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An Amphibious Attraction: The Effects of Artificial Light on Frog and Salamander Behavior

Back home, I fall asleep to a chorus of croaking. Summer nights are spent listening to the songs of crickets and frogs. The sounds are always relaxing and lulled me off to sleep. Perhaps that is why it was always so sad to find frogs squished inside our windows.

I had always assumed frogs were attracted to these deadly places for the easy meal they promised. Moths, flies, and mosquitos were drawn to the lamps positioned perfectly in front of the living room windows. After attending college for a few years, I began to notice a similar pattern. This time the frogs were drawn to street lamps rather than illuminated windows. Insects were still flocked to these light sources, but most of the frogs and toads I saw couldn't reach them. Instead, the amphibians stayed on the ground while the bugs buzzed around the LED bulbs. This made me wonder, if the frogs weren't eating insects, why were they still attracted to these artificial light sources, and how were they being affected?

LED Lights

LED's are perhaps the most efficient light sources humans have ever created. LED bulbs last longer, use less energy, and produce more light than their incandescent bulb predecessors. However, this may not be a good thing. According to wildlife.org, it's no secret that, "LED lights are rapidly replacing other lighting sources for outdoor lighting around the world" (Koblinski). LEDs produce more blue light, light of a higher and potentially more dangerous frequency. Much scientific evidence suggests "artificial light at night has negative and deadly effects on

many creatures including amphibians, birds, mammals, insects and plants” (“Light Pollution Effects on Wildlife and Wilderness). As humans, we are surrounded by artificial blue light. It’s all around us from street lights to computer and phone screens. We use artificial lights to keep our cities lit and our streets safe, but not many people realize the effect these lights have on us and other living creatures.

	LED Bulbs	Incandescent Bulbs
Lifespan	~50000 hours	~1200 hours
Luminous efficacy	~81 lm/w	~13.5 lm/w
Watts of used per hour	~10 watts	~60 watts

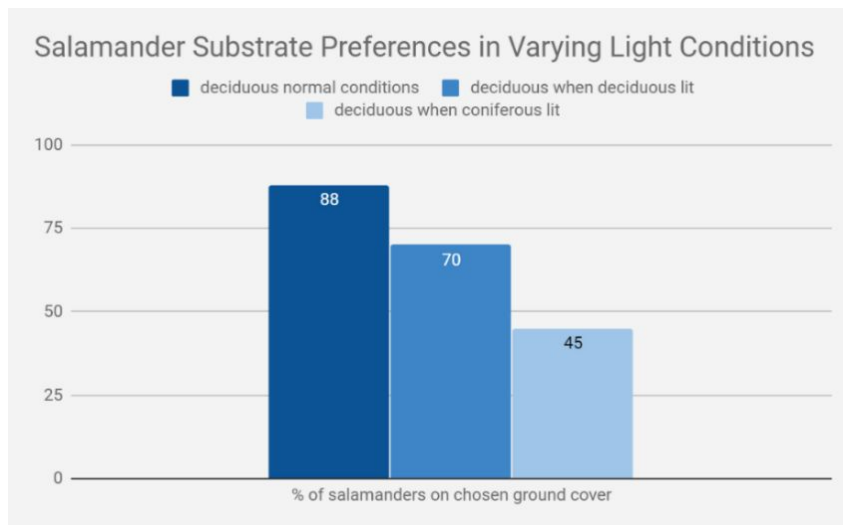
[Figure A. This graph compares LED and Incandescent bulbs in terms of longevity, brightness, and energy efficiency. (data collected from Lighting EVER, chart by Kari Peterson.)]

Impact on Amphibians

Because of the increased use of LED lights, scientists have begun conducting studies to determine how lights impact wildlife including amphibians. Frogs and other amphibians are already recognized as indicator species for chemical pollution and climate change, but as it turns out, they may be an indicator for light pollution as well.

One study published in *Animal Behavior* determined that light causes the vision of frogs to be “temporarily impaired and [...] less able to detect and subsequently consume prey” (Buchanan, 10). In this lab experiment, the foraging behavior of grey tree frogs was observed under different light conditions. As light intensity increased, the frogs’ ability to catch and consume prey decreased considerably. Another study published in the journal of *Herpetological Conservation and Biology* demonstrated how varying light levels could affect the type of ground cover salamanders preferred (Feuka et al). In this study scientists placed recently metamorphosed

salamanders along a transect with deciduous ground cover on one side and coniferous cover on the other. The salamanders were able to move freely from one side to the other. During the first trial, neither side was lit. During the following trials, either the coniferous or deciduous side was lit.



[Figure 2. This chart shows the substrate preference of spotted salamanders under different light conditions. Under normal conditions, 88% of the salamanders preferred deciduous ground cover over coniferous ground cover. This changed to 70% when the deciduous substrate was

illuminated, and only 45% when coniferous substrate was illuminated. (data from Feuka et al, graph by Kari Peterson)]

This study discovered that salamanders were less likely to chose deciduous ground cover when it was illuminated, but more likely to choose coniferous ground cover when that substrate was illuminated. This shift in behavior may cause young salamanders to choose drier habitats over moister habitats they currently occupy. This may cause them to dry out and die or be exposed to more predators.

What Can We Do?

Not everyone is a scientist, but there are still actions we can take to help save frogs and other animals from the effects of light pollution. Darksky.org recommends using 3000K or lower LED lights (“LED: Why 3000K or Less”). This is a lower powered light that isn’t as disruptive as brighter LEDs. The same organization recommends using fewer lights outdoors and ensuring all such lights are shielded so the light is focused on where it needs to be, rather than scattering

light in all directions. Other sources recommend turning outdoor lights off for a short period after sun set to limit the number of amphibians drawn to homes because of our lights (Henke).

References

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