

## **Presentation for the Conservation Commission Missouri Department of Conservation**

By Robert Wagner - November 3, 2006

In 1879 the invention of the light bulb ushered in a new era to our cities and towns. Expensive and hazardous gas lighting could now be replaced with electrical lights to aid the nighttime traveler. Now, over 125 years later, we find ourselves with lights 10-600 times brighter than gas lighting and an over abundance of light shining into the night sky. Scientists for the National Park Service have estimated that as we approach the light bulb's 150<sup>th</sup> birthday, we have left ourselves with almost no dark skies remaining in the lower 48 states. The first slide is a satellite image of Missouri at night provided by NOAA. Both Kansas City and St. Louis have more light pollution per square kilometer than Long Island, NY; Washington, D.C., Boston, MA; Mexico City, Mexico; and London, England. Nearly 70% of Americans live where they cannot see the Milky Way.

In turning the page we see a summary of the night sky brightness due to light pollution. This has actual measurements from the 50's, 70's and 1997. Using this information, scientists have been able to calculate the United States has an average yearly growth rate of 5%-10%. Looking forward to 2025, we clearly see Missouri has lost the last of its dark skies that existed in 1997.

The next page is a closer look at the 1997 image, with a county overlay. This satellite image is nearly 10 years old. I would be curious to see how a map of our state's endangered species populations would overlay on this light pollution map. I am sure with a roadmap; you will be able to clearly identify our larger cities and towns.

Continuing on, we ask the question: So what possible problems can arise from a little excess light at night? Since the first plants and animals appeared on our planet, we have had sunlit days followed by dark nights. With the proliferation of nighttime light, we are finding that many forms of life, including humans, are negatively affected by the lack of darkness at night. Humans exposed to light at night have a reduced ability to produce Melatonin, a cancer-fighting chemical naturally occurring in the body; increased stress levels; changes to our circadian rhythm; and decreased safety from glare. Plants and animals have a variety of problems

including reduced germination rates, reduced reproduction rates, and confusion when faced with artificial light. Many birds that rely upon the stars to migrate at night are finding themselves at the peril of lighted towers. A good example of this occurred in January 1998 in Southwestern Kansas. 5,000-10,000 Lapland Longspurs were found dead in the vicinity of a 420-ft illuminated tower. This is one example of many occurring daily in our state. It is estimated that 1.2 million birds die annually in the United States crashing into towers. A 2003 National Geographic article mentions over 450 bird species that migrate at night across North America are susceptible to collisions with night-lit towers, including threatened or endangered species like the Cerulean Warbler and Henslow's Sparrow. There are few studies on the effect of light pollution on mammals, although all 986 species of bats, most smaller carnivores and rodents, 20 percent of primates, and 80 percent of marsupials are nocturnal. The International Dark-Sky Association and the book “**Ecological Consequences of Artificial Night Lighting**” detail many of the existing studies.

The next slide is a copy of the front cover of the January 2006, Missouri Species and Communities of Conservation Concern Checklist published by the Missouri Department of Conservation. This shows an Indiana Bat chasing a moth under the moonlight. I am not sure if Mark knows the notoriety his illustration has taken. This is the environment we are striving to save from extinction. Small changes like adding site light pollution notes to this checklist might prove helpful to researchers.

I would like to pass around my copy of the “**Ecological Consequences of Artificial Night Lighting**”. I have marked the conclusion of the chapter on bats. The chapter has an interesting discussion about the bat and its struggle to survive in an environment where everything from its food sources to predators that hunt bats are affected by light pollution.

Continuing on, we take a brief look at how light pollution can impact hunter safety. Our eyes have to adapt to the brightest light in our field of vision. When faced with low light conditions while hunting, glare from distant light will reduce our night vision and increase our chance for game misidentification. When walking in the darkness to or from a hunting stand, hunters can be blinded by glare and run the risk of tripping over unseen hazards. Combine this with a loaded

weapon and you have a deadly combination. I am sure many hunters can relate to walking toward a bright house light and having to shield their eyes to keep from being blinded.

In looking around at other states and federal agencies, we see that many of them provide recommendations or restrictions aimed at reducing light pollution. This list includes the National Park Service, US Fish & Wildlife Service, NASA, EPA, Forest Service, Department of Energy, FAA, US Coast Guard, LEED Standards, US Geological Survey and many state laws like the New Mexico Night Sky Protection Act. The International Dark-Sky Association details many of these at it's website [www.darksky.org](http://www.darksky.org).

Moving on to the last slide. Addressing light pollution is about providing good lighting as opposed to bad lighting. 30% of the average light fixture directs light into the sky where it is completely wasted. Implementing good lighting is not about turning off all lights, but providing light where it is needed and at the levels appropriate to perform the task.

An example of the difference between good and bad lighting might go like this. Suppose we went to see a theater production or play and the director wanted to light up a character on the stage. There are a couple of different ways they could do it. The director might have a spotlight shinning on the character or they could turn all of the theater light up really bright. Although the same amount of light might shine on the character, one method has far less negative impact upon the audience. If everyone installed exterior lights while keeping the "audience" in mind, our light pollution impact would look like the 1950s pollution summary on the second slide.

This is a statewide problem that desperately needs public education. The department's website and magazine – Missouri Conservationist are excellent tools seen by thousands of Missourians. The only current mention about light pollution on the department's website is an article in the Missouri Conservationist from 2001. This article says trees will help provide protection against light pollution. I am not sure what the author was trying to say, but it underscores the need for education.

Many of our cities like Columbia are working toward adopting exterior lighting ordinances to try and control light pollution. The National Park Service has documented light pollution from Las Vegas affects the night skies of several parks, some 200 miles away. Look at the number of states, cities, towns and counties that exist within 200 miles of Columbia. With this in mind, in July I requested the Governor issue an Executive Order asking all state agencies to address light pollution in future lighting designs, renovations and ensuring our public funds are not spent on more bad lighting.

I understand your limited authority to act upon this today. It is my hope that after you have had a chance for your researchers to review this information:

- 1) You will have a basic understanding of this problem and will seek to provide education to your organization and allow them to identify the risks to Missouri's wildlife and environment
- 2) You will develop an internal policy to address light pollution in all future lighting installations
- 3) You will take a position similar to the National Park Service. They have determined their existing responsibility to protect the natural landscape also includes the night time sky
- 4) We work together to educate our state and it's leaders so perhaps one day we can adopt a state law encouraging good lighting.

As a side note, I have heard many astronomers in our state looking for unlighted areas supervised by the Missouri Department of Conservation where they could meet and view the stars especially during celestial events such as meteor showers. I believe advertising and providing a liaison for this specific purpose would create a win-win situation for the department.

In conclusion and to start the educational process, we would like to present the children's book "**There Once Was A Sky Full Of Stars**" to the Missouri Department of Conservation's Burr Oak Woods Conservation Nature Center.

Thanks you for your time!