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Submitter Information

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General Comment

I am a graduate student studying Coastal Zone Management at the University of Miami's Rosenstiel School of Marine and Atmospheric Sciences. I conducted a GIS spatial analysis of the proposed Turkey Point expansion project in light of projected sea level rise and would like to share the report. Thank you.

Attachments

Northrop_TurkeyPoint_FinalDraft

SUNSI Review Complete

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Add= A. Williamson (AREAS)

Emily Cava Northrop

MSC 460 Spatial Applications in Marine Science

10 December 2013

Turkey Point Nuclear Power Plant Units 6 and 7:

Expansion Assessment

Abstract

Turkey Point, located in Southwest Miami-Dade County, is one of five nuclear power plants operated by Florida Power & Light (FPL). The company is seeking to build two new nuclear reactors on the property, between Biscayne Bay and existing cooling canals. Although the energy company has already started raising money for the expansion, the project has not yet been approved by the U.S. Nuclear Regulatory Commission or local government. Nuclear plants are inherently controversial, but Turkey Point should be subject to additional scrutiny. Geographic Information Systems (GIS) mapping of the area shows that the construction site is unsustainable in the face of predicted sea-level rise. Furthermore, construction would further intrude into the critical habitat of the local American crocodile population.

Objective

The objective of this project was to map the proposed site of Turkey Point Nuclear Power Plant Units 6 and 7 with respect to future sea-level rise and the habitat of the endangered American crocodile, *Crocodylus acutus*.

Introduction

Turkey Point Nuclear Power Plant is one of five energy plants run by Florida Power & Light, South Florida's largest energy provider. It is located south of S.W. 344 Street in un-incorporated Miami-Dade County, east of Homestead and Florida City and adjacent to Biscayne Bay. The plant currently operates four generators: two nuclear reactors, two oil and natural-gas powered stations and one combined-cycle unit.

In June 2009, FPL submitted a proposal to the U.S. Nuclear Regulatory Commission seeking to build two new nuclear reactors on property adjacent to the current complex. Units 6 and 7, as they have been termed, would follow the Westinghouse Advanced Passive 1000 design and be capable of producing 1,100-MegaWatts of power each [1]. In addition to the reactors, "the principal structures [would include] a containment building, a shield building, an auxiliary building, a turbine building, an annex building, a diesel generator building...two standby diesel generators, two ancillary diesel generators, and one diesel-driven fire pump" [2].

Project costs are estimated to fall between \$13 and 18 billion. Although construction has yet to be approved, FPL customers can expect a \$0.46 increase in their monthly base rate in anticipation of the project. "Florida, like some other states in the U.S. Southeast, allows utilities to recover the cost to build or upgrade nuclear reactors before the projects enter service to help offset financing and other costs," reports an October 2013 Reuters article [3].

Approval from the U.S. Nuclear Regulatory Commission as well as local and state government boards is pending due to a number of unresolved plans, including but not limited to the implementation of new power lines throughout the county and the collection of water from both the county sewer system and radial collector wells beneath Biscayne Bay. These wells are of

particular concern to environmental watchdog groups such as the Tropical Audubon Society because they would likely tap into the already-stressed Biscayne Aquifer [4].

Other environmental concerns have to do with the construction's risk to sea-level rise and its impact on the threatened *Crocodylus acutus*, commonly known as the American crocodile. An environmental report for the project states that the construction plans have accommodated "a one-foot rise in sea level over the lifetime of the plant." This projection was determined linearly from measurements taken at Key West. "The sea level rise projections used by FPL are reasonable and conservative," states the report [2]. The projections, certainly conservative, are less than reasonable. Dr. Harold Wanless, chairman of the University of Miami's Geological Sciences department and climate-change expert, explains that the more accurate projections put sea-level between two and six feet higher than they are now by the end of the century. Sea-level rise is unquestionably an accelerating phenomenon, he says [5].

Nearly 400 crocodiles, attracted by the plant's warm wastewater, are thought to live in the cooling canals at Turkey Point. "Our efforts to improve nesting opportunities at the Turkey Point site have played an integral role in the growth of the American crocodile population, helping get the reptile removed from the endangered species list," FPL proclaims [6]. The company included a mitigation plan in its new proposal that might restore or preserve up to 800 acres of wetlands, but it fails to document how construction of the new facilities would specifically impact the resident crocodiles [6].

Methods

These GIS methods used in this project are summarized in **Figure 1**.

The Florida shoreline was represented with the Florida Fish and Wildlife Conservation Commission's (FWC) 2004 dataset, which was scaled at 1:12000 and projected in PCS_Albers [7]. A 2007-2008 ten foot digital elevation model (DEM) of South Florida was obtained from the South Florida Water Management District [8] and the raster was re-projected from 1983_NAD_HARN to PCS_Albers over the shoreline shapefile. The data was reclassified into two categories using the spatial analysis tool and a bicolored raster was produced. The area was divided into zones with an elevation of less than three feet and greater than three feet—a conservative mid-point between Wanless's minimum and maximum predictions.

Although the cleared land to the South of the existing facility where the new reactors are to be built is clearly visible on the shoreline and DEM maps, it was important to know where exactly the new foundations would be placed. A jpeg image of the intended layout of Units 6 and 7 was copied from the environmental report included in FPL's combined license application to the U.S. Nuclear Regulatory Commission [9]. The picture was added to the shoreline data frame and georeferenced using the appropriately named toolbar. The picture was then shifted and aligned exactly to the existing map using visual control points.

A 2005 dataset describing the critical habitat of the American crocodile was collected from the U.S. Fish and Wildlife Service (FWS) [10] and also projected in PCS_Albers. Additional data cataloguing nest and individual counts in and near Turkey Point were solicited from Christy

Santi, the GIS Librarian of FWS, and David Bucklin, the GIS Technician of the Croc Docs group at the University of Florida Research and Education Center (**Figure 2**). Unfortunately, these attempts proved futile.

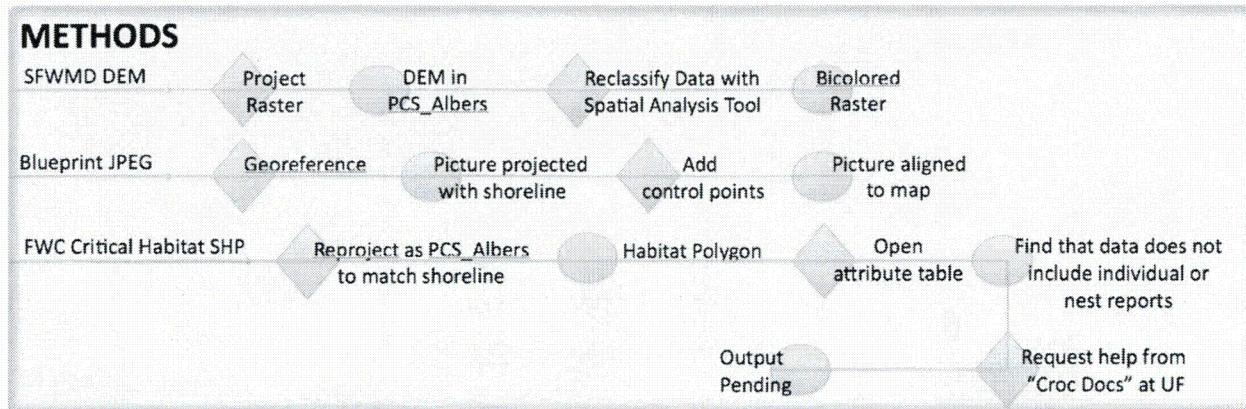


Figure 1. The process and output diagram summarizes the GIS methods used in this project. All maps were created with Esri's ArcMap10 program.


 Northrop, Emily C
 Tue 10/29/2013 11:36 AM

mark as unread

To: dbucklin@ufl.edu

Hi Mr. Bucklin,

I just found your name while working on a final project for my GIS class and hope you can help me. I am studying Turkey Point's expansion proposal (nuclear plants 6 and 7) and would like to know to what degree it will impact the resident crocodile population. I made a map of the proposed construction area and have the crocodile's critical habitat shapefile from FWS, but would like more specific data of nests or tagged individuals at Turkey Point. The Croc Docs seem to be experts on this topic -- can you share this information or at least point me in the right direction? Feel free to call me directly at 786 457 2403.

Thank you so much,
 Emily Northrop

University of Miami '15

Figure 2. E-mail correspondence with David Bucklin, GIS Technician for the Croc Docs group at the University of Florida Research and Education Center.

Results

The GIS maps created (**Figures 3-5**) show that the construction area is below three feet of elevation. Units 6 and 7 would also be built within the demarcated habitat of the threatened American Crocodile. However, more information is needed to quantify and describe the particular impact the expansion and operation of the plant would have on the species.

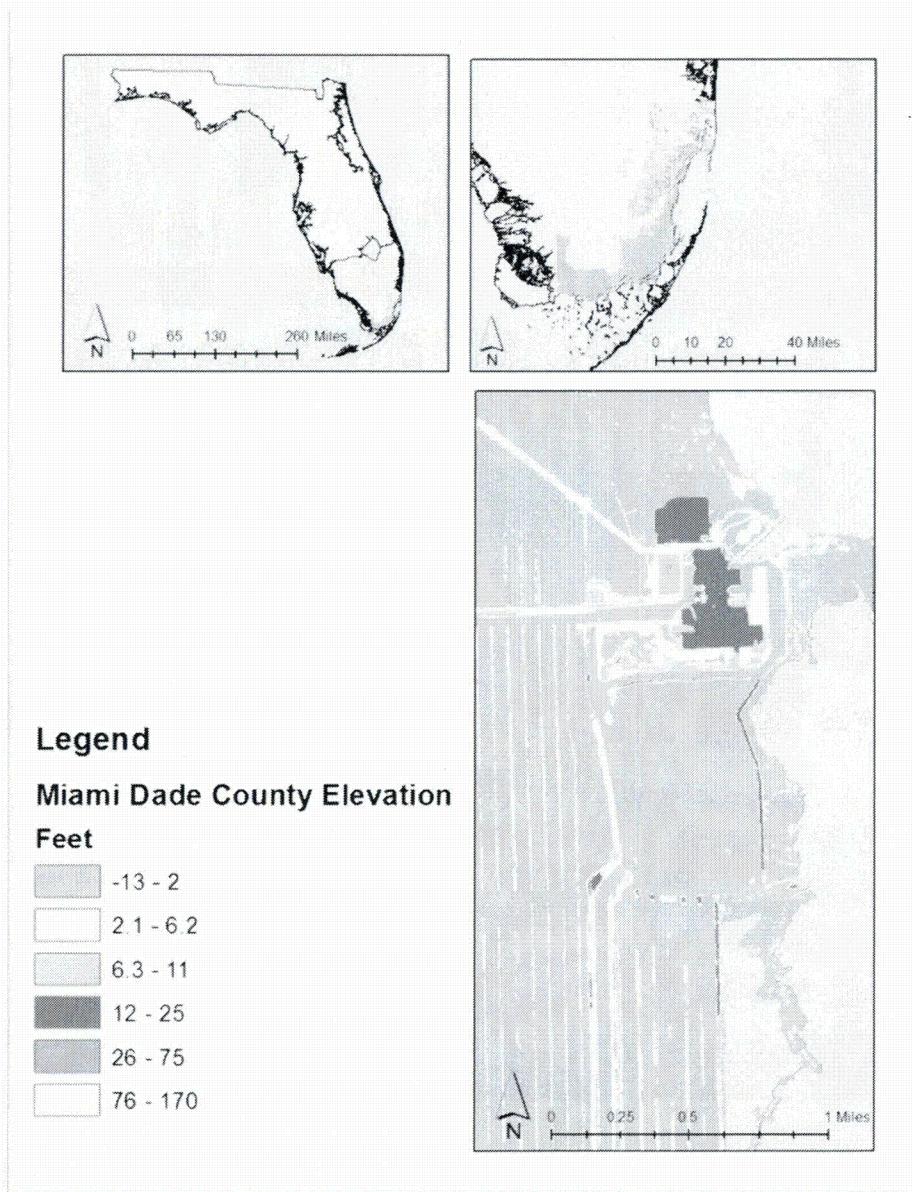
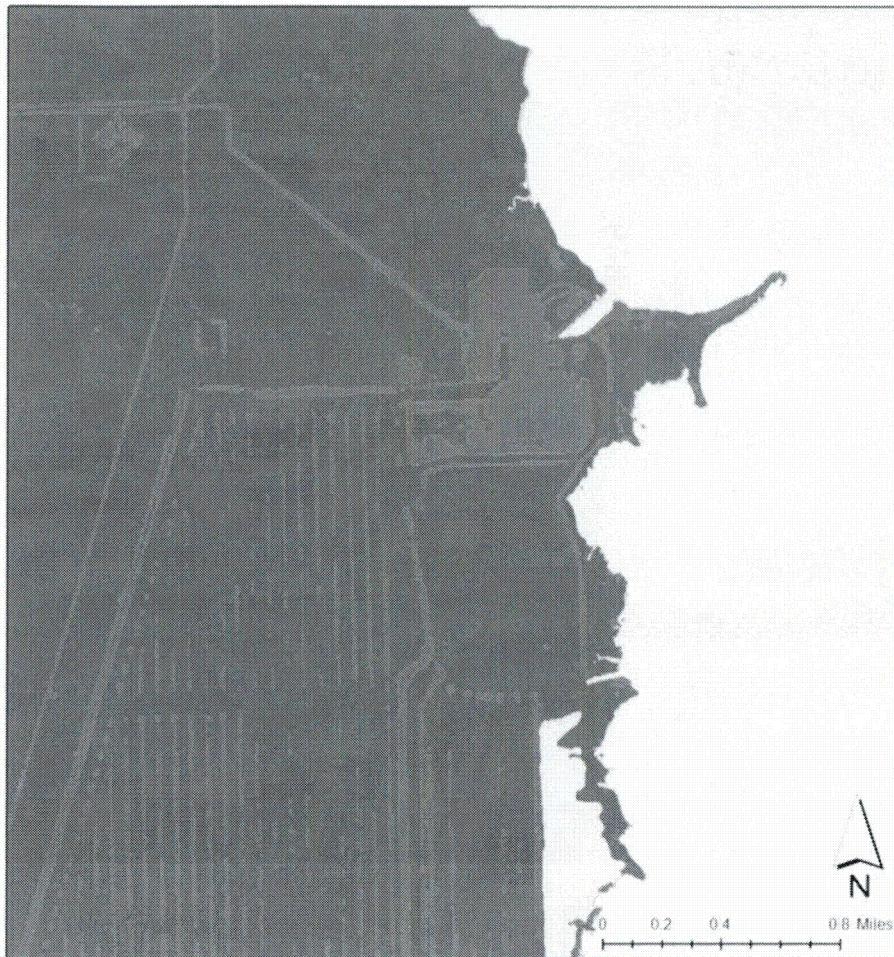


Figure 3. Digital Elevation Model of Miami-Dade County. These maps show changes in elevation across Miami-Dade County and at the Turkey Point site specifically.



Legend Miami-Dade County Elevation

< 3 feet
>3 feet

Figure 4. Reclassified and Bicolored Digital Elevation Map of Turkey Point Nuclear Power Plant. The proposed construction site is less than three feet above sea-level and adjacent to Biscayne Bay, seen here in grey.

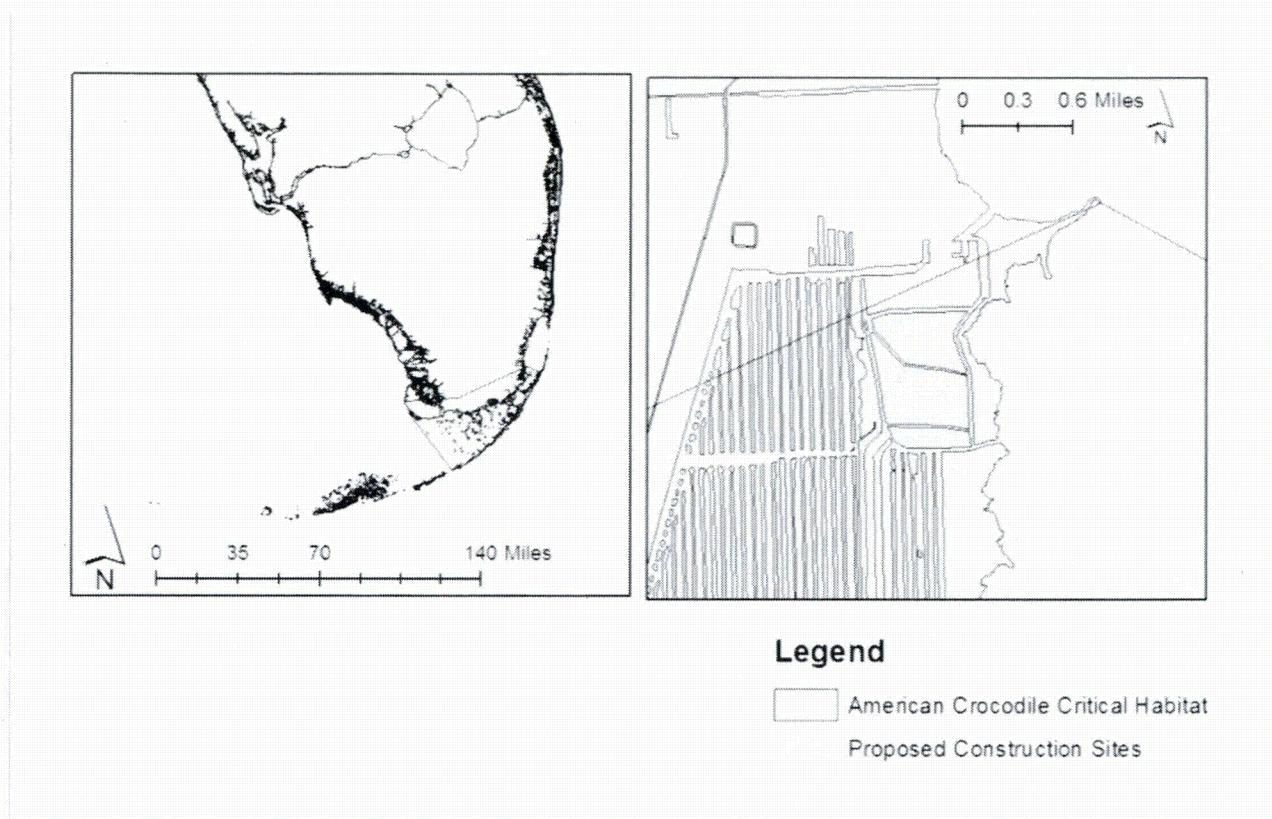


Figure 5. Habitat of the American Crocodile. The species was removed from the U.S. Fish and Wildlife's Service endangered species list in 2007. It is now considered “threatened” [11].

Conclusions

From the elevation maps, it is clear that much of Miami-Dade County will be flooded as sea-level rises throughout the coming century. The Turkey Point power plant is not an exception. Skeptics might point out that the lifespan of a typical reactor is only between thirty and forty years [12] and argue that the new units would be retired before the water rises another three feet. However, many plants have applied for and received operating extensions for an additional twenty years and because the new units would not be opened until 2020 or later, conservative predictions over short time frames are not realistic.

Expanding Turkey Point would also influence local habitats including Biscayne Bay and the wetlands of the Everglades. More information is needed to assess the threats faced to the American crocodile and other species in the area and the effectiveness of FPL's mitigation plan. The water demand of the new plant would have far-reaching effects on the Everglades and possibly oppose present restoration efforts.

Wanless and others strongly believe that the new reactors at Turkey Point will not be approved, less because of the site's vulnerability to sea-level rise but more due to concerns over nuclear power in general [11]. The Fukushima Daiichi disaster in 2011 reminded government panels and citizens that nuclear power is not guaranteed to be a safe source of energy and plants are prone to unavoidable natural forces. Though Turkey Point is unlikely to be hit by a tsunami wave, it does lie in an active hurricane corridor. FPL proudly states that its reactors sustained a direct hit from Hurricane Andrew in 1992 with no damage, but it is important to take into account the predicted rise of so-called "super storms." Furthermore, the lack of a safe disposal plan for spent rods is no longer acceptable.

Acknowledgements

I would especially like to thank my professor and advisor, Dr. Maria Estevanez, for sharing her GIS expertise and enthusiasm. I am also grateful for the support in this project provided by Diana Moanga (UM), Christi Santi (FWC), Tara Dolan (UM) and Savannah Sill (FSU).

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