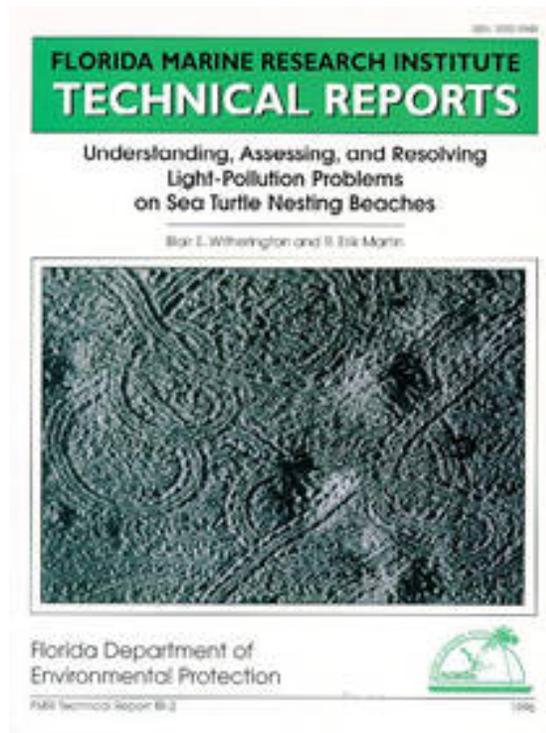




Artificial Lighting and Sea Turtle Hatchling Behavior

Artificial lighting on marine turtle nesting beaches disrupts the ability of hatchlings to find the sea from their nest, an effect termed "hatchling disorientation."

Disorientation from artificial lighting causes thousands of hatchling deaths each year in Florida and is a significant marine turtle conservation problem. Long-term monitoring of this threat involves an annual statewide effort to gather information from disorientation reports, to use this information in facilitating light management on nesting beaches and to research into additional remedies for the threats caused by lighting.



In a technical report written by FWRI scientist Blair E. Witherington and R. Erik Martin of Ecological Associates Inc., the problem is looked at in depth. The report, "Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches," also includes diagrams of common lighting fixtures and mounting positions as well as a model lighting ordinance for marine turtle protection. The following questions and responses are from Appendix J. The complete report can be downloaded in PDF form at the bottom of the page.

COMMONLY ASKED QUESTIONS

When do hatchling sea turtles emerge from their nests?

The first hatchlings of the season emerge from nests approximately eight weeks after the first nesting of the season, and this activity continues for up to eight weeks after the final nesting of the season. Outside the tropics, hatchlings generally emerge throughout the summer and early fall. In the southeastern USA, hatchlings emerge throughout the months of June, July, August, September, and October. It is a myth that hatchlings emerge only around the time of the full moon. Hatchlings ready to emerge wait just beneath the sand surface until conditions become cool. This temperature cue prompts them to emerge primarily at night, although some late-afternoon and early-morning emergences have been documented.

How do hatchling sea turtles know where the ocean is when they emerge from their nests?

Sea turtle hatchlings have an inborn tendency to move in the brightest direction. On a natural beach, the brightest direction is most often the open view of the night sky over, and reflected by, the ocean. Hatchlings also tend to move away from darkly silhouetted objects associated with the dune profile and vegetation. This sea-finding behavior can take place during any phase and position of the moon, which indicates that hatchlings do not depend on lunar light to lead them seaward.



Why do artificial light sources attract hatchling sea turtles?

Hatchlings that crawl toward artificial light sources are following the same instinctive response that leads them seaward on naturally lighted beaches. The apparent brightness and glare of artificial lighting is what often leads hatchlings astray. To a hatchling on a beach, an artificial light source appears bright because it is relatively close by, yet it is not intense enough to brighten the sky and landscape. The resulting glare makes the direction of the artificial source appear overwhelmingly bright—so much brighter than the other directions that hatchlings will ignore other visual cues and move toward the artificial light no matter where it is relative to the sea.



There are other lights near my beachfront property that are visible from the beach. Why should I modify my lights?

Any reduction in the amount of artificial light reaching the nesting beach helps sea turtles. As lighting is reduced, hatchlings emerging on moonlit nights and at locations far from the lighted property will have a better chance of finding the sea.

Can hatchlings be protected by increasing the number of lights on a nesting beach in order to prevent turtles from nesting?

Although artificial lighting tends to deter sea turtles from nesting, many do nest on lighted beaches. Apparently, the level of artificial lighting necessary to misdirect hatchlings is well below the level necessary to deter nesting. But even if beaches were lighted to the extent that no nesting occurred, hatchlings on adjacent beaches would be harmed. Regardless, chasing sea turtles away from nesting beaches means that important habitat is lost to them; therefore, it is not a beneficial conservation strategy.

How bright can a light be without affecting hatchlings or adult sea turtles on the beach?

Unfortunately, no simple measure of light intensity can reveal whether a light source will be a problem. The effects of artificial lighting on sea turtles may actually increase as ambient light-levels decrease on darker, moonless nights. Because any visible light from an artificial source can cause problems, the most reliable “instruments” to use when making judgments about problem lighting may be the eyes of a human observer on the nesting beach. Any light source producing light that is visible from the beach is likely to cause problems for nesting sea turtles and their hatchlings.

What should be done with misdirected hatchlings found on the beach?

Hatchling sea turtles found wandering away from the ocean should be taken to a darkened portion of beach and allowed to walk into the surf on their own. Those that do not crawl vigorously can be placed in the water and allowed to swim away. In all cases, local natural resource or environmental protection agencies should be notified. (Call 1-888-404-FWCC)



Whom should I notify about a light that is visible from a sea turtle nesting beach?

The owner or resident of the property where the light source is located should be contacted. In most cases, people are simply unaware rather than uncaring. Local government conservation agencies should also be notified. A growing number of coastal communities have adopted ordinances that prohibit lighting on the beach during the nesting season. Code enforcement offices often oversee the enforcement of these ordinances. If there is inadequate regulation of beach lighting in your area or if lighting problems persist, private conservation organizations may be able to help. Consult Appendix I for a list of governmental and non-governmental conservation organizations.

I do not have the ability to turn off a problem light that is located on my property. What can be done?

Luminaires that do not have convenient on-off switches are most often controlled by the utility company. Property owners should contact the entity to whom electricity bills are paid or to whom lighting lease payments are made.

Will lighting on a pier affect sea turtles on the adjacent beach?

Yes. Lighting on piers is very difficult to shield from the beach. Hatchlings on adjacent stretches of beach may crawl for great distances in the direction of the lighted pier. Hatchlings that enter the water near the pier may linger in the glow beneath the lighted structure and fall prey to fish, also attracted to the light, rather than disperse offshore.

Will placing bright lights on platforms offshore guide hatchlings into the water off lighted beaches?

Apart from being an overly expensive and complicated solution, lighting the ocean to draw hatchlings offshore would probably create additional problems. Lighting on the water can interfere with hatchling dispersal and increase mortality from fish predation.



There is not enough sea turtle nesting on this beach to justify beach-darkening efforts. Why is light-management legislation needed?

Beaches where small numbers of turtles nest can be very important. The entire nesting range of a population may be made up of sparsely nested beaches. Hawksbill turtles, for instance, one of the most endangered sea turtles, do not nest in great numbers anywhere. Moreover, any group of nesting turtles may constitute a genetically unique and vulnerable unit. Losing even small populations may mean the permanent loss of diversity. The irony in disregarding lighting problems at sparsely nested

beaches is that artificial lighting may have caused the nesting to be so low. Many lighted beaches with little

nesting may again attract more nesting turtles once they are darkened.

Crime will increase if the beach is not lighted.

Generally, beaches are not areas where there is a great need for crime prevention. Very little valuable property is stored on beaches and there is seldom much nighttime human activity to require security. Fortunately, areas adjacent to nesting beaches where people reside, work, recreate, and store valuables can be lighted for protection without affecting turtles on the nesting beach. Where this type of light management was legislated in Florida coastal communities, the Florida State Attorney's Office has found no subsequent increase in crime.

Implementing a beach-darkening program will be prohibitively expensive.

Darkening nesting beaches for sea turtles is one of the least expensive ways we can benefit the environment. The simplest solution to the problem—turning off lights visible from the beach during the nesting season—costs little or nothing and may actually save money in electricity costs. Most of the essential lighting that remains can easily be shielded so that the light performs its intended function without reaching the beach. Proper shields can be fashioned from inexpensive metal flashing and fastened with screws. Replacing fixtures is more expensive but is necessary only when an owner decides that greater lighting efficiency or aesthetics are a concern. Choosing well-designed fixtures and incorporating light-management techniques into the plans for coastal development are the most effective ways to fulfill lighting needs while protecting sea turtles.

There are too many disadvantages to using low-pressure sodium-vapor lighting to protect sea turtles.

As is true for any light source, there are both advantages and disadvantages to using low-pressure sodium-vapor (LPS) lighting. The following is a list of issues specific to LPS.

- Expense—The initial costs of LPS are substantially higher than for incandescent and fluorescent sources but are only slightly higher than costs for high-intensity discharge lighting (e.g., HPS). Operating costs, however, are generally much lower for LPS than for any other commercial source.
- Color—Because LPS sources are monochromatic, they give poor color rendition. For safety and security applications, however, full-spectrum color is seldom needed. At U.S. Air Force installations near nesting beaches in Florida (areas certain to have rigorous security requirements), most outside security areas are lighted by LPS sources.
- Disposal—The lamps within LPS luminaires contain elemental sodium, a substance that can cause fires if not disposed of carefully. However, unlike the mercury-containing high-intensity discharge lamps (e.g., mercury-vapor, high-pressure sodium vapor), the contents of LPS lamps are not toxic.
- Availability—Although LPS luminaires are not as readily available in retail stores as other light sources are, a wide variety of LPS fixtures are available from a number of manufacturers.

Sea turtle nests on our beach are moved to darker areas to protect hatchlings from lighting. Are our lights still a problem?

Yes. Although it may seem that moving nests out of harm's way will solve the problem, doing so only partially solves the problem and may create new ones. In moving nests, nothing is done to prevent lighting from deterring nesting turtles and interfering with their orientation on the beach. Moving nests also has its own negative consequences that stem from the limitations of this technique:

1. In nearly every effort to find nests, some are missed. Hatchlings from missed nests will suffer the effects of beach lighting.
2. Moved clutches of eggs often have poorer hatching rates. Moving eggs kills at least some of them, and often many die, depending upon how skillfully the moving is done.
3. Putting eggs in places other than those chosen by the nesting turtle can be detrimental. A specific nest environment is critical, both for the survivorship of eggs and for the determination of the hatchlings' sex

ratio.

How can the sacrifice of human safety and security to save a few sea turtles be justified? Thankfully, no such choice is necessary. The safety and security of humans can be preserved without jeopardizing sea turtles. The goal of any program to reduce sea turtle harassment and mortality caused by lighting is to manage light so that it performs the necessary function without reaching the nesting beach. Still, some may contend that any inconvenience at all is too much and that the concerns of humans should always outweigh those for turtles. People insistent on this generalization should not ignore the large and resolute constituency that values sea turtles. Sea turtles are valuable to people both ecologically and for pure enjoyment. In many ways, the protection of sea turtles is in our own best interests.

What good are sea turtles?

Measuring the true worth of anything is difficult, but it is especially difficult to make this measurement of a common resource. Although some may appreciate sea turtles more than others, sea turtles are of value to all. Short of a thorough discussion on the ecological place of sea turtles, suffice it to say that the world would be a poorer place to live without them. We just don't know how much poorer. With regard to sacrificing the diversity of life, Aldo Leopold wrote in his Sand County Almanac:



“The last word in ignorance is the man who says of an animal or plant: ‘What good is it?’... If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.”

More information or solutions are available:

- Visit the FWC's [Imperiled Species Management](#).
- Download these PDF files.
 - ["Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches"](#) (2,192 KB)
 - ["Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches"](#) (Spanish Version) (2.84 MB)
 - ["Coastal Roadway Lighting Manual"](#) (373 KB)

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