

EROSION: AN ANALYSIS OF STREAM BANK PROTECTORS ON DOG RIVER

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Located in the southwestern portion of Alabama in the city of Mobile, Dog River is about eight miles long and lined by residential homes. In an attempt to slow down Mother Nature a high percentage of these homes have armored their shoreline with bulkheads. The purpose of this research is to inform and raise community awareness about the pros and cons of different types of bulkheads, their environmental impacts, and what other alternatives are available.

Under Section 10 of the Rivers and Harbors Act of 1899, if you plan to do any work in, over, or under any navigable waters in the United States including piers, boat docks, boat ramps, bulkheads, and riprap, requires a Section 10 Permit from the United States Army Corp of Engineers. In this paper I outline the application process, type of permit, and how long it is valid.

Using a 19-foot center console boat, a global positioning system, and a Mobile property map this project looks at what types of stream bank protectors are most commonly used for controlling erosion along Dog River, and where they are located. A comparison of the types of stream bank protectors is analyzed, along with alternative options, and environmental impacts.

Keywords: Dog River, stream bank protectors, bulkheads

Introduction

Erosion is a natural phenomenon that threatens properties built on waterfronts. Soil erosion is a complex process encompassing detachment, transport, and deposition, and is caused by wind, water, and physical disturbance (ASABE 2002). Although natural processes contribute to erosion, the rate may be accelerated by human activities such as construction of drainage ditches upstream of estuaries, wetland drainage, boat traffic, and channel dredging. Landowners frequently respond to the threat of erosion by armoring the stream bank with bulkheads and other structures. Bulkheads are manmade armored embankments found along waterfront properties that protect the property by separating land from water. Acting as a retaining wall, bulkheads are installed to keep the earth behind them from crumbling or slumping, but these structures do not protect the shoreline

in front of them (Allison 2001). Walls tend to divert wave energy downward, resulting in

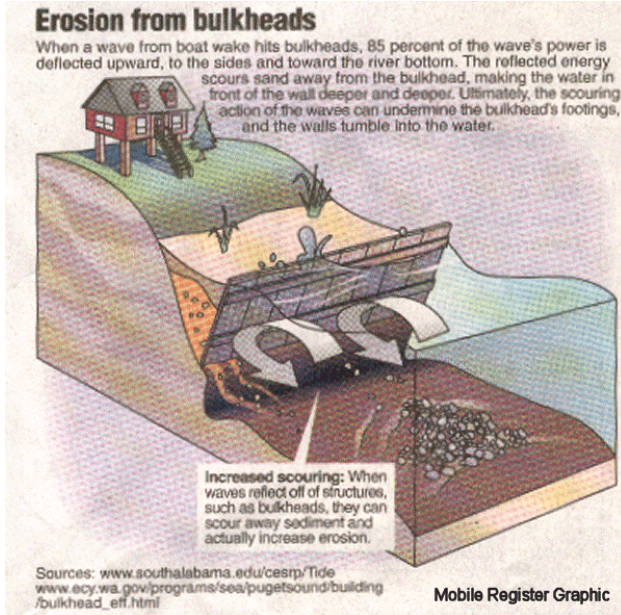


Figure 1: Erosion from bulkheads.

undermining and eventual collapse of the bulkhead (Corps of Engineers 1981) (Fig. 1). The problem with bulkheads is they can actually increase erosion, including, but not limited to, increased beach erosion, loss of sand, loss of surrounding beaches, loss of sediment, loss of plants, loss of shade,

and loss of habitat (Thom 1994). Although the armoring of a few properties has little

impact, the proliferation of structures along a stream bank can inadvertently change the estuarine environments and ecosystems. According to one study done in Mobile Bay, bulkheads cause a loss of intertidal habitat (Douglass and Pickel 1999). Ecologists have found that the intertidal and sub-tidal areas can be some of the most productive habitat for organisms (Odum 1971). A study done in the Pascagoula River estuary showed that bulkheads have a negative affect on the growth zones of estuarine-dependent fishes and invertebrates when compared to natural habitats (Peterson et. al. 2007).

The area of concern is Dog River, located in the southwestern portion of Alabama in the city of Mobile (Fig.2). The habitats of Dog River are subject to similar conditions as the Mobile Bay estuary, providing dynamic environments for many organisms. As a conduit draining into Mobile Bay, those events that occur along Dog River can affect the Mobile Bay environment and those that rely on it. Evidence of wave attack by

recreational watercraft appears to be one of the primary culprits of erosion problems to waterfront properties on Dog River. The purpose of my research is to inform and raise community awareness about the pros and cons of different types of bulkheads and their environmental impacts.



Figure 2: The Dog River Area.

Research Question

What types of stream bank protectors are most commonly used for controlling erosion along Dog River, and where are they located? A comparison of the types of stream bank protectors will be analyzed, along with alternative options. Also covered will be the process of obtaining a building permit, which is under Section 10 of the Rivers and Harbors Act of 1899 (WA State 2008).

Methods

Using a Polar 19ft. center console boat, three separate trips were made to Dog River in March. The first trip, the afternoon of Wednesday March 4, was the initial drive through the river and tributaries to explore the waterfront properties and determine the boat's handling abilities in tight navigable waters. This trip was also done to familiarize my assistant with the boat and the river. The second trip to Dog River was on the morning of Friday March 13 and my assistant and I were underway by 8am. Starting at Dog River Park and using a Magellan Explorist 500 Global Positioning System (GPS) we navigated down the river marking waypoints at each property and taking note of what kind of stream bank protector, if any, was in place. By 2pm we had successfully marked every waterfront property, within the boat's capabilities, on the west side of the river from Dog River Park to the entrance of Mobile Bay. Returning home with excitement that this project was easier than previously thought, I found out that the Mobile County property maps are outdated and do not line up with the GPS waypoints. A third trip to the river was made the morning of Saturday March 21. Starting at 6am we decided to use copies of the Mobile County property map instead of the GPS. At 1pm we found

ourselves back at Dog River Park having marked every waterfront property within the boat's capabilities on both sides of the river from Dog River Park to the entrance of Mobile Bay. Deciding there was still plenty of daylight we headed into Rabbit Creek and Halls Mill Creek to double check the previously recorded work of Sherry Allison and Sam Wilson. By 6pm we had completed marking the properties of Rabbit Creek, Halls Mill Creek, and the majority of Dog River.

Results

With over 600 waterfront properties observed and recorded, a GIS map was created using ESRI software to show the different types of bulkheads and/or natural vegetation that are located along Dog River (Fig. 3). Yellow represents aluminum, gray indicates concrete walls, green shows natural vegetation, red displays rip rap, purple documents vinyl, and tan designates wood bulkheads. As one can see there are more natural vegetation parcels near the mouth of Mobile Bay. This area of the river has more intact wetlands and marshes. Also, people's houses are set back farther off the river in this area. As one travels up the river a noticeable change in stream bank protectors takes place. When approaching the Halls Mill Creek confluence the river begins to narrow, and people's houses are not set back off the river as far as before. With heavy boat traffic in this area one would venture to say that property owners are more concerned with armoring their shoreline than people near the bay.

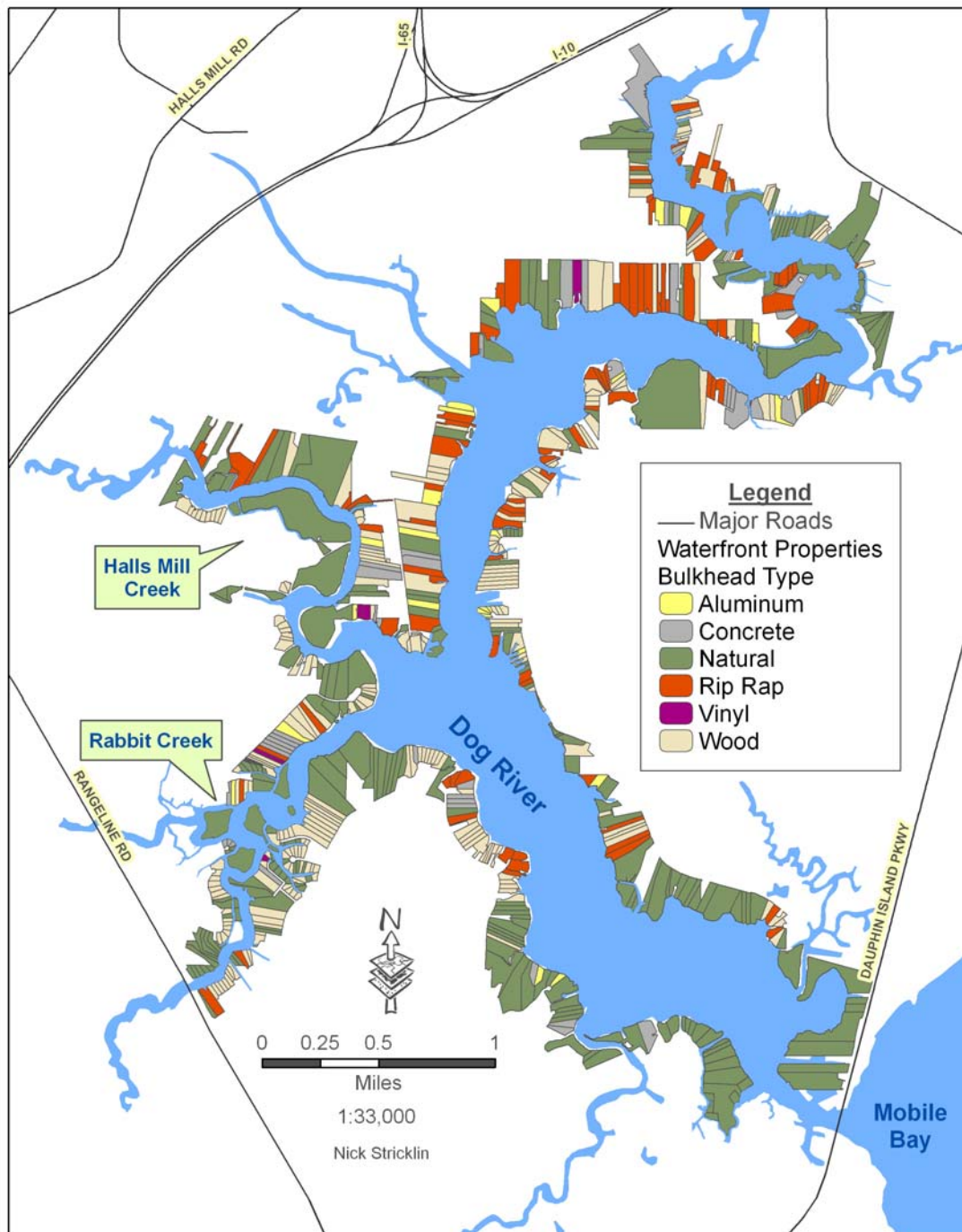


Figure 3: Bulkhead Types Along Waterfront Properties on Dog River.

Aluminum

With over 600 properties recorded, only 3.6% were Aluminum. Using aluminum material for a bulkhead is inexpensive, but also unpopular. Aluminum corrodes from the inside out so once needed repair work is noticed it is too late. Of the twenty or so aluminum bulkheads recorded, almost all of them had rust and/or holes on the side of them.

Concrete

Of all the properties only 6.7% use concrete walls as their means of protection. The majority found were older properties along the river, most of which were leaning towards the water or had big cracks in them. Concrete tends to cost more and is difficult to install, but when installed correctly it is very strong and lasts for several years. On the down side it is hard to repair and replace.

Rip Rap

Making up 15.4% of the properties, rip rap is a good material for bulkheads. It is inexpensive and easy to replace. The rocks break up wave action as it reaches the stream bank. Also, natural vegetation can grow between the rocks promoting minimal damage to the surrounding habitat.

Wood

At 38.1% of the observed properties, wood is the bulkhead of choice along Dog River. Wood costs more than aluminum, but is still relatively inexpensive. It is easy to

repair and to replace, but it does decay and rot. According to one study the chemicals used to treat wood can be very harmful to aquatic life and have a negative impact on the environment. Even if wood has been properly preserved, some quantities of toxic materials leach out into the ecosystem, especially when the wood is new (Weiss and Weiss 2004).

Natural

Natural vegetation is the second most common stream bank protector along the river. 35.4% of the properties observed had natural shorelines. It is the easiest, least expensive and most environmentally friendly form of bulkhead. The vegetation protects the stream bank from erosion while providing a natural habitat for plants and animals. More of the newer properties on the river are leaving the natural vegetation alone and building piers over the vegetation to access their docks on the water.

Vinyl

Vinyl bulkheads are recent to our area. Only 0.8% of the properties are using vinyl bulkheads. They are an environmentally friendly alternative if natural vegetation is not an option. The cost is more than aluminum, rip rap, and wood, but the material does not decay or rust. The use of vinyl is still too new to know the long-term affects, but more people on the river seem to be replacing old bulkheads with vinyl ones.

Permits

Section 10 of the Rivers and Harbors Act of 1899 requires approval to do any work in, over, or under navigable waters in the United States. The United States Army Corp of Engineers (Corps) can authorize activities by a standard individual permit, letter of permission, nationwide permit, or regional permit. Standard individual permits requires publishing of a public notice, opportunity for a public hearing, and receipt of comments from environmental and governmental agencies and the public. This type of permit is used for any activity which does not qualify under other permit processes. Letters of permission are permits in coordination with federal and state environmental agencies and a public interest evaluation but without the publishing of an individual public notice. Nationwide permits are the simplest permits, designed to regulate activities of small scope with minimal impact. Regional permits are also to authorize minor activities and are developed in cooperation with state agencies (Corps of Engineers 2009).

The cost for a permit will depend on your project. If a standard individual permit is required, the cost will be \$100. There is no cost for a letter of permission, nationwide permit, or regional permit. An application for a permit can be downloaded on the Corps website. You should also include a detailed drawing which clearly shows the scope and size of your project and the location of your project in relation to wetlands, creeks, rivers, or other waterbodies (WA State 2008). Processing time for permits can range from 6 to 24 months. The time frame is dependent on the complexity of the project. Depending on the type of permit issued the permit can be valid from 2 to 5 years. If an application is denied, only a letter of permission and standard individual permits can be appealed. The

division engineer must receive the appeal within 60 days of the permit decision date (WA State 2008).

Conclusion

This analysis of stream bank protectors along Dog River should help Dog River Clearwater Revival and local waterfront property owners in their education and conscious decision-making when implementing different types of bulkheads along the river. Everyone has a reason why they choose the type of bulkheads they do, but not everyone knows the advantages and disadvantages before their decision has been made. This report is intended to inform and raise community awareness before it is too late. Included in this analysis is a map showing where and what type of bulkheads are already in place.

To anyone wanting to continue this research be prepared to take your time and not to get in a hurry. The property maps of Mobile County only resemble what the properties really look like. It takes some time getting your bearings straight. Also, make sure your boat has a shallow hull. More of the river could have been covered if my boat's motor had not repeatedly run aground.

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