

# **OUTDOOR LIGHTING TOOL KIT**

**How Homeowners Can Save Money, Save Energy, Protect the Environment, Reduce Light Pollution and Be a Good Neighbor**



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## Introduction:

We have all experienced the annoyance and sometimes frustration when we are confronted with the oncoming headlights of a thoughtless driver who leaves the high-beams on. The glare dazzles us and we lose our ability to see the road ahead. It is that same phenomenon, although usually to a lesser degree, that may occur on our or a neighbor's property at night. We too may be projecting glare onto our neighbor's property or the street or into the night sky. This Outdoor-Lighting Tool Kit will provide you with lots of useful information about good and bad lighting, the consequences of bad lighting and most importantly, what you as a homeowner can do to improve the quality of your outdoor lighting to be a good neighbor, to reduce light pollution, to save money and energy and to protect the environment.

## What is Bad Lighting?

Bad lighting is lighting that goes where it doesn't belong because it is misaimed or inadequately shielded. It is lighting that is insufficient or excessive, that shines in neighbor's windows or out onto the street, disrupts the environment, degrades safety and security rather than enhancing it, wastes energy or obliterates our view of the stars by causing sky glow.



## What are the Consequences of Bad Lighting?

**Energy Waste:** Fifty percent of the power generated in Pennsylvania is produced by the burning of coal, a nonrenewable resource. Lighting that is on all night or on when not needed or is excessive, wastes energy and therefore indirectly contributes to the creation of greenhouse gasses, acid rain and sky glow.

**Human Health:** Many do not realize that light at night may lead to health problems. We have all experienced how sleep deprivation can reduce our ability to function effectively. However, there is a growing body of evidence that we need a period of total darkness each night to reset their internal clocks and that a lack of a period of total darkness each night can adversely impact the immune system. If your lights are shining in your neighbor's bedroom windows, reaim them or shield them or turn them off when you go to bed.

**Pollution:** To light a 175-watt dusk-to-dawn barn or yard light for one year requires the burning of 790 lbs of coal, which creates 1890 lbs of CO<sub>2</sub>, which contributes to global warming and climate change; 11 lbs. of SO<sub>2</sub>, which contributes to acid rain; and 5 lbs. of NO<sub>2</sub>, which causes smog. Smog, when illuminated from below by bad lighting, creates sky glow and reduces our ability to view the stars.



**Economics:** Unless you have your own photo-voltaic system or wind generator, electricity for lighting obviously costs money. Excessive and misaimed lighting and lights that burn all night are big money wasters. A 175-watt dusk-to-dawn barn or yard light costs about \$120/year to operate, much of it wasted because much of the light goes up into the air. Dealing with the pollution that power plants create to

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produce the power for the lighting wastes money. It is estimated that about \$10 billion a year is wasted on producing unnecessary and excessive lighting in the US. With the end of electric-rate price caps soon in Pennsylvania, the cost of lighting will climb even higher. With each light bulb that is reduced in wattage or turned off when not needed, there will be a lowering of your electricity bill.



**Environment:** The generation of electricity for wasted lighting creates air, ground and water pollution, consumes great quantities of coal, oil and natural gas and perpetuates our dependence on non-renewable energy sources. The impact of all-night lighting on plants and animals, although not always readily visible, can be significant. Like humans, plants and animals need a period of darkness each day. All-night lighting has upset the balance of nature, with adverse consequences. Trees and other vegetation can respond to light on all night with erratic growth. Animals' reproductive cycles, feeding and migration patterns are disrupted and the hunter becomes the victim. Migrating birds can become disoriented in the presence of lighting at night and collide with each other or with structures, or circle endlessly, "trapped" by the light and finally fall to the ground exhausted. Moths, lacewings, beetles, bugs, caddisflies, crane flies, midges and wasps are attracted to light, many unable to escape and subject to predation. Think about how your lighting might be adversely impacting the natural environment.



**Vision:** To better understand how bad-lighting affects our vision, it would be helpful to understand a bit more about our vision. The human eye is amazing in its adaptability. It can see in full sunlight and all the way down to full moonlight or darker. That is a million to one range! But the eye usually works within a fairly narrow range of light levels. Consider how it is when you go from a very bright to a very dark space such as going from the lobby of the movie theater to the dark theater. The eye is adapted to the amount of light in the lobby and not to the amount of light in the theater. When entering the theater, the eye slowly opens up to let in more and more light and after some delay the eye adapts sufficiently so you can see to find a seat. Going from the dark theater back out to the lobby and adapting to the increase in light happens much more rapidly. Older eyes adapt much more slowly to changes in light levels, especially from light to dark, and older eyes are much more sensitive to glary lighting.

Glare is probably the most noticeable and undesirable consequence of bad lighting. It is light that is so bright compared with the amount of light to which the eye is adjusted so as to cause an annoyance, hazard or loss of vision. Think of the bright lights of an oncoming car as a stark example of glary lighting. Glare does not decrease as you get further from the source, the size of the source just seems to get smaller but it's just a bright.



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Safety/Security: An all too frequent security scenario involves people lived in the city, where every square inch of land is lighted and where lighting is closely associated with security and crime. When they move out into the country where there is little or no light, so the natural reaction is to feel insecure, to feel that out there in the darkness there's a person lurking behind every tree, ready to pounce. Therefore they light up every square inch of their property to make them feel safe. They move their city lighting out into the country, where it is of little use, especially when you consider that most crimes occur during daylight hours, and of considerable negative consequence.

Security is a state of mind, a *feeling* of being safe from harm. Safety is freedom from danger, injury or damage. Bad lighting, e.g., lighting that creates glare and shadows, may be providing you with a false sense of security. Although it may make you feel good or secure, it may actually decrease your safety by creating dark shadows for hiding places, projecting glare out into the street to prevent law-enforcement agents and neighbors from seeing what's happening on your property, show intruders an escape route, or most importantly, causing you to relax your guard and not take reasonable precautions to protect your safety. Having outdoor lighting on all night when no one is looking out at what is being lighted, is of questionable value, except perhaps to make you feel safer.



Security lighting is best accomplished using a systems approach, which is, taking a group of steps to achieve safety. That might include:

- putting interior lights on timers that go on and off in different rooms randomly to create a sense of occupancy
- putting exterior lights on motion sensors so they come on and welcome you home or startle a would be intruder
- aiming exterior lights down so they don't project glare onto the street and so they light up areas where deep shadows from shrubs or wood piles could serve as hiding places
- keeping valuables, e.g., lawn ornaments, bicycles, motorcycles, out of sight from the street.
- installing a fake red security light on the front of your home to give the impression that you have a security system
- installing a real security system.

Safety lighting serves to illuminate potential tripping and collision hazards such as stairs or uneven pavement. For many applications it can best be accomplished using low-voltage and solar lighting.

Star Gazing: On a clear dark night, away from light pollution, about 2500 stars might be visible in the night sky. With increases in air pollution being lighted up by skyward aimed lighting, the number of visible stars in a typical suburban setting may be reduced to 250 stars. In large metropolitan areas the number of visible stars decreases to as few as a dozen. The loss of the star-filled night sky is akin to the loss of our forested landscapes and farm land. Doing what you can to not over light, to aim lights down and shield them and to only have them on when they are needed will help to preserve one of our most precious natural resources.

### What is Good Lighting?

Simply put, good lighting is lighting that goes only where it is intended to go because it is properly aimed and shielded, is just the right amount needed to do the job, doesn't shine in neighbor's windows or out onto the street, doesn't disrupt the environment, enhances safety/security and doesn't waste energy or cause sky glow.

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How much light is enough? How much light you need to see what needs to be seen depends on such factors as the size of the object being viewed and how quickly it needs to be seen. You need more light to see a bug than you need to see a cat and you need more light to search for a missing earring than to locate a misplaced watering can. You need more light if you are in a hurry to get something done than if you are casually doing something. You need more light to see something that is the same color as its surroundings than to see a piece of coal in the snow, as an example. The point is that providing enough light year in and year out to be able to find a missing earring or to light up your property like a prison yard is unnecessary, expensive, a waste of energy, a source of pollution and a visual blight. More lighting is seldom better. Use a flashlight to find that lost earring.

### What Can You Do?

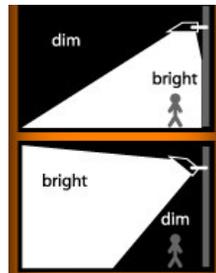
Hopefully, the preceding information has already given you some inspiration and hints on what you can do to make sure your exterior lighting is as good as it can be.

Easy Things to Do: There are some things you can do that take little effort and no expertise. Some can have big payoffs. Here are examples:

- Replace high-wattage light bulbs with a lower wattage. Pole lights and porch lights with a 15 or 25-watt incandescent bulb give off plenty of light. Anything higher wastes energy, money and creates unnecessary glare.
- Replace incandescent bulbs with energy-efficient compact fluorescent bulbs. They save energy and last much longer. The 7- and 9-watt versions give plenty of light for home applications.



- Aim floodlights down to at least 45° so the light stays on your property and out of the night sky.



- Buy an inexpensive shield to clip on to your floodlights to block them from neighbors' view and to keep light from going up.



- Buy an inexpensive shield to block view of the bulb in porch lights.



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- Turn lights off when they are not needed, especially decorative and landscape lighting. You don't need to impress your neighbors with how cool your McMansion is.



- Use solar lighting for pathways. It's easy to install and costs nothing to operate.

Other Things to Do: Some of the following suggestions may require some level of expertise or the hiring an electrician but could have a reasonable payback in terms of energy savings, reducing environmental concerns, sky glow and being a good neighbor.

- Replace the on-off switch for your outdoor floodlight with a 60-minute interval (wind-up) timer. When you put your pet out or put the trash out, set the switch to say, 30 minutes, and it will shut off automatically and not be left on all night.



- Install a motion detector on your floodlight so it only comes on when you, your guests or an intruder enters your property.



- Install a timer that automatically shuts your outdoor lighting off at a reasonable hour, say 10:30 p.m.



- Use low-voltage or solar lighting for walkways and landscaping. It's easy to install, economical, minimizes glare and provides a safe path for guests.
- Install recessed downlights that project their light downward and shield the bulb from view.



- Install a shielded post light or porch light that aims the light down and shields the bulb from view.



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What to Buy: When buying appropriate outdoor lighting, look for fixtures that are aimed straight down and are shielded so you can't see the bulb at usual viewing angles. If you can see the bulb, it isn't shielded enough and will produce glare and send light into the sky. Barn lights belong on farms with acres of land surrounding them, not on residential garages. They may look like a bargain to buy at \$25 each, complete with the bulb, but you'll be paying the utility \$130 a year to power them and projecting light pollution in all directions. Don't be talked into buying one.

Where to Buy: The big-box stores typically have a dazzling array of power devouring, glare producing products, among which you might find perhaps one or two appropriate fixtures. The following websites provide a full array of appropriate residential lighting equipment:

- Green Earth Lighting: <http://www.greenearthlighting.com>
- Brite Lites Out: <http://www.britelitesout.com>

### Examples of Proper Lighting Fixtures



Low Voltage



Wall Bracket



Downlighting



Wall Bracket



Shielded Floods



Solar Path



Post-Top

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### Where to Get More Information:

- The International Dark-Sky Association, IDA, website contains an array of additional helpful information on the subject, including a list of fixtures that have been rated as dark-sky friendly. <http://www.darksky.org>.

### References for Further Reading and Research

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