



Our shared heritage

Image of CT River at night: from dartmouth.edu



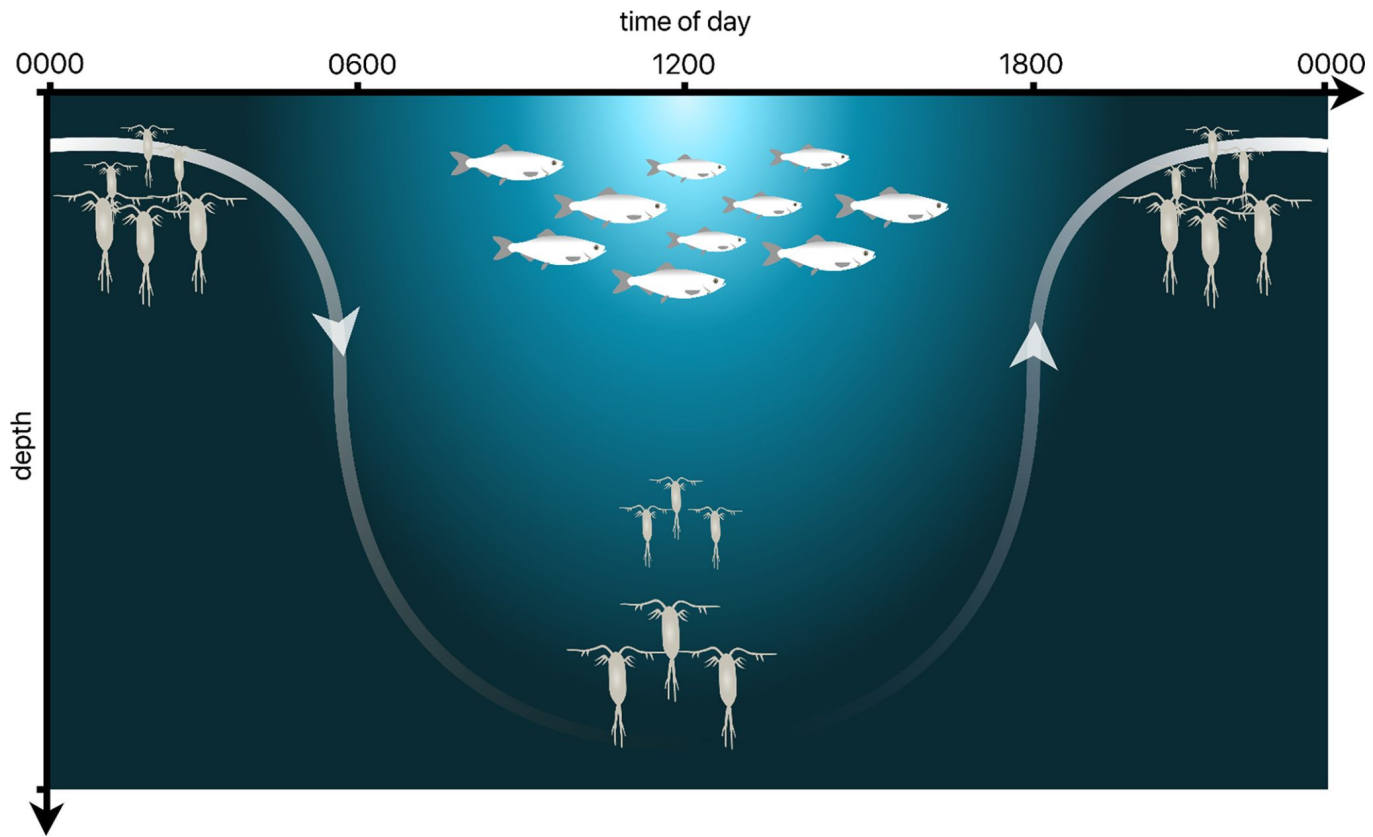
A growing (& glowing) concern

Image on Falls River Cove by Misha Semenov-Leiva



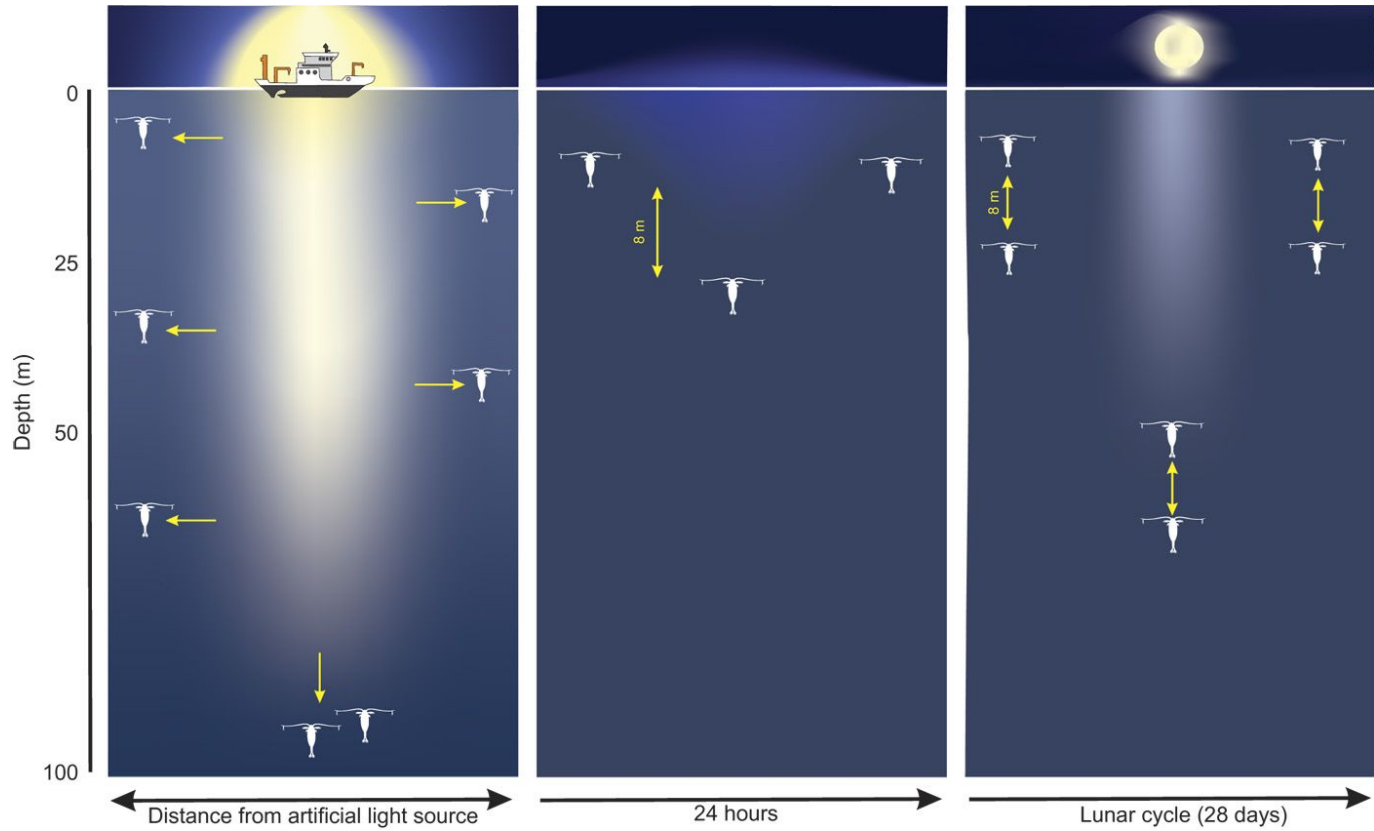
A growing concern

Skyglow map from <https://www.lightpollutionmap.info/>



Effect on animals: Diel Migration

Image from Wiley Online Library



Effect on animals: Diel Migration

Image from Science Magazine

Three species of tadpoles and a tadpole predator were exposed to artificial light at night (ALAN)



Wood Frog
(*Rana sylvatica*)



Spring Peeper
(*Pseudacris crucifer*)



American Toad
(*Anaxyrus americanus*)



Eastern Newt
(*Notophthalmus viridescens*)

Individual Effects

When exposed to ALAN:



Spring peepers were darker



Wood frogs were smaller



Newts collected early in the spring were larger

Tadpole artwork by Ben McLaughlin
www.theartisticsscintist.com



Effect on animals: Amphibian cycles

Image from Environmental Pollution Magazine & Purdue.edu

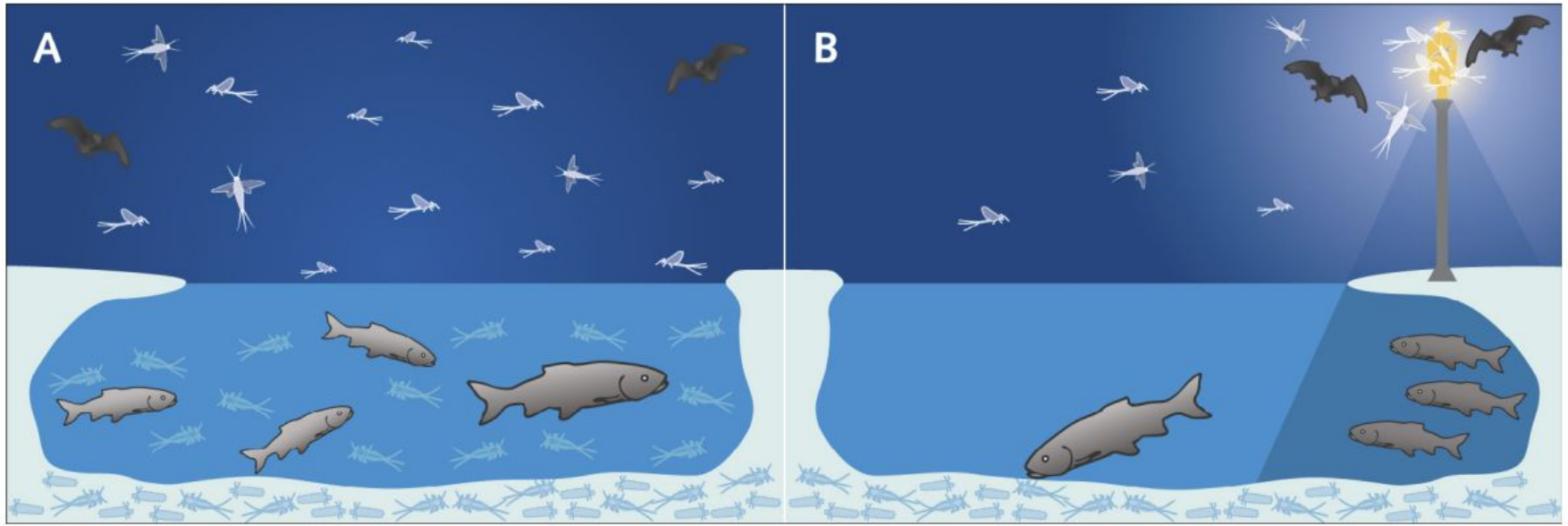
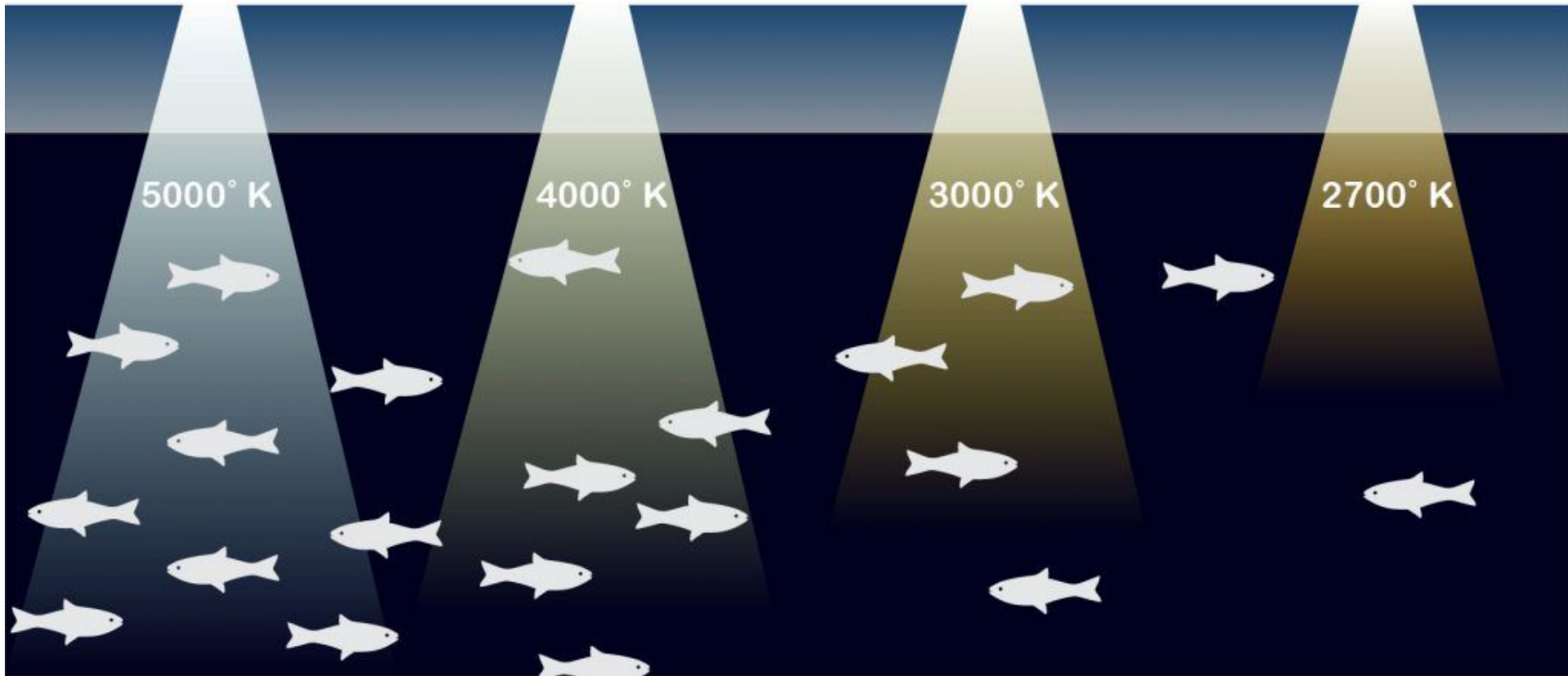


Fig. 4. A schematic of a stream ecosystem under natural nighttime conditions (A), and the same system under the influence of artificial light (B). Note the predicted shifts as light is introduced from A to B in the positions of small fishes seeking cover, suppression of streaminvertebrate drift, adult insects attracted to lights, and bats shifting their foraging efforts near the lights. Refer to *Ecosystem functioning: Food webs* in the text for details.

Effect on animals: aquatic ecosystem

Image from Perkin et al. in *Ecosphere*

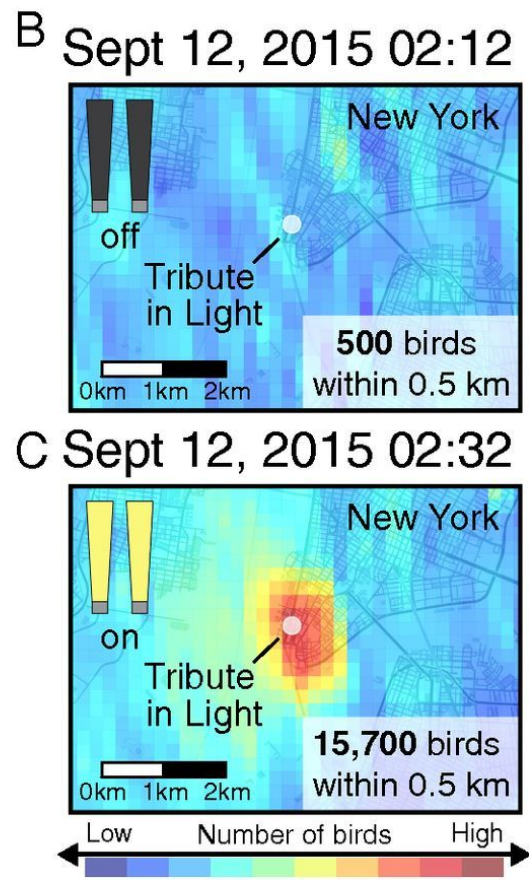
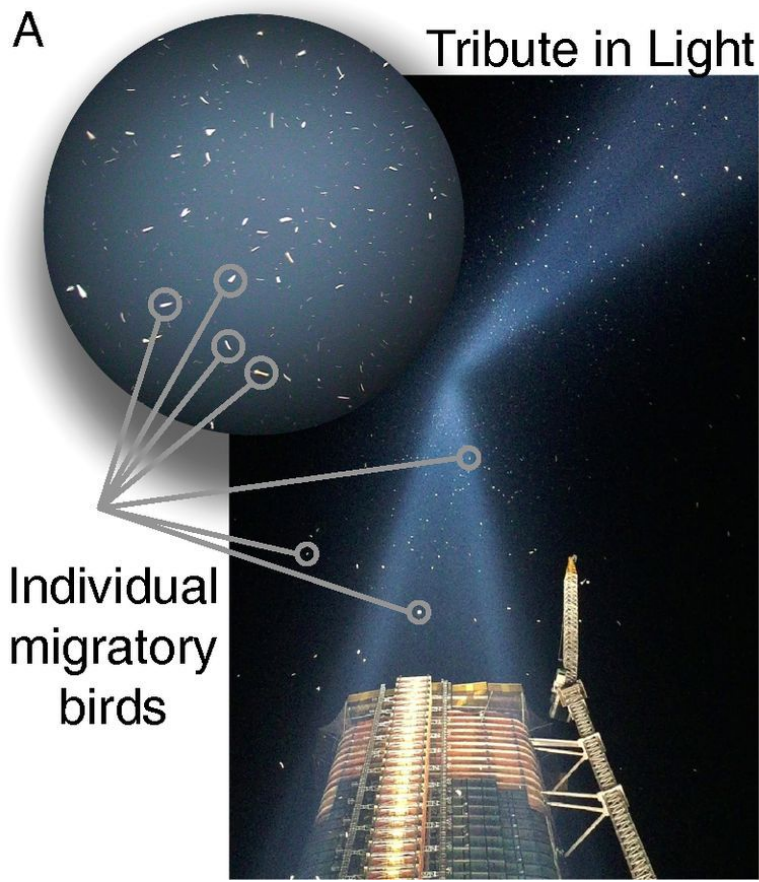


Effect on animals



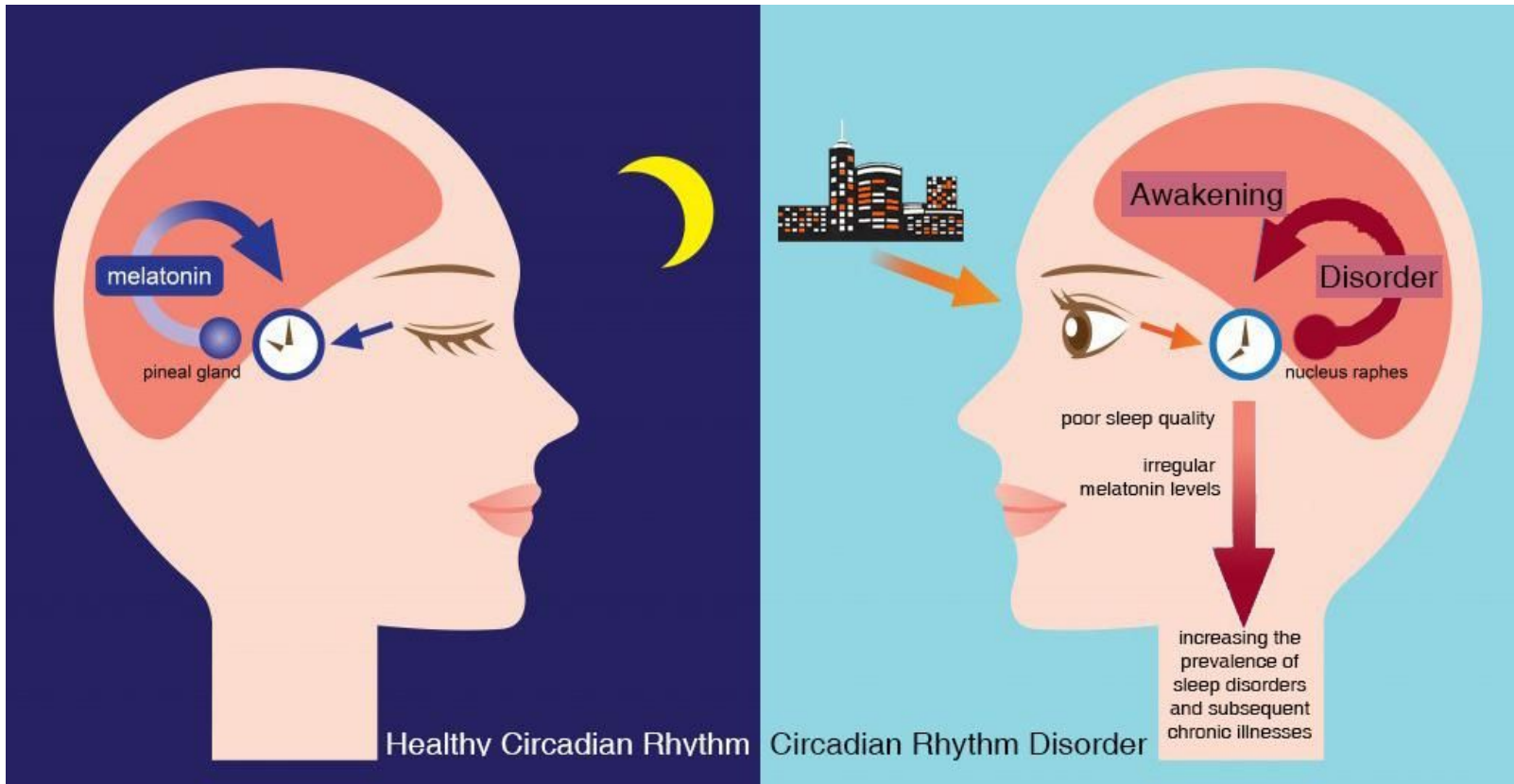
Effect on animals

Image from The Scientist



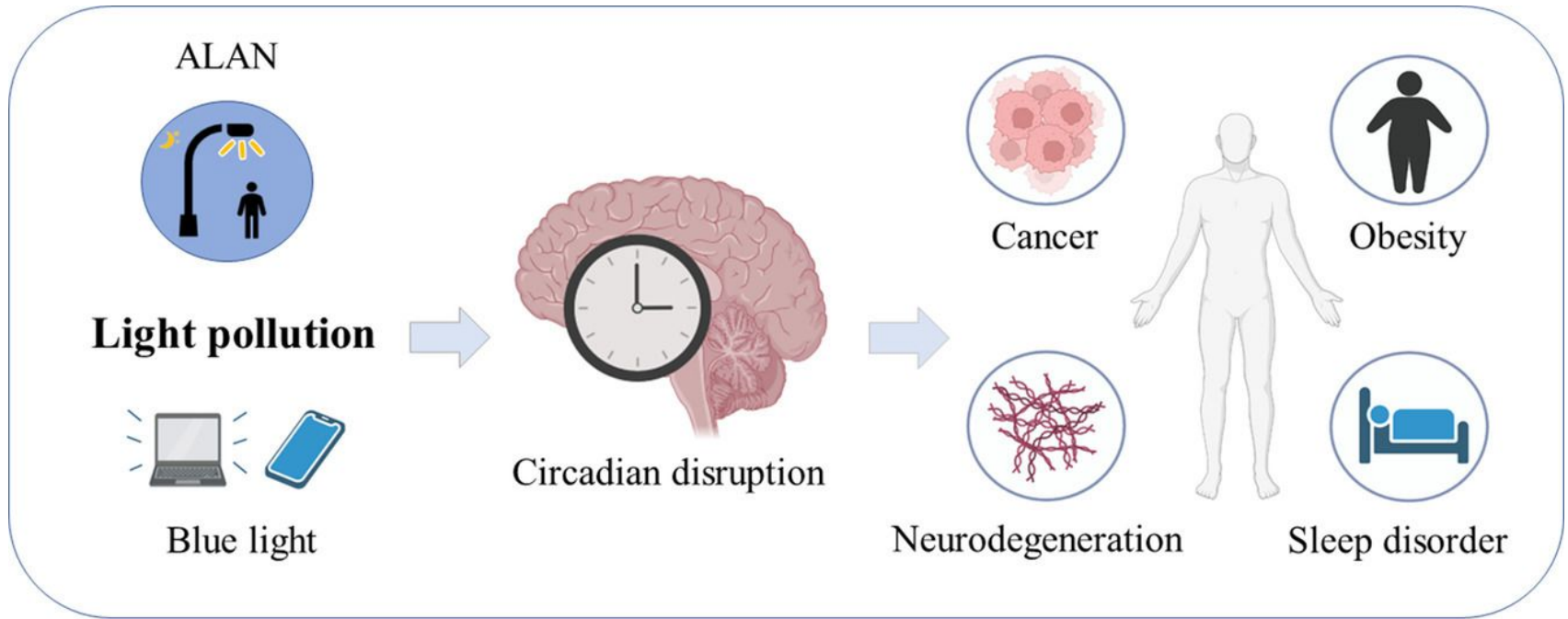
Effect on animals

Image from Birdcast & New York Times



Effect on humans

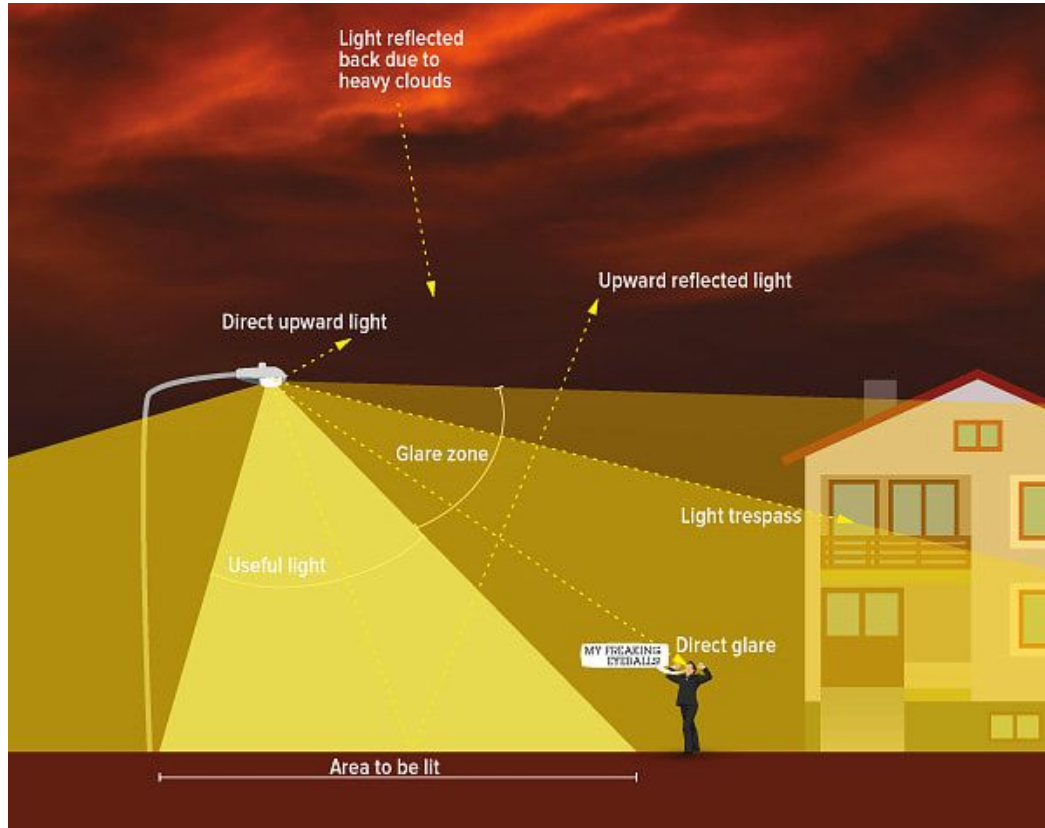
Image from Harvard University



Implications for light pollution regulations

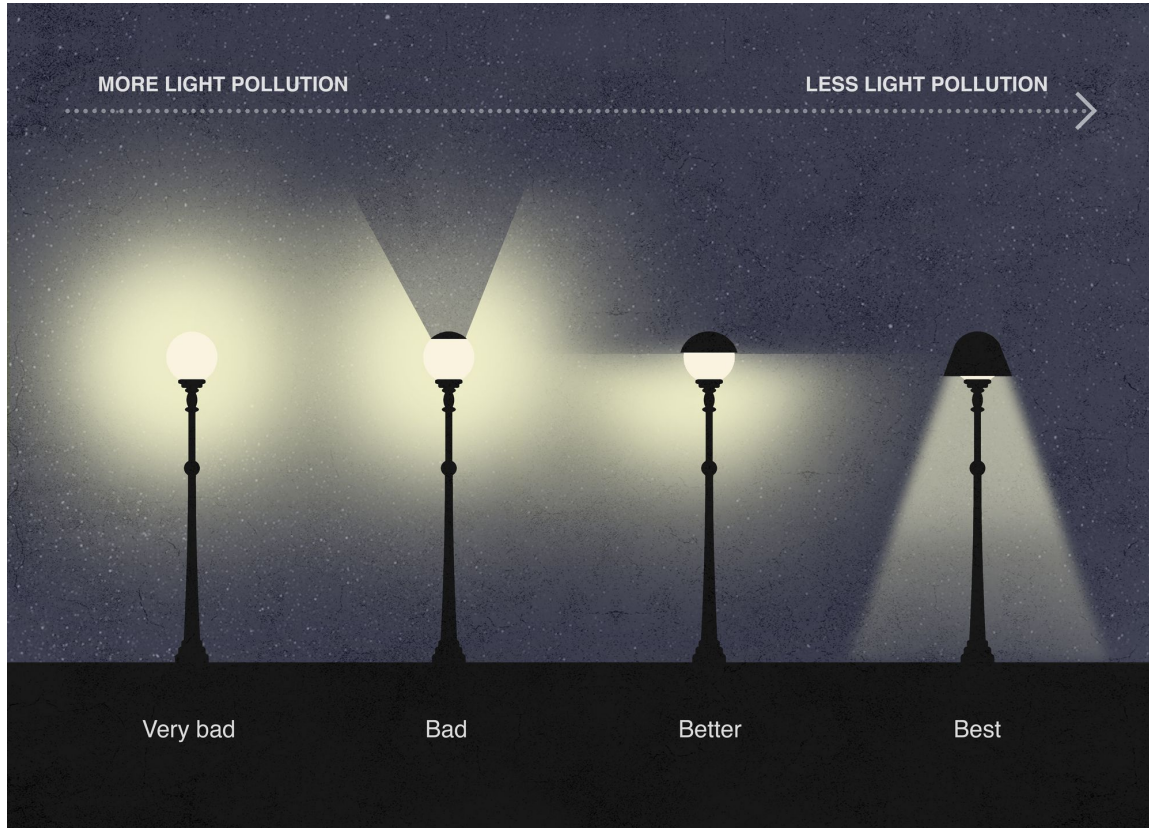
Effect on humans

Image from Cao, Xu, & Yin in Journal of Environmental Sciences



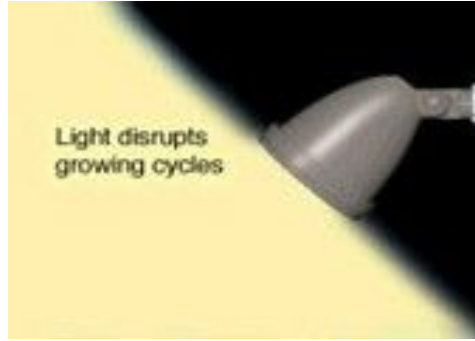
What needs to be lit vs what gets lit

Image from International Dark-Sky Association



A Simple Fix: Full Shielding for all lights (BUG rating)

Image from ArchDaily

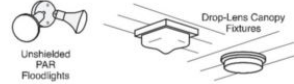
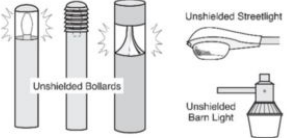
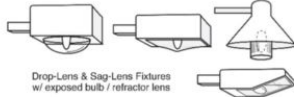


A Simple Fix: Full Shielding for all lights (BUG rating)

Slide from Phil Inderwiesen, IES

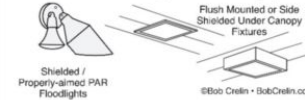
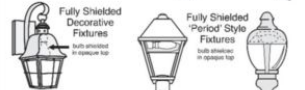
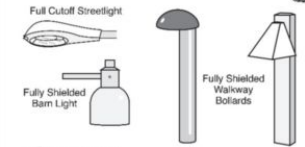
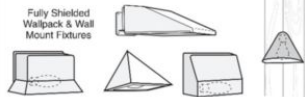
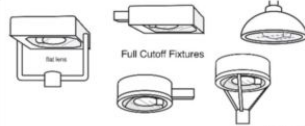
Unacceptable/Not Compliant

Fixtures that produce glare and light trespass



Acceptable/Compliant

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



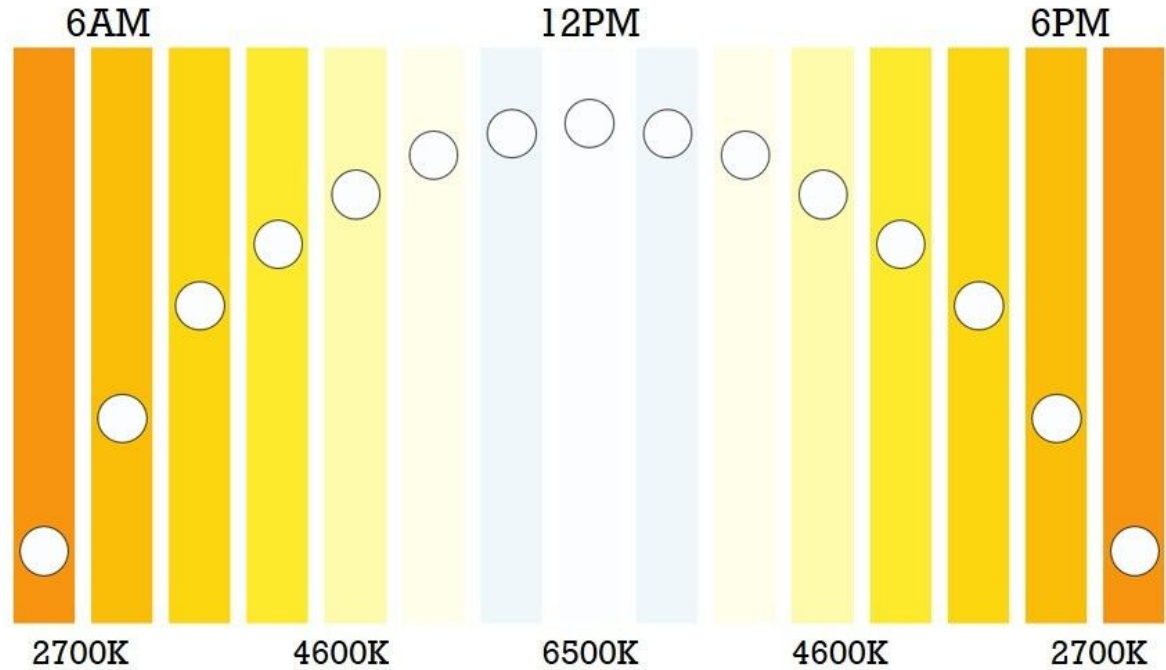
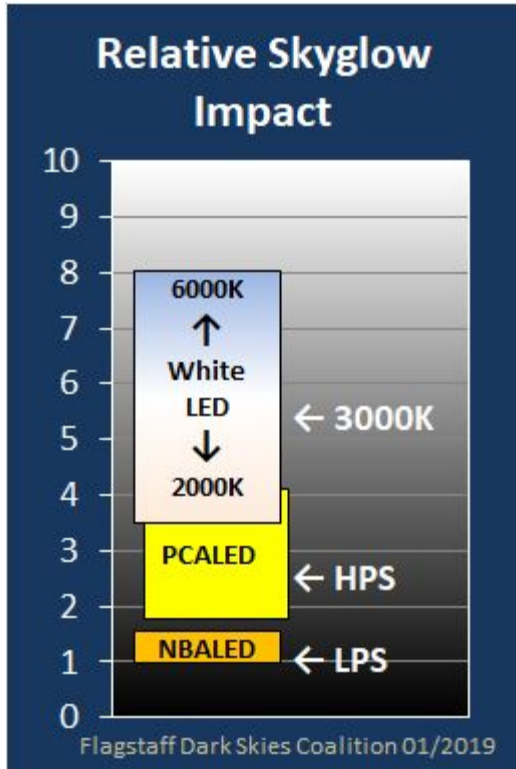
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The Naughty List & The Nice List of Lights

Image from International Dark-Sky Association



One Example: An Easy Switch



Another Easy Goal: Keep the Light Temperature <2700K

Image from Flagstaff Dark Skies Coalition

Lighting Facts Per Bulb

Brightness **820 lumens**

Estimated Yearly Energy Cost \$7.23

Based on 3 hrs/day, 11¢/kWh

Cost depends on rates and use

Life

Based on 3 hrs/day

1.4 years

Light Appearance

Warm

Cool

2700 K



Energy Used

60 watts

Know your lighting facts!

ONE

MINIMIZE THE AMOUNT OF ILLUMINATION

- Don't use more lighting fixtures around your home than necessary
- Use lower lamp wattage



THREE

MINIMIZE THE DURATION OF ILLUMINATION

- Install switches, timers and dimmers to turn off (or down) lights when not in use



TWO

MINIMIZE THE AREA OF ILLUMINATION

- Shine light only where it's needed
- Aim fixtures downward so no light is directed up or to the sides
- Ensure that little or no unwanted light falls onto adjacent properties



FOUR

USE LONG-WAVELENGTH LIGHTS

- Use bulbs with "warm" color temperatures below 3000K



What can You do?

Image from International Dark-Sky Association

Lighting, Crime and Safety



There is no clear scientific evidence that increased outdoor lighting deters crimes. It may make us feel safer, but has not been shown to make us safer.

A [2015 study published in the Journal of Epidemiology and Community Health](#) found that streetlights don't prevent accidents or crime, but do cost a lot of money. The researchers looked at data on road traffic collisions and crime in 62 local authorities in England and Wales and found that lighting had no effect, whether authorities had turned them off completely, dimmed them, turned them off at certain hours, or substituted low-power LED lamps.

What about safety?

Image from International Dark-Sky Association

Sports Facilities Can Be Fully Shielded

Unshielded Sports Stadium Lighting



Shielded Sports Stadium Lighting


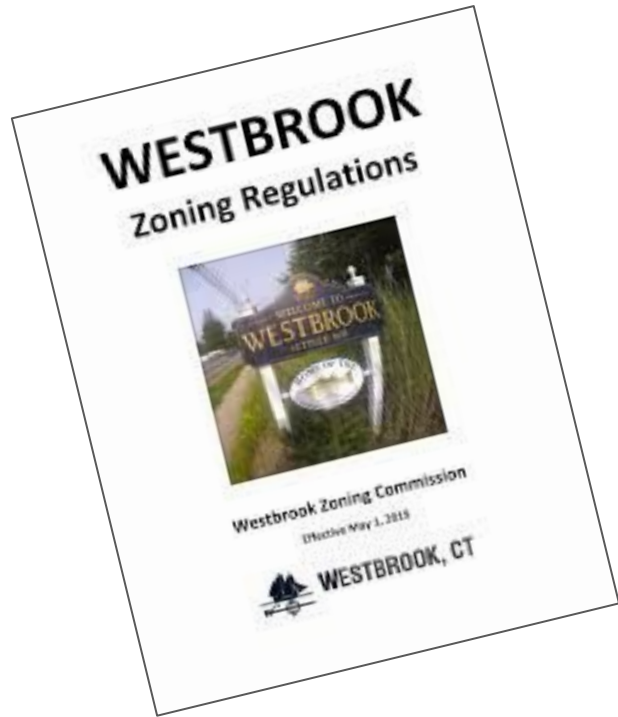


What about sports?




Fully Shielded Tennis Facility

Slide from Phil Inderwiesen, IES



illuminating
ENGINEERING SOCIETY



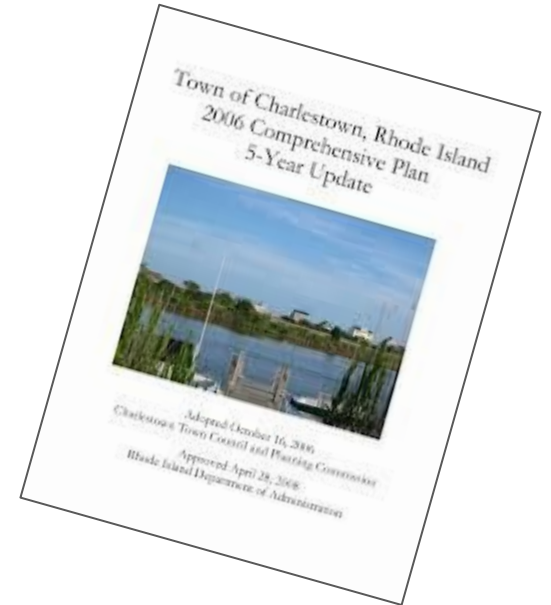
ida
INTERNATIONAL
D A R K - S K Y
ASSOCIATION

JOINT IDA - IES

**MODEL
LIGHTING
ORDINANCE
(MLO)**

with USER'S GUIDE

June 15, 2011



Can this be regulated?

Table G - Residential Lighting Limits

Lighting Application	LZ 0	LZ 1	LZ 2	LZ 3
Row 1 Maximum Allowed Luminaire Lumens* for Unshielded Luminaires at one entry only	Not allowed	420 lumens	630 lumens	630 lumens
Row 2 Maximum Allowed Luminaire Lumens* for each Fully Shielded Luminaire	630 lumens	1,260 lumens	1,260 lumens	1,260 lumens
Row 3 Maximum Allowed Luminaire Lumens* for each Unshielded Luminaire excluding main entry	Not allowed	315 lumens	315 lumens	315 lumens
Row 4 Maximum Allowed Luminaire Lumens* for each Landscape Lighting	Not allowed	Not allowed	1,050 lumens	2,100 lumens

IDA model code: Maximum Lumen Limits

Image from International Dark-sky Association

LIGHT POLLUTION. For the purposes of Section 101, Gateway Conservation District, excessive, misdirected, or obtrusive light from artificial sources emanating from a site shone into the sky, onto the land or into the water column of the Connecticut River and its tributaries, including but not limited to site and architectural lighting, lighting on private residential docks, and up-lighting of trees or other site features, which may result in: brightening of the night sky, inhibiting the observation of stars and planets; light trespass onto neighboring properties including the Connecticut River; visual glare and discomfort; or significant disruptions to wildlife and ecological cycles.

“Within the Gateway Conservation Zone, lighting of properties, including site lighting and the illumination of building facades and other architectural features, shall be the minimum necessary for health and safety. The purpose of this standard is to minimize the amount of artificial lighting emanating from Conservation Zone properties in a way that may contribute to excessive environmental lighting that may adversely impact wildlife and contribute to light pollution.”

Proposed Gateway Site Plan Review Criteria

Site Lighter Pro

43 Watt LED

Replace the Fixture
Not the Pole



NEW

Low Cost Option
LOWER MOUNTING HEIGHTS

PLM43LED

Design is Protected by US Patent D772,474



LUMEN: 5,334

WATTS: 43

LUMENS PER WATT: 133

CRI: 82

CC: 4500K

DIMMING: 0-10V

Ordering Information

CATALOG#	DESCRIPTION	VOLTS
PLM43LED	43W LED Low Wattage Site Lighting Solution	120-277

Options

ADD SUFFIX#	DESCRIPTION
PC	120 V Photocontrol
PM	208-277V Photocontrol

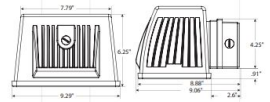
Performance

- Eliminates Glare & Offensive Light
- Less Wasted Light
- More Footcandles on the Ground
- Labor Saving: Quick and Secure Mounting

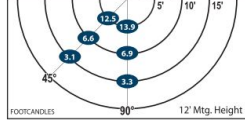
Dimensions & Specifications

Overall Height: 6.25"
Overall Width: 9.29"

Depth: 9.06"
Weight: 10 lbs.



Recommended Mounting Height - 12-14 ft.



FOOTCANDLES ON THE GROUND						
Mtg. Hgt.	90°	15°	5°	10°	15°	Avg FCs 400 sq. ft.
12'	13.9	6.9	3.3	12.5	6.6	3.1
14'	10.6	6.3	3.3	9.8	5.9	3.2
						6.5



- Arco 40 Post Lights
- Corvus Spotlights
- Deimos Wall Lights
- Astrum Recessed Lights
- Cylon Spotlight
- Transformer
- Cable Divider - 3 Way
- 5m Extension Cable

Arco 40 Post Lights

Corvus Spotlights

Deimos Wall Lights

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Cylon Spotlight

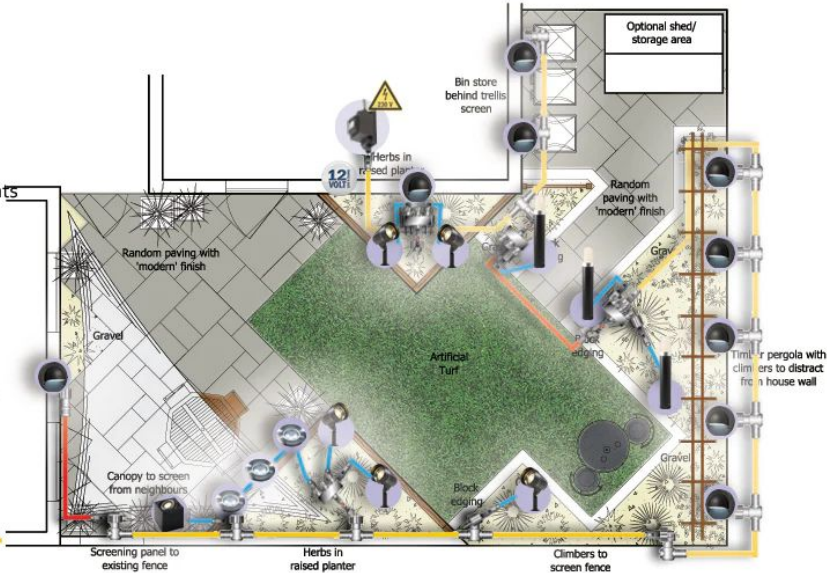
Transformer

Cable Divider - 3 Way

5m Extension Cable

15m Cable with 6 connectors

10m Cable with 4 connectors



Approval process: checklists based on cutsheets + site plans

Image from 12V Garden lights

Three Avenues for Implementation:

EDUCATION: Gateway Commission begins an education campaign, sending information to local towns and organizations, collaborating with Sustainable CT

GATEWAY STANDARDS: all 8 towns adopt definition of “light pollution” and light pollution guidance into Gateway-specific site plan review through the usual Gateway Standards adoption process.

TOWN ORDINANCE: towns that are interested in going further use the Commission’s Model Lighting Ordinance as a guide to adopt lighting regulations into their general zoning regulations. Scale of applicability (including retroactive regulation & renovations) is up to the towns.