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Should a Bridge be Built to Connect Upper and Lower Outer Banks Once Bonner Bridge is Removed?

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Build the Long Bridge Coalition. No Date. Build the Long Bridge: Sound Solutions for Replacing the Bonner Bridge in North Carolina. Available: http://www.buildthelongbridge.org/overview.html. Accessed 01/19/2014.

This is the website of the Build the Long Bridge Coalition which consists of several organizations including the Southern Environmental Law Center and the Audubon Society. The coalition is advocating the construction of a long bridge that bypasses Pea Island and circumvents the Pea Island National Wildlife Refuge. They use the site to highlight their priorities and explain the rationale behind their support of the long bridge.

Citizens Action Committee. No Date. Replacethebridgenow.com: A Citizens Action Committee for the Immediate Replacement of the Bonner Bridge. Available: http://www.replacethebridgenow.com/ Accessed 01/19/2014.

This is the website of the Citizen's Action Committee to Replace the Herbert C. Bonner Bridge. The website is used to advocate the immediate replacement of the Bonner Bridge. They are in favor of the construction of the short bridge and use this site to protest against efforts to halt construction by other groups.

Dolan, R., and R. Glassen. 1973. Oregon Inlet, North Carolina—A History of Coastal Change. Southeastern Geographer 13(1):41-53.

This journal article presents an in depth examination of the history and the geologic characteristics of the Oregon Inlet. It explains the mechanism by which the inlet was created and how it is maintained. The article also reviews the history of the Bonner Bridge. It is one of the studies that correlated the construction of the bridge to a change in sand deposition on Pea Island.

Johnson, P. A., and D. A. Dock. 1998. Probabilistic bridge scour estimates. Journal of Hydraulic Engineering 124(7):750-754.

This article looks to quantify the amount of bridge scour experienced at the base of the Bonner Bridge. The author simulates several storms to determine the likelihood of achieving different scour depths. The author also calculated the pile depths needed to secure a new bridge for specific life spans and bridge designs.

NC Department of Transportation. 2006. Herbert C. Bonner Bridge Structural Condition Assessment. Available: http://www.islandfreepress.org/2013Archives/09.06.2013-2006ReportOnBridgeCondition.pdf. .Accessed 01/19/2014.

This site contains a link to the Bonner Bridge structural condition assessment. A group of four engineering companies completed the assessment. Each engineering company inspected a specific component of the bridge. They observed problems in the superstructure, substructure, bents, and the foundation. They concluded that the bridge had overall rating of poor. They included repair estimates that totaled $43.5 million, but cautioned that even with the repairs the bridge only had a remaining service life of 10 years (the report was written in 2006).

NC Department of Transportation. No date. Bonner Bridge Replacement Project. Available: http://www.ncdot.gov/projects/bonnerbridgereplace/. Accessed 01/19/2014.

Since the Bonner Bridge replacement is considered a high profile project, the North Carolina Department of Transportation created this site to update citizens on the status of the project. The site contains sections on the history of the bridge along with news

related to the bridge. There is a multimedia section that contains conceptual video of the replacement project and photos of past repair projects. There is also a section for affected property owners and contact information for NCDOT's lead engineer.

Outerbanks.com. No date. Herbert C. Bonner Bridge. Available: http://www.outerbanks.com/herbert-c-bonner-bridge.html. Accessed 01/19/2014.

This site targets visitors that come to the Outer Banks. This page gives visitors an overview of the history of the Bonner Bridge and illustrates some of the ongoing problems associated with the bridge. It highlights some of the attractions situated near the bridge and travel tips to those crossing the bridge.

Overton, M. F., J. S. Fisher, W. A. Dennis, and H. C. Miller. 1992. Shoreline Change at Oregon Inlet Terminal Groin. Coastal Engineering Proceedings 1(23) .

This paper seeks to determine the impact of the Oregon Inlet terminal groin on the Pea Island shoreline which was constructed to try to keep Pea Island from migrating away from the bridge. The paper also reviews the history of the groin and gives a thorough description of the groin as well. The researchers initiated a monitoring program that took aerial photographs of the shoreline every other month and after severe storms. The authors conclude that the groin has had no adverse impact on the shoreline downdrift of the groin.

Pietrafesa, L. J. 2012. On the Continued Cost of Upkeep Related to Groins and Jetties. Journal of Coastal Research 28(5):iii-ix.

In this article, the author presents information on the use of jetties and groins for stabilization purposes in North Carolina as well as in other states. The author presents the current issue along with some historical facts about the use of groins and jetties specifically in North Carolina including the terminal groin and the Bonner Bridge. The author also calculates the cost of beach nourishment at locations affected by the groin.

Riggs, S. R., and D. Ames. 2009. Impact of the Oregon Inlet Terminal Groin on Downstream Beaches of Pea Island, NC Outer Banks. Available: http://core.ecu.edu/geology/riggs/IMPACTS%20OREGON%20INLET%20TERMINAL%20GROIN%2011-30-09%20%282%29.pdf Accessed 01/19/2014.

This link connects directly to a white paper created by Stanley Riggs and Dorothea Ames entitled "Impact of the Oregon Inlet Terminal Groin on Downstream Beaches of Pea Island, NC Outer Banks". The terminal groin was created to keep Pea Island from migrating away from the Bonner Bridge. The paper outlines how the groin and a connecting rock revetment keep sand from moving naturally and their impact on beaches on Pea Island. The paper also discusses the cost of maintaining the terminal groin and additional costs associated with the groin such as beach nourishment and the construction of dune ridges.

Riggs, S. R., S. J. Culver, D.V. Ames, D. J. Mallison, D. R. Corbett, and J. P. Walsh. 2008. North Carolina's Coasts in Crisis: A Vision for the Future. NC Coastal Geology Cooperative Research Program. Available: http://thescholarship.ecu.edu/bitstream/handle/10342/2863/Coasts%20in%20Crisis%20Booklet%20for%20web.pdf?sequence=1. Accessed 01/19/2014.

This white paper outlines different issues the coastal managers face when dealing with the North Carolina coast. In the section *Human Response to Changing Coastal Systems,*

the history of the Oregon Inlet is examined along with the issues introduced by the construction of the Bonner Bridge.

Sheppard, D. M. 1997. Coastal Hydrology and Hydraulics. Available: http://ntl.bts.gov/lib/20000/20200/20209/PB98116023.pdf. Accessed 01/19/2014.

This is a publication of the U.S. Department of Commerce sponsored by the National Technical Information Service. The report covers two topics. The second topic in the report describes an unsuccessful attempt to measure velocities in the Oregon Inlet. The researchers attempt to implement a field measurement program to measure scour depth at the base of the Bonner Bridge by deploying three instruments to measure scour. The researchers were unable to take any measurements because of the extreme velocities and the amount of sediment deposited. This report is included to illustrate the dynamic nature of the Oregon Inlet.

Smith, C. G., S. J. Culver, S. R. Riggs, D. Ames, D. R. Corbett, and D. Mallinson. 2008. Geospatial analysis of barrier island width of two segments of the Outer Banks, North Carolina, USA: anthropogenic curtailment of natural self-sustaining processes. Journal of Coastal Research 70-83.

This article looks at the role humans have played in the disruption of natural sedimentary processes on the Outer Banks. The authors used aerial photographs and bathymetric surveys to examine the changes in the width of Pea Island and Avon-Buxton along with their associated shoreline change. The researchers find that the both islands have experienced significant narrowing. They find that the narrowing zones tend to widen if allowed to rebound naturally, but the construction of dune ridges impede this process.

Southern Environmental Law Center. 2013. Bonner Bridge Replacement. Available: http://www.southernenvironment.org/cases/bonner_bridge_replacement/. Accessed 01/19/2014.

This webpage is a section of the Southern Environmental Law Center's website dedicated to information related to the Bonner Bridge replacement. The site outlines the history of the bridge replacement plan and explains why the SELC is opposed to the current replacement plan. It also has a section dedicated to current news related to the Bonner Bridge.

Witcher, T.R. 2012. Maintaining Infrastructure Challenges Outer Banks. American Society of Engineers. Available: http://www.asce.org/CEMagazine/Article.aspx?id=25769808646#.Ut_dIbQo5MZ. Accessed 01/19/2014.

The article presents a brief background of the issues that led to the need to replace the Bonner Bridge. It also reviews the NC Department of Transportation process in selecting the short bridge option.

Taylor Bailey

Beaufort Observer. 12/16/2013. Former DOT official exposes the absurdity of the "long bridge option for Bonner Bridge. http://www.beaufortobserver.net/Articles-NEWS-and-COMMENTARY-c-2013-12-16-270329.112112-Former-DOT-official-exposes-the-absurdity-of-the-long-bridge-option-for-the-Bonner-Bridge.html Accessed: 01/19/2014

This article sums up the opinions of Jim Trogden, former chief operation officer for the North Carolina Department of Transportation. Trogden represents the opinion to build the

long bridge. In the suit handled by the Southern Environmental Law Center, he disputes the ideas presented by the plaintiff and explains why the bridge should be built.

Build the Long Bridge Coalition. No Date. Sound Solution for Replacing the Bonner Bridge in North Carolina. Build the Long Bridge. http://www.buildthelongbridge.org/overview.html Accessed: 01/21/2014

This article is strongly in favor of the reconstruction of Bonner Bridge. It explains not only why the long bridge is "most cost effective" but also why is will help "restore national wildlife refuge." Since both of the issue are big concerns for the opposition this article is important to explain why these issues are not of concern.

Dean, C. 03/05/2012. A North Carolina Lifeline Built on Shifting Sand. The New York Times. http://www.nytimes.com/2012/03/06/science/highway-12-outer-banks-lifeline-is-under-siege-by-nature.html?pagewanted=all&_r=1& Accessed: 01/16/2014

This article goes into in-depth detail regarding erosion along the North Carolina Coast and the effects on Highway 12. Specialists from varying backgrounds give their professional opinions on the effect of coastal erosion and what this means in terms of a future for the outer banks. This paper would be beneficial to those opposed to reconstruction the Bonner Bridge, because it explicitly states that the Outer Banks will no longer exist in the years to come due to erosion and storms.

Defenders of Wildlife. No Date. Bonner Bridge Replacement Long Bridge Restores Safe, Reliable Transportation and a Restored Wildlife National Refuge on North Carolina's Outer Banks.http://www.defenders.org/press-release/bonner-bridge-replacement-long-bridge-safest-most-reliable-least-expensive-option-long Accessed: 01/21/2014

The Defenders of Wildlife, a conservation organization argue that if the Bonner Bridge is going to be rebuilt that a long bridge is the best choice. They claim is it the most economical, reliable, and safest. It list specific financial cost to support their claim.

Dicleli, M., and S. Albhaisi. October 2003. Maximum length of integral bridges supported on steel H-piles driven in sand. Engineering Structures. 25(12):1491-1504.

This journal focuses on the engineering aspect of building a bridge and provides useful understanding of why bridges built in sand require maintenance. However, if gives suggestion as to the exact type of bridge that should be built in order to effectively reduce cost and the amount of maintenance typically needed. This article can be used for those in favor of building the bridge to specify what type of bridge and to support why this is the best idea.

Feagin, R., A. Williams, M. Martinez, and O. Purez-Marqueo. March 2014. How does the social benefit and economic expenditures generated by a rural beach compare with its sediment replacement cost?. Ocean and Coastal Management. 89:79-87.

This article discusses the economic value of losing the beach versus the cost it would take to maintain a beach. This journal focuses of beaches in Texas as example to explain the values of both of these costs. Although the article does not discuss beach outside of Texas, this information can relate to the current dilemma for the North Carolina coast. If a bridge is rebuilt, North Carolina will have to continue to commit to investing maintenance into the bridge and the eroding coastline. However, if the value of losing the outer banks as a tourist attraction is less than the coast to preserve it than economically this is wiser decision.

Horton, B. August 2009. Holocene sea-level changes along North Carolina Coastline and their implications for glacial isostatic adjustment models. Quaternary Science Reviews. 28(17-18): 1725-1736.

This journal presents observations and predictions relating to sea-level rise. It specifically focuses on the effects of sea-level rise in North Carolina. This article addresses the coastline in two parts, Region 1: Albemarle, Currituck, Roanoke, Croatan, and northern Pamlico sounds and Region 2: southern Pamlico, Core and Bogue sounds, and farther south to Wilmington. The information is important, because it describe future expectation for changes to the North Carolina Coastlines.

Jun, J., and B. Meng. December 2011. Computation of wave loads on the superstructures of coastal highway bridges. Ocean Engineering. 38(17-18):2185-2200.

This article focuses on damage to coastal highways along the US coast of the Gulf of Mexico due to water from storms. Although the article does not address the North Carolina coast the concept is fairly similar. It gives specific suggestions as to the design to minimize damage from storm waves.

Lazarus, E., and A. Murray. March 2011. An integrated hypothesis for regional patterns of shoreline change along the Northern North Carolina Outer Banks, USA. Marine Geology. 281(1-4): 85-90.

This journal focuses on the shoreline change in North Carolina due to erosion, storms, and other natural factors. It explains what effects will likely occur in the future and demonstrates these effects visually with models.

McGraw, M. 11/19/2007. Pea Island NWR and Bonner Bridge. Refuge Watch. http://www.refugewatch.org/2007/11/19/pea-island-nwr-and-bonner-bridge/ Accessed: 01/21/2014

This article emphasizes the effects of reconstruction Bonner Bridge on Pea Island. Since Pea Island would likely become a prime construction zone if a long bridge were built, many conservationists are concerned about the effects it will have on the endangered wildlife that currently resides there. This article offers an alternative idea to building a long bridge; it suggests that a short bridge would be safer for the protected wildlife. However, a short bridge will be much most financially costly.

NCDOT. (North Carolina Department of Transportation). No Date. Proposed Ferry Toll Rates. http://www.ncdot.gov/ferry/about/default.html Accessed: 01/20/2014

In 2013, the General Assembly adopted a new toll policy to fund North Carolina Ferries. This document explains the new policy and lays out the fees for various individuals based on their form of transportation. This information can be used as a comparison to show the economic cost of funding a ferry versus build and bridge.

Southern Environmental Law Center. 12/11/2013. Bonner Bridge Replacement. http://www.southernenvironment.org/cases/bonner_bridge_replacement/ Accessed: 01/19/2014

The Southern Environmental Law Center is opposed to the Bonner Bridge being rebuilt. This article gives a case summary of why the bridge should not be reconstructed. Furthermore, it represents the opposition to the Beaufort Observer article listed above.

U.S. Fish and Wildlife Service. No Date. Pea Island. http://www.fws.gov/refuges/profiles/index.cfm?id=42540 Accessed: 01/21/2014

Pea Island is a wildlife refuge for many endangered species. This article sums up a brief overview of Pea Island and expands upon the wildlife that is protected there. If the Bonner Bridge is reconstructed it will cause Pea Island to be a primary construction zone. This could be hazardous to these species. Therefore, this paper represents the ecological and conservational issues with rebuilding the bridge.

Waggoner, M. 09/01/2011. NC has a love-hate relationship with Highway 12. NBC News. http://www.nbcnews.com/id/44360591/ns/travel-destination_travel/t/nc-has-love-hate-relationship-highway/#.UuBfKZko7mQ Accessed: 01/16/2014

This article describes the torn feelings of Carolinians on the outer banks. Though the islands often face destruction from storm, many feel attached to the place they call home. This article emphasizes the numerous time that Highway 12 has had to be repaired over the years and further discusses the public view in the debate of whether or not to build a bridge.

WRAL TV. 11/19/2012. Rebuilding NC 12: Saving a vital link or throwing money into the ocean?. http://www.wral.com/rebuilding-nc-12-saving-a-vital-link-or-throwing-money-in-the-ocean- /11784177/ Accessed: 01/16/2014

This article emphasizes the amount of money that North Carolina has had to invest in Highway 12 over the years due to general management and natural impacts. North Carolina citizens voice their opinions and some feel that the highway is not worth preserving. This article can be used to represent both the economic impact of restoring the area and the opposing public opinion.

Amber Burch

Bell S.S., R.A. Brooks, B.D. Robbins, M.S. Fonseca, and M.O. Hall. 2001. Faunal response to fragmentation in seagrass habitats. Biological Conservation. 100(1): 115-123. Available from: http://www.sciencedirect.com.jproxy.lib.ecu.edu/science/article/pii/S0006320700002123 Accessed: 01/22/2014

In this review, the fragmentation in seagrass systems were looked at and how those landscape changes have an effect for fauna. It was determined that seagrass tends to die off with high incidences of boat propeller damage, and that damage did detect an effect of habitat fragmentation on the fauna there.

Build The Long Bridge Coalition. No Date. Build the Long Bridge. Available from: http://www.buildthelongbridge.org/overview.html Accessed: 01/20/2014

The long bridge will help restore a national wildlife refuge. Pea Island ecosystem depends on the occasional over wash of sand to build up marshes in the Pamlico Sound. By completely bypassing the refuge, the long bridge will allow restoration of natural forces and habitat can be restored for migratory birds, sea turtles and other species.

Build The Long Bridge Coalition. No Date. Build the Long Bridge. Available from: http://www.buildthelongbridge.org/pdf/restores.pdf Accessed: 01/20/2014

This website offers two alternatives: long vs. short bridge. The short bridge will require extensive maintenance of NC12 as storms and other weather events wash sand over the road. This will be continuous and will inevitably be damaging to wildlife that depends on natural processes. However, the long bridge alternative will be built in the Pamlico Sound, completely bypassing the refuge. It will allow tor the restoration of natural forces

and allow FWS to restore habitats for migratory birds, sea turtles, and other species for years.

Davenport, J. and J.L. Davenport. 2006. The impact of tourism and personal leisure transport on coastal environments. Estuarine, Coastal and Shelf Science. 67(1-2):280-292. Available from: http://www.sciencedirect.com.jproxy.lib.ecu.edu/science/article/pii/S0272771405003999 Accessed: 01/22/2014.

This review, although not direct to North Carolina beaches, demonstrates the effect that coastal transport infrastructures (such as ferries) have on marine ecosystems. It is stated that the environmental impact of ferries is comparable to cruise ships with regards to the potential of fuel oil spillages.

Erftemeijer, PLA, and R.R. Robin-Lewis. 2006. Environmental impacts of dredging on seagrasses. Marine Pollution Bulletin. 52(12):1553-1572. Available from: http://www.sciencedirect.com.jproxy.lib.ecu.edu/science/article/pii/S0025326X06003778 Accessed: 01/22/2014

This review pinpoints the impact on seagrasses caused by dredging and sand mining that also includes the physical removal and burial of vegetation as well as the effects that are caused by an increase of turbidity and sedimentation. Dredging operations have been shown to damage seagrass ecosystems.

Frederick, T.S and S.W. Echeverria. 1995. Natural and human-induced disturbance of seagrasses. Environmental Conservation. 23(1): 17-27. Available from: http://journals.cambridge.org/download.php?file=%2FENC%2FENC23_01%2FS0376892900038212a.pdf&code=1cf0a5e64d0da47aa69d566e33aeaf5e Accessed: 01/22/2014.

This study looks at how natural occurrences and human events influence and create disturbances in seagrasses throughout the world. Although natural occurrences were shown to have the greatest impact on seagrass areas, humans were shown to also be apart of the cause. Human-induced events such as nutrient loading from runoff, sewage disposal, dredging, filling, pollution and upland development all play a part in harming seagrass habitats.

Hovel, K.A. 2003. Habitat fragmentation in marine landscapes. Biological Conservation. 110(3): 401-412. Available from: http://jw3mh2cm6n.search.serialssolutions.com/?ctx_ver=Z39.88-2004&ctx_enc=info%3Aofi%2Fenc%3AUTF-8&rfr_id=info:sid/summon.serialssolutions.com&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&rft.genre=article&rft.atitle=Habitat+fragmentation+in+marine+landscapes%3A+relative+effects+of+habitat+cover+and+configuration+on+juvenile+crab+survival+in+California+and+North+Carolina+seagrass+beds&rft.jtitle=Biological+Conservation&rft.date=2003-04-01&rft.pub=Elsevier+BV&rft.issn=0006-3207&rft.volume=110&rft.spage=401&rft.epage=412&rft_id=info:doi/10.1605%2F01.301-0001469187.2007&paramdict=en-US Accessed: 01/22/2014

This research study looks at the abundance of juvenile crab survival in seagrass habitats. It questions whether their survival is linked to the habitat cover or configuration. This study showed that in North Carolina, seagrass cover and configuration, the structural complexity of seagrass all influence the survival of the juvenile blue crab. In conclusion, seagrass conservation strategies should be incorporated for species-specific habitat structures to allow those species a better chance at survival.

Mallison, D.J., C.W. Smith, S. Mahan, S.J. Culver, and K. McDowell. 2011. Barrier island response to late Holocene climate events, North Carolina, USA. Quaternary Research. 76(1): 46-57. Available from: http://www.sciencedirect.com.jproxy.lib.ecu.edu/science/article/pii/S0033589411000640 Accessed: 01/20/2014

This research study looks at the geologic record of inlet activity of the Outer Banks to better understand the storm impacts. With the present atmospheric circulation patterns and sea-surface temperatures, there has been increased inlet activity as well as more intense hurricane impacts.

Parnell, K.E. and H. Kofoed-Hansen. 2001. Wakes from large high-speed ferries in confined coastal waters. Coastal Management. 29:217-237. Available from: http://jw3mh2cm6n.search.serialssolutions.com/?ctx_ver=Z39.88-2004&ctx_enc=info%3Aofi%2Fenc%3AUTF-8&rfr_id=info:sid/summon.serialssolutions.com&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&rft.genre=article&rft.atitle=Wakes+from+large+high-speed+ferries+in+confined+coastal+waters%3A+Management+approaches+with+examples+from+New+Zealand+and+Denmark&rft.au=Parnell%2C+KE&rft.au=Kofoed-Hansen%2C+H&rft.date=2001&rft.pub=Taylor+%26+Francis&rft.issn=1521-0421&rft.eissn=1521-0421&rft.externalDBID=n%2Fa&rft.externalDocID=oai_arrow_nla_gov_au_1279059344478165&paramdict=en-US Accessed: 01/21/2014.

This study focuses on large, high-speed boats that carry passengers and vehicles (such as ferries) that produce large wake waves in the waters that they travel in. These large, fast boats have been shown to cause environment problems such as beach change and ecological disturbance.

Riggs S.R. and J. Youngman. January 1, 2010. The 'short bridge' to oblivion. News Observer. Available from: http://www.newsobserver.com/2010/01/01/263397/the-short-bridge-to-oblivion.html Accessed: 01/22/2014

This article by Riggs and Youngman states that because of storm events, global climate change, sea-level rise, and just the instability of this barrier island, the short bridge replacement absolutely cannot work. A longer bridge from the most stable area is said to be more preferable because of the fact that the island is continuously moving.

Smith, C.G., S.J. Sulver, S.R. Riggs, D. Ames, and D.R. Corbett. 2008. Geospatial analysis of barrier island width of two segments of the Outer Banks, North Carolina, US. Journal of Coastal Research. 26(1): 70-83. Available from: http://search.proquest.com/docview/210873111/fulltextPDF?accountid=10639 Accessed: 01/20/2014

In this study, scientists compared two sections of the Outer Banks of North Carolina (Pea Island and Avon-Buxton areas) to show that there is a large relationship between the oceanic and the estuarine shoreline dynamics that will in time result in continuing long-term changes in the size of the barrier island. Results show that parts Pea Island had a net increase in barrier island width between the years of 1852 and 1998 whereas other parts of Pea Island and the entire Avon-Buxton area had a net loss in barrier island width. Events such as natural inlet processes, flood tide deltas, and over wash events all played roles in the changing of shoreline dynamics and barrier size. In conclusion to this study,

the narrowing of zones tend to naturally rebound back to larger areas, however, attempts to protect the barrier island by means of construction and maintenance of artificial barrier dune ridges will result in the opposite result.

NCDOT. 2005. Environmental Consequences: Natural Systems: Chapter 4.7. Available from: http://www.obtf.org/documents/SDEIS2/SSDEISChap4.pdf Accessed: 01/19/2014

This impact statement discusses construction-related changes in topography and soils in low-lying areas. A bridge pile placement will cause an increase in impervious surface; and for surface water/water quality there will be a temporary increase in turbidity and the new bridge could increase the amount of highway storm water runoff into the Pamlico Sound. To the biotic communities, construction will cause biological impacts to their highly productive coastal ecosystem ways. For wetlands and open water habitats, all bridge structure options will shade open water, which will impact SAV and wetland biotic communities. For fisheries and wildlife, once bridge piles are in the ocean because of shoreline erosion, it will permanently affect diversity and density of some aquatic wildlife. However, on the opposite side of things, previous studies suggest that hardened structure attract reef or substrate dependent fish and could actually enhance the diversity and density of these fish assemblages in the near shore area.

U.S. Fish and Wildlife Service. No Date. Herbert C. Bonner Bridge replacement project: compatibility issues for Pea Island National Wildlife Refuge in North Carolina. Available from: http://www.fws.gov/peaisland/images/bonnerbridgefactsheet62603.pdf Accessed: 01/20/2014.

This "factsheet" released by the U.S. Fish and Wildlife Service (FWS), states the compatibility issues between the Pea Island National Wildlife Refuge and the replacement of the Bonner Bridge. According to FWS, Pea Island is use by hundreds of thousands of migratory birds, as well as many other species of wildlife every year. The refuge there also houses many endangered species. Because the ocean is constantly moving between 10 to 15 feet closer to NC 12 every year, NCDOT then has to create temporary dunes, remove sand, and relocate sections of the highway in many locations. All of this movement has a tremendous impact on the Refuge and unfortunately has resulted in the loss of wildlife habitat. FWS has stated that NCDOT has 4 alternatives for the bridge, but all pose a threat to wildlife such as impacting migratory bird habitats and submerging aquatic vegetation. FWS discusses the 4 options that NCDOT has to build the bridge while also state, which would be cheapest for the state vs. what, is best for the wildlife.

U.S. Fish and Wildlife Service. 2013. S-Curves beach nourishment interim protection for N.C. highway 12. Available from: http://www.fws.gov/peaisland/images/S-Curves%20Beach%20Nourishment%20DRAFT%20CD%20REVIEW.pdf Accessed: 01/21/2014.

In this draft of a beach nourishment protection for NC Highway 12 and Pea Island National Wildlife Refuge by the U.S. Fish and Wildlife Service is the anticipated biological impacts that will occur with the construction that will take place in the replacement of the Bonner Bridge. It is stated that "with regards to dredging", some marine and estuarine organisms (especially in the larval state) will be caught in the dredge head to then be discarded onto the beach. Smaller sea turtles may also be caught in the hydraulic dredge.

White, H. 2012. Restoration is good for business. Coastal Review Online. Available from: http://obxcommonground.org/category/1-environmental-news-and-issues/ Accessed: 01/20/2014

This article by White discusses the conservation of our coastal habitats. He shows how restoration of habitats can ultimately improve the NC coastal economy by creating more jobs and also by encouraging more tourism.

Cory Byrd

Beaufort Observer, (2013, December 08) Bonner Bridge issue shows the need for reform in environmental laws. Beaufortobserver.com. Available: http://www.beaufortobserver.net/Articles-NEWS-and-COMMENTARY-c-2013-12-08-270211.112112-Bonner-Bridge-issue-shows-the-need-for-reform-in-environmental-laws.html Accessed: (1/22/2014).

In this article in the Beaufort Observer, it is addressing the environmental laws that are being fought to build this new bridge. Bonner Bridge is being worn down each day and the production of the replacement bridge was on hold by an environmental law firm, saying the project management did not take enough time to look over all the laws and now has filed a lawsuit. This article is stating we need new environmental laws so there is no more obstruction of justice.

Bryant, M. (n.d). Herbert C. Bonner Bridge Replacement Project: Compatibility Issues for Pea Island Nation Wildlife Refuge in North Carolina. Fish and Wildlife Service. Available: http://www.fws.gov/peaisland/images/bonnerbridgefactsheet62603.pdf. Accessed: (1/20/2014).

This is a two page pdf file from the Fish and Wildlife Service, about the four options that were chosen for the replacing of Bonner Bridge. This file is concentrated mostly of the environmental impacts of each of the four choices. It looks at the alternant corridors that will run through or around Pea Island and analyzes which one will have the least impact on the Refuge.

Build The Long Bridge: Sound Solutions for Replacing the Bonner Bridge in North Carolina. N.d. Available: http://www.buildthelongbridge.org/. Accessed: (1/20/2014).

This is a website that is for building the longer bridge. It gives and in-depth overview of the project. Talking about how the bridge will be more cost effective, how it will help restore the National Wildlife Refuge, and gives an example of a similar situation that has happened in Louisiana and it worked out for the states benefit. The website also has sections about how the long bridge will be safer and more reliable as well as how it will help restore Pea Island National Wildlife Refuge.

Culver, S.J., D.V.,Ames, D.R., Corbett, D.J., Mallinson, S.R., Riggs, C.G. Smith, and D.J., Vance. 2004. Foraminiferal and Sedimentary Record of Late Holocene Barrier Island Evolution, Pea Island, North Carolina: The Role of Storm Overwash, Inlet Processes, and Anthropogenic Modification. Journal of Coastal Research. 22(4): 836-846. Available: http://www.bioone.org/doi/full/10.2112/03-0103.1. Accessed: (1/20/2014).

In this article the researchers used Foraminiferal, data found in core samples, geochemical dating and ground-penetrating radar transects hoping to show the hurricane history of a portion of the Outer Banks using overwash-event records found in the sediments. The samples were taken from Pea Island National Fish and Wildlife Refuge. After all the test the core samples taken from Pea Island did not show a detailed over was

recorded, instead it showed combined roles of overwash, inlet processes, and human modification in this part of the barrier island.

Eilperin, J. (2012, March 18). As Climate Changes, Louisiana Seeks to Lift a Highway. LA1 Coalition. Available: http://www.la1coalition.org/news/washington-post-as-climate-changes-louisiana-seeks-to-lift-a-highway. Accessed: (1/20/2014).

This is a website about LA-1 which runs through the marshlands of southern Louisiana. This article is on the problems with finishing the rest of highway 1. It addresses money issues they are having with finishing the rest of the highway, and has a few thoughts with what the project manager has to say. The highway is having similar problems as Bonner Bridge; it is sinking into the marshlands. Instead of building parallel to the old road they have realized that that should build a long bridge around the marshland to avoid the same problems in the future, even though it will cost more money. In the website it give a description of the road and what has already been built and talks about the benefits of the longer highway. It is a good example of why building parallel to the same location isn't always in the best interest of the state.

Frankenberg, D. 1995. The nature of the Outer Banks.: environmental processes, field sites, and development issues, Corolla to Ocracoke, 2nd ed. The University of North Carolina Press, Chapel Hill, North Carolina.

This book is showing each factor that is coming into play to move the Outer Banks. It gives in detail each ecological landmark that makes up each barrier island, and gives a look into the manmade landmarks like the Bonner Bridge. The end of the book looks at the problems we will be facing in the feature with the Outer Banks, and how to avoid some of the feature problems.

Inman, D.L. and R. Dolan.1989. The Outer Banks of North Carolina: Budget of Sediment and Inlet Dynamics along a Migrating Barrier System. Journal of Coastal Research. 5(2): 193-237. Avaiable: http://www.jstor.org/stable/pdfplus/4297525.pdf?&acceptTC=true&jpdConfirm=true Accessed: (1/22/2014).

In this journal article it discusses how much sediment is being eroded of the barrier islands and there inlets on the Outer Banks due to sea level rise and shoreline erosion. Knowing the islands are moving due to waves, winds, tides, and storms the researchers asked, is there a possible way to stop or slow down the moving inland of the islands. After the research they came up with a few possible solutions to slow down the movement, but overall the barrier islands should be considered "moving".

Mallinson, D.J., S.J. Culver, S.R., Riggs, J.P., Walsh, D.V., Ames, and C.W. Smith. 2008. Past, Present and Future Inlets of the Outer Banks Barrier Islands, North Carolina. Department of Geological Sciences, Harriot College of Arts and Sciences East Carolina University, Greenville.

This white paper talks about the formation of the inlets of the Outer Banks. It gives detailed looks about the Oregon, Hatteras, Ocracoke, Buxton, Isabel, Drum and Ophelia inlets. It talks about the past inlets that have been destroyed by storms in the past, and it talk about new inlets that could possibly form around the Outer Banks.

Nolan, I. (2014, January 10). No Good Choices for Bridging the Breach in North Rodanthe. Island Free Press. Available: http://islandfreepress.org/PivotBlog/?e=275. Accessed: (1/21/2014).

This website is comparing the two options that are being discussed for the replacement of the Bonner Bridge. The website lists both choices in detail and also gives a good description on what the impacts will be with each bridge. The bottom of the webpage gives a more information column with a lengthy Environment Assessment done by the project manager and the Department of Transportation.

North Carolina Department of Transportation. Purpose of, and Need for, Action. (n.d). Outer Banks Task Force. Available: http://www.obtf.org/documents/FEIS/03_FEISChapter1.pdf. Accessed: (1/22/2014).

This is a document from the North Carolina Department of Transportation, about the replacement of Bonner Bridge and the benefits of building the new bridge. This document outlines the project purpose and planning that is going into the new bridge. It also shows how proficient the new bridge will be.

Riggs, S.R., D.V. Ames, S.J., Culver, and D.J. Mallinson. 2011. The Battle for North Carolina's Coast.: Evolutionary History, Present Crisis, & Vision for the Future. The University of North Carolina Press, Chapel Hill, North Carolina.

This book outlines what problems were are having with North Carolinas barrier islands. How much the shore level is rising each year and the effects it is causing of the Outer Banks. The book also goes into feature sea-level rise and how humans need to change and adapt to the situations that are inevitably going to happen. It touches on the human modifications that have been made on the islands, how they are affected by the sea-level rise, and how maintenance have had a substantial, long-term negative impact on the natural islands themselves.

Riggs, S.R., D.V. Ames, S.J., Culver, D.J., Mallinson, D.R., Corbett, and J.P. Walsh, J.P. 2009. Eye of a Human Hurricane: Pea Island, Oregon Inlet, and Bodie Island, Northern Outer Banks, North Carolina. Geological Society of America 460(4): 43-72.

In this article the researchers looked specifically at Pea Island, the Oregon Inlet, and Bodie Island. They examined the function of the inlet and Pea Island and how overwash and the rising sea level affected their natural functions. The article also shows how the island can move in just one year and how the humans have tried to move it back to its original position. The final sections are about how Pea Island has been affected by beach nourishment and a few thoughts on what should be done about the Bonner Bridge and highway 12.

Riggs, S.R., S.J. Culver, D.V., Ames, D.J., Mallison, D.R., Corbett, and J.P. Walsh. 2008. North Carolina's Coasts in Crisis.: A Vision for the Future. Department of Geological Sciences, Harriot College of Arts and Sciences East Carolina University, Greenville.

This white paper talks about North Carolinas Coastal System and how each year it is changing and what the major effects will be on the coast. There is a section about the history of storms and how they are progressively getting worse because of global warming. It also talks about what is at risk and what adaptations North Carolinians have to do to utilize the islands wisely.

Siceloff, B. (2013 December 3). Erosion closes Outer Banks bridge, NCDOT plans repairs and emergency ferry. Newsobserver.com. Available: http://www.newsobserver.com/2013/12/03/3429044/ncdot-closes-outer-banks-bridge.html. Accessed: (1/22/2014).

This new article is addressing that the bridge is in need of repairs again because of erosion that could take as long as 90 days. It also talks about the lawsuits that are piling up over the Bonner Bridge, and it also talks about the hard times the residents of Hatteras have to face. Emergency ferries are being used the help passenger's cross the inlet but the effort is not enough for everyone needing to cross.

Witcher, T.R., (2012, May 15). Maintaining Infrastructure Challenges Outer Banks. Civil Engineering. Available: http://www.asce.org/CEMagazine/Article.aspx?id=25769808646#.UuAdQRAo6Uk Accessed: (1/22/2014).

This is a website that takes a look at the Bonner Bridge and Highway 12 and how they are affected each year by storms and erosion, and the costs of up keep. It looks at the benefits of the long bridge and why it is a good option but out of the price range. It also looks at how the small bridge will be cheaper and people will still be able to drive through the Pea Island Wildlife Refuge, which bring in nearly three million people a year. It also talks about the highway 12 hotspots that keep being wiped out by storms and need repairing.

Dustin Foote

Build the Long Bridge Coalition. No Date. In Depth Review. Build the Long Bridge. http://www.buildthelongbridge.org/overview.html. Accessed 01/19/2014

This is bias resource compiled by environmental groups and outer bank residents. However, it outlines the two replacement options for building a new bridge. A short bridge would run parallel to the existing bridge, or a longer bridge would run 17 miles across the Pamlico Sound. The longer bridge would bypass Pea Island. This organization is in favor of the longer bridge alternative and outlines how the longer bridge better serves public safety, cost, and ecological protection. Though more expensive, annual maintenance cost of the longer bridge is expected to be lower. This reference also sites a similar situation in Louisiana on LA-1. While arguing their case, the authors repeatedly reference evacuation routes during hurricane events as a priority.

Carter, D. S. 12/18/2013. The Better Bonner Bridge Alternative Avoids Eroding Sand. News and Observer. http://www.newsobserver.com/2013/12/18/3470479/the-better-bridge.html. Accessed 01/19/2014

In December 2013, Bonner Bridge was temporally closed. Derb S. Carter Jr. is director of the N.C. office of the Southern Environmental Law Center and reflects on the impact of the shutdown. The conflict between local and state government is discussed and according to Derb if the conflict had been resolved in 2003 a new bridge would already be constructed. A long bridge verses a short bridge is briefly discussed, but both share a common concern of continued maintenance by NCDOT. The author is in favor of a bridge/causeway through the shielded Pamlico Sound that avoids the eroding north end of Hatteras Island.

Corbett, J. J., and A. Farrell. 2002. Mitigating Air Pollution Impacts of Passenger Ferries. Transportation Research Part D 7: 197-211.

In 2002 a study was done on the pollution impacts of passenger ferries. While this paper has nothing to do with NC State it has some useful data on emission trade off between ferry system verse bridges. Engine emissions were examined in both old and new ferry models and compared with projected emissions from commuters. Less CO but more NO and PM are produced in diesel-powered ferry systems per passenger trip than if people

commuted independently. The study also brings up an interesting point about the reliability of ferry systems verses their flexibility. New routes can easily be incorporated; however, reliability in extreme weather events is of concern.

Crawford, T.W., D. J. Marcucci, and A. Bennett. 08/13/2012. Impacts of Residential Development on Vegetation Cover for a Remote Coastal Barrier in the Outer Banks of North Carolina, USA. Journal of Coastal Conservation: 17:431-443.

In 2013 a study was done on the impacts of residential development on vegetation for remote coastal barrier in the Outer Banks of North Carolina. This article does not address Bonner Bridge directly. It does show how coastal barrier environments are heavily influenced by human activities. This paper raised several important questions in my mind. If a new bridge or replacement bridge is constructed, what will the environmental costs be during construction in addition to the environmental cost of continued urbanization of the outer banks that a new bridge could prompt? The results of this study pertaining to coupling natural and human systems should be studied further if alternative sites are considered for a short and/or long bridges.

Herbert C. Bonner Bridge. No Date. Outer Banks. http://www.outerbanks.com/herbert-c-bonner-bridge.html. Accessed 01/19/2014

This website provides an overview on the history of Bonner Bridge from the standpoint of an Outer banks promotional group. The Bonner Bridge is called a "lifeline" for seven villages along the Northern Outer banks and is credited to kick starting the economy of the seven communities through tourism. This source does not take a stance on the long bridge short bridge debate and even touches on groups that do not want to replace the bridge. The communities that are affected by the debate are the central focus.

Kozak, K. 07/18/2013. Groups Win Appeal on Bonner Bridge Permit. North Carolina Coastal Federation. http://www.nccoast.org/m/article.aspx?k=ee8a7984-5fab-41ac-a18a-d7c627dc4c79. Accessed 01/21/2014

A Wake County Superior Judge ruled in favor of the Southern Environmental Law Center and has put NCDOT on hold regarding construction of a new bridge. In 2011 NCDOT awarded a 215 million dollar contract for the construction of a parallel bridge over Oregon Inlet. The SELC represents to main environmental groups that have concerns over the ecological impact of the bridge. The group is in favor of a 17-mile long bridge that would bypass Pea Island National Wildlife Refuge. High-speed ferries are also being examined by the petitioners.

McCloskey, S. 12/11/2013. Heads in the Sand Over Bonner Bridge. NC Policy Watch http://www.ncpolicywatch.com/2013/12/11/heads-in-the-sand-over-the-bonner-bridge/. Accessed 01/20/2014

This news piece defines Bonner Bridge in very clear terms. Bonner Bridge spans Oregon Inlet and allows locals and visitors to travel down NC 12 from the southern Outer Banks and cross back to the mainland in the northern part of the Outer Banks. An important point that this article addresses is the maintenance of NC 12 in addition to bridge maintenance. A parallel bridge could fix the immediate problem of bridge shutdowns but it does not address NC 12. The more expensive long bridge alternative would bypass some of the more "difficult" parts of NC 12. In 2003 NCDOT and local officials had agreed on the long bridge alternative through the Pamlico Sound, but environmental groups halted construction.

Midgett, B. 01/17/2014. NC Needs to Face Reality on Bonner Bridge Replacement. News Observer. http://www.newsobserver.com/2014/01/17/3542415/nc-needs-to-face-reality-on-bonner.html. Accessed 01/20/2014

In 2006 NCDOT hired an independent engineer that concluded regardless of repairs, by 2016 Bonner Bridge will have to be replaced. Hatteras supports over 2.5 million visitors annually and houses over 40 thousand residents in the summer months. The author is in favor of the short bridge replacement and states that evacuation of visitors and residents makes a ferry system unreliable. Hatteras Island is powered via electric lines that run under Bonner Bridge, alternatives would have to be explored if Bonner Bridge is not replaced. Cost of the long bridge option is said to be unrealistic.

Miselis, J.L., and J.E. McNinch. 07/17/2006. Calculating Shoreline Erosion Potential Using Nearshore Stratigraphy and Sediment Volume: Outer Banks, North Carolina. Journal of Geophysical Research: Earth Surface(2003-2012) 111: F2 Online Published.

At the core of the Bonner Bridge Debate is the ever-changing formation of the Outer Banks. The Outer Banks have a natural cycle of movement, with inlets forming and disappearing over time. This is an in depth study on the movements of the banks and predicting future erosion rates. Studies such as this are important when examining the long-term maintenance of a Bonner Bridge replacement.

NCDOT. No Date. Bonner Bridge Replacement Project. NCDOT. http://www.ncdot.gov/projects/bonnerbridgereplace/. Accessed 01/19/2014

In 1963 the NCDOT spent $4.1 million to extend NC route 12 over the Oregon Inlet. The project was designed to provide visitors and locals with access to Hatteras Island in addition to alleviating pressure on the existing ferry route to the island. Between its construction and 1990, NCDOT has spent over $56 million on repairs. In 1989 the NCDOT began exploring options for a new bridge; however, they are currently faced with several lawsuits most recent of which was filed on August 13 on behalf of the Defenders of Wildlife and the National Wildlife Refuge Association. Until these lawsuits are resolved the project is at a standstill. While facing lawsuits, NCDOT has investigated multiple options for new bridge designs. Currently a parallel bridge along side the existing bridge has been chosen.

Nolan, I. 09/06/2013. Time has Run Out for Replacing Bonner Bridge. Island Free Press. http://islandfreepress.org/PivotBlog/?e=258. Accessed 01/20/2014

NCDOT has commissioned four independent companies to access the structural integrity of Bonner Bridge. Their findings show that the bridge is currently safe for transportation but is in need of replacement soon. If repairs recommended by the group are made, the bridge could remain functional for another ten years. These repairs are costly and are not a long-term solution. Environmental groups oppose current replacement of the bridge and law makers are at a standstill.

Ports, M.A., P. Johnson, C. Shea, and A. Rahmani. 1997. On Scours Frontier. Civil Engineering. 67:8:60-62.

The study examines both physical and computer models that attempt to assess scour in the design plans of a new bridge. The current bridge has cost the state millions in repair cost and additional sand has been added to its supports numerous times. Accurate assessment of scour in proposed designs is critical for reducing future maintenance costs. The three variables being examined in scour estimates are water depth, flow velocity, and angle of attack.

Southern Environmental Law Center. 12/11/2013. Bonner Bridge Replacement. Southern Environmental Law Center. http://www.southernenvironment.org/cases/bonner_bridge_replacement. Accessed 01/19/2014

This is a case summary of the states plan to replace Bonner Bridge written by an environmental group and is concentrated towards environmental issues surrounding replacing the bridge. The review focuses on the continued natural erosion that will continue to affect a new bridge. The study discusses alternative options instead of a parallel bridge replacement such as a high-speed shallow draft ferry system or alternative bridge sites. Construction affects wildlife on species such as turtles and birds are briefly mentioned. A timeline for Bonner Bridge also provides information after 1990 to 2014 about NCDOT expenditures.

Tsai, J., T. Cook, D. J. Findley, and M. Miller. 2011. North Carolina Ferry System. Transportation Research Record: Journal of the Transportation Research Board, No. 2216:2011:108-115.

An alternative for constructing a bridge is implementing a ferry system that will allow locals and visitors to cross between the southern and northern parts of the Outer Banks. This study reviews the current NCDOT Ferry Division, which operates twenty-one vessels on seven routes. This study examines the challenges the system currently faces such as lack of capacity and aging vessels. If a ferry system was to replace Bonner Bridge, there are many key aspects that would have to be addressed such as vessel operation during severe weather events as evacuation routes would have to rely on the system. Length of trip was of concern in all seven routes and many who oppose the ferry system believe it will constrict tourism.

WNCN. 12/06/2013. McCroy, GOP say lawsuit is slowing Bonner Bridge Replacement. Associated Press. http://www.wncn.com/story/24151649/mccrory-traveling-to-outer-banks-to-see-bridge. Accessed 01/18/2014

In 2013 the Bonner Bridge was temporally closed after state officials learned that sand had been scoured out from some of the supports. At the time of this article, the state planned on dredging the inlet to fortify the supports with sand. The Southern Environmental Law Center is opposing governor McCroy and the NCDOT decision on replacing Bonner Bridge with a 2.5-mile parallel bridge. According to the SELC the state's plan does not address breaches on the coastal sections of NC 12.

Oliva Green

Buildthelongbridge.org. No Date. Build the Long Bridge: Sound Solutions for Replacing the Bonner Bridge in North Carolina. http://www.buildthelongbridge.org/overview.html. Accessed 1/20/14.

The Long Bridge is safer and more reliable, it's also more cost effective in the long run, and it will help restore the National Wildlife Refuge.

Colwell, C. R. Farshchi, T. and Jenkins, J. Kim. 2013. Evaluating Transportation Alternatives for Hatteras Island, North Carolina Outer Banks. Ms project Nicholas School of the Environment, Duke University.

There are three options for the replacement of the bridge a long bridge, a short bridge, and the option to completely get rid of the bridge. After interviewing several government officials and specialists, and weighing out the costs for each option and the amount of habitat destruction, and long term costs, the decision for the long bridge seems best fit.

Fenster, M.S. D. Robert. 1993. Historical Shoreline Trends Along the Outer Banks, North Carolina: Processes and Responses. Journal of Coastal Research: 172-188.

An attempt to link the spatial and temporal shoreline responses of a segment of the Outer Banks to their causative processes. The determination is made difficult because of the lack of consistent empirical data. Very few of the coasts shore lines are systematically monitored.

Fox.A, A. Kohn. 12/3/13. Judge:" We need the bridge replaced." Wavy.com. http://www.wavy.com/news/north-carolina/ap-north-carolina/safety-concerns-force-bonner-bridge-closure. Accessed 1/20/14

Addresses the possible issues with letting the bridge deteriorate. When the bridge was last shut down, ferries were the only mode of transportation. Those with medical emergencies were given priority, however a round trip is 11 to 12 hours. Another issue that came up was electricity. Electric wires are built in under the bridge, and if anything were to disrupt that, the island would be without electricity. Generators would be necessary.

Glass, A. and O. Pilkey. 4/21/13. Denying Sea-level Rise: How 100 centimeters divided the state of North Carolina. http://www.earthmagazine.org/article/denying-sea-level-rise-how-100-centimeters-divided-state-north-carolina. Accessed 1/20/12

Politicians have denied scientific evidence involving sea-level rise. Scientists predict the possibility of an increase of 100 centimeters by 2100, meaning that any coastal management should take that into consideration when planning. North Carolina should be taking special precaution due to the Outer Banks.

Inman, D.L. and R. Dolan. 1989. The Outer Banks of North Carolina: Budget of Sediment and Inlet Dynamics Along a Migrating Barrier System. Journal of Coastal Research: 193-237.

The Outer Banks are a classical example of a transgressive barrier island coast with cuspate headlands. The barriers and their migrating inlets are constantly changing under the influence of waves, currents and sea level rise.

Matson, N. and D. Carter. No Date. Bonner Bridge Replacement Long Bridge is More Cost Effective. http://www.defenders.org/publications/pea_island_national_wildlife_refuge_bridge_cost_effectiveness.pdf. Accessed 1/21/14.

Taking in future costs that the short bridge would require to keep open to the public, though the long bridge is more expensive upfront, it is the better choice. It will be built in much calmer waters, in a more stable part of the island.

McCloskey, S. 12/11/13. Heads in the sand over Bonner Bridge. NC Policy watch http://www.ncpolicywatch.com/2013/12/11/heads-in-the-sand-over-the-bonner-bridge/. Accessed 1/20/14

Arguments for the parallel bridge state that it's cheaper, and will be designed to last through category 3 to 4 hurricanes and sand erosion. Arguments for the 17-mile bridge state that the estimate of $1.2 billion is very inflated, seeing that the estimate in 2012 was only $569 million.

North Carolina Department of Transportation. No Date. Bonner Bridge Replacement Project. http://www.ncdot.gov/projects/bonnerbridgereplace/.Accessed 1/20/14

An overview of the replacement project. Includes description of the plan, Bonner Bridge history, challenges the project faces, and the purpose behind the replacement.

Outerbanks.com. No Date. Herbert C. Bonner Bridge. http://www.outerbanks.com/herbert-c-bonner-bridge.html . Accessed 1/20/12

Bonner Bridge is a lifeline for Hatteras Island; it connects the barrier island communities to the Northern Outer Banks. It was opened in 1963 to the public, and cost $4 million to build. $50 million has been spent between the years of 1987 and 1999 in order to keep it open to the public. There are currently three ongoing debates on the replacement of the bridge, a seventeen mile long bridge going from Oregon inlet to Rodanthe, a smaller parallel bridge, or the option of letting the bridge deteriorate and revert back to the ferry system.

Overtone M.F, J.S Fisher, W.A Dennis, and H.C Miller. 1992. Shoreline Change at Oregon Inlet Terminal Groin.

The Oregon inlet Terminal Groin was completed in 1991 in order to provide protection to Bonner Bridge. It also stands to protect the shore line downdrift of the groin. To date, there are no adverse impacts on the groin.

Pendleton, A E. Elizabeth, Thieler, and Williams. No Date.Coastal Vulnerabilty Assessment of Cape Hatteras National Seashore (CAHA) to Sea-Level Rise. USGS Science for a Changing World.

The coastal vulnerability index provides insight into the relative potential of coastal change due to future sea-level rise. Cape Hatteras National Seashore preserves a dynamic natural environment that much be understood in order to be managed properly. The CVI can give insight to how the shores may evolve in the future.

Pilkey, O. 1/14/14. The continual cost of coastal confusion: Ferries the Solution. NCSpin.com. http://www.ncspin.com/2014/01/14/the-continual-cost-of-coastal-confusion-ferries-the-solution/. Accessed 1/20/14.

Although many mistakes were made when planning the bridge in the first place, due to projected sea level rise and accelerated beach erosion, the public should invest in a modern high speed, high capacity ferry system. However if a bridge must be made, the long bridge option is the way to go because it will allow for the removal of the terminal groin, and it will allow the inlet to migrate. It will avoid costly beach replenishment and alleviate the need for Highway 12.

Pilkey, O. H. Coburn, and S. Andrew No Date. Web Files. Virginian Pilot. http://www.wcu.edu/WebFiles/PDFs/Virginian_Pilot_Jan_06.pdf. Accessed 1/20/14.

Construction of a new 17 mile long bridge has many benefits that include allowing Pea Island time to respond to the sea level rise, give tourists a rout to the scenery, and allowing a reliable means for transportation between the villages meaning Highway 12 can be closed. This bridge may buy more costly up front, but in the long run it will pay off.

Southern Environmental Law Center. 12/11/13. Bonner Bridge Replacement, Outer Banks NC 12 Access Unreliable for Hatteras. Environmental Law Center. http://www.southernenvironment.org/cases/bonner_bridge_replacement. Accessed 1/20/14

Southern Environmental Law Center states that the DOT failed at planning a way to maintain NC Highway 12 if a parallel bridge is built as a replacement for the Bonner Bridge. The new bridge will mean that the highway will go through Pea Island National Wildlife Refuge, to Rodanthe on the Barrier Islands. This highway is continuously being

overwashed or washed out by high tides and storms. The SELC and other conservation groups are pushing for a safer alternative, which includes a "long bridge' that would place the southern end of the bridge in the village of Rodanthe.

Andrew Jones

Build the Long Bridge. No Date. Sound solutions for replacing the Bonner Bridge in North Carolina. http://www.buildthelongbridge.org/overview.html. Accessed 1/22/14.

Current and past issues with the Bonner Bridge and the stretch of land connecting Nags Head to the Southern Outer Banks has people looking for long term solutions to fix these problems. One proposed solution is to build a "long bridge". The long bridge will be a raised section of road that runs through the Pea Island National Wildlife Refuge and will be much less susceptible to destruction from the ocean and storms. The initial costs of building the long bridge are high but the money saved in the future from not having to clean and replace the road will make it cost effective. Louisiana has had similar issues to the ones facing NC and the Bonner Bridge area and has decided to develop a long bridge of its own. The article uses this example to strengthen its argument for the construction of a long bridge in North Carolina.

Dawn Kurry. December 6, 2013. Hatteras Island to lose millions with Bonner Bridge closed. http://www.bizjournals.com/triangle/news/2013/12/06/hateras-island-to-lose-millions-with.html. Accessed 1/22/14.

With the Bonner Bridge being closed due to safety reasons it is speculated the lower eight villages of the Outer Banks could lose over $3.4 million in revenue throughout the course of December. An East Carolina University professor has speculated that the region south of the Bonner Bridge will lose about $110,000 daily as long as the bridge remains closed.

Dolan, Robert, Glassen, Robert. May 1973. Oregon Inlet, North Carolina- A History of Coastal Change. Southeastern Geographer, Volume 13, Number 1: pg 41-53.

Understanding sandy inlets and Barrier Islands is fundamental for geologists. Knowing how they change with time is crucial for coastal engineers. In this article one inlet is the focused area of study; the Oregon inlet in North Carolinas Outer Banks. Oregon Inlet which separate Bodie Island to Pea Island was first discovered in 1585, since this time the inlet has undergone periods or migration and temporary closure, like most barrier island inlets do. Such inlets create a connection between the salty ocean and the lagoons behind the barrier island. The lagoon or sound between the NC mainland and the Outer Banks is one of the largest in the nation with a surface area of over 2,500 square miles. On average the Pamlico Sound is 10 feet deep with maximum depth reaching 35 feet in select areas. The sound is also very susceptible to storm surge and abnormally high storm tides. The distribution of inlets along the Outer Banks has changed over time with new inlets opening and closing as storms pass through the region. The direction and magnitude are the two main influences that cause the littoral drift of these inlets. Sand is carried and deposited by currents and waves creating spits and shoals that can lead to the closure of one inlet and the opening of another. The article also touches on the history of the Oregon inlet and the implementation of the Bonner Bridge.

Emory P. Dalesio. December, 2013. Groups shun North Carolina critics, appeal Bonner Bridge Case.http://m.scnow.com/news/state/article_cdfe1398-61c3-11e3-a12b-001a4bcf6878.html?mode=jqm. Accessed 1/22/14.

Environmental groups are outraged with North Carolinas plan to replace the Bonner Bridge stating the replacement project ignores the costs and environmental impacts of

keeping open a road continually cut off by storms and sand. Ten years ago the NCDOT decided to construct a 17 mile long bridge that would be raised over susceptible segments of NC highway 12, environmental; groups supported this construction. But this project was estimated to cost over $1 billion, so the idea was revoked and instead a plan to construct a 2.5 mile bridge that cost $200 million was implemented. This has environmentalists angry because they believe this is not a viable long term solution, and is something that violates federal environmental laws.

Jeff Hampton. December 13, 2013. Bonner Bridge closure makes journeys of routines. http://hamptonroads.com/2013/12/bonner-bridge-closure-makes-journeys-routines. Accessed 1/22/14

The Bonner Bridge was shut down on December 3rd with little notice to Outer Banks residents after severe erosion was discovered around the bridge pilings. The Bonner Bridge is the only road connecting the north Outer Banks to the Southern Outer Banks, with over 500 residents relying on it to get to work. The closure of this bridge turned a one and a half hour commute to a six hour commute. The state opened up a free ferry service to take residents from Rodanthe to Stumpy Point, an operation that costs the state over $6,000 daily. This is inconvenient for the state and its people and is raising question of how to prevent such a problem in the future.

Julia M. Klein. November 8, 1990. Collapse of Tourism follows collapse of bridge. http://articles.philly.com/1990-11-18/news/25927476_1_bridge-collapse-ferry-service-fishing-club. Accessed 1/22/14.

Three weeks after a storm driven barge severed the Bonner Bridge, the southern Outer Banks' only lifeline to the mainland, the island seems deserted. The bridge is the only means for tourists and resident to get to the southern Outer Banks, and since it has been cut off the island has become a ghost town.

North Carolina Department of Transportation. No Date. Bonner Bridge Replacement Project. http://www.ncdot.gov/projects/bonnerbridgereplace/. Accessed 1/22/14.

The Bonner Bridge is crucial to North Carolinas $19.3 billion tourism industry. It is a lifeline for the people living in the Southern Outer Banks. For 50 years the bridge has been battered by storms and the ocean to the point that it now needs to be replaced. Currently work is being done to reinforce the Bonner Bridge until the new bridge is finished but with financial and legal issues the project is taking longer than expected to be completed.

North Carolina Department of Transportation. August 17, 2010. Historic number of citizens comment on Bonner Bridge replacement project in Dare County. https://apps.ncdot.gov/NewsReleases/details.aspx?r=3933. Accessed 1/22/14.

More than 3,800 people have sent comments to the NCDOT regarding the replacement of the Bonner Bridge and of these 3,800 people 95% favor the immediate construction of a new bridge. This issue has raised more public outcry than any other in Outer Banks history with resident commenting on how and when they believe the construction of a new bridge should take place.

Riggs Stanley R., Ames Dorothea V., Culver Stephen J., Mallinson David J., Corbet D. Reide, Walsh John P. 2009. Eye of a human hurricane: Pea Island, Oregon Inlet, and Bodie Island, northern Outer Banks, North Carolina. GSA Special Papers 2009, v. 460: p. 43-72.

With the construction of NC highway 12 the segment of land from Bodie Island to Hatteras has become one of the most man altered landscapes in the nation. In the past the

Barrier Islands of North Carolina have been able to move freely with storms, tides, and currents but now that there is rigid man made structure the land is becoming more permanent, or at least we hope. The construction of highway 12 has given life and access to the Southern outer Banks and has made it one of the most popular tourist destination in the United Stated but constant destruction and over wash of highway 12 has made it a popular topic of controversy. Many plans and projects have tried to protect the integrity of the barrier island with the implementation of jetties, groins, and barriers. This article goes in depth of how humans are trying to fight Mother Nature in order to keep the Outer Banks in place.

Sam Walker. December 27, 2013. Bonner Bridge will remain open during A-jacks support projects. http://outerbanksvoice.com/2013/12/27/bonner-bridge-will-remain-open-during-a-jacks-project/. Accessed 1/22/14.

Early in December Bonner Bridge was closed for 12 days after large amounts of sand were washed away from its support piers making the structure unstable. The bridge was reopened after a dredge pumped sand back to the support structures making the bridge more stable. The bridge piling are being continually scanned and inspected to make sure the bridge is safe for travelers. Bags of sand have been dropped to further strengthen the pilings and soon large concrete fixtures will be dropped to help hold sand in place and stabilize the Bonner Bridge.

Southern Environmental Law Center. No Date. Bonner Bridge Replacement. http://www.southernenvironment.org/cases/bonner_bridge_replacement. Accessed 1/22/14.

North Carolinas current plan is to replace Bonner Bridge and continue rebuilding the stretch of highway 12 that connects the southern Outer Banks to the North Carolina mainland. This website claims that this plan is illegal and unsafe for residents and tourists. This stretch of road is continually over washed and eroded year after year costing the state and tax payers an undisclosed amount of money. Alternatives to rebuilding the road are suggested such as a longer bridge that will bypass the unstable section of highway 12 or a low-draft ferry that can carry vehicles to the Southern Outer Banks.

U.S. Fish and Wildlife Service. No Date. Herbert C. Bonner Bridge Replacement Project. http://www.fws.gov/peaisland/images/bonnerbridgefactsheet62603.pdf. Accessed 1/22/14.

In 2006 the NCDOT proposed a plan to construct a replacement bridge for the Bonner Bridge in North Carolinas Outer Banks. The Bonner Bridge has been a useful means of transportation for residents and tourists of the Outer Banks but it is nearing the end of its life. When the bridge was constructed, its environmental impacts were not fully understood. Continual wash outs have forced the NCDOT to repeatedly protect the integrity of the highway system. The remainder of the article focuses on four alternatives to replacing the current bridge and how each will impact the area financially and environmentally, particularly focusing on migratory birds.

Haley Quarles

Carter, D. S. December 18, 2013. The better Bonner Bridge alternative avoids eroding sands. http://www.newsobserver.com/2013/12/18/3470479/the-better-bridge.html. Accessed 1/22/2014.

The “longer bridge” option is discussed in this article. The longer bridge would run through the sheltered Pamlico Sound to bypass the north end of Hatteras Island that is

eroding. The article further elaborates of the price discrepancies that face the rebuild of the Bonner Bridge.

Crawford, T. W., Marcucci, D. J., and A Bennett. March 24 2013. Impacts of residential development on vegetation cover for a remote coastal barrier in the Outer Banks of North Carolina, USA. Journal of Coastal Conservation.

Development has a negative effect of vegetation in remote areas of the coast. This study describes the types of coastal vegetation, how vegetation has changed post development, and ways to preserve vegetation.

Fenster, M.S., and R Dolon. No date. Historical Shoreline Trends along the Outer Banks, North Carolina: Processes and Responses. Journal of Coastal Research 9: 172-188.

Hatteras Island is used as the example in this study where trends of the North Carolina shore line were discussed. Long term and short term trends were studied and it was found that erosion, among other things, have occurred and could be due to a number of factors.

Klein ,J.A. November 18, 1990. Collapse Of Tourism Follows Collapse Of Bridge. http://articles.philly.com/1990-11-18/news/25927476_1_bridge-collapse-ferry-service-fishing-club. Accessed 1/22/2014.

This article is from 1990 when the Bonner Bridge collapsed. The article gives insight into the locals' lives after the bridge collapsed about how it affected local businesses. This brings rise to the thought that the bridge is a lifeline and without it what would business be like for the locals.

Southern Environmental Law Center. No date. Bonner Bridge Replacement. http://www.southernenvironment.org/cases/bonner_bridge_replacement. Accessed 1/22/2014.

This article is geared toward the side of not rebuilding the bridge in the same location it is already in. It is stated that the rebuild plan in illegal and unreliable. This article does give what they believe to be "reliable, safe alternatives" such as a longer bridge or high speed ferries.

Moore, L. J., List, J. H., Williams, S. J., and D. Stolper. No date. Complexities in barrier island response to sea level rise: Insights from numerical model experiments, North Carolina Outer Banks. Journal of Geophysical Research 2010: 115.3.

This study used morphological behavior models to determine how sea-level rise would affect the barrio islands. The island eventually became submerged with water. This same effect would occur with Hatteras Island where the original Bonner Bridge is connected to.

NCDOT. No date. Bonner Bridge Replacement Project. http://www.ncdot.gov/projects/bonnerbridgereplace/. Accessed 1/22/2014.

The Bonner Bridge Replacement Project is a plan to tear down the existing Bonner Bridge and replace it with a new more safe bridge. This article goes into detail of the project and explains the bridges history, its current condition, and challenges that the project faces such as lawsuits.

NCDOT. No date. Bonner Bridge Repair Work. http://www.ncdot.gov/projects/bonnerbridgerepairwork/ . Accessed 1/22/2014.

Updates are currently being made to improve the Bonner Bridge until the future bridge is under construction. A few of the bents are being repaired with scouring protecting work. A few of the most recent projects have cost upwards of three million dollars.

News Channel 3. January 3, 2014. Emergency repairs continue on the Bonner Bridge. http://wtkr.com/2014/01/03/emergency-repairs-continue-on-the-bonner-bridge/. Accessed 1/22/2014.

This article discusses the current updates that were done to the Bonner Bridge to make it safe again for travel. As stated in the article, the Bonner Bridge is the only bridge that links to Hatteras Island therefore making it very important for travel. The article goes on to discuss what types of repairs were conducted on the bridge.

Outer Banks.com. No date. Herbert C. Bonner Bridge. http://www.outerbanks.com/herbert-c-bonner-bridge.html. Accessed 1/22/1014.

The history of the Bonner Bridge is discussed first in this article. Before the original bridge was constructed, the use of unpractical ferry usage was briefly explained. After the four million dollar bridge was constructed, many storms caused damage to the bridge thus called for reconstructions projects. This article also discusses the attractions that the bridge connects to such as fishing spots and the Oregon Inlet.

Rebuilding NC12. December 11, 2013. Underwater Surveys and Pile Tests on Completed on Bonner Bridge.http://nc12repairs.blogspot.com/2013/12/underwater-surveys-and-pile-tests-on.html. Accessed 1/22/2014.

The majority of this article covers the above and underwater tests that were done prior to reopening the Bonner Bridge in December 2013. Most interesting and informative to the future of the bridge was the last paragraph that states that as of July 2011 $215.8 million was awarded to the rebuild of the Bonner Bridge. Construction could have commenced as early as the beginning of 2013 but lawsuits prohibited it.

Sonu, C. J., and V. L. Van Beek. No date. Systematic Beach Changes on the Outer Banks, North Carolina. Chicago Journals 79: 416-425.

This study measured the coastline of North Carolina and proved that it is ever changing and moving. This study backs up the idea that putting the bridge in the same location will eventually fail because of the eroding coastline.

Southern Environmental Law Center. No date. Bonner Bridge Replacement. http://www.southernenvironment.org/cases/bonner_bridge_replacement. Accessed 1/22/2014.

This article is geared toward the side of not rebuilding the bridge in the same location it is already in. It is stated that the rebuild plan in illegal and unreliable. This article does give what they believe to be “reliable, safe alternatives” such as a longer bridge or high speed ferries.

The Outer Banks Voice. No date. Related stories. http://outerbanksvoice.com/2013/12/05/politicians-selc-trade-blame-over-bonner-bridge-crisis/. Accessed 1/22/2014.

The political side of why the new bridge has not undergone construction is briefly explained with this article. The Southern Environmental Law Center is given the blame for the hold on the rebuild and in return they blame the state. Statements from press conferences are also given in this article.

Work, P. A., Spencer, M. R., and R Osborne. No date. Flood Retrofit of Coastal Residential Structures: Outer Banks, North Carolina. Journal of Water Resources Planning and Mangement 1999: 88-93.

This study was done to help better outfit structures for flood damage. It was conducted on houses but some of the same concepts and ideas are used for the construction of bridges.

Meganne Rose

Anon 2012 "Island Links". .Alexandria: Transport Topics Group (TTPG), 2012. 27 Aug. 2012. Accessed: 22 Jan. 2014. <http://search.proquest.com.jproxy.lib.ecu.edu/docview/1038155516?accountid=10639>.

Goes into the history of the Bonner Bridge from 1962, and explains how the bridge has more than exceeded its intended lifespan. Gives perspective on the lifespan of a future build of the bridge.

Frankenberg, D. 1995 *The Nature of the Outer Banks: Environmental Processes, Field Sites, and Development Issues, Corolla to Ocracoke*. Chapel Hill, NC: University of North Carolina

This book goes into detail about the natural processes that directly effect Hatteras Island and HWY 12. It also goes into the environmental hazards of over development and change along North Carolina's Coast.

Klein, J.M. 1990 "Collapse Of Tourism Follows Collapse Of Bridge." *Philly.com*. The Inquirer, 18 Nov. 1990. Accessed 22 Jan. 2014. <http://articles.philly.com/1990-11-18/news/25927476_1_bridge-collapse-ferry-service-fishing-club>.

This article from the Philadelphia Inquirer goes into the side effects of not having a bridge connecting Hatteras Island to the rest of the Outer Banks. The Economy of The Outer Banks relies primarily on tourism, and without a convenient means of travel, Hatteras Island will suffer due to a lack of tourism, as happened previously in the collapse of Bonner bridge in 1990s.

Kozak, C. 2010 "20 Years Ago a Runaway Dredge Tore a Hole in the Bonner Bridge, and Islanders and Visitors Relied on Temporary Ferries for Months." *Hatteras and Ocracoke Island News*. Island Free Press, 25 Oct. 2010. Accessed. 20 Jan. 2014. <http://islandfreepress.org/2010Archives/10.25.2010-20YearsAgoARunawayDredgeToreAHoleInTheBonnerBridgeAndIslandersAndVisitorsReliedOnTemporaryFerriesForMonths.html>.

This article from a local newspaper details why the plan to adopt ferries as a reliable means of transport for the people who live in Oregon Inlet is not sustainable, and goes on to state the reasons and necessities of Bonner Bridge. Gives a local perspective to the bridge.

Lane, B. 2013 "Hatteras Island Economic Impact." *Outer Banks Economy*. Outer Banks Visitor's Bureau, July 2013. Accessed 22 Jan. 2014. <http://www.outerbanks.org/media/914511/hatteras_island_economic_impact_assessment_final_report_july_2013.pdf>.

The economic profile for the Outer Banks, including Oregon Inlet and Hatteras Island. Directly shows the correlation between healthy tourism and a healthy economy.

Organisation for Economic Co-operation and Development. 1995. *Repairing Bridge Substructures*. Organisation for Economic Co-operation and Development, Paris

Explains the necessary methods involved to repair common bridge issues such as 'Scouring' caused by erosion and sand movement.

Outerbanks.com. 2013. "Herbert C. Bonner Bridge." *Herbert C. Bonner Bridge*. ICWNET Inc, 2013. Accessed. 22 Jan. 2014. <http://www.outerbanks.com/herbert-c-bonner-bridge.html>.

Goes into the history of the bridge, as well as the surrounding Hatteras Island area.

Outerbanks.org. 2013. "Visitor's Bureau." OuterBanks Visitor's Bureau, 2013. Accessed. 22 Jan. 2014. <http://www.outerbanks.org/media/925789/bonner_bridge_faqs.pdf?utm_source=Bonner+Bridge+FAQ&utm_campaign=Event+site+mtg&utm_medium=email>.

This quick Q and A type PDF gives the visitor's information about the Bonner Bridge closing, and how the temporary closing of the bridge effected the tourists to Hatteras Island.

Siceloff, B. 2013. "NewsObserver.com." *Erosion Closes Outer Banks Bridge, NCDOT Plans Repairs and Emergency Ferry*. Raleigh News Observer, 3 Dec. 2013. Accessed. 22 Jan. 2014. <http://www.newsobserver.com/2013/12/03/3429044/ncdot-closes-outer-banks-bridge.html>.

Article detailing the hardships faced by citizens and by the economy of Hatteras Island as the environmental groups stall the rebuilding of the Bonner Bridge. Lists why Ferrys are not an option.

Smyre, B. and J. Page.2013. "Bonner Bridge Replacement Project." *Bonner Bridge Replacement Project*. North Carolina Department of Transportation, n.d. Accessed. 22 Jan. 2014. <http://www.ncdot.gov/projects/bonnerbridgereplace/>.

Goes into the reasons for and expected cost of total Bonner Bridge replacement.

Southern Environmental Law Center. 2013. "Bonner Bridge Replacement." *Bonner Bridge replacement*. Southern Environmental, 11 Dec. 2013. Accessed. 19 Jan. 2014. <http://www.southernenvironment.org/cases/bonner_bridge_replacement>.

This article explains the shortcomings of the proposed Highway 12 plan in regards to the Pea Island National Wildlife refuge that would be directly affected by the building of Bonner Bridge in a new location.

Stille, D. R. 2005. *Erosion: How Land Forms, How It Changes*. Compass Point, Minneapolis, MN

This details exactly how erosion affects land masses, structures, and how it can be counteracted.

United States General Accounting office. 2002 *Environmental and Economic Concerns Still Need to Be Resolved*. N.p.: United States, General Accounting Office, 2002. *Oregon Inlet: Jetty Project*. 2002. Accessed. 22 Jan. 2014. <http://www.gpo.gov/fdsys/pkg/GAOREPORTS-GAO-02-803/pdf/GAOREPORTS-GAO-02-803.pdf>.

Goes into the constant dredging necessary to keep the area around Bonner Bridge from being destroyed on a regular basis, supports moving the bridge.

Walker, S. 2013."First Look at the Bridge." *The Outer Banks Voice*. N.p., 6 Dec. 2013. Accessed. 22 Jan. 2014. <http://outerbanksvoice.com/2013/12/06/gov-mccrory-gets-first-hand-look-at-bonner-bridge/>.

Gov. McCrory gets a first hand look at the state of Bonner Bridge, and says he will ask the Southern Environmental Law Center to drop the lawsuit and allow for repairs and replacements of the bridge.

Walker, S. "Priority Loading on Emergency Ferry, Other Schedules Altered." *The Outer Banks Voice*. Outer Banks Voice, 5 Dec. 2013. Accessed. 22 Jan. 2014. <http://outerbanksvoice.com/2013/12/05/priority-loading-on-emergency-ferry-other-schedules-altered/>.

Lists the Schedule's and changes necessary to make Ferrying people across to Hatteras Island a possibility. The ferry itself takes 2 hours to cross, and would need fuel restocks quite often.

Nina Sassano

Bryant, M. Herbert C. Bonner Bridge Replacement Project: Compatibility Issues for Pea Island National Wildlife Refuge in North Carolina. US Fish and Wildlife Service. Accessed: 2014. Available: http://www.fws.gov/peaisland/images/bonnerbridgefactsheet62603.pdf

The US Fish and Wildlife Service provides ample background on the Bonner Bridge with a connection to the wildlife that thrives in the area. With a perspective focused on migrating birds, the USFWS suggest a plan for the future of the Oregon Inlet/Hatteras Island connection.

Colwell, C., R. Farschi, T. Jenkins, and J. Kim. 2013. Developing a Decision Model for Evaluating Transportation Alternatives in High-Hazard Coastal Areas. MS Project, Nichols School of Environment, Duke University.

This publication takes historical hurricane data from North Carolina, and projects future storm invasions along the coast, applying this information to the structural integrity and plausibility of the Outer Banks having "long term static road structures". The authors take particular notice and consideration of NC 12 and the Bonner Bridge, and look at arguments from both environmental and development organizations.

Dean, C. 2012. A North Carolina lifeline built on shifting sands. New York Times. Available: http://www.nytimes.com/2012/03/06/science/highway-12-outer-banks-lifeline-is-under-siege-by-nature.html?pagewanted=all.&_r=0

This article takes a look at coastline erosion and flooding, and how they apply to coastal construction, in particular the Bonner Bridge. This examines the point of view of the locals, as well as the environmentalists, and government workers.

Dougherty, K. 2013. Environmental zealots must give up Bonner Bridge crusade. The Virginian-Pilot. Available: http://hamptonroads.com/2013/12/environmental-zealots-must-give-bonner-bridge-crusade

A conservative, non-environmentalist look at the debate for rebuilding the Bonner Bridge. This article focuses on the ideals of the communities living on the island, and takes a human-driven approach to the argument of rebuilding the Bonner Bridge.

Kurry, D. 2013. Hatteras Island to lose millions with Bonner Bridge closed. Triangle Business Journal. Available: http://www.bizjournals.com/triangle/news/2013/12/06/hateras-island-to-lose-millions-with.html

This article takes a close look at the monetary impacts associated with closing the Bonner Bridge, after the bridge had to temporarily close in late 2013. This article features the research of ECU's Hans Vogelsong, who has recently calculated that closing the Bonner Bridge would cost "Hatteras Island a minimum of $110,000 per day". This article also mentions future plans, including costs, for the construction, maintenance and repair for the Bonner Bridge.

Moore, M., T. Green, and T. Bartlet. 2008. Structural Condition Assessment of the Herbert C. Bonner Bridge, North Carolina. American Society of Civil Engineers. Proceedings from the Structures Congress Conference 2008. Permalink: http://ascelibrary.org/doi/abs/10.1061/41016%28314%2920

** Need to gain access to full article, but looks very useful, based on Abstract.

Published in 2008, this article provides a scientific assessment on the longevity of the current structure of the Bonner Bridge. This article weighs the pros and cons of rebuilding a new bridge in the current location, examining environmental, economic and social impacts associated with the removal or replacement of the bridge.

NC Department of Transportation. 2013. Bonner Bridge Replacement Project. Accessed 2014. Available: http://www.ncdot.gov/projects/bonnerbridgereplace/

This site provides information for homeowners along the Outer Banks and throughout North Carolina who may be seeking more knowledge about the Bonner Bridge. Included is Bridge history, current maintenance plans, challenges faced with construction of a new bridge (including financial impacts), press releases, and user friendly photos and videos of the status of the Bonner Bridge.

Outer Banks. 2013. Herbert C. Bonner Bridge. Accessed 2014. Available: www.outerbanks.com/herbert-c-bonner-bridge.html

This source provides a history of the Oregon Inlet, as well as information on the reasons for the building of the Bonner Bridge, technical issues with the bridge, cost for maintaining the bridge, an overview of the current debate to build the bridge again, and other miscellaneous information regarding the Bonner Bridge and the Oregon Inlet. Good place to start a search for information regarding the history of the bridge, etc.

Overton, M., and J. Fisher, 2005. Final Report: NC Coastal Highway Vulnerability. CTE/NCDOT Joint Environmental Research Program. Accessed 2014. Available: http://www.ncdot.gov/doh/preconstruct/tpb/research/download/2002-05finalreport.pdf

This research evaluates the vulnerability of coastal highways in North Carolina.

Rebuilding NC 12. 2013. Underwater Surveys and Pile Tests on Completed on Bonner Bridge. Available: http://nc12repairs.blogspot.com/2013/12/underwater-surveys-and-pile-tests-on.html

This briefing from the NC 12 Rebuilding blog details repairs made and the structural integrity of the Bonner Bridge after its most recent closing in December 2013. This site also provides information on the emergency ferry routes that run in the event of the bridge failing or being closed to traffic.

Riggs, S. R., S. J. Culver, D. V. Ames, D. J. Mallison, D. R. Corbett, and J. P. Walsh. 2008. North Carolina's Coast in Crisis: A Vision for the Future. East Carolina University. Accessed 2014. Available: http://www.geology.ecu.edu/NCCoastsinCrisis.pdf

Research presented in this White Paper examines the different coastlines along North Carolina, and the inevitable erosion of the Outer Banks. The authors examine a possible economic renaissance for the future of the coast of North Carolina, but not without an understanding of the changing landscape.

Schofield, R. 2013. Enviro Community responds to cheap shot attacks over Bonner Bridge. NC Policy Watch: The Progressive Pulse. Accessed 2014. Available:

http://pulse.ncpolicywatch.org/2013/12/09/enviro-community-responds-to-cheap-shot-attacks-over-bonner-bridge/

Detailed report of the NC League of Conservation Voters response to conservative state officials blaming environmentalists for the deterioration of the Bonner Bridge.

Smyre, B., and J. Page, 2008. NC 12 Bonner Bridge Replacement Project: Final Environmental Impact Statement, Citizen's Summary and User Guide. US Department of Transportation Federal Highway Administration, North Carolina Department of Transportation. Accessed 2014. Available: http://www.obtf.org/documents/FEIS_CitizensSummary.pdf

A user-friendly mainly unbiased look at construction efforts of the Bonner Bridge and NC 12. Provides background information about the environment along NC Coast along with the impacts of human development. Excellent resource for the general public.

Southern Environmental Law Center. 2013. Bonner Bridge Replacement: Outer Banks NC 12 Access Unreliable for Hatteras. Accessed 2014. Available: http://www.southernenvironment.org/cases/bonner_bridge_replacement

The Southern Environmental Law Center provides a strong case against the rebuilding of the Bonner Bridge and NC 12 in this brief case study. They use specific examples and photos of how damaging storms can be to the area, and propose alternatives for the Bonner Bridge.

US Army Corps Of Engineers Wilmington District. 2013. NCDOT Replacement of Herbert C. Bonner Bridge and NC 12 Long Term Management Plan, Dare County, NC (Regulatory). Congressional District: NC -3. Accessed 2014. Available: http://www.saw.usace.army.mil/Portals/59/docs/review_plans/Congressional%20Fact%20Sheets/58%20-%20NCDOT%20Bonner%20Bridge%20-%20NC12%20Management.pdf

This is the most current draft plan for the rebuilding of the Bonner Bridge from the US Army Corps of Engineers, along with the US Coast Guard, US Fish and Wildlife Service, and the National Park Service. This document provides a purpose, background and current status information on the rebuilding of the bridge, and NC 12. Provides the governmental perspective of bridge construction and maintenance.

Amanda Sharp

Associated Press. December 6, 2013. McCrory, GOP says lawsuit is slowing Bonner Bridge replacement. WNCN.http://www.wncn.com/story/24151649/mccrory-traveling-to-outer-banks-to-see-bridge . Accessed on 01/21/2014.

This article written by the Associated Press talks about how the Governor Pat McCrory and other fellow republicans blamed the emergency shutdown of the Bonner Bridge, which is the only bridge that links the Outer Banks Islands to mainland North Carolina, on the environmental lawsuit that has held up construction of a replacement bridge. The article states that McCrory stated the he was going to send a letter to The Southern Environmental Law Center's board of directors to drop the lawsuit. He believes that the situation is inexcusable.

Cesare, M., J.C. Santamarina, C.J. Turksta, and E. Vanmarck. September 1993. Risk-Based Bridge Management. Journal of Transportation Engineering 119: 742-750.

The journal article provides an outline for a methodology for bridge projects which could serve as part of a bridge management system. The Markobian model is used to decay the structural components and then a reliability index is determined for each element. The reliability of the bridge is calculated as a system reliability. This is done by combining individual reliability of the components into a series system. The repairs to bridges can be modeled by any year.

Hampton, J. December 17, 2013. Bonner Bridge is open, but erosion remains a risk. Hampton Roads. http://hamptonroads.com/2013/12/bonner-bridge-open-erosion-remains-risk . Accessed 01/20/2014.

The article written by Jeff Hampton provides insight on a local who had to use the ferry in order to make it across the Pamlico Sound. The ferry ride was a two-hour-plus trip, and the passengers were very excited once the bridge was reopened. Although the reopening was celebrated among the ferry passengers, erosion remains a threat. A device, that is rarely used, is being placed on the bridge to monitor movement 24 hours a day and send an alarm if the structure wobbles more than a few inches. The dredged sand added 15 to 20 feet around the pilings. It was expected that 90 percent of the dredged sand would be whisked away by the currents; however, about half settled in the proper place. Environmental groups have filed lawsuits against plans to replace the bridge, they argue that the bridge should be placed in a new location.

Hampton, J. December 4, 2013. Bonner Bridge closed over safety concerns. Hampton Roads. http://hamptonroads.com/2013/12/bonner-bridge-closed-over-safety-concerns . Accessed 01/21/2014.

The article written by Jeff Hampton discusses the Bonner Bridge closing. Transportation officials closed the fifty-year-old Herbert C. Bonner Bridge, which links N.C. 12 across the Oregon Inlet to Hatteras Island due to the concern about the safety of the span's support. Sonar scans revealed that there was too much underwater scouring of the sand around the bridge's supports. The strong currents that go through Oregon Inlet tend to sweep sand from the base of the bridge supports. Ferry services began to cross the Pamlico Sound. There is no set date for the reopening of the bridge. The article also states that this is the first time that the bridge has been closed since 1990 when a barge struck and damaged the supports. The article includes the plans to get the bridge up and running.

Moore, M., T. Green, and T. Bartelt. October 2008. Structural Condition Assessment of the Herbert C. Bonner Bridge in Dare County, North Carolina. American Society of Civil Engineers: 314: 1-10.

This journal article contains detailed information on the structural conditions of the Herbert C. Bonner Bridge, which is located in Dare County, North Carolina. The construction of Bonner Bridge was completed on April 7, 1964 and is now nearing the end of its very useful life. As of 2008, the bridge was scheduled to be replaced within the next two years. There are two replacement options. The "short bridge" option includes rebuilding the bridge next to the current bridge, which is a 2.7 mile long bridge. The second option, which is known as the "long bridge", is a 17.5 mile long bridge around the Pea Island National Wildlife Refuge. The article contains graphs and images that supports the author's claims.

NCDOT. No Date. Bonner Bridge Replacement Project: Dare County, North Carolina. http://www.ncdot.gov/projects/bonnerbridgereplace/ . Accessed 01/20/2014.

The North Carolina Department of Transportation website provides a description of the Bonner Bridge Replacement Project, which states that the project will replace the existing bridge over Oregon Inlet and provide a long-term retention of N.C. 12 between Oregon Inlet and Rodanthe. The Bridge was opened in 1963 and is the only highway that provides connection between Hatteras Island and mainland North Carolina. The website also includes the latest news and updates involving the project, the bridge's history, a description of how the state plans to keep the current bridge safe for travel, and the challenges that are being faced while trying to complete the new bridge.

Newsobserver. December 15, 2013. Bonner Bridge reopened, NCDOT says. Raleigh News and observer. http://www.newsobserver.com/2013/12/15/3463176/bonner-bridge-reopened-sunday.html . Accessed 01/20/2014.

This brief article released by the Newsobserver.com soon after Bonner Bridge was reopened in mid-December informed the public about how the bridge was determined safe. The article states that there were multiple inspections that show that the bridge is safe, the test included sonar scars, test pilings, and several inspections. The bridge was closed on December 3, 2013, which is when the state hired a contractor to pump 30,000 cubic yards of sand from Oregon Inlet's channel. The North Carolina Department of Transportation believes that the dredging will support the structure long enough to all the traffic to safely travel for now.

Nolan, I. July 13, 2012. No quick resolution of Bonner Bridge replacement lawsuit is likely. Island Free Press.http://islandfreepress.org/PivotBlog/?e=201 . Accessed 01/21/2014.

This "Shooting the Breeze" Editor's Blog is written by Irene Nolan. The blog contains an article about the lawsuit that was filed to stop the Bonner Bridge replacement project. The lawsuit was filed by the Defenders of Wildlife and the National Wildlife Refuge Association, represented by the Southern Environmental Law Center. The lawsuit was filed on July 1, 2011 in the U.S. District Court for North Carolina's Eastern District. The article goes on to explain why the lawsuit has been filed and the plaintiffs favor a longer bridge or ferry access to Hatteras.

No date. Build The Long Bridge: Sound Solutions for Replacing the Bonner Bridge in North Carolina. Buildthelongbridge.org. http://www.buildthelongbridge.org/overview.html . Accessed 01/21/2014.

This website provides information on the Bonner Bridge Replacement and an in-depth overview on sound solutions. The website provides descriptions on how the long bridge is safer and more reliable, the long bridge is more cost effective, the long bridge will help restore a national wildlife refuge, and commitment to visitor access. A longer bridge allows a safe evacuation route to the mainland from the Outer Banks. The construction of a long bridge will only cost $425 million while the cost of maintaining NC-12 through 2060 and the constriction of the short bridge is $683 million. The long bridge will allow restoration of natural forces and habitat that can be restored for migratory birds, sea turtle and other species.

Outerbanks.com. No Date. Herbert C. Bonner Bridge. http://www.outerbanks.com/herbert-c-bonner-bridge.html . Accessed 01/20/2014.

The Outer Banks website provides a description of the importance of the Herbert C. Bonner Bridge. The website describes the bridge as a "lifeline" for Hatteras Island because it connects the barrier island communities of seven villages with the Northern

Outer Banks. The bridge opened the door for mainstream tourism to the southern Outer Banks. The bridge allows vacationers to access the beaches along Cape Hatteras within minutes, which is the better alternative to weather-dependent ferry rides. The website includes great descriptions of the history and specifics of the Bonner Bridge, attractions surrounding the Bonner Bridge, and tips and trips for visiting or crossing the Bonner Bridge.

Pompe, J. 2010. Altered Environments: The Outer Banks of North Carolina. The Journal of Southern History: 508-509.

The article examines the environmental impact of human activity on coastal areas, using the Outer Banks which is North Carolina's barrier islands. It shows that humans have attempted to control natural forces that occur such as erosion. It states that maybe humans should let nature take its course and do less engineering, and that will be the best way for humans to coexist with the shoreline ecosystem. Humans have occupied the Outer Banks for many centuries.

Smith, C.G., S.J. Culver, S. R. Riggs, D. Ames, D. R. Corbett, and D. Mallinson. 2008. Geospatial Analysis of Barrier Island Width of Two Segments of the Outer Banks, North Carolina, USA: Anthropogenic Curtailment of Natural Self-Sustaining Processes. Journal of Coastal Research 24:70-83.

This journal article comparison two sections of the Outer Banks, North Carolina. The two areas are Pea Island and Avon-Buxton. The article shows the importance of the relationship between oceanic and estuarine shoreline dynamics and the long-term changes in the barrier island width. Some areas have experienced oceanic shoreline erosion. The area of these two places have decreased over the years due to the high rates of oceanic shoreline erosion. Modification to these areas, such as constriction, could eliminate the erosion that is occurring.

Southern Environmental Law Center. December 11, 2013. Bonner Bridge Replacement: Outer Banks NC 12 Access Unreliable for Hatteras. http://www.southernenvironment.org/cases/bonner_bridge_replacement . Accessed 01/20/2014.

The Southern Environmental Law Center website provides a case summary description about the state's current plan to replace Bonner Bridge. Which includes the plan to rebuild the bridge in its current location, this ignores the obvious and persistent problems of NC 12. The current plan is to rely on a stretch of road that is continuously washed over or washed out by the high tides and storms that cut off the access to and from Hatteras Island. This jeopardizes residents, tourists, local businesses, and the coastal wildlife. The website also provides a description of how the plan is unreliable, a list of reliable and safe alternatives, and of the wildlife that are at risk.

Van Rijn, L.C. 2011. Coastal erosion and control. Ocean and Coastal Management 54: 867-887.

This journal article discusses the coastal erosion problem that occurs at many coastal sites which is caused by natural effects as well as human activities. The article talks about the coastal cell concept, which deals with coastal erosion by identifying and analyzing the sediment volumes that have accumulated at various places. Large amounts of sand nourishment is an attractive solution to the erosion that is occurring on the cost; however, it may not be the best economic solution.

Walker, Sam. December 27, 2013. Bonner Bridge will remain open during A-Jacks support project. The Outer Banks Voice. http://outerbanksvoice.com/2013/12/27/bonner-bridge-will-remain-open-during-a-jacks-project/ . Accessed 01/20/2014.

The Outer Banks Voice website's short article on the construction that took place recently on Bonner Bridge states that the North Carolina Department of Transportation said that the bridge would remain open during the emergency repair work. The bridge was closed from traffic for twelve days because the sand around the pilings near the southern curve of the 50-year-old bridge had been moved away by the powerful currents that move through the inlet connecting the Pamlico Sound and the Atlantic Ocean. The article also states that crews from Carolina Bridge Co. of Orangeburg, S.C. have been dropping giant sandbags around the pilings since before Christmas and starting January 2, 2014 they will start placing concrete structures called A-Jacks alongside the pilings. The North Carolina Department of Transportation awarded a $1.6 million contract to Carolina Bridge for the repairs.

Brandi Summerlin

Riggs, S.R., S.J. Culver, D.V. Ames, D.R. Corbett, D.J. Mallinson, C.G. Smith, and D.J. Vance. 2006. Foraminiferal and sedimentary record of late Holocene Barrier Island evolution, Pea Island, North Carolina: The role of storm overwash, inlet processes, and anthropogenic modification. *Journal of Coastal Research* 2006:22-836-846.

Back in the early 1950's storm overwash was a big concern as it often is today. This article discusses some of the ways in which oceanic, or storm overwash, could have been avoided or at least limited. Riggs and his colleagues tell about the use of construction of artificial barrier dune ridges, large-scale plantation of grass and shrubs, and of course the building of NC Highway-12 in 1953 to put a halt to the issue of overwash. While this method was intended to help the situation the article states that the road as well as the barrier dune ridge(s) were rebuilt and relocated several times due to the forceful nature of natural disasters. This article is a good read and really ponders the question, should we continue to rebuild where we know storms and natural disasters often take place and leave disastrous trails in their wake. While this article was first intended to talk specifically about hurricanes and their prevalence along the Outer Banks it winds up being a lot more than that.

Frankenberg, D. 1995. The nature of the Outer Banks.: environmental processes, field sites, and development issues, Corolla to Ocracoke. The University of North Carolina Press, Chapel Hill, North Carolina.

Dirk Frankenberg's' "The nature of the Outer Banks: environmental processes, field sites, and development issues, Corolla to Ocracoke" is a book that focuses heavily on the following: sea level rise, sand transport by wind and water, and sand stabilization by plants. This book is truly a piece of work worth reading. Not only does Frankenberg explain the issues currently affecting the coast of North Carolina but he really displays how these powerful natural forces have an everlasting effect on our coast. One quote that I find to be quite profound is in the foreword of his book. Frankenberg says "The only thing constant about the coast is change" and this statement that he makes is well conveyed throughout his book.

Frankenberg, D. 1997. The nature of North Carolina's southern coast: barrier islands, coastal waters, and wetlands. The University of North Carolina Press, Chapel Hill, North Carolina.

The book listed above, "The nature of North Carolina's southern coast: barrier islands, coastal waters, and wetlands" written by Dirk Frankenberg is an excellent source for learning more about the coast and how certain conditions sustain it or destroy it. There is also a lot of material on rising sea level and changing tidal range(s) and how that has an impact on the coastal habitat. There is a really good section, starting on page 14, which is headed: "How Barrier Islands, Inlets, and Beaches Are Controlled by Tides, Waves, and Sediment Supply". The aforementioned gives a lot of in-depth details as well as photographs and drawings to really drive his point home: that is, that our coast is constantly changing and there are a lot of different environmental processes affecting it.

Godfrey P.J. 1970. Oceanic overwash and its ecological implications on the Outer Banks of North Carolina. U.S. National Park Service, Washington, D.C.

This book by Paul J. Godfrey takes a different perspective on what is destroying our outer banks. In "Oceanic overwash and its ecological implication on the outer banks of North Carolina" Godfrey introduces the idea that maybe it is man that is barrier island's worst enemy not the sea. This book, like many of the others, also focuses on sea level rise, plant life, and shoreline erosion.

Kozak, C. (2013, March 29). Bonner bridge replacement project awaits federal judge's decision. http://islandfreepress.org/2013Archives/03.29.2013-BonnerBridgeReplacementProjectAwaitsFederalJudgesDecision.html. Accessed 1/18/2014.

The article "Bonner bridge replacement project awaits federal judge's decision" was written back in early 2013. The author Catherine Kozak writes about the various departments and judges associated with this case in reference to Bonner Bridge. The use of the ferry system or possibly even building an alternative bridge, however, the Department of Transportation (DOT) quickly shot those ideas down. The permits that are required for this project as well as the legal matters that are associated with this issue are also mentioned in this article. Some people associated with the DOT goes as far as to say that they expect that the project will be completed by 2016 or 2017, including demolition of the old Bonner Bridge. A rather strong statement since this topic/project has been ongoing since the early 1900's.

Krynock, L.W., J.G. Shelden, and J.D. Martin. 2005. Highway vulnerability along NC 12—Ocracoke Island, North Carolina. American Society of Civil Engineers 2005:423-432.

This article by Laurel W. Krynock and colleagues is a compilation of analyzing data. Long term erosion, and erosion which was a product of various storms, has really impacted not only the coastal region but a huge part of a highway known as NC highway-12 on Ocracoke Island. This article specifically deals with analyzing the vulnerability of highway-12 after it recently took a hit by Hurricane Isabel back in September of 2003. This article really depicts the severity of these natural disasters (primarily hurricanes) and how every time sand and water cover the roadway along this vulnerable spots the North Carolina Department of Transportation (NCDOT) are forced to either close down this bridge or either begin immediate repair. Out of all the books and journal articles I've found I believe this one is most important because it has more relevance to our current topic of Bonner Bridge and it is a pretty recent publication.

McCloskey, S. 2013. Heads in the sand over Bonner Bridge. http://www.ncpolicywatch.com/2013/12/11/heads-in-the-sand-over-the-bonner-bridge/. Accessed 01/19/2014.

Once again as the Bonner Bridge had to be closed off due to emergency repairs in December of 2013 confrontation amongst city officials and public officers began. This article talks about the various lawsuits that have been filed in regards to the reconstruction/reparation of Bonner Bridge. High-end officials such as Governor Pat McCrory and leaders of the general assembly target the individuals at the SELC (Southern Environmental Law Center) for the lack of progress being made in reference to Bonner Bridge. In the article the mention of budgeting and alternatives are included as well. This article is a good article to read because it really does help identify both the negatives and positives associated with Bonner Bridge.

NCDOT. North Carolina Department of Transportation. 2010a. Environmental assessment of NC 12 replacement of Herbert C. Bonner bridge appendix D. http://www.obtf.org/documents/EA/BonnerBridgeEAAppendixD_05072010.pdf. Accessed 01/17/2014.

The article listed above is really a compilation of comments and thoughts from the public as well as the responses by government officials. This source is good for debating purposes because it is not biased toward one side of the issue. It shows both the pros and cons of each alternative/plan thought of. The comments that come from the public are those consisting of phone calls, emails, and letters. While the cost is often mentioned for alternative options if you consider the cost that has already been put into keeping Bonner Bridge up and safe for the general public it is a thought that really could be pondered: what is the better option here?

Pietrafesa L.J., L. Xie, and D.A. Dickey. 2005. On sea-level variability on the eastern seaboard of the United States. American Society of Civil Engineers 2005:42-51.

The aforementioned article is an interesting read referring to sea-level rise in regard to the eastern seaboard of the United States. The article pulls data from previous studies showing how sea-level was in the past. By using that data and analyzing it, they are able to get a better idea of the situation that we are dealing with now. Another very big concern being raised in this article is the fact that property development along these coastal regions is increasing significantly and sea level is increasing more and more all along raising serious concerns for owners, builders, and public officers. All of these factors are powerful and should be given much thought before builders keep placing more property along the coast and environmental factors will have a not-so-happy impact on it.

Riggs, S.R., M.P. O'Conner, and V. Bellis. 1975. Estuarine shoreline erosion in the Albermarle—Pamlico region of North Carolina. NC Sea Grant, N.C. State University, Raleigh, North Carolina.

While the book entitled "Estuarine shoreline erosion in the Albermarle—Pamlico region of North Carolina" may be older than some of the other books listed in this annotated bibliography it is still a valuable resource in accessing information regarding the outer banks. This book tends to focus on the various types of shorelines and what causes erosion along the coast. In addition to that, it also discusses how to cope with estuarine erosion. While the book does provide some useful information, the photographs and diagrams tend to be harder to read/decipher. If you would like to see a layout of the coast I would suggest looking at some of the photographs in the other books provided since they are more recent publications.

Riggs, S.R., D.V. Ames, S.J. Culver, and D.J. Mallinson. 2011. The battle for North Carolina's coast: evolutionary history, present crisis, and vision of the future. The University of North Carolina Press, Chapel Hill, North Carolina.

While we all know that the coast is a cherished spot for all tourists it is true that the barrier islands and their associated wetlands are in serious need of help right now. In "The battle of North Carolina's coast: evolutionary history, present crisis, and vision of the future" by Stanley Riggs and his colleagues, they reinforce just how serious the environmental and economic problems are that we are facing now in regard to the Outer Banks. However, in this book they take a slightly different approach than some of the others. Instead of simply stating the facts they add insight and encourage thoughts of hope through taking strong, affirmative action now.

Riggs, S.R. and D.V. Ames. Drowning the North Carolina coast: sea-level river and estuarine dynamics. 2003. NC Sea Grant, N.C. State University, Raleigh, North Carolina.

Stanley R. Riggs, the author of "Drowning the North Carolina coast: sea-level river and estuarine dynamics", and several other coastal books is insightful to the issues surrounding the coast of North Carolina. This book does an excellent job in explaining the flow of energy in its various forms such as waves, currents, astronomical tides and storm tides, and how this energy has a direct impact on the Earth, its water system, and shoreline. In addition, the explanations noting shoreline erosion and how natural disasters affect the coast are truly confounding.

Smith, C.G., S.J. Culver, S.R. Riggs, D. Ames, D.R. Corbett, and D. Mallinson. 2008. Geospatial analysis of barrier island width of two segments of the outer banks, North Carolina: USA: Anthropogenic curtailment of natural self-sustaining processes. *Journal of Coastal Research* 2005:24(1)-70-83.

The article listed above put out by the Journal of Coastal Research addresses topics such as: changes in oceanic and estuarine shorelines, flood tide transport, and the effects of overwash. Specifically, the authors look at two sections of the Outer Banks known as Pea Island and Avon-Buxton and compare the two. By doing this they are able to clearly see the interactions occurring between changing oceanic and estuarine shorelines as well as the alterations taking place in barrier island width. The article directly speaks to how the human population is evolving quickly along the barrier islands associated with the Outer Banks of North Carolina and this makes it crucial that we get a better understanding and record of how barrier islands are being affected.

Southern Environmental Law Center. No date. Replacing the Herbert C. Bonner Bridge: A History of Missteps. http://www.southernenvironment.org/cases/bonner_bridge_replacement/bonner_bridge_replacement_background/. Accessed 01/17/2014.

The website listed above is a site that provides background information on Bonner bridge and the process of replacing it. The history of Bonner bridge dates all the way back to 1990. While I think this is an excellent website providing information in a chronological time order it is put out by the SELC (Southern Environmental Law Center) so the information shows evidence of bias.

NCDOT. North Carolina Department of Transportation. (2013, December). NC Highway 12: NCDOT Reopens Bonner Bridge. http://www.ncdot.gov/nc12/. Accessed 01/19/14.

The article listed above was put out by the North Carolina Department of Transportation. As of December 15th, the Bonner Bridge is once again open to traffic, however, the article states that emergency repairs are still be taking care of. The point of the NCDOT's website is to put out information regarding recent projects and providing travel information to residents or travelers. The NCDOT states the importance of Bonner Bridge as it is still the only link to Ocracoke Island. They state that they will continue to monitor the bridge closely.

Travis Tobin

Barkin, D. December 9, 2013. A Newcomer's Guide to the Bonner Bridge Controversy. Raleigh News and Observer. Available: http://www.newsobserver.com/2013/12/09/3446101/a-newcomers-guide-to-the-bonner.html. (1/20/14)

This is a Q&A session that explains some of the basics of the Bonner Bridge issue. The author explains the significance of the bridge and how something needs to be done quickly. He also explains very well the argument between the state and the SELC.

Basnight, M. January 16, 2010. The better bridge for Oregon Inlet is the parallel bridge. Available: http://www.newsobserver.com/2010/01/16/286689/the-better-bridge-for-oregon-inlet.html. (1/20/14).

This was a letter to the editor written by the president pro-tem of the state Senate, Marc Basnight, from Manteo, NC. He explains how the parallel bridge is a better economical and biological decision

Bryant, M. August 2006. Herbert C. Bonner Bridge Replacement Project. US Fish & Wildlife Service. Available: http://www.fws.gov/peaisland/images/bonnerbridgefactsheet62603.pdf. (1/20/14)

This document mentions the effects on Pea Island National Wildlife Refuge of building a replacement of the old Bonner Bridge. The first proposal by the NCDOT had the bridge making landfall on Pea Island, this writing provides the alternatives they came up with to avoid Pea Island National Wildlife Refuge

December 8, 2013. Bonner Bridge issue shows the need for reform in environmental laws. Beaufort Observer. Available: http://www.beaufortobserver.net/Articles-NEWS-and-COMMENTARY-c-2013-12-08-270211.112112-Bonner-Bridge-issue-shows-the-need-for-reform-in-environmental-laws.html#123. (1/20/14)

This is an article written to fight for the residents of the Outer Banks and those who rely on Bonner Bridge for their everyday routine. The author blames 'wacko-environmentalists' for causing harm to the people of Cape Hatteras and other affected areas. This article gives a different perspective, but one that needs to be considered.

Dolan, R. and H. Lins., 1986. The Outer Banks of North Carolina: U.S. Geological Survey, Professional Paper 1177-B. U.S. Geological Survey. Reston, Virginia.

This is a very useful paper that speaks about the geological history of the Outer Banks. The author includes how the inlets are changing and their history. This will be useful because the biggest argument with Bonner Bridge is how long of a bridge the replacement needs to be due to the every changing inlets of the Outer Banks.

Fox, A., A. Kohn., and C. Rogers. Judge: 'We need the bridge replaced'. Wavy. Available: http://www.wavy.com/news/north-carolina/ap-north-carolina/safety-concerns-force-bonner-bridge-closure. (1/20/14)

This news article interviews different locals who rely on Bonner Bridge for daily activity. It also brings up medical concerns or emergencies that will happen, and having to take a ferry to get medical help will be very dangerous for locals.

Lay, R. January 10, 2014 Plans for N.C. 12 bridge in Rodanthe aired at public gatherings. The Outer Banks Voice. Available: http://outerbanksvoice.com/2014/01/10/plans-for-n-c-12-bridge-in-rodanthe-aired-at-public-gatherings/. (1/20/14).

This article clearly shows the different phases of a big project the NCDOT has to improve roads and travel along the Outer Banks. The main phase is the Bonner Bridge replacement, but it also speaks about different projects and multiple solutions.

Mallinson, D.J, S.J. Culver, S.R. Riggs, J.P. Walsh, D. Ames, and C.W. Smith. December, 2008. Past, Present and Future Inlets of the Outer Banks Barrier Islands, North Carolina. Thomas Harriot College of Arts and Sciences and Institute for Coastal Science and Policy. East Carolina University.

In this white paper by professors here at ECU they go into detail about Oregon Inlet and provide some significant historical information. There is mention of the two options of the bridge replacement and their opinion is offered.

Midgett, B. January 14, 2014. NC needs to face reality on Bonner Bridge replacement. NC Spin Available: http://www.ncspin.com/2014/01/18/nc-needs-to-face-reality-on-bonner-bridge-replacement/. (1/20/14)

This article speaks about the absolute need of the Bonner Bridge replacement. The author Beth Midgett says that this is the only adequate solution to the current problem. She also explains the economical effects if the replacement isn't built and how there are many residents on the island that rely on the bridge to go to work.

NCDOT. September 4, 2014. One of the State's most Crucial lifelines Stands on Borrowed Time. Available: https://apps.ncdot.gov/NewsReleases/details.aspx?r=8720. (1/20/14)

This writing speaks about the urgent need for the bridge replacement. It explains how the current upgrades of the old bridge are only going to last temporarily. Lastly it mentions the obstacles that are in the way of building the new bridge.

Riggs, S and D. Ames. 2003. Drowning the North Carolina Coast: Sea-Level rise and Estuarine Dynamics. NC Sea Grant, NC State University, Raleigh, NC.

Information in this book can be very useful for the topic of Bonner Bridge. Specifically I found information on shoreline erosion and the different things that cause erosion. Many are proposing the short bridge solution, but with erosion of Pea Island the short bridge solution would have a short life span.

Riggs, S, S.J. Culver, D. Ames., D.J. Mallison, D.R. Corbett, and J.P. Walsh. October, 2008. North Carolina's Coast in Crisis: A Vision for the Future. Thomas Harriot College of Arts and Sciences. East Carolina University.

This writing contains vital information about infrastructure construction along the Outer Banks of North Carolina. It provides information and history on Bonner Bridge and all the work that has been done to it. It also provides information about beach nourishment and what can and cannot be done to slow down erosion. History of beach nourishment projects along the coast of NC are provided along with history of erosion along the coast.

Rogers, S, and T. Skrabal. Managing Erosion on Estuarine Shorelines. North Carolina Sea Grant, NC State University, Raleigh, NC.

This document had numerous ideas for managing and/or controlling erosion. These ideas are very useful for the Bonner Bridge discussion due to discussion of the erosion of Pea Island and wasting money on the short bridge option that would eventually be non-accessible.

Trogdon, J. December 10, 2013. Guest Column: Correcting some errors in statements by the SELC on Bonner Bridge. Island Free Press. Available: http://www.islandfreepress.org/2013Archives/12.10.2013-GuestColumnCorrectingSomeErrorsInStatementsBySELCOnBonnerBridge.html. (1/20/14)

This is a column written in response to the SELC's appeal of the federal court ruling in the case. The author states in his response that the "long bridge is not viable option, and will never happen in NC." He states his case why.

Youngman, J., S. Riggs. January 1, 2010. The 'short bridge' to oblivion. Raleigh News and Observer. Available: http://www.newsobserver.com/2010/01/01/263397/the-short-bridge-to-oblivion.html. (1/20/14)

Stanley Riggs is a Geology professor here at ECU and Julie Youngman works with the SELC. They both contribute in this article arguing that the short bridge idea of the state will be of no good. They state their case for the longer bridge alternative.

Adrian Vu

Alipour, A., B. Shafei, and B. Shinozuka. 2013. Reliability-Based Calibration of Load and Resistance Factors for Design of RC Bridges under Multiple Extreme Events: Scour and Earthquakes. Journal of Bridge Engineering. 18(5), 362-371.

This article evaluates how bridge structures respond to scour and earthquake events. By doing so the reliability of the bridge will be determined and to what extent the reliability of the bridge is. This will also help determine the failure probability of the bridge structures in the event of natural disasters.

Carteret County News-Times. December 3, 2013. NCDOT closes Bonner Bridge. http://www.carolinacoastonline.com/news_times/article_71cd81b8-5c54-11e3-9f5c-0019bb2963f4.html . Accessed January 21, 2014.

This article is about Bonner Bridge being forced to close. Reasons for the closing is due to safety reasons. It will remain closed until it has been properly tested and repaired. The article also talks about the steps that have been taken to try to build a new replacement bridge.

Farrell, B. December 3, 2013. Bonner Bridge closure triggers concern about well-being, economy on Hatteras. http://www.wvec.com/news/Bonner-Bridge-closure-concern-for-safety-economy-on-Hatteras-Island-234347821.html . Accessed January 21, 2014.

This article talks about the impact of the closure of Bonner Bridge. The article highlights things such as how not having the bridge available would affect emergency response if something were to happen to the citizens and how using the ferries to travel make it more inconvenient for travel. The article also touches on the economic risks of not having the bridge, which would be a close example as to what local residents would go through if the bridge weren't replaced and merely torn down.

Hampton, J. December 7, 2013. Bonner Bridge progress hits legal roadblocks. http://hamptonroads.com/2013/12/bonner-bridge-progress-hits-legal-roadblocks . Accessed January 21, 2014.

This article talks about how Bonner Bridge is being forced to close due to safety concerns. The article also mentions brief history on the bridge as well as plans that were proposed to replace the current bridge. The bridge, due to safety issues, was forced to close so that they could work on it and make sure it will be safe to use. Since its closure the topic of how replacing the bridge is brought up because how much longer the current bridge will hold up is unknown so a solution needs to be found soon.

Johnson, P. and D. Dock. 1998. "Probabilistic Bridge Scour Estimates. Journal of Hydraulic Engineering. 124(7): 750-754. Accessed January 21, 2014.

This article focuses on the framework of bridges. This article touches on different aspects about bridges that need to be considered before building it otherwise the bridges won't last for long and will end up needing to be replaced yet again. This pertains to Bonner Bridge because all of the factors mentioned in the article need to be addressed by the engineer of the replacement bridge.

Kim, J., V. Y. Ivanov, and N. D. Katopodes. 2013. Modeling erosion and sedimentation coupled with hydrological and overland flow processes at the watershed scale. Water Resoures Research 49:5134–5154.

This article talks about modeling erosion and other natural events similar as well as predicting them. This is important because being able to predict areas that are more vulnerable to these natural events is essential especially when attempting to build a replacement bridge.

Kozak, C. July 18, 2013. Groups Win appeal on Bonner Bridge Permit. http://www.nccoast.org/article.aspx?k=ee8a7984-5fab-41ac-a18a-d7c627dc4c79 . Accessed January 21, 2014.

This article is about when the permit to build a replacement bridge was stalled. This was because a court ruled in favor of the group that wanted to challenge the permit for building he new bridge. The article also touches on the issues of what would happen if the current permit to build the bridge were to happen and also if the plans were to, instead, extend the new bridge.

Kurry, D. December 6, 2013. Hatteras Island to lose millions with Bonner Bridge closed. http://www.bizjournals.com/triangle/news/2013/12/06/hateras-island-to-lose-millions-with.html . Accessed January 21, 2014.

This article focuses on how the closing of Bonner Bridge affects not only the local residents, but the economy of the area. Because tourism is such a big part of the economy for the Outer Banks, by not having the bridge available to travel tourism goes down and the community is estimated to be losing $110,000 a day and will continue to accumulate if nothing is done to reopen it. This would also be a problem if law makers were to choose to tear down the bridge altogether and decide to only use ferries as a source of transportation to and from the island.

Midgett, B. January 17, 2014. NC needs to face reality on Bonner Bridge replacement. Raleigh News and Observer. http://www.newsobserver.com/2014/01/17/3542415/nc-needs-to-face-reality-on-bonner.html . Accessed January 21, 2014.

In this column the author gives a brief summary of the Bonner Bridge situation and how a solution can't be agreed upon as of yet. The author gives examples of what would happen if certain scenarios were to happen to Bonner Bridge as well as how it would effect the citizens who use the bridge. An example the author uses is if the use of the bridge were compromised how this would jeopardize the safety of residents and security because without the use of Bonner Bridge in emergency evacuation situations it would be almost impossible to ensure the safety and evacuation of all residents even with ferries.

Miselis, J.L and J. E. McNinch. July 17, 2006. Calculating shoreline erosion potential using nearshore stratigraphy and sediment volume: Outer Banks, North Carolina. Journal of Geophysical Research: Earth Surface (2003-2012). 111:F02019.

This article is about how the Outer Banks of North Carolina are changing due to factors like erosion. The article also touches on why these factors make it difficult to build things like bridges. This would be a good source to talk about as it pertains to Bonner Bridge because those who plan to replace Bonner Bridge must also consider these geological factors.

North Carolina Department of Transportation. No Date. Bonner Bridge Replacement Project. http://www.ncdot.gov/projects/bonnerbridgereplace/ . Accessed January 21, 2014.

This website provides a brief history of Bonner Bridge as well as information on possible future plans for Bonner Bridge. This website mainly focuses on ways to improve the bridge or replacing it altogether due to it's unsafe nature as of right now. The website also touches on what obstacles might be in the way if a new bridge were to be built and different alternatives to solving this issue.

Outer Banks Voice. December 6, 2013. Gov. McCrory gets first hand look at Bonner Bridge. http://outerbanksvoice.com/2013/12/06/gov-mccrory-gets-first-hand-look-at-bonner-bridge/ . Accessed January 21, 2014.

This article is about Governor McCrory going to Bonner Bridge and talking to the residents that would be affected by Bonner Bridge. Much of the article is talking about how Southern Environment Law Center is impeding the progress of finding a solution to replacing Bonner Bridge. The article talks about how Southern Environment Law Center has a lawsuit, which blocks construction of a replacement bridge because their solution is different then what others had in mind, which is to simply replace the current bridge.

Replace the Bridge Now. September 16, 2013. http://www.replacethebridgenow.com/ . Accessed January 14, 2014.

This website provides background on Bonner Bridge as well as updated information on the bridge. The website provides not just background, but also the next plan for action to rebuilding Bonner Bridge and the steps that are required beforehand in order to carry on with the rebuilding.

Southern Environment Law Center. No date. Bonner Bridge Replacement. http://www.southernenvironment.org/cases/bonner_bridge_replacement . Accessed January 21, 2014.

This website provides background on Bonner Bridge and problems with the Bonner Bridge. The website also talks about the different proposed solutions such as just replace it, but not necessarily change the size which would mean the bridge will more likely then not run into the same problems the current Bonner Bridge has. Southern Environment

Law Center doesn't simply want to replace the bridge because they believe the same problems will arise with the new bridge and provides, what they believe, is the best solution, which is to build a longer bridge. They also provide insight on the wildlife risks that come along with construction.

Williams, S.J., 2013. Sea-level rise implications for coastal regions. Journal of Coastal Research. Special Issue No. 63, pp. 184–196.

This article talks about sea-level rise and how coastal regions are constantly changing. It also talks about several factors that affect sea-level rise and the history of sea-level rise. This is important because knowing the trend of sea-level rise will help aid in determining a safe location to build a replacement bridge.

Takeisha Ward

Build The Long Bridge. In-Depth Overview. http://www.buildthelongbridge.org/overview.html . Accessed: 1/22/2014.

This source explains the benefits of replacing the Bonner Bridge. It compares and contrast the options of the long bridge to the bridge built parallel to the Bonner Bridge. It finds the long bridge to be more reliable, more cost effective and very similar to Louisiana's solution to a problem like this.

Creech, M. 12/07/2013. RenewAmerica. Environmentalist Close Bonner Bridge. http://www.renewamerica.com/columns/creech/131207 . Accessed: 1/22/2013.

This source tells of how the closing of Bonner Bridge will injure tourism and cause residents hardship. The ferry is time consuming and will limit travel. It also says that the Bonner Bridge was built in the early 60s and has never had more than a 30-year lifespan.

ICWNET. 12/16/2013. Herbert C. Bonner Bridge. http://www.outerbanks.com/herbert-c-bonner-bridge.html . Accessed: 1/22/2014

This source gives a history about the bridge. It tells us how for centuries the island and the northern outer banks were connected until 1846, when a hurricane cut an inlet in between the two. From there, a privately owned ferry was used to transport locals and some tourist. Eventually more and more visitors started to come until the NCDOT stepped in and bought out the ferry taking over all of its daily operations.

Lutz, W. 08/04/2006. Defenders of Wildlife. The Bonner Bridge Replacement: Long Bridge is the safest, most reliable, least expensive option in the long run.http://www.defenders.org/press-release/bonner-bridge-replacement-long-bridge-safest-most-reliable-least-expensive-option-long . Accessed: 1/22/2014

This source is explaining why the long bridge is the better option for replacing the Bonner Bridge. It's safer because NC-12 will be built on a rapidly eroding shoreline. It's also more cost efficient. The long bridge is also environmentally sound because it completely bypasses the refuges and several nesting sites.

NC Beaches. No Date. Coastal Erosion. http://www.ncbeaches.com/Features/Weather/CoastalErosion/ . Accessed: 01/22/2014.

This source tells how North Carolina's coastline has had an ongoing threat of coastal erosion. Sea level rise along with storms or hurricanes cause up to hundreds of feet of shoreline to be stripped away. It also says that erosion isn't always a bad thing because

throughout history it has led to new inlets and harbors and new feeding grounds of coastal species.

NCDOT. 12/03/2013. Bonner Bridge to Close Immediately. https://apps.ncdot.gov/newsreleases/details.aspx?r=9088 . Accessed: 01/22/2014.

Sonar scanning revealed concerns where too much sand has eroded from the support structure of the Bonner Bridge. The NCDOT has closed the bridge until the department can bring in additional resources to inspect the bridge and fortify the structure. Until it is safe to reopen, the NCDOT Ferry Division will provide emergency support to move people across the Pamlico Sound.

NCDOT. No Date. Bonner Bridge Replacement Project. http://www.ncdot.gov/projects/bonnerbridgereplace/. Accessed: 1/22/2014

This source mainly tells us of the importance of keeping the Bonner Bridge as well as the cost of replacing it. It is important to keep the bridge, not only for the current residents, but also for tourism. With its' landmarks, Hatteras Island has a great impact on the economy. It also talks about why the current bridge is no longer safe for travel and gives options for building a new one.

Southern Environmental Law Center. No Date. Bonner Bridge Replacement Background. http://www.southernenvironment.org/cases/bonner_bridge_replacement/bonner_bridge_replacement_background/. Accessed: 01/22/2014.

This Source gives a timeline on the history of missteps of the Bonner Bridge from 1990 to 2012 and so on.

Brenna Wells

Boyer, T. No date. Herbert C. Bonner Bridge. Outerbanks.com. http://www.outerbanks.com/herbert-c-bonner-bridge.html. Accessed 1/21/14.

Outerbanks.com goes into great detail about the history of the Bonner Bridge. It talks about how there came to be a need for a bridge, how they funded building it, and how it has benefited the local economies. It also gives information about what there is to do in the outer banks, fishing, hunting, sightseeing, etc...

Carter Jr, D.S. 18 December 2013. The better Bonner Bridge alternative avoids eroding sand. Raleigh News and Observer. http://www.newsobserver.com/2013/12/18/3470479/the-better-bridge.html. Accessed 1/21/14.

This article says that the waterway the bridge is crossing is expanding so building a bridge where the existing one is would be a waste, however highway NC 12 is the only way across so a bridge is necessary. NCDOT has changed their mind from a bridge based in Pamlico Sound (sheltered) to a bridge in the same place but with a higher budget, and is now saying that it is unaffordable. SELC is fighting for a bridge in a different location and longer. Instead of funding to fix/replace the bridge NCDOT is funding emergency alternatives in case the bridge needs to be closed immediately.

Corillo, T. and B. Mitchell. 3 December 2013. Officials discuss plans to repair closed Bonner Bridge. News Channel 3. http://wtkr.com/2013/12/03/bonner-bridge-to-close-immediately. Accessed 1/21/14.

This article says that the bridge was left in critical condition for four days before they decided to close it. It also talks about a couple different ways that officials want to fix the

bridge (sandbags) instead of rebuilding it all together. Mitchell and Corillo also talk about how the damage was found using sonar and what caused the damage.

Everts, C.H., 1985. Sea Level Rise Effects on Shoreline Position. J. Waterway, Port, Coastal, Ocean Eng 111:985. http://ascelibrary.org.jproxy.lib.ecu.edu/doi/pdf/10.1061/%28ASCE%290733-950X%281985%29111%3A6%28985%29

Everts talks about the sea level rise and how it isn't consistent year to year but it plays a major role in the shoreline. As the sea level changes it adds and removes sediments, physically altering the shore.

Hampton, J. 17 December 2013. Bonner Bridge is opened, but erosion remains a risk. Pilot Online. http://hamptonroads.com/2013/12/bonner-bridge-open-erosion-remains-risk. Accessed 1/21/14.

The article gives a more personal aspect of the bridge closure by quoting people who were there when the bridge was reopened, and how it being closed affected them. Hampton mentions a device that is placed on the bridge to measure movement and sends out an alarm if it moves more than a few inches.

Johnson, P.A. and D.A. Dock. July 1998. Probalistic Bridge Scour Estimates. Journal of Hydraulic Engineering 124:2-3. http://ascelibrary.org.jproxy.lib.ecu.edu/doi/pdf/10.1061/%28ASCE%290733-9429%281998%29124%3A7%28750%29

This journal talks about scouring of bridges. It says that the Bonner Bridge has been scoured and needed continual maintenance since it was built in 1962. The inlet itself has needed dredging since 1960 to remain navigable. Scour problems are expected to continue at the bridge.

Keaney, B.D. and J.R. Batts. 2007. Concrete Cylinder Piles at Oregon Inlet, North Carolina. Contemporary Issues in Deep Foundations 2007:2-10. http://ascelibrary.org.jproxy.lib.ecu.edu/doi/pdf/10.1061/40902%28221%299

In the 1990's NCDOT first proposed rebuilding the bridge as the result of several attempts to fix the existing structure including the surrounding land. The bridge is located on a space of land that is formed, deteriorated, and grown by the movement of the tide in and out. The land itself if composed of sand, silt, and soft clay. This journal also talks about how concrete piles are used and how they are tested to make sure they're strong enough.

Kenney, A. 6 December 2013. Environmental group decries 'irresponsible public attacks' over Bonner Bridge. Raleigh News and Observer. http://www.newsobserver.com/2013/12/06/3439336/environmental-group-decriesirresponsible.html. Accessed 1/21/14.

This article goes into detail about how the issue of the bridge has quickly become a political battle. It has gone to lawsuits and blaming other agencies for the shut down or not being able to build a new bridge. The DOT and SELC can not decide who is justified in their reasoning. DOT seems to want to build the bridge as fast and as convenient as possible to get it reopened while SELC wants to consider making a better, safer bridge that costs more and takes longer.

Kozak, C. 25 February 2013. DOT Torpedoes Ferries at Oregon Inlet. North Carolina Coastal Federation. http://www.nccoast.org/m/article.aspx?k=c7492298-a8c8-48be-a9d5-db2b9c2cfcc2. Accessed 1/22/14.

This article talks about the use of ferries to get across the Oregon Inlet instead of a bridge. It's an idea but there are issues. The maintenance of the ferries and the inlet are some of the concerns. Also they would need a vessel that can move faster and doesn't displace as much water because that causes drag. It is also expensive to make the round trip.

McClosky, S. 11 December 2013. Heads in the Sand over the Bonner Bridge. NC Policy Watch. http://www.ncpolicywatch.com/2013/12/11/heads-in-the-sand-over-the-bonner-bridge/. Accessed 1/22/14.

This article talks about the fight between the NCDOT and SELC. NCDOT wanted to bypass the lawsuits that SELC issued by leaving the road open to the bridge while they worked on it, but SELC's lawyer caught this and put a stop to it saying that NCDOT was trying to hide the issue as a whole from the public. An agreement was made to move the bridge to Pamlico Sound so that it was on safer ground and out of wildlife reserve areas, but that plan foiled when they decided it was cheaper to just build a bridge parallel to the existing one.

Moore, L.J., J.H. List, S.J. Williams and D. Stolper. 2007. Modeling Barrier Island Response to Sea-Level Rise in the Outer Banks, North Carolina. Coastal Sediments '07:1-2, 10. http://ascelibrary.org.jproxy.lib.ecu.edu/doi/pdf/10.1061/40926%28239%2989

Because the Outer Banks is such a low island it is drastically affected by sea level change. Recent predictions say that portions of the outer banks will eventually crumble off completely. If the sea level rises only a certain amount than the chances of the outer banks staying intact are good, but if there is a significant increase then they will likely crumble due to a "threshold collapse."

Moore, M., T. Green and T. Bartelt. 2008. Structural Condition Assessment of the Herbert C. Bonner Bridge in Dare County, North Carolina. Structures 2008: Crossing Borders:1-10. http://ascelibrary.org.jproxy.lib.ecu.edu/doi/pdf/10.1061/41016%28314%2920

This journal goes into depth about how the bridge is constructed. How the bridge is inspected, what it is inspected for. How they fix things that are damaged. What it costs to fix the bridge. What they recommend to fix and how/when. At the end they say that the bridge is deteriorated and needs to be replaced because it is becoming unsafe.

North Carolina Department of Transportation. No date. Bonner Bridge Replacement Project. http://www.ncdot.gov/projects/bonnerbridgereplace/. Accessed 1/21/14.

This is a government site that goes into a little bit of detail about a lot of aspects of the bridge. It talks about why the standing bridge is having problems and what they're doing to fix those problems temporarily. It says that the new bridge would be a different design and is a better design to help withstand the weather and water changes. Why they haven't already started building a new bridge (lawsuits). Why the bridge is important and how much it has/will cost to continue to fix to keep it safe.

Southern Environmental Law Center. No date. Bonner Bridge replacement. http://www.southernenvironment.org/cases/bonner_bridge_replacement. Accessed 1/21/14.

This agency is clearly for not replacing the bridge as is. They say that it needs to either be extended to reach safer grounds or completely gotten rid of and another alternative used (ferries). It talks about the wildlife being at risk by having a bridge where it is. A link on the bottom takes you to a break down by year of what has happened with the bridge and what is expected to happen in the future.

U.S. Fish and Wildlife Service. No date. Herbert C. Bonner Bridge Replacement Project. http://www.fws.gov/peaisland/images/bonnerbridgefactsheet62603.pdf. Accessed 1/22/14.

This talks about how the bridge effects wildlife in the Pea Island reserve area. That land is protected to help migratory birds and other wildlife. However the ocean constantly jeopardizes the location of the bridge and it is under constant maintenance. NCDOT has suggested four different alternatives and it briefly talks about each one.