

Strathcona County's

Dark-Sky
and

Energy Efficient Lighting

COMMUNITY HANDBOOK

Strathcona
County

*Preserving a natural 'dark-sky' environment
through the use of responsible
community lighting*

Cover photo by **Yuichi Takasaka**

“Beaver Pond” on Ingraham Trail, North East of Yellowknife

This publication was created by Strathcona County in conjunction with the Beaver Hills Initiative and Light Efficient Communities Inc.

www.strathcona.ab.ca

www.beaverhills.ab.ca

www.lightefficientcommunities.com

Strathcona County – Lighting The Way Of The Future

Strathcona County is a leader in delivering programs and services that advance social, environmental and economic sustainability. In July 2010, adding to its previous efforts and achievements, Strathcona County became the first community in Alberta to endorse a **Light Efficient Community** policy.

The ‘Light Efficient Community’ approach to lighting the night-time environment parallels ongoing efforts by the Beaver Hills Initiative, Strathcona Wilderness Centre and the Beaver Hills Dark Sky Preserve to protect and conserve unique areas in and around Strathcona County.

As part of the policy implementation process, the purpose of this handbook is to inform Strathcona County citizens about the best residential lighting practices for the community, and to introduce the new, locally developed policy. The handbook aims to assist both rural and urban citizens with their choices in night-time lighting, thus conserving natural dark skies and enhancing the livability of the community.

Through the application of good lighting practices, Strathcona County and its citizens will:

- improve their night-time environment and quality of life
- reduce energy costs and waste
- return a natural heritage of dark skies to the community
- serve as an example to other communities for the adoption of similar lighting practices



Living in a **Light Efficient Community**

Strathcona County's first efforts to improve the illumination of public spaces can be seen in the shielded, downward directed outdoor lighting for Centre In The Park. Interior lighting makes use of efficient LEDs in the central glass stairwell. The downtown redevelopment area in Sherwood Park includes the new community centre, library, County Hall, and a number of private residential and commercial buildings. The elegant design of light fixtures for Centre In The Park illustrates how dark-sky friendly lighting can bring a touch of style to our public realm.

What is a Light Efficient Community?

A Light Efficient Community uses light responsibly, lighting the night-time environment only when and where it is essential. It uses only the right amount of light necessary for the task. This minimizes energy waste, lowers power-related costs, and reduces its carbon footprint. Citizens take pride in preserving a dark sky, while enhancing its health, safety and quality of life.

What does a Light Efficient Community look like at night?

A Light Efficient Community has safely-lit streets that provide maximum visibility while minimizing light pollution and glare. Lights are turned off when not in use. Citizens who must light their property at night use well-directed lighting, often connected to timers or motion sensors. Decorative property features are lit by energy-efficient, shielded fixtures. A starry sky is visible from most areas of the community.

What if I live in a rural area?

You may well be accustomed to having a night-time environment that is more natural. Using effective outdoor lighting can still make a big difference. Bright, unshielded lights can draw unwanted attention to your property and also disturb wildlife in the area. Farm and yard lights should use as low wattage as possible, be directed downward, be shielded, and may be connected to timers or motion sensors.

What are the results of becoming a Light Efficient Community?

A Light Efficient Community creates a healthier living environment that is less vulnerable to energy price increases, and more mindful of the negative effects of excessive artificial lighting. Neighbourhood lighting levels are aesthetically pleasing, not intrusive or disturbing. Citizens enjoy a more natural night-time sky, as well as improved views of the Milky Way and Northern Lights.

Why does this concern me?

Improving the lighting in Strathcona County is an important undertaking that affects the whole community. The diversity of land use in Strathcona County requires a 'big picture' approach that addresses the needs of residents, visitors, developers, and users of parks, open spaces and buildings. Citizens can take simple actions that make a difference to their neighbourhood lighting.

Dark-Sky and Energy Efficient Lighting

Community lighting levels should be safe and provide good visibility. Research in science, engineering and crime prevention shows that bright, poorly directed light can create black-out areas and glare, providing opportunities for intruders. Well-directed lighting with appropriate wattage results in uniformly lit ground areas and a darker night sky.

'Light pollution' is the excessive or obtrusive use of lighting that compromises visibility or has a negative impact on the environment. Light pollution increases ambient light levels and results in 'sky-glow'. This blurry orange glare is most noticeable in populated areas but can also be seen in rural areas.

Dark-sky and energy efficient lighting improves visibility and conserves the night-time environment by reducing ambient light levels, energy costs and power consumption, carbon footprint and greenhouse gas emissions, as well as negative impacts to the health of people and wildlife.



International Dark-Sky Association - poorly directed, unshielded sidewalk lighting

Effective lighting:

- directs light to exactly *where* it is needed
- uses light only *when* it is needed
- provides the right *amount* of light for the task

How can you help?

Problem:

Solve by using:

Light waste	sensors and timers on all outdoor lighting, turn off lights when not in use, and choose efficient bulbs
Light trespass	shielded, carefully directed lights to prevent glare for neighbours and cyclists
Light clutter	only as many light sources as necessary
Up-light	fixtures that keep the light directed downward
Over-illumination	the lowest wattage bulb that is appropriate for the task



Good lighting and innovative design at Centre In The Park

Responsible Lighting Choices

Which lights should I use?

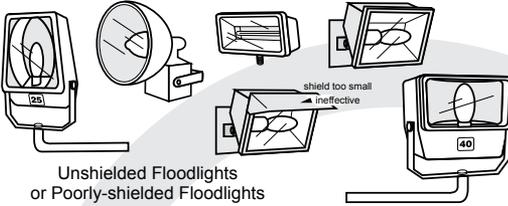
Use fully-shielded lights that only emit light downward and not above the horizontal plane of the fixture. These are referred to as **Full Cut-Off (FCO)** lights.

How bright should I light?

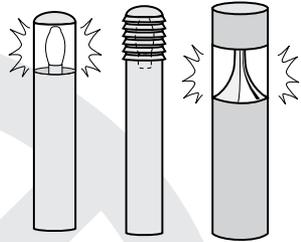
Use low intensity lighting for more uniform visibility. Full Cut-Off lighting requires *less* wattage because it directs the light more effectively.

UNACCEPTABLE / DISCOURAGED

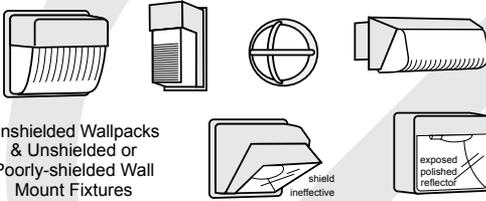
Fixtures that produce glare and light trespass



Unshielded Floodlights or Poorly-shielded Floodlights



Unshielded Bollards

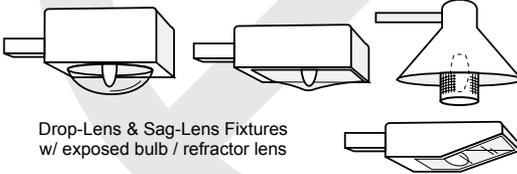


Unshielded Wallpacks & Unshielded or Poorly-shielded Wall Mount Fixtures

Unshielded Streetlight

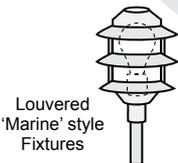


Unshielded Barn Light

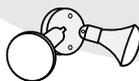


Drop-Lens & Sag-Lens Fixtures w/ exposed bulb / refractor lens

Unshielded 'Period' Style Fixtures



Louvered 'Marine' style Fixtures



Unshielded PAR Floodlights

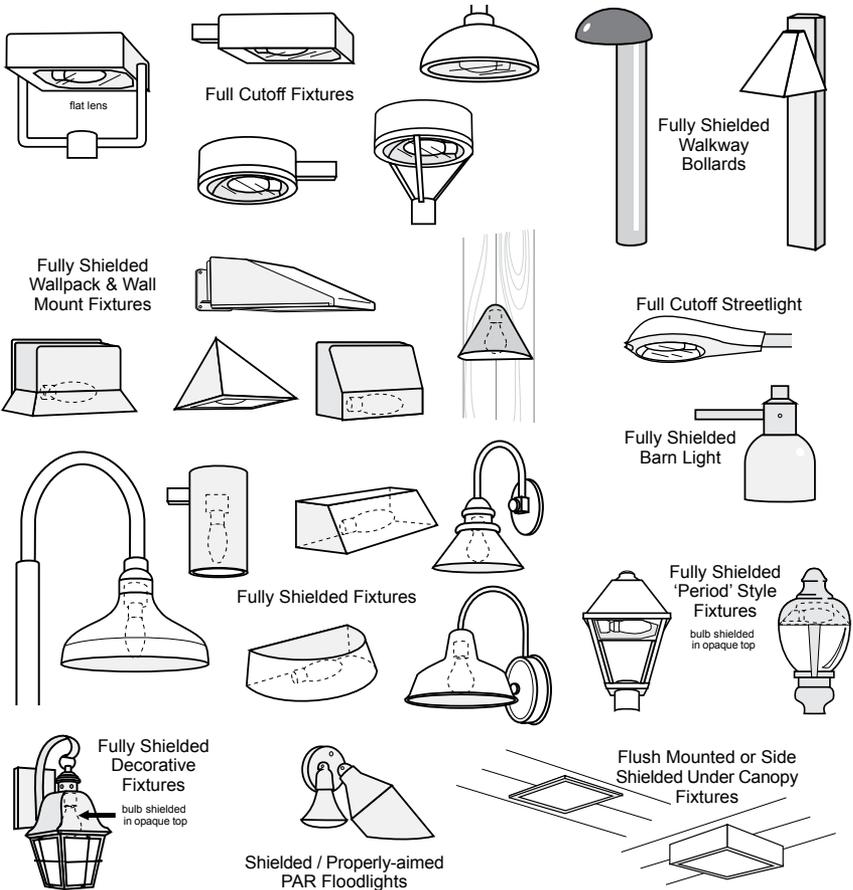


Drop-Lens Canopy Fixtures

Rendered for the Town of East Hampton, NY by Bob Crelin ©2/05

ACCEPTABLE

Fixtures that shield the light source to minimize glare and light trespass and to facilitate better vision at night



Rendered for the Town of East Hampton, NY by Bob Crellin ©2/05

Where can I find the right lights?

There are increasing choices for Full Cut-Off fixtures and International Dark-Sky Association (IDA) approved fixtures at hardware stores. As demand increases, so will availability and competitive prices. Some fixtures may already carry the IDA seal of approval, guaranteeing that you are buying a dark-sky friendly fixture. If your local store hasn't heard of this, have them visit www.darksky.org or www.energystar.gov

Cost Savings Through Sustainable Lighting Practices

Residential light pollution accounts for 28 per cent of total urban light pollution costs*. Just think of the difference residents can make by taking the simple measures outlined in this handbook! Thomas Edison once remarked, “*We will make electricity so cheap that only the rich will burn candles*”. If Edison was alive today, he might be recounting the costs.

Outdoor lighting that shines directly upward wastes an estimated 17,400 gigawatt-hours per year across North America. At an average of \$.10 per kilowatt-hour, this waste adds up to \$1.74 billion a year. Every year, 9.1 million tons of coal, or 32.3 million barrels of oil are wasted generating the energy for this lost light - almost 600 million gallons of gasoline wasted*.

Urban centres across North America and Europe have started to cut municipal energy costs by using better lighting practices. Retrofitting streetlights using Full Cut-Off fixtures has resulted in thousands, and even millions of dollars in annual savings for participating municipalities. Additional savings can be realized by converting to energy-saving LED (light emitting diode) lighting, as LEDs can be specifically controlled and adjusted to meet varying lighting level requirements.

Lighting improvements must be addressed through multiple actions within the community in order to have a significant impact. Use of electricity now and in the future will require good planning. By implementing the policy, the citizens of Strathcona County can effect change.

*Mills, E. 2002. “The \$230-billion Global Lighting Energy Bill” International Assoc. for Energy-Efficient Lighting and Lawrence Berkeley National Laboratory June 2002

*Visit www.darksky.org for more information.

Health and Night-Time Lighting

Darkness helps us to get a good night's sleep. However, especially in urban centres, we are 'lighting up the night' and have created an abnormal balance between day and night. Although some of us would like to be able to function around the clock, humans have been diurnal (i.e. awake during the daytime) creatures throughout history.

Strathcona County's lighting policy strives to improve the health of all life in the community by adhering to the natural cycles of night and day. Recent studies have linked unnatural night-time lighting levels with adverse effects on human health, including sleep disturbance, depression and even some types of cancer.*

In 2009, the American Medical Association developed a policy in support of light pollution controls, as a result of a growing number of studies linking night-time lighting to health problems.

Night vision

The human eye takes time to adapt to changes in lighting levels, especially when adjusting to dark areas after exposure to bright lighting. Glare decreases contrast, sensitivity, and colour perception, inhibiting adaptation to the dark. Glare can create public health hazards, including those associated with unsafe driving conditions.



International Dark-Sky Association - Glare can create public health hazards, including those associated with unsafe driving conditions

Aging eyes are more susceptible to the effects of glare, which causes the pupils to respond by letting in less light, thus compromising vision. Some night-time lighting, though intended to provide safety, can make it difficult for the eye to focus and may cause halos around objects.

*Chepesiuk, Ron. "Missing the Dark: Health Effects of Light Pollution," *Environmental Health Perspectives*. Vol. 117, Num. 1, January 2009

Visit docs.darksky.org/Docs/AMA%20Light%20pollution.pdf

For more information and research studies on lighting and human health, visit www.darksky.org

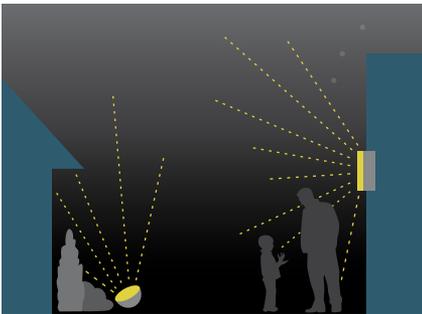
Lighting for a Safe Community

We don't see the same way as an owl or a cat so it is natural to take precautions in the dark. Our night vision is better if we eliminate glare and are not blinded by our own lights. In fact, night-time lighting often provides a false sense of security and wastes precious energy and dollars.

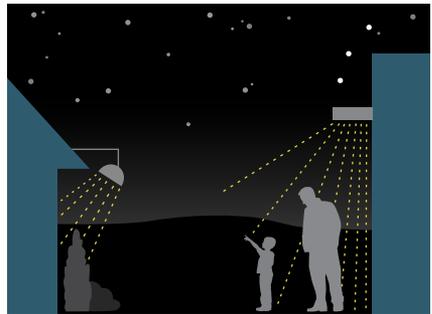
Here are some points to consider for night-time lighting.

1. Landscape or decorative lighting

- Are my fixtures directing light downward and not above the horizontal?
- How bright do they need to be?
- Are there times when darkness is better?



Unshielded fixtures create glare and waste light.



Use fully shielded fixtures, direct lights downward and not above the horizontal plane of the fixture.

Did you know that most residential break-ins occur during daylight hours? The presence of light tends to decrease the *fear* of crime at night, but studies show that increased lighting is not a significant factor in *preventing* crime. Crime Prevention Through Environmental Design (CPTED) promotes “the proper design and effective use of the built environment in order to lead to a reduction in the fear and incidence of crime and an improvement in the quality of life.” Strathcona County uses CPTED principles in reviewing development applications.

2. Safety: walkways, stairs, entrances or porches

- What do I want to light up, when, and why?
- What is the lowest wattage to do the job?
- Can timers, dimmers or motion sensors save me money?



Improperly shielded lighting reduces visibility and creates glare. The image on the right shows how residents can improve the visibility of their stairs, entrances and walkways by using properly shielded, downward directed outdoor lighting.

International Dark-Sky Association (Southern Arizona Section)

3. Security

- Is lighting the right tool for security on this part of my property?
- Could glare and dark shadows conceal intruders?
- Does my lighting give vandals just enough light to work within instead of deterring them?
- Am I creating light trespass or glare for my neighbours, pedestrians, cyclists or motorists?
- Are motion sensors suitable for my property?



Martin Morgan-Taylor

LEFT: Glare and dark shadows can conceal intruders. RIGHT: Visibility is greatly improved with well-directed lighting.

Impact Of Artificial Light On The Environment

Strathcona County has a unique urban and rural character. The natural areas, wetlands, lakes, urban parks and forests all contribute significant biodiversity to the community. Plants, animals, birds, insects and amphibians that live in the community are affected by night time lighting.



With new technology and increasing adaptability of lighting design, safe lighting can be provided at a lower cost and with less energy consumption than in the past. Public participation as a Light Efficient Community will build a sense of responsibility and prove in a visible way, that individual actions really *do* make a difference.

Did you know?

- The study of the biological effects of darkness on living things is known as *Scotobiology*.
- Most plants detect the season by duration of darkness. Flowering, development, seed formation, and the onset of dormancy can be compromised through the cumulative effects of light pollution.
- The sleeping, hunting and breeding habits of nocturnal animals, as well as activity patterns and social interaction, can be seriously disturbed by light pollution.
- In North America alone, over one hundred million migrating birds die annually due to poor lighting practices. Birds are attracted by light sources and become disoriented, exhausted and unable to fly out again into the darkness. Visit www.flap.org
- Insects, a staple diet for birds and animals, can be attracted or misdirected by artificial lights. This can result in an imbalance in the ecosystem as an unlimited 'fast-food' smorgasbord is created for predators.
- You can help preserve a healthy night-time environment by closing drapes over illuminated windows, turning porch lights off, and keeping your property as naturally dark as possible while keeping it safe.



Bringing Back the Stars Over Strathcona County

Do you have a special memory of camping under the stars in a beautiful natural area? Did the stars seem almost close enough to touch? This wonderful connection to the ‘bigger picture’ can also be captured in our urban landscapes where those same stars still shine...hidden by an unnecessary curtain of artificial sky-glow.

The night-sky has inspired people to express their wonder and curiosity about our universe through poetry, music, art, and the sciences. Its changing seasonal ‘pages’ store our cultural history of sky stories and myths in a giant celestial library! What stories did your own ancestors know about the night sky?

Glittering stars of our northern constellations, spectacular aurora, rare views of noctilucent clouds...the latitude of Strathcona County and its proximity to protected places, such as the Beaver Hills Dark Sky Preserve, gives citizens the opportunity to experience spectacles unseen in other parts of the world. By using good lighting practices, these free celestial adventures can remain a part of our cultural heritage.



Photo by Douglas P. Hube - Rare and beautiful ‘noctilucent’ clouds occur at very high altitudes in the earth’s atmosphere. Local sightings in Strathcona County’s northern night sky are most often reported during the month of June.

Lights down, stars up!

Let's bring back the stars over Strathcona County and make night-time a 'friendlier dark'.

Did you know?

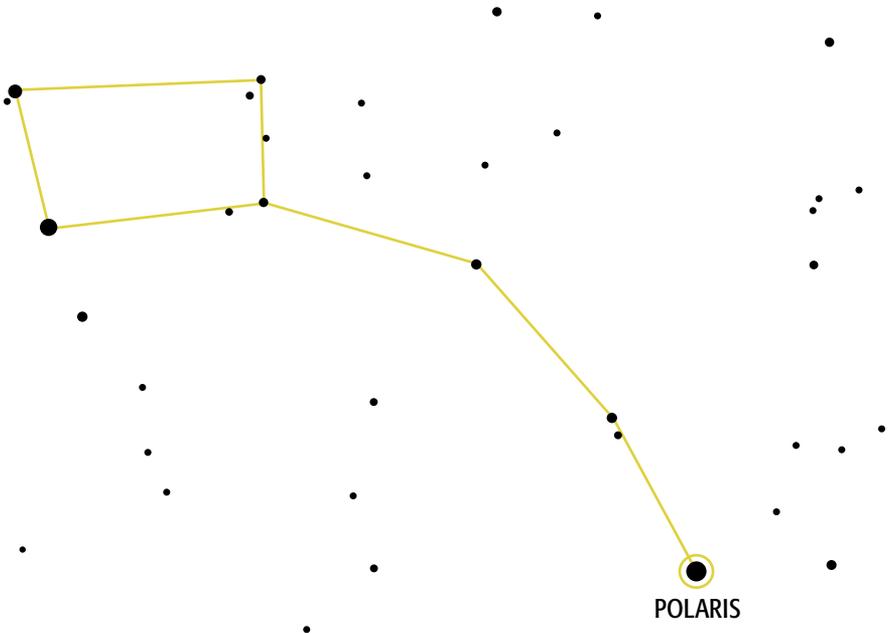
- Sirius is the brightest star in the winter sky, twinkling in the collar of Orion the Hunter's 'dog'.
- Arcturus, Vega, and Altair mark the corners of the huge 'Summer Triangle'.
- In the autumn you can see the white smudge of Andromeda Galaxy under a clear dark sky, without binoculars!
- The constellation of Leo the Lion prowls the spring sky, harbouring galaxies only revealed with a telescope.
- Magnificent aurora is often visible from dark sites in Strathcona County, especially in the spring and fall. Dress warmly and turn your yard lights off to be dazzled by this gift from nature! Visit www.aurorawatch.ca
- The International Space Station (ISS) can be seen regularly transiting our southern sky...and it's really bright! Remember to wave, there are people up there! Visit www.heavens-above.com
- Using binoculars, you can see double stars, beautiful star clusters, galaxies and nebulae from a dark backyard, balcony or urban park.
- The sky is a calendar, a clock and a compass. To learn how to find the constellations, visit www.skymaps.com

How Dark Is Your Sky?

The community effort to bring back the stars over Strathcona County will produce measurable effects. Astronomers measure the actual darkness levels with ‘sky quality meters’, but you can simply look up and **count** the stars! This is a wonderful activity for all ages and a good reason to step out and get some fresh air.

A good dark-sky test is to count the stars visible in the Little Dipper, including Polaris, which is about halfway up our northern sky. If only the three brightest stars are visible, your ‘piece of the sky’ is suffering badly from the effects of light pollution.

Start your own project by keeping an annual star count from your backyard or nearby park. Kids could have a ‘Starry Birthday Party’ sleepover and count the stars annually. Your ‘Starry Growth Chart’ will be a record of how your community is bringing back the stars by using smart lighting methods. To become part of a world-wide effort to preserve dark skies, visit www.globeatnight.org





'TIPI' by Alan Dyer – Astotin Lake 2006

'Star Parties' at Elk Island National Park have enabled thousands of visitors to enjoy unforgettable experiences under dark skies.

The Beaver Hills Dark Sky Preserve

The Beaver Hills Dark Sky Preserve was declared in 2006 in accordance with the Royal Astronomical Society of Canada guidelines. The partnership includes:

- Royal Astronomical Society of Canada
- Parks Canada (all of Elk Island National Park)
- Cooking Lake and Blackfoot Provincial Recreation areas
- Strathcona Wilderness Centre
- Ukrainian Cultural Heritage Village
- Sherwood Fish and Game: Ketchamoot Creek Recreation and Conservation Area

Visit edmontonrasc.com/public/bhdsp.html

Through information and links in this guide citizens can stay informed with current research on the effects of artificial lighting on human health, safety, wildlife and culture.

References & links

FSC LOGO

www.strathcona.ab.ca

www.beaverhills.ab.ca

www.lightefficientcommunities.com

www.strathcona.ca/wildernesscentre

www.rasc.ca

www.edmontonrasc.com

www.darksky.org

www.darkskysociety.org

docs.darksky.org/PG/PG3-residential-lighting.pdf

www.britastro.org/dark-skies/simulator.html

www.nrcan.gc.ca

darkskysociety.org/handouts/birdsafebuildings.pdf

corona-gw.phys.ualberta.ca/AuroraWatch

spaceweather.com

List of supporters

Beaver Hills Initiative

Light Efficient Communities Coalition

Beaver Hills Dark Sky Preserve

Royal Astronomical Society of Canada, Edmonton Centre

International Dark-Sky Association

Elk Island National Park

Strathcona Wilderness Centre

Printed on paper with 55% recycled fibre. (30% post-consumer)

Strathcona
County

