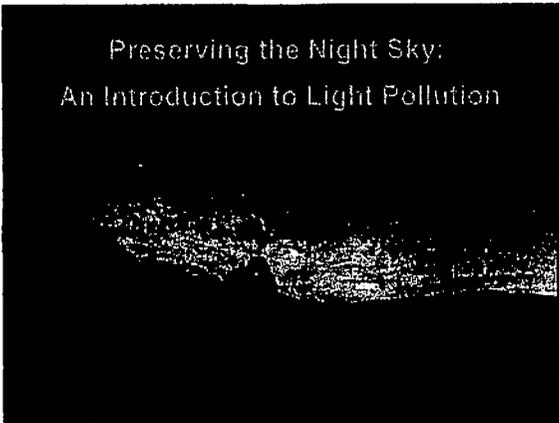


Preserving the Night Sky: An Introduction to Light Pollution

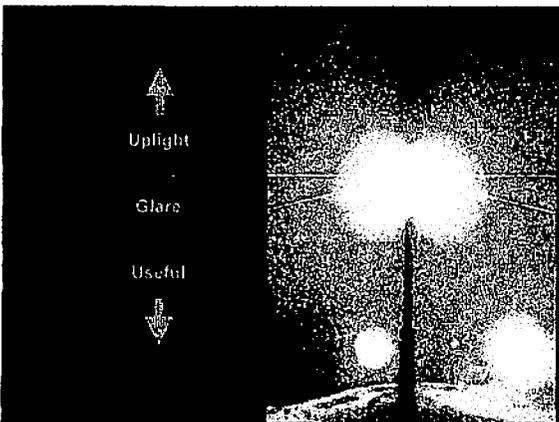
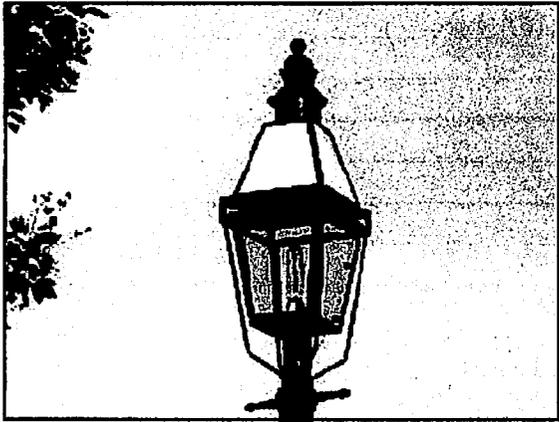


Light Pollution

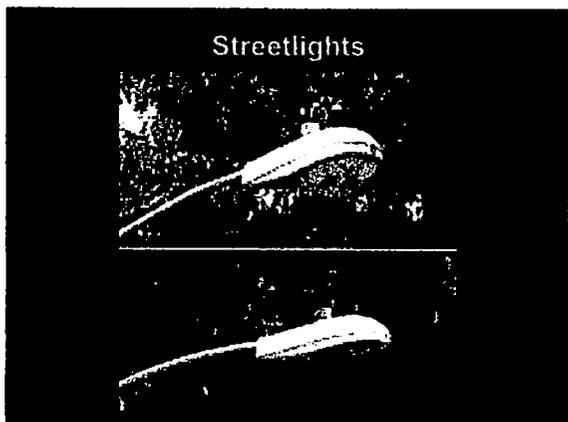
Illumination of the night sky by artificial light sources

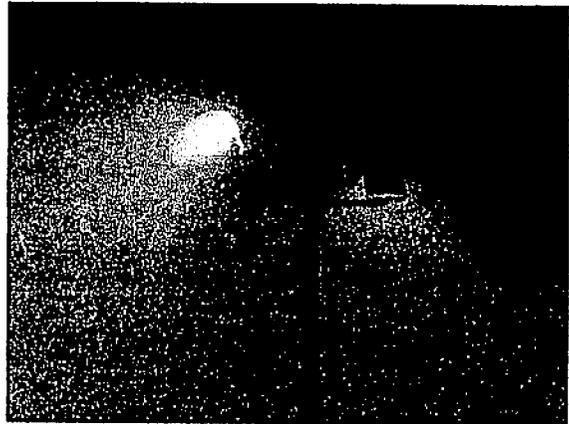
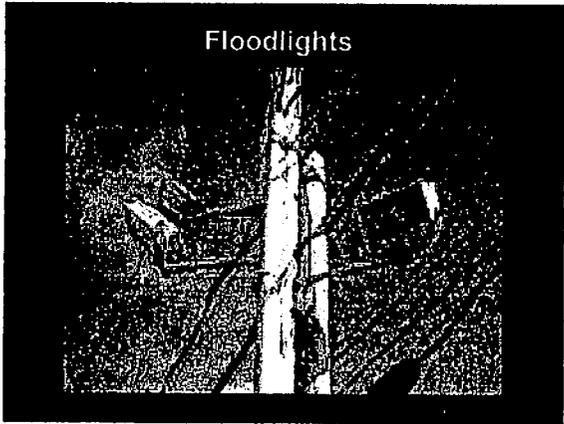
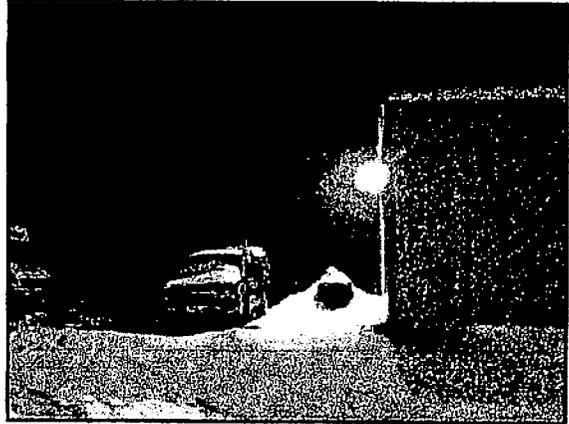
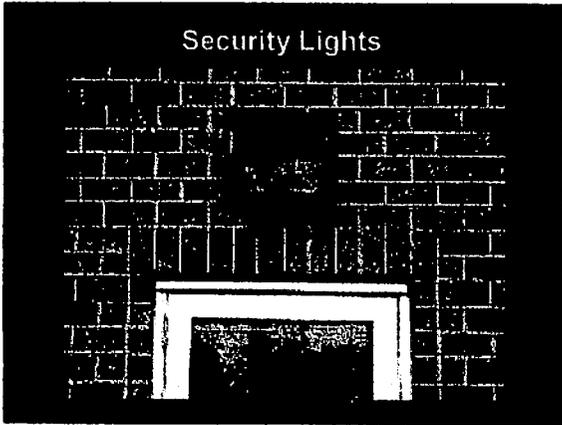
Also includes other incidental or obtrusive aspects of outdoor lighting -- glare, trespass, and disturbance of the natural nighttime landscape.

Much of this light never touches the ground.
It never lights anyone's way, never provides any security, visibility, or guidance to anyone. Instead, it shines straight up into the sky.



Streetlights





Consequences of Light Pollution

- Loss of the starry sky (skyglow)

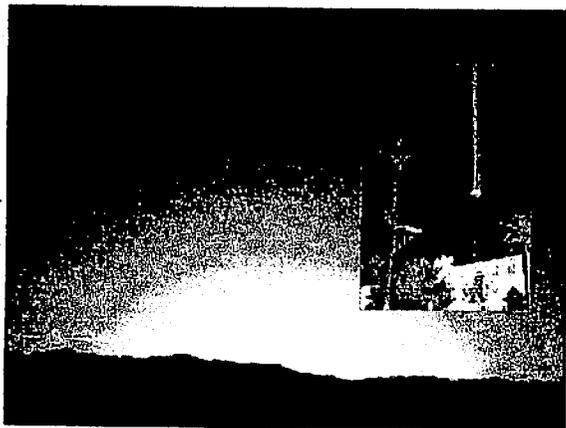
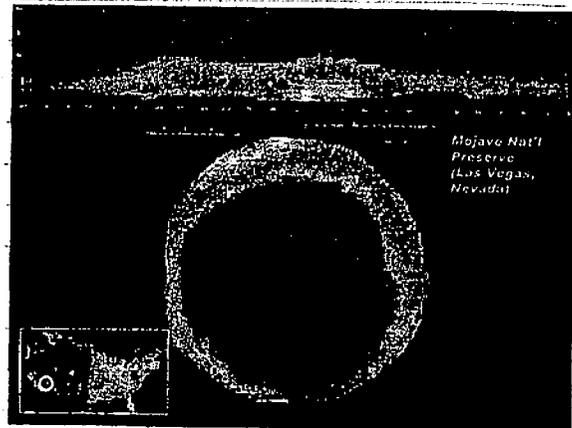
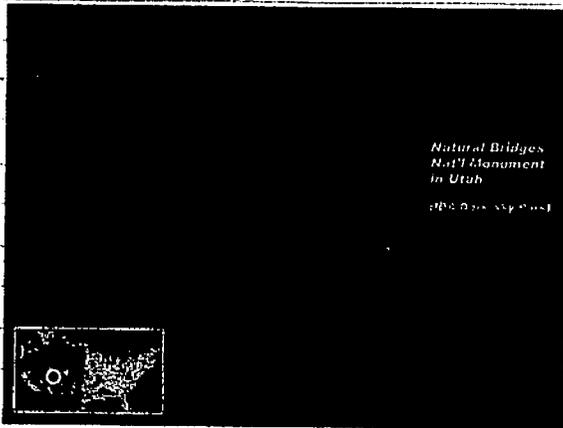
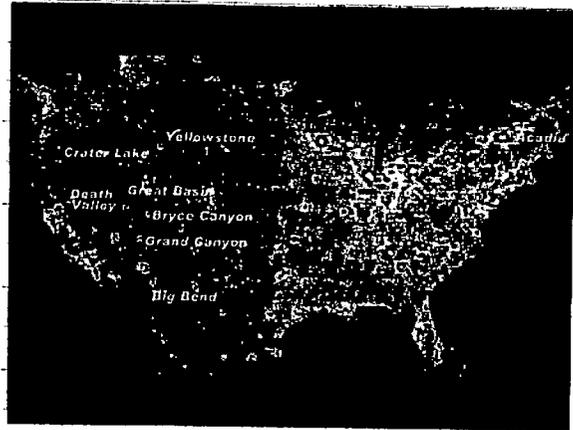
The Great Northeast Blackout

DISASTERS

13 August 2003

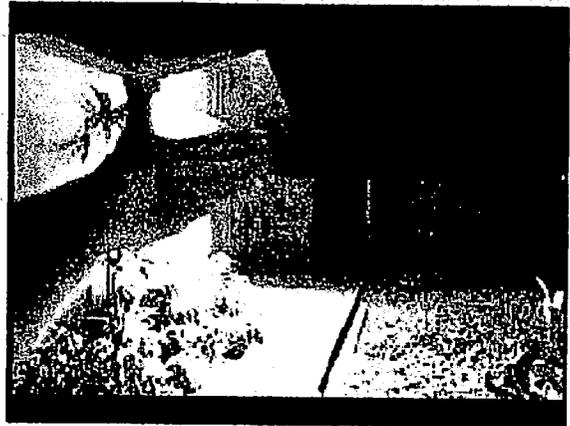
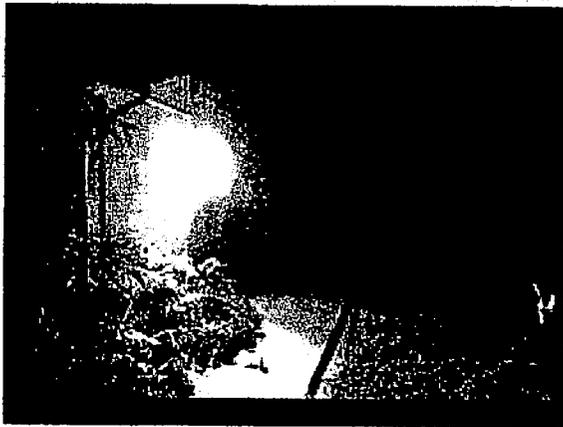
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The Great Blackout



Consequences of Light Pollution

- Loss of the starry sky (skyglow)
- Visual impairment (glare, trespass)

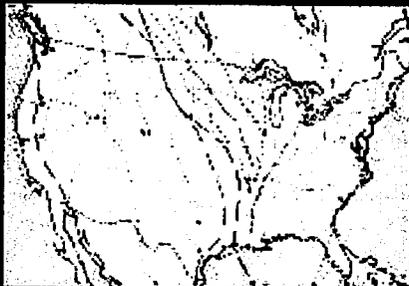


Consequences of Light Pollution

- Loss of the starry sky (skyglow)
- Visual impairment (glare, trespass)
- Environmental consequences

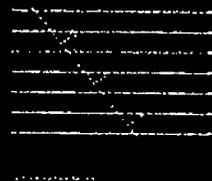


Bird Migratory Flyways

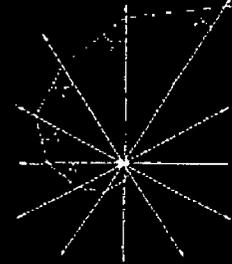


U.S. Department of the Interior
Bureau of Land Management
2000

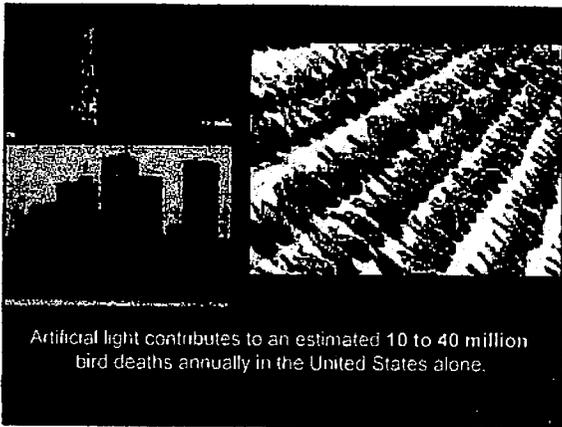
On Moonlight, all primary
rays "parallel"



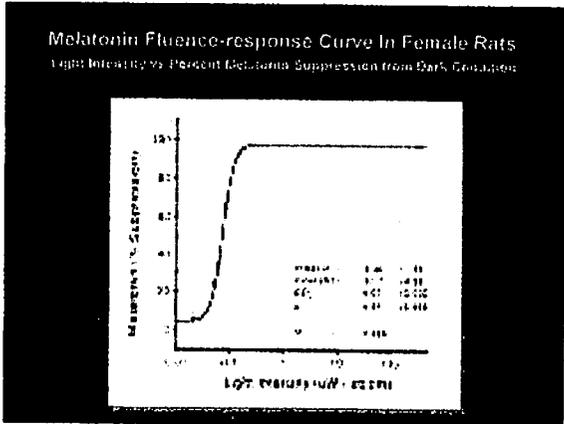
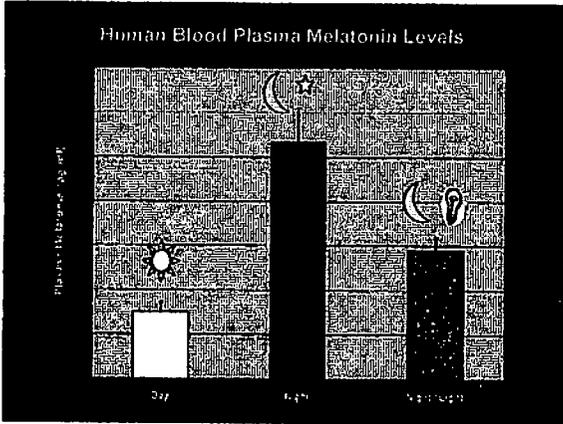
On Streetlight, rays
are "diverging"



©Ray 2002

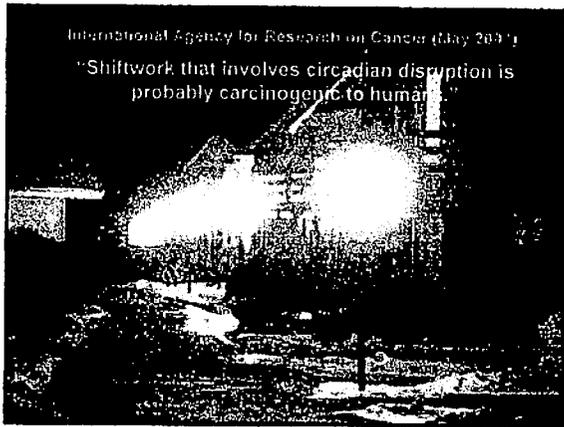


- ### Consequences of Light Pollution
- Loss of the starry sky (skyglow)
 - Visual impairment (glare, trespass)
 - Environmental consequences
 - Human consequences



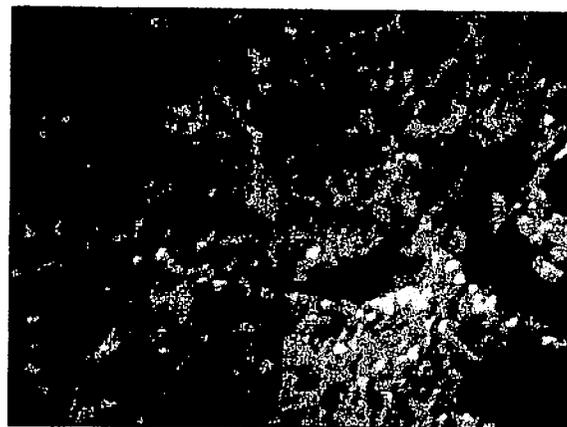
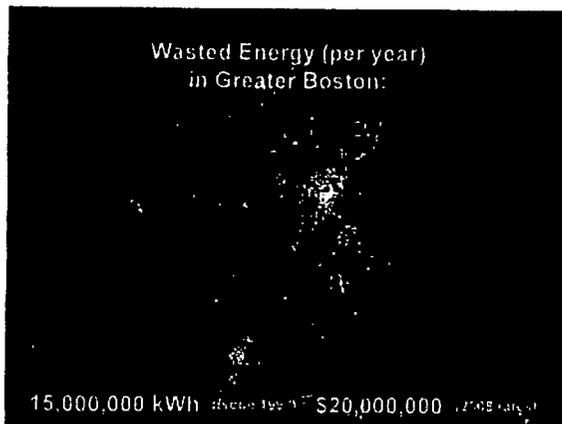
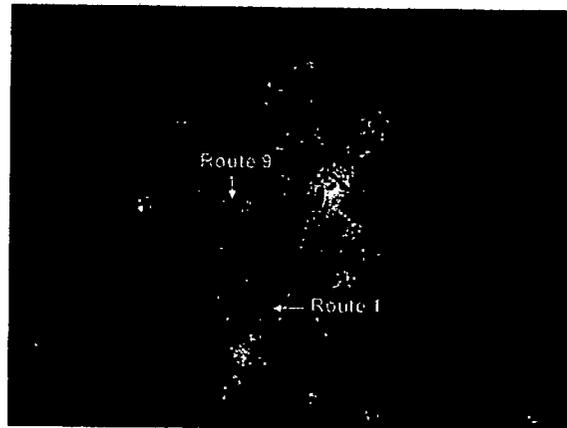
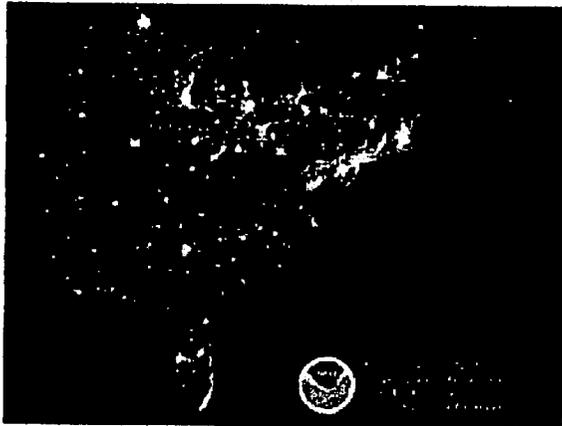
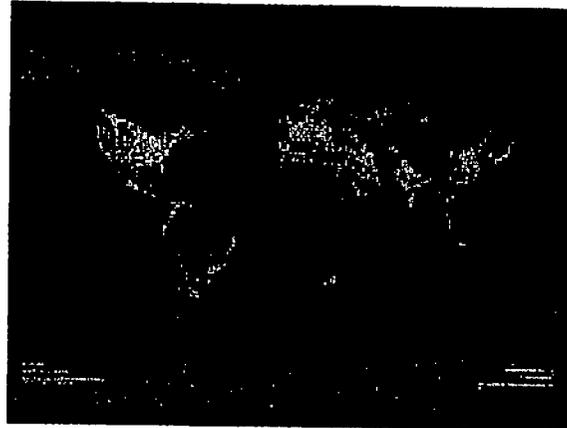
Light-at-Night Hypothesis

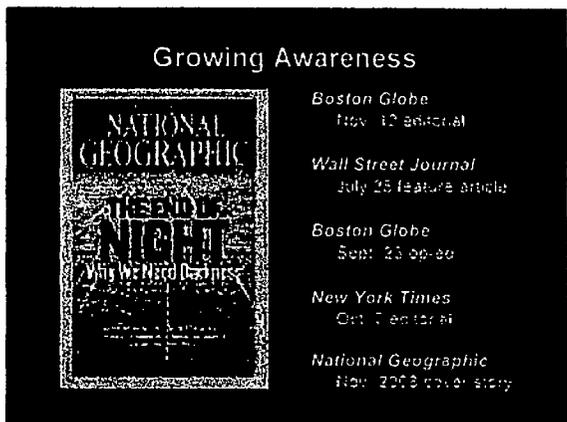
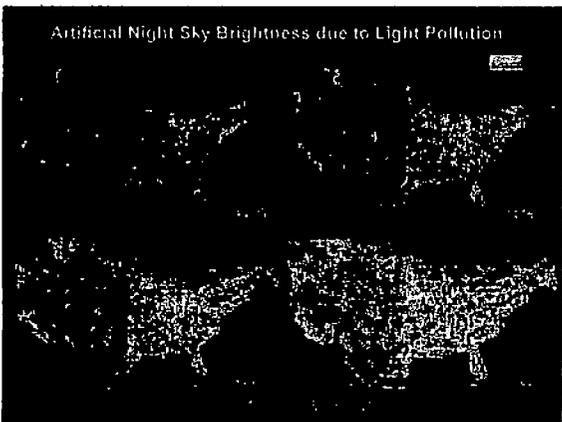
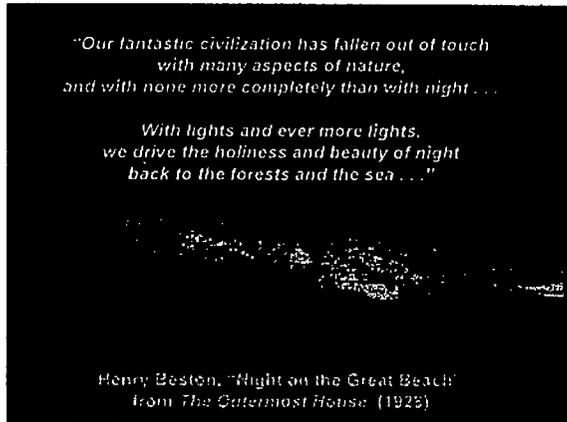
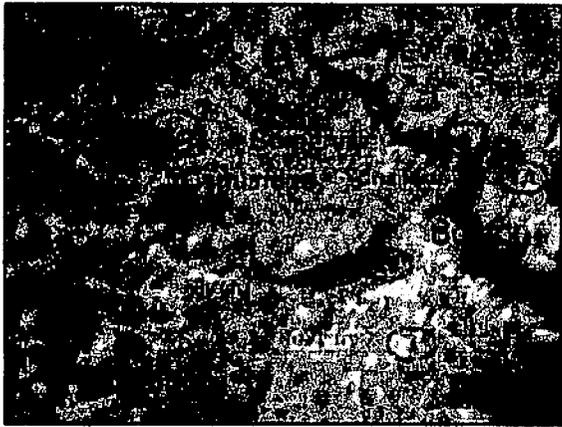
Exposure to light at night suppresses pineal-gland melatonin production, which may explain some of the high and unaccounted for risk of breast cancer in industrialized 24-hr/day societies (shift work & fat intake at night).



Consequences of Light Pollution

- Loss of the starry sky (skyglow)
- Visual impairment (glare, trespass)
- Environmental consequences
- Human consequences
- Energy waste





Commonly Asked Questions

Why is The City of Calgary retrofitting the streetlights now?

Energy prices reached an all time high in January 2001. The streetlight system is The City's single largest electricity consumer. The City needed to find a way to reduce costs in operating the streetlight system. By going to lower wattage fixtures, we will use less energy which will help keep operating costs down. Using less electricity reduces the greenhouse gas emissions from gas and coal-burning generators. When all the residential streetlights have been replaced, carbon dioxide emissions will be reduced by approximately 16,000 tonnes a year.

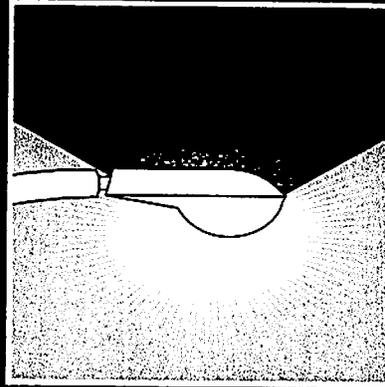
Will the retrofit cause my taxes to go up?

Funding for the EnviroSmart Streetlights project will come from cost savings derived from saving energy and by postponing scheduled group relamping. (Residential streetlights in Calgary are relamped on a five-year cycle.) By retrofitting streetlights at the rate at which we can recapture savings based on electricity rates and not group relamping, your taxes will not increase.

* Based on estimated \$0.07 per kilowatt hour. Costs are for comparison purposes only and are not actual costs.

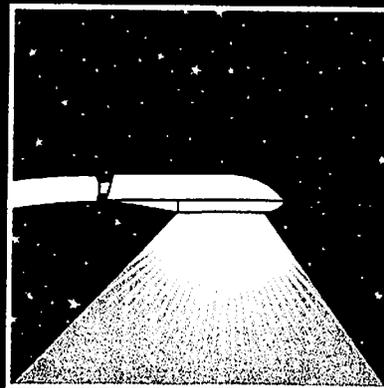
What is light pollution?

Simply put, light pollution is wasted light. You can recognize light pollution by sky glow (the glow at night above cities and towns), light trespass (unwanted light going onto private properties) and glare (harsh light shining in one's eyes).



What does the word "retrofit" mean?

Retrofit is a "buzzword" meaning to change a component (in this case streetlight fixtures) to meet current performance and environmental standards using new technology.



Are all the residential streetlights going to be retrofitted?

Under the guidelines used for this initial portion of the retrofit project, some streetlight locations require special consideration and may not be retrofitted at this time.

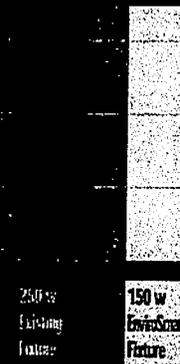
These excluded locations are:

- In front of playgrounds
- In front of parks
- In locations where the spacing between the streetlights is too great
- Some intersections
- Decorative style streetlights.

How is the project being funded?

The City-wide EnviroSmart Streetlights project is estimated to cost \$7.2 million. This project is partially funded by three levels of government (Federal, Provincial and Municipal) under the Infrastructure Canada – Alberta Program (ICAP).

ICAP is funding \$3 million of the total cost. The remainder of the cost of the project will be paid for from the cost savings in electricity and by avoiding group relamping. It is estimated that based on current electricity prices, The City will recover the cost of installing the new fixtures over a six to seven-year period, with continued savings of \$2 million a year.



(2)

Drury, Margaret

From: Peters, Penny on behalf of Davis, Henrietta
Sent: Tuesday, February 24, 2009 3:58 PM
To: Drury, Margaret
Cc: Lopez, Donna
Subject: Health and Environment Meeting for February 24, 2009

Henrietta wanted this email put into the record for the meeting tonight.

Thanks,

Penny

From: Mike Hansen [mailto:mhansen@einhornresearch.org]
Sent: Friday, February 20, 2009 4:41 AM
To: Davis, Henrietta
Subject: Re: REMINDER: Health and Environment Meeting for February 24, 2009

I sent the following note to Ms Lopez in response to the invitation. Sorry I'll miss the meeting. And many thanks for keeping me informed. The City really should follow through with the plans to modify the post-top lamps in Porter and Harvard Squares to include baffles and shielding.

Thank you for the invitation. But, because I am presently working on my masters at the University of Glasgow in Scotland, I will not be able to attend.

Please let the councillors know that I still have a strong interest in this issue and will support any and all efforts to improve our community, environment, and reduce energy waste. I'm sure there are many people who will be attending the meeting better versed in the technical issues and more eloquent than me. But, I do know that there is much we as a City can be doing that isn't being done. Even without any new legislation, the City can commit *all* of its departments and agencies to doing the right thing (only using full cutoff and fully-shielded fixtures) and work with groups such as the MBTA to get existing lighting modified.

Thanks again for passing on my apologies and lame excuse for not attending. I'll be back this summer and look forward to hearing of positive changes in the City.

Mike Hansen
2561 Massachusetts Ave. #1
Cambridge, MA 02140-1020
(617)661-6520

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LAM PARTNERS INC
LIGHTING
DESIGN

17 October, 2008

Henrietta Davis
Office of the City Council
795 Massachusetts Avenue
Cambridge, MA 02139

Dear Councilor Davis:

Thank you for sending me a copy of the letter from City Manager Healy responding to Council Order No. 13 4/28/08. I believe that there may be an additional opportunity for light pollution reduction and energy savings for municipal outdoor lighting.

Principles of light pollution control include not only the direction of light downwards, as mentioned in the letter, but not using any more light than is needed to do the job. Generating higher light levels than are needed increases light pollution and wastes energy.

I believe that much of the street lighting we inherited from NStar lights our streets to levels higher than needed for pedestrian and driver safety and comfort. It may seem non-intuitive to make this claim since often it is assumed that an increase in light levels results in an increase in benefit – “twice as bright = twice as good”. But this is not true and is not supported by research. For example, Massachusetts Avenue from Harvard to Arlington is lighted to a much higher level than necessary and at least two-to-three times higher than the criteria published in IESNA Recommended Practices.

There is an opportunity to reduce energy use, greenhouse gas emissions, and light pollution, by simply retrofitting streetlights to a lower wattage. The City of Calgary completed such a program. Please go to www.calgary.ca and search on *EnviroSmart Streetlight Retrofit*, and see the attached brochure. While the energy savings and light pollution benefits will be immediate, the financial payback benefit of such a program will be highly dependent on the rates the City is paying for the electricity used by streetlights. The cost of a retrofit program would ideally be financed by future energy cost savings. If the City is paying very low rates for street lighting energy, then the payback period would be very long and the program would not be justifiable solely on financial grounds. But it would certainly help achieve the City's greenhouse gas reduction goals.

I would be happy to advise the City on this matter on a volunteer basis. Please contact me if you think I could be of assistance.

Sincerely,

Glenn Heinmiller, IALD, LEED AP, LC

The new EnviroSmart Streetlights will:

Save energy and money. The new lower wattage flat lens fixtures use less energy, helping to keep operating costs down. After six to seven years, The City will regain the cost of installing the new fixtures from energy savings.

Reduce greenhouse gas emissions. Using less electricity reduces the emissions produced by gas and coal-burning generators. When all the residential streetlight fixtures have been replaced, carbon dioxide emissions will be reduced by as much as 16,000 tonnes a year.

Reduce glare to increase visibility. Glare is significantly reduced with the new flat lens streetlight fixtures, increasing visibility by directing light onto the roadway and preventing it from shining into the eyes of motorists.

Reduce excessive lighting and light pollution. New ways of designing and providing street lighting have been developed in the last several years. The City is committed to reducing our level of light pollution by using the most efficient design methodologies and streetlight fixtures available.

Maintain a safe level of lighting on The City's residential roads by meeting minimum Illuminating Engineering Society (IES) guidelines.

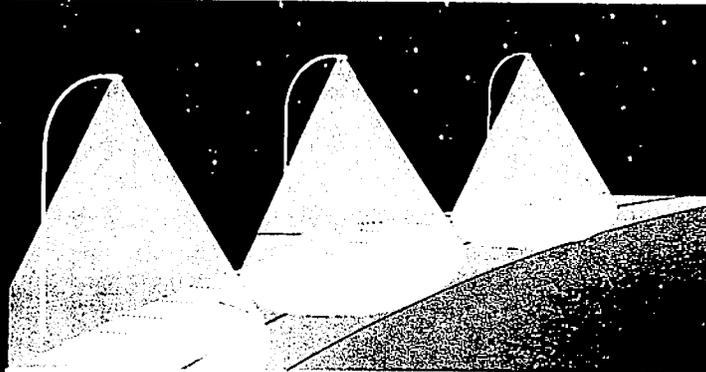
We would like to hear what you think about the EnviroSmart Streetlights project and your new streetlights. Please visit our website to leave your comments.

www.gov.calgary.ab.ca/roads/streetlight

For more information, call:

The City of Calgary
Corporate Contact Centre

268-CITY (2489)



EnviroSmart streetlights

The City of Calgary
leads the way in:

- Saving money
- Saving energy
- Reducing light pollution
- Protecting the environment.

We are the first city in North America to embark on an extensive program to retrofit residential streetlights with new, lower wattage flat lens fixtures.

The City of Calgary will be retrofitting up to 40,000 residential streetlight fixtures between March 2002 and 2007.



Infrastructure Canada - Alberta Program
Programme Infrastructures Canada - Alberta



Produced by Customer Service & Communications, Creative Resources

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