SEARCHING FOR SEDIMENT SOURCES IN SPRING CREEK

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Sediment deposition in Spring Creek has been a major issue since channelization was completed in 2002. One of the goals of the channelization project on Spring Creek was to limit stream bank erosion by erecting gabion walls. The project was so well received that it was presented a prestigious award. Severe erosion and deposition is still taking place within Spring Creek. The city must constantly remove sediment to prevent upstream flooding. My research examines areas along Spring Creek to provide a positive source for this constant sediment. The use of a stream table showed how the dynamics of Spring Creek would operate. Aerial photograph and field observation along Spring Creek identified potential erosion areas, and eliminate others. At identified locations along Spring Creek, nails were inserted into the soil to measure erosion rates. Locations and results are displayed on a map and graph. These rates show a rising trend in erosion along Spring Creek's banks, upstream from the channelized portion of the creek. The results from my project indicate that the construction project on Spring Creek has met the goal of limiting stream bank erosion, but is now acting as a huge sediment basin where all sediment eroded upstream of the project is dumped. With these results, organizations such as Dog River Clear Water Revival have a better understanding of how channelization projects will affect water quality in any similar stream projects.

Keywords: stream, erosion, sediment

Introduction:

Water control issues have plagued the Dog River Watershed for some time. Trash, sedimentation, oxygen levels are constant reminders of why acts should be taken to maintain water quality as high as possible. Spring Creek has been a constant source of annoyance for the city of Mobile. In 2002, the city hobbled Spring Creek, making it wider and deeper. This was in response to "problems" with the creek flooding residential areas and the Cock of the Walk parking lot. Instead of allowing the creek to operate in a natural pattern, and limiting the urbanization around the creek, the city went ahead and changed the natural landscape to prevent flooding. A map of Dog River Watershed is shown in figure 1. To prevent flooding, the stream channel was dug wider and deeper, and penetrable walls were erected to maintain the structure. The project was also

designed using gabion walls to prevent severe erosion of the channel. Sediment continues to be deposited in Spring Creek however, in massive amounts. This sediment is continually being dredged by the city. A sediment basin was installed on the creek to collect this sediment, but far too much is showing up in the creek than should be expected (Oertel 2003). Years after construction has been completed, the creek seems to have taken on a more natural look, trying to defy the construction projects bounds. This sediment is a major issue however, it builds up so rapidly, yet no source has been identified to prevent this problem. Dredging this sediment so often carries extreme costs, why not stop the sediment at the source? The city of Mobile, Dog River Clearwater and other related organizations should be concerned about the massive amounts of sediment making its way into the small portion of swamp located behind the old Cock of the Walk restaurant. This sediment build up can be seen in Fig. 2.

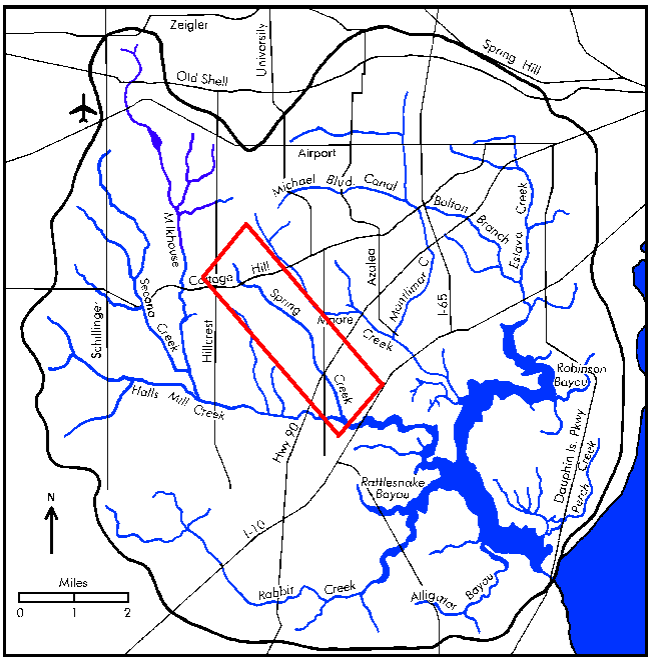

Figure 1: Location of Spring Creek in Red Box (Fearn, 2011)

Research question:

Where is this sediment coming from?

This would show how effective the construction project on Spring Creek actually was, and possible ways to prevent

the sediment buildup in the future. This would save the city time and money, and actually solve the problem of deposition in the creek. My hypothesis on the sediment source is that stream bank erosion is still occurring, and the channelization project has not met one of its goals.

Figure 2: Spring Creek
(Google Earth 2011)

Methods:

Efforts were made to find the source of the sediment prior to going out into the field. This narrowed the sources I was looking for, once work in the field began. The first step was using a stream model to predict the patterns of Spring Creek. A stream model is a device used to examine the operations of streams, at a small scale. Instead of going out into the field first, Spring Creek can be simulated indoors, using the model. Using the stream model allowed me to observe how sediment builds up in the straighter, wider areas of streams, and to locate the source of this sediment. Most of the sediment that was deposited in the lower, slower moving sections of the stream model came from the upstream banks. Quick moving water in the upper portions of the stream model eroded the banks (stream bank erosion) very rapidly. Stream bank erosion was supposedly stopped by the channelization however, so my hypothesis for sediment sources based on

the stream model was stream bank erosion directly upstream from the portion that was channelized. Remote sensing techniques were also used. Viewing aerial photography lead to possible sediment sources as well. A couple different construction projects in the Spring Creek drainage area were seen over the course of several years. My hypothesis was that localized areas of construction are not the main source of sediment. This is a result of the continuous problem of sediment buildup; if it were due to construction, there would be a very definitive correlation between construction and sediment, which there is not. Also, construction areas are more tightly regimented than the stream banks; this means erosion control methods such as silt fencing and hay bails should be utilized and installed properly, according to established codes.

A focus on the areas of likely sources was conducted in the field. 13 sites were selected based on previous factors, and allowable field conditions. Figure 3 shows the location of the sites selected. At each site on March 17, two 3.5inch nails were driven into the ground to a depth of three inches. Two were used for the purpose of redundancy and accuracy. A small plastic ribbon was attached to one of the nails to help relocation efforts. On April 21, I went back to each site and recovered the nails, recording amounts of erosion, or deposition, by recording the nail head's new height above the ground. Table 1 shows the site descriptions, and is referred to in my discussion.

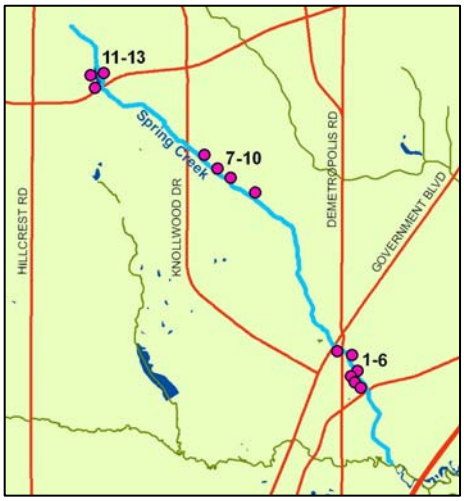

Figure 3: Spring Creek sample sites

Table 1: Spring Creek site descriptions

Site	Description
1	Stream bank (channelized)
2	Stream bank (channelized)
3	Stream bank (channelized)
4	Sand bar in creek (channelized)
5	Stream bank (channelized)
6	Stream bank (channelized)
7	Stream bank (natural)
8	Stream bank (natural)
9	Sand bar in creek (natural)
10	Stream bank (natural)
11	Construction silt fence
12	Stream bank (cement)
13	Construction silt fence

Results:

My results are shown on Figure 4. Each site number displayed along the x-axis, and the amount of erosion, or deposition, measured is displayed along the y-axis. The average of the two nail head heights at each site was used for the site total. In cases where only one nail was found, site number 9, that nail head height is the total amount.

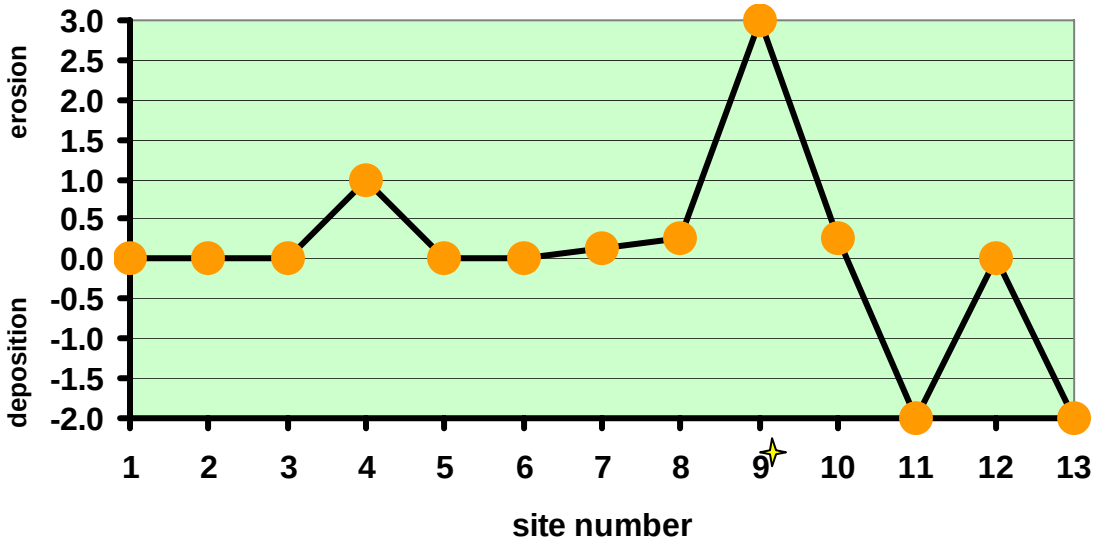

Figure 4: Findings at nail erosion sites

Conclusion:

The build-up of sediment since the channelization of Spring Creek is a tremendous problem. One of the main reasons for performing construction on the creek was to limit the erosion taking place, and it obviously has not been stopped. Although at first glance it may seem erratic, figure 4 shows a very unique trend when compared with the site descriptions of table 1. According to my findings, stream bank erosion has been stopped along the portions of Spring Creek that have been channelized. This shows that, despite the tons of sediment buildup inside of the channelized portions, the sediment is not actually coming from this part of the creek. When you observe the sample sites upstream of the channelization, it begins to show a trend, and erosion is seen along the stream banks. Sites 4 and 9 were selected to observe a movement of sediment inside the creek. At site 9, the one recovered nail was lying flat and buried. This is due to the entire nail being uncovered, and subsequently re-covered in sediment. This shows a much higher stream velocity and erosive force as does site 4, which shows a significant amount of sediment movement, but not enough to completely uncover the nails. The more rapidly moving water can erode the stream banks more easily, and carry a larger sediment load downstream. The channelization of Spring Creek does prevent bank erosion in the area that was modified. However, this rapid transition from natural, narrow stream, to wide, deep channelized portion is causing massive problems for Spring Creek. The stream is constantly attempting to heal itself. Large sand banks have formed inside of the channel walls, and are now acting like stream banks, inside the channel. Once the deepened, widened channel finally slows the water, the sediment is deposited in large amounts, and subsequently dredged by the city. Sites 11 and 13 were picked to observe a fairly large

construction project off of Cottage Hill Road, a new subdivision called Snowden Court. The two sites were completely buried, indicating that the silt fences installed were working.

Spring Creek is suffering from severe erosion in the upper portions and subsequent deposition in the lower reaches of the creek. This significant problem degrades the water quality and also the stream environment. This project shows the channelization was a success, in that it stops stream bank erosion, but subsequently adding several of it's own problems. Dog River Clearwater Revival can benefit from these findings by showing how channelization of a natural stream is detrimental to the stream's health, and causes many unwanted issues, namely sedimentation.

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