The Sea Turtle Friendly Lighting Initiative

A. Introduction

Sea turtles are a beloved species in Florida. This is evidenced by the fact that there are dozens of sea turtle protection groups around the state, many coastal communities having passed ordinances to protect sea turtles, and the sea turtle license plate remaining the second most popular vanity license tag in Florida (ranking only behind the University of Florida in number of tags sold or renewed).\(^1\) During the late spring, summer, and early fall, Floridians share the beach with sea turtles, a cohabitation that can lead to a wide variety of conflicts. One such conflict, and the one that may be most easily remedied, results from the anthropogenic footprint of light on the beach at night. Each year egg-bearing female sea turtles abandon the urge to nest on lighted beaches, and thousands of sea turtle hatchlings suffer from misorientations\(^2\) and disorientations.\(^3\) These incidents exacerbate an already difficult journey by leading the sea turtles away from the water – and often to death – and creating potential liability for both those who cast that light, as well as those charged with regulating it.

The Conservation Clinic at the University of Florida’s Levin College of Law undertook this “Sea Turtle Friendly Lighting” (STFL) policy analysis on behalf of the Sea Turtle Conservancy to provide guidance to local governments, state regulators, sea turtle advocates, and coastal residents on the most appropriate means to address artificial beachfront lighting concerns in Florida. This report results from an interdisciplinary collaboration of law and graduate students and their faculty, along with experts at the Florida-based Sea Turtle Conservancy, the world’s oldest sea turtle research and conservation group.\(^4\) The report includes both a new model sea turtle friendly lighting ordinance for local governments, as well as a model set of sea turtle friendly lighting provisions, which can be considered by homeowner and condominium associations for inclusion in governance documents. Sea turtle advocates believe that the current law, including a 1993 model ordinance adopted as a rule by the Florida Department of Environmental Protection, does not adequately protect sea turtles. Moreover, advances in our understanding of sea turtle biology, coupled with advances in lighting technology, have rendered many parts of most existing ordinances and the model ordinance obsolete.

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Part I of this report provides background information on the problems associated with artificial beachfront lighting in Florida. This includes information on sea turtle biology with respect to artificial light, the legal protections for sea turtles as endangered and threatened species, and successes with new lighting technology. Part II details the process and results of a “content analysis” undertaken to analyze the relative strengths and weaknesses of existing sea turtle lighting ordinances around Florida. Part III and IV address the lack of needed guidance for local governments and coastal community associations, both of which have been sued for failure to address artificial lighting. Part III is a revised model lighting ordinance, titled “Model Sea Turtle Friendly Lighting Ordinance” that incorporates advances in both lighting technology and sea turtle biology since the enactment of the model ordinance in 1993. Part IV is titled “Sea Turtle Friendly Lighting Model Guidelines for Planned Communities.” These guidelines could be added to community association bylaws to provide additional, privately enforced safeguards. They could also be required as a condition of development approval by state and local regulatory agencies. The Clinic used the best scientific data available as the basis of these highly technical lighting guidelines.

B. The Response of Sea Turtles to Artificial Lighting

Artificial beach lighting at night can interfere with the normal behavior of adult and hatchling sea turtles. Light level is a strong cue for nest site selection, as adult turtles prefer darker beaches to those with more light. Consequently, beaches with high light levels often have lower nesting densities or no nests at all. Also nests found on artificially lighted beaches may be clustered in the few remaining darkened areas. These high nest concentrations can be detrimental to the population of sea turtles because concentrated nests increase the rate of hatchling mortality. Adult sea turtles may have difficulties finding their way back to the ocean in the presence of artificial light, a phenomena known as “misorientation” or “disorientation.” Artificial beach lighting may also cause misorientation and disorientation in sea turtle hatchlings by interfering with their ability to correctly interpret cues that should lead them to the ocean. These cues include the light color (wavelength), brightness, horizon shape, continuity, silhouette and slope. Disruption of orientation

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negatively impacts hatchling survival by increasing the chances that hatchlings are taken by terrestrial predators, killed by exposure to lethal temperatures after sunrise, crushed by vehicles on the road, entrained in swimming pools, and exhausted and/or dehydrated to the point of death. Behavioral studies show that hatchlings orient most strongly towards shorter wavelengths of light (white light), including near-ultraviolet measured at 360 nanometers. Hatchlings are least sensitive to wavelengths greater than 580 nanometers, which are seen as reds and ambers in the light spectrum. Thus, excessive artificial lighting, when not within an acceptable wavelength band, draws hatchlings toward the land rather than the sea, significantly impairing their chances of survival.

C. The Legal and Regulatory Background

Light pollution has been defined as the “degradation of the photic habitat by artificial light.” Light pollution is a particularly salient issue in Florida, which hosts 90% of the sea turtle nesting in the United States and must balance protection with increasing resident and tourist populations. In 2012, the number of foreign and domestic visitors that Florida attracted rose 4.6% from 2011 to reach 91.4 million people. One estimate suggests that by 2050 there will be nearly 15 million residents in Florida’s coastal counties. With this increase in population, comes an increase in the use of artificial light that can escalate already problematic light pollution. Florida’s high percentage of already developed coastal properties, coupled with increasing development pressure for the foreseeable future, means that sea turtle populations are increasingly vulnerable to the adverse impacts of artificial lighting.

Recognizing artificial lighting as a threat to sea turtle populations, the Florida Legislature tasked the Department of Environmental Protection (DEP) with adopting by rule “guidelines for local

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11 Id.
13 Id.
14 See Witherington & Martin, supra note 10.
15 See Horch, Gocke, & Salmon, supra note 8.
16 See Witherington & Martin, supra note 10.
government regulations that control beachfront lighting to protect hatching sea turtles.\textsuperscript{21} In response, DEP enacted rule 62B-55 F.A.C., entitled \textit{Model Lighting Ordinance for Marine Turtle Protection} in 1993, but did not require local governments to adopt the model (although many local governments have incorporated all or parts of it).

Within the last year, DEP has begun to promulgate an updated set of best management practices for the lighting of beachfront buildings, parking lots, and dune crossovers to better protect nesting sea turtles and hatchlings from artificial light pollution. The latest 2013 draft DEP guidelines provide a basis for many of the technical standards used in this report’s content analysis as well as the model STFL Ordinance and Guidelines. Once adopted, the DEP guidelines will be implemented as a condition of the Department’s Coastal Construction Control Line (CCCL) permitting program for development seaward of the CCCL.\textsuperscript{22} However, the proposed DEP guidelines only apply to new construction. Additionally, not all development that could potentially contribute to illumination on the beach at night is covered under the CCCL permitting process. In a state where successful nesting is essential to the survival of sea turtle populations, current state and local laws may not go far enough to protect these species from the legal and biological consequences of light pollution.

Both federal and state laws protect all five sea turtles species found in Florida. Section 9 of the 1973 Endangered Species Act (ESA) strictly prohibits the “take” of these species by any person.\textsuperscript{23} In the ESA, the term “take” includes the harassment and harm of protected wildlife.\textsuperscript{24} To “harm” means an act that actually kills or injures wildlife, such as significant habitat modification that actually kills or injures wildlife by \textit{significantly impairing essential behavior patterns, including breeding, feeding, or sheltering}.\textsuperscript{25} The 1995 Florida Marine Turtle Protection Act (MTPA) contains further provisions for the protection of sea turtles. The MTPA makes it a third degree felony\textsuperscript{26} to “knowingly take, disturb, mutilate, destroy, cause to be destroyed,… or harass any marine turtles or the eggs or nest of any marine turtles described in this subsection.”\textsuperscript{27} The definition of “take” within the MTPA ‘means an act that actually kills or injures marine turtles, and includes significant habitat modification or degradation that kills or injures marine turtles by significantly impairing their essential behavioral patterns, such as breeding, feeding, or sheltering.’\textsuperscript{28} Thus, “significant habitat modification that actually kills or injures wildlife” could be punishable by a third degree felony.

\textsuperscript{22} Fla. Stat. § 161.053(4) (2012).
\textsuperscript{24} 50 C.F.R. § 17.3 (2012).
\textsuperscript{25} 50 C.F.R. § 17.3 (2013) (emphasis added). The Department of the Interior regulations that implement the ESA and define ‘harm’ as described above was upheld by the US Supreme Court in \textit{Babbitt, Secretary of the Interior, et. al. v. Sweet Home Chapter of Communities for a Great Oregon, et. al.} 515 U.S. 687 (1995).
Scientific evidence shows that artificial lighting on beaches disrupts sea turtle behavior, which is prohibited under the federal ESA and complementary state law. A federal appellate court has already found that artificial lighting on a Florida beach may result in a violation of the ESA’s take provision. In one Florida case, the federal government sued a condominium association after its lighting near a sea turtle nesting area caused high loggerhead turtle hatchling deaths. The case eventually settled, with the condominium association agreeing to pay a $15,000 fine and correct the lighting situation. Accordingly, it is in the best interests of local governments and coastal property owners to be proactive and incorporate the best lighting practices and technologies into their own ordinances or governing documents. Those practices and technologies are incorporated into the STFL Ordinance and Guidelines provided in this document.

Eighty-two local governments in Florida have adopted beach lighting ordinances, with most of them based on the 1993 DEP Model Lighting Ordinance. Yet, there are still high numbers of disorientation events throughout the state. For example, according to the Florida Fish and Wildlife Conservation Commission (FWC) in 2008 (the last year FWC published disorientation reports), Palm Beach County reported over 9,000 disoriented turtles, Franklin County in the Panhandle reported 1,506, and Sarasota County in Southwest Florida reported 3,279. The Sea Turtle Oversight Protection, Inc., the organization permitted by FWC to monitor nesting and disorientations in just Broward County, reported over 20,656 disorientations in 2012. These data suggest that artificial beachfront lighting remains one of the major threats to Florida’s sea turtles, and that current state and local laws have not been adequate to address this threat.

### D. Technological Developments

Regulating artificial lighting can incorporate two approaches. Sea Turtle Friendly Lighting technologies can be mandated or human behavior can be addressed. Instead of relying on recent technological developments, many of the ordinances reviewed in the content analysis (70%) primarily seek to regulate behavior. Some of these ordinances require that residents close their curtains, move interior housing lights away from windows, and even to turn off exterior lights during turtle nesting season. However, proper design guidelines and new lighting technologies can eliminate much of the need for this kind of behavioral regulation.

29 *Loggerhead Turtle v. County Council of Volusia County, Florida*, 148 F.3d 1231 (Florida 11th Cir. 1998).


31 FWC Unpublished Data (available upon request).


In 2010-2012, the Sea Turtle Conservancy received several grants from the National Fish and Wildlife Foundation to correct lighting problems on large beachfront properties.\textsuperscript{34} During this project, the Sea Turtle Conservancy successfully retrofitted over 65 properties, darkening approximately 45,000 linear feet of beach,\textsuperscript{35} while greatly reducing the need for residents to change their habits during the nesting season. The general principles of \textit{Keep it Low, Keep it Long, and Keep it Shielded} are embodied in the retrofits and can be seen in the before and after photos below (Figures 1 and 2). Preliminary data shown in Figures 3 and 4 suggest that, following the retrofits in 2011, disorientations from artificial lighting during the 2011 nesting season dropped to zero and remained at zero during the 2012 nesting season. In addition to the ecological benefits, some retrofitted property owners wrote the Sea Turtle Conservancy proclaiming significant savings on their outdoor electricity bills as a direct result of the retrofit, which included very energy efficient LED lights. After receiving retrofits, the property owner of La Playa Condominiums in Satellite Beach wrote to the Sea Turtle Conservancy to inform them that their outside electricity bill had decreased from $1,100 a month to $350 a month, a nearly 70\% cost savings.


Before STFL Retrofits

After STFL Retrofits

Figure 1. Before and After STFL Retrofit images of The Oceanwalk Resort, Daytona Beach, FL.

Before STFL Retrofits

After STFL Retrofits

Figure 2. Before and After STFL Retrofit images of O'Shucks and Trader Rickey’s Restaurant, Cocoa Beach, FL.
Figure 3. The number of sea turtle hatchlings that were disoriented after emergence at The Diplomat in Longboat Key. (Note: 2002 and 2008 each recorded 8 disorientations and low nesting)

Figure 4. The number of sea turtle hatchlings disoriented to lights on coastal properties in Anna Maria Island. (Note: The seven properties listed were disorienting between 900-1,300 hatchlings a year. Disoriented hatchlings dropped 100% to 0 the next two consecutive nesting seasons following the retrofits.)
E. Conclusion

The vast majority of coastal governments in Florida have enacted local legislation focused on creating a balance between the need for development, the safety and security of residents, as well as visitors, and the protection of sea turtles. Sea turtle lighting ordinances can be found in 21 of 27 counties (78%) with nesting habitat. Additionally, many municipalities in counties without lighting ordinances have enacted their own lighting legislation. However, the Conservation Clinic’s Content Analysis reveals that most local ordinances are out of date and do not adequately protect sea turtles. Lighting technology has advanced since Florida’s local governments first implemented lighting ordinances, and since DEP adopted the first model lighting ordinance by rule in 1993. For example, less than 10% of ordinances surveyed require lights to be long wavelength (580 nm or greater), which is the end of the light spectrum that is least detrimental to sea turtles. Recent advances in available lighting technology, such as LEDs in red and amber, and design practices, such as fixtures being fully shielded, have been proven to significantly decrease the impacts of artificial light on sea turtles.

A strong ordinance is one that uses sea turtle friendly lighting principles as its touchstone – *Keep it Low; Keep it Long; Keep it Shielded*. A strong ordinance relies more heavily on state of the art lighting technology, while minimizing behavioral regulation, and incorporates public education and outreach coupled with strong and meaningful “on the ground” enforcement. A key provision missing from many of the ordinances surveyed is the provision for compliance inspections, both prior to and during the nesting season. This should be coupled with adequate training for compliance and enforcement officers. In addition, the affected public should be notified prior to the nesting season in order to give them reasonable time to come into compliance.

The Model Sea Turtle Friendly Lighting Ordinance and Model Guidelines for Planned Communities presented here reflected the latest thinking in Sea Turtle Friendly Lighting design. However, these are models. Local governments and communities should always reflect upon their unique circumstances and draft their governance documents in accordance with local needs.