drafted by the Pennsylvania Outdoor Lighting Council (POLC)¹⁰ and lighting ordinances in Cherokee County, Georgia,¹¹ and Sarasota County, Florida,¹² represent the range of approaches to light pollution appropriate for larger municipalities in the United States. Though the ordinances share the goal of reducing light pollution, the purposes behind each example vary. The purposes, major definitions, general approach, and significant features of each example are discussed in the following paragraphs.

A. The IDA Guidelines

The IDA guidelines list permitting “reasonable use of outdoor lighting for nighttime safety, utility, security, and enjoyment,” minimizing and “revers[ing] any degradation of the nighttime visual environment and the night sky; minimizing glare caused by

8 The International Dark-Sky Association, Policy/Programs, Lighting Ordinances, Model Lighting Ordinance, <http://www.darksky.org/mc/page.do?sitePageId=58880> (last visited May. 8, 2008).

9 *Lighting Regulations 101: Simple Guidelines for Lighting Regulations, 70 Nightscape* (The Int’l Dark-Sky Ass’n, Tucson, Ariz.) at 11 (2007).

10 *Model Lighting Section for Zoning Ordinances*.

11 Cherokee County, Ga., Outdoor Lighting and Road Glare Ordinance.

12 Sarasota County, Fla., Marine Turtle Protection Ordinance.

limiting excessive or unnecessary outdoor lighting”; “conserv[ing] energy and resources;” and “protect[ing] the natural environment from the damaging effects of night lighting” as purposes of lighting regulation.¹³ These phrases are very general and cover a wide range of purposes that could motivate a community to enact lighting regulations.

In addition to listing purposes, the guidelines offer some “practical considerations” and a few sample definitions.¹⁴ The IDA suggests the enforcement of a curfew for turning off lights by a certain time.¹⁵ Also, the IDA suggests that regulations exempt lighting for swimming pools, lighting required by building codes (such as exit signs or illumination of stairs), and holiday lights.¹⁶ Likewise, a lighting ordinance could require low voltage landscape lighting, and fully shielded luminaires and glare minimization for outdoor athletic field lighting.¹⁷

The IDA defines “glare” as “[i]ntense and blinding light [which] [c]auses visual discomfort or disability.”¹⁸ “Fully shielded (full cutoff) luminaire” is defined as a “luminaire emitting no light above the horizontal plane.”¹⁹ Further, the IDA defines “luminaire” as a “complete lighting unit consisting of one or more electric lamps, the lamp holder, any reflector or lens, ballast (if any), and any other components and accessories.”²⁰

The main idea behind the IDA’s publication is found in the article’s title, “Simple Guidelines for Lighting Regulations.”²¹ The guidelines are, in fact, simple and to the point; they provide a general overview of the purposes and requirements of lighting regulation and are not meant to be a comprehensive model.²²

13 *Lighting Regulations 101: Simple Guidelines for Lighting Regulations*, 70 *Nightscape* (The Int’l Dark-Sky Ass’n, Tucson, Ariz.) at 11 (2007).

14 *Id.*

15 *Id.*

16 *Id.*

17 *Id.*

18 *Id.*

19 *Id.*

20 *Id.*

21 *Id.*

22 *Id.*

B. Pennsylvania Outdoor Lighting Council Model Lighting Section for Zoning Ordinances

One of the POLC’s goals is “to improve outdoor lighting practices in Pennsylvania by educating municipal officials and the public about good outdoor lighting.”²³ Providing a model lighting ordinance for municipalities “lack[ing] the specific expertise with lighting issues” is one important component of the POLC’s efforts to improve outdoor lighting practices.²⁴ The most recent work by the POLC is a model lighting section for zoning ordinances, which became available in March of 2008.²⁵

The model ordinance first states that its purpose is “to require and set minimum standards for outdoor lighting” in order to:

- (1) Provide for and control lighting in outdoor public places where public health, safety and welfare are potential concerns;
- (2) Protect drivers and pedestrians from the glare of non-vehicular light sources;
- (3) Protect neighbors, the environment and the night sky from nuisance glare and light trespass from improperly selected, placed, aimed, applied, maintained or shielded light sources;
- (4) Promote energy efficient lighting design and operation;
- (5) Protect and retain the intended visual character of the various Municipality venues.²⁶

This list of purposes covers a variety of general concerns, ranging from maintaining the integrity of the night sky to preserving the character of the community. Of course, a municipality may be interested in addressing a specific problem caused by

23 Pennsylvania Outdoor Lighting Council (POLC), <http://www.polcouncil.org/> (last visited May 7, 2008).

24 *Id.*

25 *Model Lighting Section for Zoning Ordinances* (Pa. Outdoor Lighting Council 2008).

26 *Id.* at (A)(1)-(5).

lighting, such as its impact on a particular species. Nonetheless, the model provides a more than adequate starting point for a municipality to craft an ordinance to address its specific concerns.

Applicability of the ordinance extends to both interior and exterior lighting that may create “a nuisance or hazard as viewed from outside.”²⁷ Only “temporary seasonal decorative lighting” and emergency lighting are specifically exempted from the ordinance.²⁸ The model includes criteria for lighting fixture design, glare control, installation, signs and billboards, and maintenance.²⁹ Separate sections outline requirements for residential areas and recreational facilities.³⁰

The model ordinance requires submission of lighting plans, which must include a “layout of all proposed and existing lighting fixtures” as well as an “illuminance” grid, “which demonstrates compliance with light trespass, illuminance and uniformity requirements.”³¹ The lighting plan must also include information on light maintenance and descriptions of equipment, such as glare reduction and on/off control devices.³² Additionally, the ordinance implements an 11:00 p.m. curfew on outdoor lighting, with exceptions for illumination of the United States and state flag and businesses open past 11:00 p.m.³³

Definitions included in the ordinance are quite thorough and specific. The model ordinance defines “illuminance” as “[q]uantity of light, measured in footcandles” and in turn, defines a “footcandle” as a “[u]nit of light density incident on a plane (assumed to be horizontal unless otherwise specified), and measurable with an illuminance meter, a.k.a. light meter.”³⁴ “Light trespass” is defined as “[l]ight emitted by a lighting fixture or installation, which is cast beyond the boundaries of the property on which the lighting installation is sited.”³⁵ One of the most lengthy and specific definitions is that for

glare, “[e]xcessive brightness in the field of view that is sufficiently greater than the brightness to which eyes are adapted, to cause annoyance or loss in visual performance and visibility, so as to jeopardize health, safety or welfare.”³⁶

The general approach behind the POLC model ordinance is to provide a useful tool for a municipality that “lacks specific expertise with lighting issues [but] seeks well designed ordinance language that can be tailored to its specific needs.”³⁷ The model’s five general purposes and precise language throughout its provisions serve as a more than adequate starting point for a community interested in enacting a lighting ordinance. The next example, an actual ordinance in effect in Cherokee County, Georgia, reveals how a community may adapt and tailor general lighting principles to fit their particular needs.

C. Cherokee County, Georgia’s Outdoor Lighting and Road Glare Ordinance

In July of 2001, Cherokee County, Georgia, adopted an outdoor lighting and road glare ordinance as part of its zoning ordinance.³⁸ The Cherokee County ordinance states that its purpose and intent is:

- (1) To encourage systematic practices in the use of outdoor electrically powered luminaries [sic], consistent with conserving energy and maximizing the benefits to the citizenry;
- (2) To increase nighttime utility, safety, security, and productivity; to foster the nighttime use of property; and to protect the privacy of residents;
- (3) To reduce light trespass, obtrusive light, and sky glow; and to reduce roadway glare and extreme variations of illumination, to which elderly drivers are particularly sensitive;

27 *Id.* at (B)(1).
28 *Id.* at (B)(2)(3).
29 *Id.* at (D)(1)-(7).
30 *Id.* at (E), (F).
31 *Id.* at (G)(1)-(2).
32 *Id.* at (G)(3)-(4).
33 *Id.* at (G)(4)(j), (G)(7)(f).
34 *Id.* at (C)(1), (C)(5).
35 *Id.* at (C)(6).

36 *Id.* at C(4).
37 Pennsylvania Outdoor Lighting Council (POLC), <http://www.polcouncil.org/> (last visited May 7, 2008).
38 Cherokee County, Ga., Outdoor Lighting and Road Glare Ordinance (July 10, 2001).

(4) To preserve and enhance the natural nighttime visual environment of Cherokee County;

(5) To preserve the views of the starry sky, encouraging the enjoyment of their aesthetics, the education of the public in the sciences, and the astronomical study of celestial bodies; and

(6) To accomplish these purposes by limiting illuminance levels; by directing the luminaire emissions away from roadways, other properties, and the sky; and by reducing illumination levels during later hours of the night.³⁹

Cherokee County exempts a number of outdoor lights from the outdoor lighting and road glare regulations. Specifically, the ordinance exempts emergency lighting “by police, fire, ambulance, and rescue authorities[;]” lamps powered by fossil fuels; “glass tubes filled with neon, argon, and krypton[;]” violet, blue, green, or yellow fluorescent tubes; lighting for “meteorological data gathering purposes[;]” low-wattage fluorescent holiday decorations; and luminaires on property owned or operated by federal or state government.⁴⁰ Any lighting necessary for safe “flight, takeoff, landing, and taxiing” of aircraft is exempt, but the ordinance applies to other outdoor lighting at airport facilities.⁴¹ Up to four luminaires per acre or lot (for areas less than one acre) on non-residential property are exempt from the ordinance, provided that certain “luminaire source types and wattages” are used.⁴²

Specific provisions in the outdoor lighting and road glare ordinance outline requirements for parking areas, outdoor advertising, roadway lighting, fueling stations, outdoor recreational facilities, storage yards, car dealerships, and security lighting.⁴³ The ordinance sets a curfew of 11:00 p.m. for outdoor

lighting; facilities may remain illuminated only to conclude scheduled outdoor events beginning prior to 11:00 p.m. or as permitted in the provision on security lighting.⁴⁴

For any project that requires submission of a development plan, such as a subdivision, commercial development, or project that requires a building or electrical permit, an applicant must also submit a site plan demonstrating compliance with the outdoor lighting ordinance.⁴⁵ This plan must “indicat[e] the layout of proposed luminaire locations” as well as an impact statement “demonstrating that the proper steps have been taken to ensure no negative impact upon the community and its residents”⁴⁶ Additionally, the site plan must include descriptions of the luminaires, glare reduction and on/off control devices, and mounting devices.⁴⁷ A “photometric grid” documenting “footcandle readings every 10 feet and the average footcandle” is required for “areas where more than half of the maximum allowable illumination footcandle values . . . are applied for.”⁴⁸

In the ordinance, “illuminance” is defined as “the quantity of light arriving at a surface divided by the area of the illuminated surface, measured in footcandles.”⁴⁹ A “footcandle” is “unit of measure for illuminance on a surface that is everywhere one foot from a point source of light of one candle, and equal to one lumen per square foot of area.”⁵⁰ The ordinance, in part, seeks to reduce light trespass, sky glow, and glare.⁵¹ “Light trespass” is defined as “unwanted light emitted beyond the boundaries of the property on which the luminaire is located, detrimentally affecting residents, vehicle operators and pedestrians, the natural environment and astronomical observations.”⁵² “Sky glow,” a unique term, is “the brightening of the nighttime atmosphere by light emitted above the horizontal plane and by light reflected upward from illuminated surfaces, which reduces the visibility of astronomical

39 *Id.* § 24-1 (A)-(F).

40 *Id.* § 24-14 (D)-(F), (H)-(J).

41 *Id.* § 24-14 (C)

42 *Id.* § 24-14 (K). The ordinance lists five types of lighting with wattage limits, any combination of which would comply with this provision. *Id.*

43 *Id.* § 24-6 (A)-(G), (I).

44 *Id.* § 24-6 (I)(1)-(2).

45 *Id.* § 24-9.

46 *Id.* § 24-9 (B)(1)-(2).

47 *Id.* § 24-9 (B)(3).

48 *Id.* § 24-9 (B)(6).

49 *Id.* § 24-2.

50 *Id.* § 24-2.

51 *Id.* § 24-1 (C).

52 *Id.* § 24-2.

objects.”⁵³ Lastly, “glare” is “the sensation produced within the visual field by luminance that is sufficiently greater than the luminance to which the eyes are adapted, causing annoyance, discomfort, or loss in visual performance and visibility.”⁵⁴

This outdoor lighting and road glare ordinance represents a well-crafted ordinance addressing the needs and concerns peculiar to the Cherokee County community. The next section discusses a Florida county ordinance which focuses more specifically on wildlife protection.

D. Sarasota County, Florida’s Lighting Ordinance for Marine Turtles

The Sarasota County Code chapter covering the environment and natural resources includes an ordinance on marine turtle protection.⁵⁵ The stated purpose of this ordinance is “to protect threatened and endangered Marine Turtles that nest along the Beaches of [the] County... by safeguarding the nesting female and Hatchling Marine Turtles from the adverse effects of Artificial Light and Hatchling Marine Turtles from injury or harassment.” Therefore, much of the ordinance sets forth lighting requirements and limitations.

The requirements of the marine turtle protection ordinance apply to all of Sarasota County, a few surrounding keys, and adjacent waters.⁵⁶ However, the standards for existing development, publicly owned lighting, and construction are only applicable during the marine turtle nesting season,⁵⁷ which, according to the ordinance, is May 1 through October 31 every year.⁵⁸

The major sections of the ordinance primarily operate to limit artificial light on the beach area.⁵⁹ Exterior lighting for new development must be positioned so

that the source of light is not directly visible from the beach and “areas seaward of the Primary Dune, or the Beach in areas where the Primary Dune no longer exists” are neither directly, indirectly, nor cumulatively illuminated.⁶⁰ Nonetheless, certain kinds of lights that are visible from the beach are permitted.⁶¹ These types of lights include fixtures of a maximum of 25 watts, low pressure sodium vapor bulbs, “True Neon”⁶² light sources, or lights that are adequately shielded to comply with beach illumination restrictions.⁶³

Special lighting provisions for dune crosswalks and parking areas near the beach are also covered by the ordinance.⁶⁴ For all doors and windows on structures within direct sight of the beach, tinted glass is required.⁶⁵ For new development, the ordinance requires inspection by a County Inspector upon completion of construction to assess compliance, and the inspector may schedule another inspection to confirm that subsequent remedial action is bringing the property into full compliance.⁶⁶ The standards for existing development, for the most part, require changes to existing lighting to comply with the same requirements applied to new development.⁶⁷

“Directly,” “indirectly,” and “cumulatively illuminated” are terms that seem to be unique to this ordinance. “Directly illuminated” means “illuminated as a result of glowing element(s), lamp(s), globe(s), or reflector(s) or any Artificial Light source which is visible to an observer on the Beach.”⁶⁸ “Indirectly illuminated” means illumination produced by the same sources which “is not visible to an observer on the Beach.”⁶⁹ “Cumulatively illuminated” is defined as “illuminated by numerous Artificial Light sources that as a group illuminate any portion of the Beach. Such cumulative illumination must be bright enough

53 *Id.* § 24-2

54 *Id.* § 24-2.

55 Sarasota County, Fla., Marine Turtle Protection Ordinance (Dec. 14, 2004).

56 *Id.* § 54-753.

57 *Id.*

58 *Id.* § 54-754.

59 *See* §§ 54-755, 54-756, 54-757, 54-759.

60 *Id.* § 54-755 (1).

61 *Id.* § 54-755 (2).

62 The ordinance defines “True Neon” as “a tubular lamp containing neon gas that emits pure red light.” *Id.* § 54-754.

63 *Id.* § 54-755 (2)(a).

64 *Id.* § 54-755 (5), (6).

65 *Id.* § 54-755 (9).

66 *Id.* § 54-755.

67 *See Id.* § 54-756 (requiring replacement and repositioning of fixtures as well as improvement of vegetative buffers).

68 *Id.* § 54-754.

69 *Id.*

to cast a shadow on any portion of the Beach during any night of the sea turtle Nesting Season.”⁷⁰ The ordinance, however, does not provide a definition of “illuminated.” Artificial light is “any source of light emanating from a human-made device.”⁷¹

The Sarasota County ordinance article on marine turtle protection demonstrates how strict lighting requirements and restrictions may achieve a very specific purpose, namely wildlife protection. The next section provides a comparative evaluation of these examples of lighting regulations.

III. Comparison and Evaluation of Various Approaches

Which approach to lighting regulation is best largely depends on the purpose motivating the community to regulate lighting. Nonetheless, a comprehensive lighting ordinance may address a variety of needs and fulfill various goals. Any set of general guidelines for regulating lighting should alert the reader to the myriad goals and purposes that lighting regulation may achieve.

The IDA guidelines, for the most part, make for a good, brief overview of what lighting regulation should entail. The guidelines provide an introduction to lighting regulation and concisely convey the range of purposes behind lighting regulations. The guidelines also provide some important points to consider while also offering some ordinance language in the form of sample definitions.

The POLC model lighting ordinance provides more precise language for a community seeking to enact lighting regulations. A municipality with more specific concerns than those addressed in the model’s list of purpose could simply revise the list in order to achieve its goals. Compared with the simple guidelines offered by the IDA, the POLC model is more technical and may require some consultation with a lighting expert.

Cherokee County provides a good example of lighting regulation on the county level, which appears to respond to specific local concerns. As compared with the suggested exemptions in the IDA guidelines and the short exemption provision in the POLC model lighting ordinance, the exceptions section of the Cherokee County ordinance is more thorough. For example, holiday lighting is not fully exempted; rather only “low-wattage fluorescent, quartz-halogen, and incandescent light sources are exempted.”⁷² Additionally, the ordinance fully exempts airport lighting necessary for safe “flight, takeoff, landing, and taxiing” as well as light needed for meteorological purposes.⁷³ Unlike the POLC model, the Cherokee County ordinance only requires that a photometric grid accompany site plans for certain projects, which may be more efficient than requiring it for all projects.⁷⁴

In contrast to the Cherokee County ordinance and the POLC model, the Sarasota County ordinance requires inspection in lieu of site plan submission.⁷⁵ This approach seems more appropriate for this ordinance since it includes more building related requirements, such as tinted glass on windows and doors in sight of the beach.⁷⁶ The ordinance sets forth stringent regulation of beachfront lighting and is likely quite effective in achieving its purpose – “safeguarding the nesting female and Hatchling Marine Turtles from the adverse effects of Artificial Light.”⁷⁷

72 Cherokee County, Ga., Outdoor Lighting and Road Glare Ordinance § 24-14 (J) (July 10, 2001).

73 *Id.* § 24-14 (C), (E).

74 *See supra* notes 31, 47-50 and accompanying text.

75 *See supra* notes 31, 47, 68 and accompanying text.

76 Sarasota County, Fla., Marine Turtle Protection Ordinance § 54-755 (9).

77 *Id.* § 54-752.

70 *Id.*

71 *Id.*

IV. Conclusion

The IDA guidelines are, for the most part, effective as general guidelines for lighting regulation. The model lighting section for zoning ordinances offered by the POLC, on the other hand, offers a thorough and precise model for a community seeking to enact regulations. The Cherokee County outdoor lighting and road glare ordinance represents the extent to which a community may effectively address certain problems and concerns through lighting control. Similarly, the Sarasota County marine turtle protection ordinance demonstrates how a municipality may tailor lighting regulations in order to achieve very specific purposes. Each of these ordinances provides an example of why and how a community may implement lighting regulation.

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