Restoring Our Wetlands

Presented to the Athenaeum Society

Hopkinsville, Kentucky

November 3, 2005

By

Edward H. Higgins

Restoring Our Wetlands

Many years ago, during the spring of my 6th grade year at Belmont Elementary School, I saw a movie one Saturday Morning at the old Princess Theater. The movie was about the French Arcadians being forced out of Nova Scotia and their trials upon being relocated along the eastern bank of the Mississippi river near New Orleans. The only other thing I remember about the movie is that every time the fightin' was about to start the Arcadians had what, at the ripe old age of 12; I thought was the coolest war hoop that ever existed. Please forgive me if I don't demonstrate that great wail for you. I know I couldn't do it justice in my present state of sobriety.

A few months later, after my brother's high school graduation my parents realized that with Johnny's enrollment in college we needed to take our last vacation that would include the whole family. We packed all six of us into the station wagon and made what in family lore would become known as "THE TRIP!" From Hopkinsville to the Great Salt Lake, the Grand Canyon, Mexico City, Texas, New Orleans and back to Hopkinsville. In my heart, I know that Chevy Chase's great movie "Vacation" was in fact based on a few of my family's experiences.

As fate would have it a cousin and former Athenaeum member, Martin Standard, was living near New Orleans at the time. It should come as no surprise to those of you who knew Martin that he believed that visitors should get to know the real New Orleans and Louisiana when they imposed upon his hospitality. So our brief stay with Martin and his wife Sara included visits to the French Quarter with the kids in a jazz hall while the adults were attracted to Bourbon Street. Martin also directed us to the outlying areas for some real Cajun and Creole food that included raw oysters, Etouffee, crawfish, gumbos, and red beans and rice.

Thirty-six years later my younger sister and her husband moved to Slidell which is just outside the Big Easy and they were not that impressed with the French Quarter or New Orleans. But Jim and Sue loved to ride his Harley and most of these rides were down country roads and very often through the bayous and other wetlands. During several of our

visits before they moved last May, we always found our way out to their latest great find. These excursions always included great foods, genuine people and cold beer. What more could one ask for?

I include these bits of personal history to show that I have had more than a passing interest in the Cajuns and bayou country for more than forty years. However, the bayous and marshlands and the way of life they have sustained for 300 years have been disappearing at an alarming rate. Southern Louisiana includes the most rapidly vanishing land mass in the world today. Fifty acres a day or an area the size of football field every 30 minutes are being lost to erosion, subsidence, and the forces of man and nature. That means by 2050 one third of coastal Louisiana will have vanished into the Gulf of Mexico. Nationally, Louisiana currently experiences about 90 percent of the total coastal marsh loss in the continental United States. But what can we do, especially after Katrina and Rita have delivered their double whammy to the area.

In the summer of 2004 representatives of FEMA, The National Weather Service , The National Hurricane Center, The Corp Of Engineers, New Orleans, and various departments from the Louisiana state government met at Louisiana State University to predict and prepare for a worse case scenario if a category 4 or 5 hurricane were to make landfall in the southern Louisiana area. Their predictions were right on target but obviously the level of preparedness fell far short of the desired response two months ago. But what should we do about the mess which Katrina has left?

Maybe those who feel it would be a waste of time and money to rebuild New Orleans and the supporting infrastructure are right. However, New Orleans and the surrounding area are vitally important to our nation. New Orleans is one of the two busiest seaports in the U.S. It is the number one seaport in regards to agricultural exports, an issue that is vital to area farmers. The mouth of the Mississippi is also the leading gateway for our nation's petroleum imports. The offshore platforms account for a huge portion of our domestic oil production. Louisiana and the Texas Gulf region account for more that 40% of our petroleum refining capabilities. This is obvious from the recent spike in gasoline prices

while these facilities were offline. The Louisiana coast is second only to Alaska in commercial fishing and seafood production. As a wildlife habitat, it makes Florida's Everglades look like a petting zoo by comparison. And where else can one find a Mardi Gras atmosphere, great Cajun and French cuisine all within a days drive of home.

This truly is a unique and vital region of our country and it must be rebuilt. Do we simply rebuild the levees higher and stronger and invite everyone to return home or do we correct and eliminate many of the problems we have created for ourselves.

Perhaps a short lesson in the geology of the area might be in order. The forces of the Mississippi River are the primary architect of the land form in Louisiana. For 7,000 years, prior to the interference of man, the Big Muddy flooded each year depositing new sediments and restoring the land. During the rest of the year erosion and subsistence, the sinking of the land under its own weight, took away a portion of what the Mississippi delivered in the spring and lowered the level of the land. This lost elevation is restored and elevated with the floods the next year. When the elevation of the land exceeds the levels of the flood the sediment is deposited further downstream or further out the coast and the process is begun anew.

The French began settling what would become New Orleans about 300 years ago. At that time between New Orleans and the Gulf of Mexico was a vast, dense hardwood forest that reached for miles. Beyond the forest, there were miles and miles of freshwater marshes and beyond those were saltwater marshes. Beyond the marshes were broad and tall barrier islands. When storms such as Katrina or Rita did strike, these forests, marshes and islands acted like speed bumps diminishing the power of the storm and the storm surge that accompanied it. The results were a bad but not devastating event.

Almost immediately upon settling the area, man began to build levees to protect themselves from the much more frequent and more predictable floods. In doing so man altered the flow of the river and limited the distribution of the sediments that came with the floods. Subsidence, the settling or sinking of the soil and compaction eventually led to parts

of New Orleans being the eight feet below sea level that it is today. In the past 100 years the southern portions of Louisiana has subsided two to three feet. During the last century man became even more adept at controlling the river and the annual floods. Today the natural distribution of the sediment has virtually been eliminated. Since the 1950s engineers have cut more than 8,000 miles of canals through the marsh for petroleum exploration and ship traffic. These new ditches sliced the wetlands into a giant jigsaw puzzle, increasing erosion and allowing lethal doses of salt water to infiltrate brackish and freshwater marshes. All of these factors have led to the disappearance of more than 1,900 square miles of forest, marshes and barrier islands. In essence, man has made an unnatural landing strip for storms such as Katrina so that they can deliver devastating blows to the area. Had Katrina hit 50 or 100 years ago it would have created much less damage and not been nearly as powerful as it reached the New Orleans area. One can only wonder what a difference it would have made if the storm surge and the strength of Katrina had been reduced by marshes and barrier islands.

Add to the mix that all concerned Federal Governmental Agencies predict that during this century the ocean levels will rise from 1-3 feet due to climate changes. It's easy to imagine the problems that our coastal cities will be facing in the next 50-75 years. It really doesn't matter if the oceans rise three feet or if the soil settles three feet the results will be basically the same. The rise in sea levels will mean that our coastal cities will be facing major crisis when storms hit the area. It is hoped that lessons learned in wetland reclamation and construction in Louisiana can be applied to other coastal areas in U.S. and the world.

About 35 years ago environmentalists finally began to gain the attention of governmental officials as they raised concerns about the vanishing coastal wetlands. After endless studies and planning, several proposals were advanced.

As they search for ways to halt the destruction of the wetlands, scientists look to the river for help and hope. Allowing the Mississippi to revert to flooding wetlands beyond its levees with its nutrient and sediment rich waters would help to alleviate the crisis of land loss, but at the cost of the human community, the infrastructure and commerce of coastal Louisiana. Instead scientist and engineers seek to replenish the wetlands, yet retain vital

flood protection, by controlling the delivery of sediment into marshes. This has been done on a small scale by diverting river water through manmade channels or by capturing the sediment and moving it to project sites via barges.

Draining over 40% of the continental United States, the Mississippi River collects sand, silt and clay to become a huge sustainable source of sediment. The challenge for wetland restoration experts is to capture a portion of the tons of particles carried in the river and transport it to create new land and to nourish existing marshes. Pumps, pipes, barges and dredges can combine to restore some of the benefits that the river's floods historically delivered to coastal Louisiana.

Among the proposals for rebuilding the wetlands is allowing fresh water and sediment to fan out from various points along the Mississippi levees south of New Orleans in the Gulf of Mexico, allowing for the delta to be rebuilt or barging in sand from the Gulf to rebuild the barrier islands.

If we envision the Mississippi as giant tube, it now deposits its sediments far out in the Gulf on the continental shelf where they are lost as a building material. If engineers could strategically punch holes in the tube or levees, they would creating a more natural delta flow, allowing sediment to build up and new fresh water grasses to take root and grow thus holding these areas together. While this process has been successfully attempted, it has proven to be a very slow and expensive process for rebuilding the lost wetlands.

But what if there was a way to built hundreds of acres of land in weeks that mimicked the natural land-creation processes, and used a renewable resource – Mississippi River sediment – as it raw material.

Some engineers and scientists say pipeline sediment transport is that technique and that it could play a major role in saving coastal Louisiana. "Pipeline transport, moving dredged sediment through pipelines to wetland sites, replicates the natural processes that

create wetlands," says Dr. Joe Suhayda, a coastal oceanographer. "It lets us go out into open water and rebuild a marsh in a matter of weeks."

Worldwide, the technique has been put to many uses: Singapore has used dredged materials to increase the size of its main island by 20%, in the Netherlands; 4.2 million cubic yards of sediment were transported via pipelines to build a 100 mile freight railway. In Louisiana pipeline transport has already been used in major highway construction and is being developed as a technique for reversing land loss on islands, along shorelines, and in wetlands.

Pipeline transport begins where the sediment is located. In Louisiana, that's primarily at the bottom of the Mississippi River and the Gulf of Mexico. Collecting sediment from these underwater sites for restoration purposes has typically used a pipeline dredge, a specialized vessel capable of removing sediment from depths of up to 70 feet.

The dredge carries a suction pipe mounted on an arm that extends into the water. The end of the pipe might be outfitted with a wide dustpan or a nine foot cutterhead. As the pipe moves it sucks up sediment and propels it through the pipeline. Large amounts of water keep the dredged materials moving. This slurry is usually from 5-33% sediment depending on the size of the sediment particles being used on a project.

Powerful pumps propel the slurry 24 hour a day, seven days a week until the work is completed. These pumps are placed every two to four miles along the pipeline depending on the particle size contained in the sediment.

At the placement site, dredged material flows from the pipeline in a muddy rush. Sediment particles collect and build up and as water drains away, new land is created. Engineers and scientists assure us that they could easily build a sizable barrier island in less than a year using this pipeline technology. This all sounds simple enough but there are many small steps to be considered along the way.

Every project begins with by selecting sediment that has characteristics suited to the projects goals. Sand is best for rebuilding barrier islands, for example, while nutrient-rich silt boosts the plant growth in fragmented marshes.

According to Shea Penland of the Pontchartrain Institute of Environmental Studies at the University of New Orleans, both the Mississippi River and the Gulf of Mexico are rich sources of available sediment. Because neither of these sources currently enters the wetland naturally, it's referred to as "new sediment." New river sediment is also referred to as renewable. The Mississippi drains 40% of the continent and continuously replenishes it sediment load. It carries all the kinds of sediment needed for wetland restoration. We can choose to dredge a point bar for silt and clay or a mouth bar for coarser sand.

Although the most immediate source may be the huge deposits at the mouth of the Mississippi River, sediment can also come from bays, waterways and the Gulf of Mexico. Maintenance dredging of navigation channels can also provide material for rebuilding wetlands.

What ever the source, sediment delivered via pipelines is tested for grain size and contaminates. According to the Corp of Engineers contaminates do not stick to the relatively coarse sediments which would be used. A greater concern would be degree of salinity in the sediment slurry. Too much salt will kill a freshwater marsh.

In theory sediment could be moved several hundred miles but current plans in Louisiana call for pipelines to run less than 10 miles. Whenever possible, pipelines are laid along existing channels, canals and roads to minimize their impact on the environment.

Once the pipeline starts to discharge its load, the sediment is shaped to fulfill the projects objectives. The sediment may be piled up with earth moving equipment, or sprayed in a thin layer directly onto an existing marsh. Or a pipeline might discharge sediment into water where drifts and currents carry it to its intended destination.

An area newly constructed from transported sediment can be quite barren. Given time, natural colonization is likely to take place, although hand planting can jump-start natural vegetative growth and encourage plant habitation. But the health and longevity of created marshes, like natural ones, depend on a regular dose of rejuvenating sediment and nutrients. One method of feeding the marsh is to leave transport pipes in place permanently. Another is to flood the project sites with sediment-laden river water. Near the river's mouth, where there are no levees, this can be done by diverting water through gaps cut into the rivers banks.

Other questions also linger. Who resolves property rights along the transport routes? What footprint does a setting up pipes leave in a fragile marsh? Is it better for the pipes to float or sink? How do you protect the oyster beds and fisheries and who maintains the pipelines?

Personally I find the possibilities of pipeline wetland restoration amazing. But can these types of projects really be done? Well, they already have been.

The success of three pipeline projects illustrates the technique's land building potential. Just 10 years ago the Bayou LaBranche along I-10 south of Lake Pontchartrain was open water. The result of more than 150 years of subsidence, flooding and erosion that began when railroads constructed in the 1830's altered the flow of water through the wetland. By 1995 only a narrow strip of marsh less than 50 foot wide separated the ponds from the Lake.

The project involved dredging sediment from the bottom of Lake Pontchartrain, then pumping it through a 7,500 foot long pipeline to the open area of water. In four weeks, nearly 2.7 million cubic yards of sediment were placed to create 300 acres of land.

The West Bay project embodies one of the ironies of wetland loss. Though only a few yards from the sediment rich waters of the Mississippi, the marsh subsided and converted to open water. The goal of the project was to create a diversion through which

sediment-laden water would flow naturally to the marsh during high river stages, creating land over the course of 20 years. But by pumping the dredged material from the channel, they were able to restore 200 acres right away. In this case according to Project Manager, Gregory Miller of the Corp of Engineers, "This project shows how well piped sediment compliments other restoration methods. It jump started the land building process, and the river will do the rest."

Louisiana's barrier islands, the coast first line of defense against hurricanes, are eroding even more rapidly that the inland marshes they protect. Timbalier Island, a narrow strip of land south of New Orleans, had suffered extensive hurricane damage. It was predicted to vanish in the next 25-30 years if it did not receive new sediment. In this project 4.6 million cubic yards of sand were pumped to the island from more than three miles out in the gulf. "This project was the first to use sand from so far out in the gulf," says EPA Project Manager Patty Taylor. "The sand dredged from the gulf is superior to that which could have been harvested closer to shore. The high quality sand performed even better than expected and allowed the project to be completed $4 million under budget and several months early."

While these types of projects are not cheap, they do seem to be more cost effective that many of the other alteratives. With the backing of a diverse group of business, political, governmental and environmental interest, a consensus solution for coastal restoration has been crafted. It calls for many of the methods I have talked about tonight to be employed. However it comes with a $14 billion dollar price tag over the next 40 years. That may sound terribly expensive. However, considering that congress has already approved almost $200 billion for the devastation brought on by Katrina, the price begins to seem more reasonable. This cost is roughly equal to a month of the war in Iraq or the cost of the big dig in Boston and it offers benefits to a much larger section of the American public.

Yet at this time Congress has allocated only $540 million with the promise of another $2 billion over the next ten years. At that rate the funding will be complete 80 - 100 years from now.

While building a functional wetland with transported materials is not simple, the possibilities excite wetland scientists. Pipeline transport creates new land quickly. It needs to be used on a scale that has never been tried before. In building dams and levees on the river man has demonstrated that we have the power to control huge floods. We can use that same power to restore the environment and afford protection from hurricanes too.