

# The Dark Sky

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**Goal:** Protect the dark sky of Albemarle County as one of our many natural, scenic, scientific and cultural resources, for the benefit of residents, visitors, and the larger scientific community, now and in the future.

## Introduction

The night sky historically has been a source of beauty and value to people and cultures throughout the world. In this century, astronomical research has generated information and technology that we now use in our daily lives, and space exploration promises to grow. Aside from scientific and aesthetic considerations, cycles of daylight and darkness have ecological consequences. Bright lights on tall buildings confuse migratory birds, and deciduous trees near streetlights retain their leaves too late in the year. Our lives are affected by the night sky in numerous ways, some not yet fully understood.

Albemarle's clear skies and dark nights are more than just a scenic resource to the County. Our local appreciation for the dark sky may have begun with Thomas Jefferson and his design for an observatory at the Academical Village. Leander McCormick further encouraged the community's interest in astronomy with his generous endowment of the refracting telescope at University of Virginia. Later, with construction of the Fan Mountain station near Covesville, Albemarle County became home to the largest and only major optical observatory at a dark site east of the Mississippi River. The ability to see the stars clearly has been a strong if unexpressed part of the region's beauty, and a real influence on the county's development.

## Light Pollution

Obtrusive lighting, often referred to as light pollution, obscures our view of the sky and primarily comes from inefficient and misdirected lighting sources. Scientists refer to it as *urban sky glow*; motorists know it as *glare*; consumer advocates lobby against it as *energy waste*; neighbors call it *light trespass* and, often, *nuisance*. Simply defined, it is too much light shining in the wrong direction. It not only fails to accomplish its purpose, it often creates problems where there were none.

Urban sky glow results from unshielded light shining upward creating a glow that obscures the night sky and can even disrupt ecological patterns in plants and animals. Under ideal conditions, 2,500 stars and the Milky Way galaxy are visible from horizon to horizon; in a moderately illuminated suburb, because of sky glow only 200 to 300 stars can be seen.

Glare occurs when one can see light directly from the fixture or bulb, dazzling the eye and reducing the effectiveness of the emitted light. In response to glare, the human eye undergoes a process known as transient adaptation: the pupil must rapidly adjust in size to go from extreme

light back to darkness. Not only is this transition taxing to the eye, but at times it cannot be accomplished quickly enough to avoid accidents. With our eyes struggling to adapt from high to low light, we are blind to things we would normally see. Glare degrades the quality of the built environment, as increasingly elevated levels of illumination are needed to overcome its impacts.

Lighting accounts for 20 to 25 percent of all electricity sold in the United States. According to some estimates, as much as \$1 billion may be wasted annually as a result of inefficient lighting sources. Quality lighting is well shielded, uses the right amount of light, directs the light where it is needed, and uses energy efficient lighting sources. In addition to the direct cost savings, installation of quality lighting would ultimately result in less coal burned (the source of most electrical power in the United States), thereby reducing air pollution and acid rain. The economic benefit of efficient energy use thus complements protection of the dark sky resource.

Light trespass occurs when lighting is not confined to the originating property. Spill light falling over property lines can illuminate adjacent grounds or buildings in an objectionable manner, interfering with the owner's enjoyment of his property, privacy and view of the night sky. The nuisance resulting from light trespass often forces government to be the arbitrator of disputes. "Good neighbor development" includes careful attention to quality lighting, both in rural and urban neighborhoods.

Light pollution is not the inevitable price of progress. There are many remedies, and in fact this kind of pollution is not difficult to reduce. It does require education and commitment: education, because even some lighting professionals are not aware of the problem; and commitment, because there are many lights throughout this community and others which are inefficient and poorly installed.

## **Lighting Fallacies**

Misconceptions about lighting abound, some so common we never question them and thus perpetuate the problem in our own homes and communities.

1. "The more lights the better." Although we need well-lit main streets and pedestrian areas, security lights, and parking lot lighting, we do not need glare, competing lights, light trespass and energy waste. Lights should be effective, not just numerous.
2. "Light pollution only affects astronomers." School children need to see the Milky Way as much as astronomers do, if for different reasons. Our cultural traditions have developed around the mysteries of the natural world, part of which is the vast night sky. Space exploration, and the host of everyday applications it has brought with it, occupies a central part of twentieth century history, and there will be more discoveries in the future. School children today may be working in space tomorrow, and if not, they will be citizens charged with appreciating and protecting the world around them.
3. "You can get away from the lights if you drive out of town." One shouldn't have to take a vacation to see the night sky, when quality lighting is available and often less expensive than conventional fixtures. Many Americans live in urban corridors so large that it isn't practical to drive out of town just to enjoy the stars.

4. “It’s too late to do anything.” Our awareness of light pollution is recent, and it will take sustained effort to change the habit of over-lighting. Nonetheless, it is a problem that can readily be solved with available technology. Education is the key.
5. “Security lights prevent crime.” No one really knows if outdoor nighttime lighting prevents crime. It can deter illegal activity by making it more visible, and it can also make a house or business a more convenient target. Most crimes take place during the day. If outdoor security lights are needed, there are many to choose from and many installations that are effective but not polluting.

## What Is Good Lighting?

Good lighting serves the user, and thus will vary according to the site and circumstance. Characteristics of good lighting include but are not limited to:

1. It provides adequate lighting for the task, but does not over-light.
2. Lighting fixtures are fully shielded, so that no light is emitted above the horizontal plane and there is little or no glare.
3. Lighting fixtures are carefully installed to maximize effectiveness on the targeted area and minimize or eliminate adverse impact beyond the property borders.
4. It utilizes fixtures with high-efficiency lamps that meet the light-color needs of the design criteria.

Examples of common lighting fixtures are included in **Error! Reference source not found.**

## Lighting Ordinance

On September 4, 1996, the Albemarle County Board of Supervisors adopted a Resolution of Intent to amend the Zoning Ordinance to regulate outdoor lighting for all uses in all zoning districts, directing the Planning Commission to hold a public hearing and send its recommendation to the Board at the earliest possible date. Dark Sky tours were organized in the Spring of 1997 by the Department of Astronomy at University of Virginia for City and County officials, community businesses and citizen groups. The Planning Commission recommended approval of a lighting ordinance in April, 1998 and forwarded it to the Board of Supervisors. The ordinance was adopted by the Board of Supervisors on August 12, 1998.

Amendments to the Zoning Ordinance and other initiatives related to protection of the quality of our night sky should be based on the following objectives:

- OBJECTIVE:** Reduce light pollution caused by uplighting, excessive lighting, glare and light trespass.
- OBJECTIVE:** Promote lighting energy efficiency, thereby conserving private and public funds, while providing adequate lighting for the task.

**OBJECTIVE:** Provide a safe and secure developed environment, through quality lighting design which minimizes glare and avoids creating dark areas near well-lit areas.

**OBJECTIVE:** Protect the McCormick and Fan Mountain Observatories through Dark Sky initiatives, in the interest of scientific research, public education, and future economic development opportunities.

If the lighting ordinance is to be accepted and implemented in a timely and effective manner, the parties involved in the development process - property owners, the business community, government, and the construction industry - must understand the value of dark skies and good lighting. An educational program is needed, one which adopts a proactive approach and draws upon the resources available in the community.

**Strategy:** Establish an advisory committee composed of representatives from business, astronomy (professional and amateur), public utilities and/or agencies, design and construction industries, county residents (urban and rural), and local community organizations, to undertake the following tasks:

- Evaluate current lighting practices;
- Identify dark sky/lighting issues and concerns in Albemarle County;
- Review ordinances from other jurisdictions;
- Study and recommend as necessary additional lighting provisions to the Planning Commission, including by not limited to an ordinance to phase in shielding of existing lighting and establish maximum foot candle requirements for categories of uses.

**Strategy:** Develop a community-based educational program:




- Initiate public information and education programs about dark sky and lighting topics in cooperation with the University of Virginia McCormick and Fan Mountain Observatories and other interested parties;
- Develop workshops on technical lighting topics, for individuals in the building materials, electrical contracting, design, construction, and associated industries, and individual homeowners.

**Strategy:** The Board of Supervisors should adopt a resolution asking power companies to cease promoting unshielded and inefficient outdoor lighting in the County.

**Strategy:** Explore the feasibility of Albemarle County participating in the Green Lights Program established by the Environmental Protection Agency to promote energy efficiency in building design and maintenance.

**Strategy:** Albemarle County should take a leadership role in developing exemplary lighting in its public building projects, including playing fields and parking lots.

**Table 2-12: Examples of Common Lighting Fixtures**

Table 2 – 12: EXAMPLES OF COMMON LIGHTING FIXTURES	
SHIELDED LIGHTING	UNSHIELDED LIGHTING
PARKING LOT LIGHTING	
 <p>Full Cutoff Shoebox</p>	 <p>Drop Lens Cobra Head</p>
DUSK-TO DAWN SECURITY LIGHTING	
 <p>Nema Head Yard Light with Retrofit Shield</p>	 <p>Nema Head Yard Light</p>
DECORATIVE LIGHTING	
<p>LAMP IS LOCATED IN SOLID TOP</p>  <p>Decorative Fixture with Full Cutoff Optics</p>	 <p>Unshielded Acorn Fixture</p>
WALL MOUNTED LIGHTING	
 <p>Full Cutoff Cannister</p>	 <p>Unshielded Wall Pack</p>