

Inappropriate lighting and light pollution causes problems in at least five areas:

Economics, safety and security, environmental impact, aesthetics and light trespass, and cultural heritage

Economic issues

- Approximately \$5.5 billion dollars spent annually on electric production for light that is simply wasted (sent sideways, upwards, or in directions where it can do no good)
- Uses an estimated 35 million barrels of oil or 26 million tons of coal that could be used for other purposes (such as lowering our currently high gas prices!)

Safety and security

- Glare from unshielded or poorly aimed lights blinds pedestrians and motorists making for potentially hazardous and life threatening conditions
- Excessively bright lights can cause momentary blindness or dazzle the eyes to the point of loss of vision
- As we grow older, our eyes cannot adjust as quickly to changing light levels. Meaning uneven and excessive lighting can cause vision problems for our older drivers more than in younger drivers. We are facing an aging population: this is an increasingly serious problem.
- A Texas study showed that 20/20 vision drops to 20/25 at night. Add the effects of glare, an aging eye that cannot adapt quickly to changing light levels, a slightly tinted or dirty windshield, and the vision easily drops below 20/40, at which point Texas law requires corrective lenses or a restricted license. Many middle-aged people are probably driving at less than NY's vision levels due to these factors.
- Crime and lighting are not linked.
 - US Dept of Justice study showed no correlation between lighting and a reduction in crime.
 - National Institute of Justice found a 50:50 effect: lights help the criminals see what they are doing as much as it helps us see them.
 - When lights are installed inappropriately, they can hinder our ability to see to the point of causing problems. (A friend leaving a bank / ATM lobby in Pittsford was unable to see a person waiting just outside, even though he looked carefully for people before leaving. This was due to excessively bright and inappropriately aimed lights outside shining at the lobby entrance.)
- Some schools in western states have experimented with turning off lights at night. They were rewarded with dramatic reductions of vandalism and a significant saving of electricity costs. The vandals couldn't see to do their dirty work.

Environmental impact

- Generation of that wasted electricity results in about 66 million tons of CO₂ released into the atmosphere each year, increasing global warming. Other emitted gases increase acid rain.
- Effects on animals
 - Migrating birds killed by the tens of millions from running into buildings, towers, and guy-wires due in large part to lighting problems (see www.towerkill.com and www.flap.org for more info)
 - Some species of turtles require full darkness in order to lay their eggs
- Effects on plants
 - Studies show that nighttime lights cause weed species to continue growing at night more than they cause desirable plants to continue growing at night.
- Recent studies show problems in humans: tentative link between nighttime lighting and certain forms of cancer, especially breast cancer.

Aesthetics and light trespass

- Excessive and inappropriate lighting gives areas a harsh, garish look – not every street should look like Jefferson Rd or downtown Las Vegas
- Light trespass should be given the same consideration as noise or physical trespass – until shields were recently installed, Wegmans lights on Fairport Rd store were a prime example of how not to light a property. They used to illuminate the fronts of the houses on the north side of Fairport Rd hundreds of feet beyond Wegmans' property line.
- Residential lighting can trespass, too. As Benjamin Franklin said, "Your rights stop at the tip of my nose." In other words, your rights stop when they affect me—light trespass infringes on my right to darkness, whether it be in my bedroom or in my backyard interfering with my ability to view the heavens.

Cultural

- Loss of connection with heritage of sky-lore, stories, and inspiration
- The heavens have inspired poets, authors, philosophers, and religious thinkers throughout history
- Ancestors could see as many as 3-4,000 stars on any given night. From Fairport/Perinton and similar suburbs, we can see roughly 800. From downtown Rochester, it's approximately 50. From the heart of major cities it's a dozen or fewer
- Most people cannot find more than one or two of the constellations—they can't see the stars!
- Most people have no understanding of the workings of the sky—they don't know how when or why the stars move across the sky, they don't understand the cycle of moon phases, they cannot make the connection between the seasons and the sky

Causes of light pollution

30-50% of light pollution is caused by roadway and municipal lighting. The remainder is caused by commercial and residential lighting. In all cases, light pollution is generated by:

- Using poorly shielded or unshielded luminaires, which spray light everywhere
- Using improperly aimed luminaires so as to cause light to miss its intended target (e.g. spotlights)
- Using excessive levels of light, increasing reflection and dispersion of light into the atmosphere
- Using inappropriate light-generation technologies – using broad-spectrum lighting rather than monochromatic light sources, which could be filtered out for astronomical or scientific viewing

Solutions to light pollution

- Mandate full-cutoff fixtures for all pole and wall mounted installations. Outlaw globe, acorn, sag-lens, and other poorly shielded fixtures.
- Require spotlights to be aimed properly, never more than 45 degrees from the horizontal, and to be baffled or shielded to prevent light trespass or uplighting.
- Outlaw light distribution beyond the property line, as the current Perinton ordinances do.
- Outlaw façade, unshielded canopy, and roof lighting – they are simply advertising vehicles designed to circumvent signage and advertising limitations.
- Use appropriate levels of lighting as recommended by the Illuminating Engineering Society of North America (IESNA), those being:
 - Entrances (in active use) 5 foot-candles (fc) or (inactive, infrequent use) 1 fc
 - Roadways: 0.3 - 1.6 fc
 - Parking lots: 0.8 - 3.6 fc
 - Service stations is 1.5-3 fc in driveways up to 20-30 fc at pump island (not the 80-110fc that they often use)
 - IESNA states that the illuminance of an area should never exceed 10 times that of any surrounding area
- Use monochromatic light sources and the most efficient light generation technologies whenever feasible, for example low-pressure sodium rather than mercury vapor.

The International Dark-Sky Association (IDA) has produced a handbook for community leaders and planners, which I encourage you to read. It is an excellent resource that describes the problems, solutions, and even provides model code. You can access it for free over the Internet by visiting

<http://www.darksky.org/ida/ordsregs/lchintro.html>