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Unwelcome neighbors? industrial growth and water pollution in Lake Charles, Louisiana, 1940-1960

Jonathan Zachary DeLaune
Louisiana State University and Agricultural and Mechanical College, zackdelaune@gmail.com

UNWELCOME NEIGHBORS? INDUSTRIAL GROWTH AND WATER POLLUTION IN LAKE CHARLES, LOUISIANA, 1940-1960

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To Andra F. DeLaune
(1948-2002)
Who I hope would have been proud.

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Preface

The first memories I have of the Lake Charles area are from early childhood. My father was born and raised in the area, and we would sometimes visit extended family there. Driving west along Interstate 10, we would pass through Lake Charles, cross the Calcasieu River, and continue west a few miles to Sulphur, where the family lived. At first glance, Lake Charles is not a very remarkable city; its appearance is not much different from any other small urban area. There are schools, slums, ranch houses, malls, a small university, and an airport. The city sits on a nearly circular lake, with man-made beaches and riverboat casinos lining the shores. However, what we saw on the west side of the lake always made me think twice about taking a swim. In Westlake (the community just across the river), the highway seems to run an industrial gauntlet. As we drove, towers, pipes, tanks, and flames surrounded us. The names came into view on tanks, trucks, rail cars, and road signs: PPG, Conoco, Citgo. The sign welcoming you to Westlake hangs from industrial pipes, suggesting the intimate bond this area has with industry.

Entrance to Westlake
(Photo Credit: Author)

Baseball fields lay in the shadow of tank farms. Streets have names such as Cities Service Highway and PPG Road. Windsocks hang from poles around the city, offering crucial safety information in case of an accidental release. Industry affects nearly every aspect of life in this region, and even at a young age, I could see that this was a unique place. It was much different from the town in central Louisiana where I grew up. The largest industry I had seen at home was a paper mill. While all of these sights and smells in Lake Charles were offensive at the time, I later learned that the plants were the reason my father's family came to Lake Charles. My grandfather was the chief safety officer at the Cities Service refinery, and many of his relatives had moved to Lake Charles (from northwestern Louisiana) for the job opportunities in the petroleum industry. The contradiction of the positive (jobs) and negative (pollution) aspects of industrial agglomerations was my inspiration for this research. I wanted to explore the social, cultural, and geographic forces behind the industrial growth of the area, and how people reacted to this sudden, drastic change.

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Abstract

This paper focuses on the industrialization of Lake Charles, Louisiana during World War Two and the resulting shifts in pollution-related policy and public perceptions of pollution. A major impetus for the industrialization of the South was federal investment during the war. This is especially true for Lake Charles, a city where industrial agglomeration began with war-time financing of manufacturing plants to combat the shortages of aviation fuel and rubber. By tracing the public response to offensive pollution and the resulting shift in public policy, this paper will reveal a fundamental conflict between development-minded government institutions and a population interested in protecting natural resources. The responses to pollution in this newly industrializing Southern city expose an underlying popular dissatisfaction with the pollution-tolerant policy.

Chapter 1
Introduction

Geography and History

Lake Charles is a city situated in southwestern Louisiana, at the convergence of the west Louisiana forests, south-central Louisiana prairies, and Gulf Coast marshland. According to the 2000 census, the city had a population of 71,757 persons, with an Metropolitan Statistical Area (MSA) population of 184,700. Interstate 10 runs east-west through Lake Charles, and when traveling this highway, the most striking characteristic of the city is its particularly industrial nature. Refineries and petrochemical plants line both sides of the highway, and dot the horizon in many directions. When lit up at night, they almost overpower the lights of the city. This industrial agglomeration is what most often receives the credit for the city's growth to its present size. Before the twentieth century, however, it would have been hard to imagine the substantial industrialization and growth Lake Charles would experience.

The first European settlers arrived in the Lake Charles area during the Revolutionary War. Residents later named the lake after Charles Sallier, a native of Savoy, France, who built his home on the shores in 1800. The lake itself is nearly circular and two miles wide, with the Calcasieu River running through its western side. By 1867, enough settlers (150) had arrived on the banks of the lake to incorporate a town named, appropriately, Lake Charles. The townspeople initially made most of their money in the cattle industry, utilizing the vast pastures to the east and south of the city. In 1880, however, both the railroad and the timber industry arrived. The Louisiana Western Railroad connected the city to many parts of the state, east and west, and spurred an interest in development in the area. J.B. Watkins of the North American Land & Timber Company bought 960,000 acres of the large forested area north of the city, and built a railroad running north and south to serve this natural resource area. This railroad would soon connect the city with St. Louis and thus many northern markets. It also heralded the beginning of extensive railroad building and logging in western and southwestern Louisiana. In 1892, longleaf pine covered 2,500,000 acres in this area of Louisiana, and logging companies from the North poured in for the harvest. The explosion of the timber industry was so extensive that loggers virtually exhausted the forests by the early 1930s (Stokes 1957). J.B. Watkins also helped develop the rice industry, which would become a large contributor to the southwestern Louisiana economy. In 1886, he invited Dr. Seaman A. Knapp, one of the leading agriculturalists of the Midwest, to Lake Charles. Knapp worked with rice farmers to improve irrigation and production, and constructed the first rice mill in the city, with a capacity of 3,000 barrels per day. Watkins' timber company even constructed a canal that would provide for the irrigation of 15,000 acres of rice fields. Because of these developments, by the early 1890s Lake Charles was the center of the rice industry in Louisiana, and southwestern Louisiana had claimed its position as the leading rice production area in the United States. The next industry to come to the city was sulphur mining. The Union Sulphur Company began extracting sulphur in 1896 from what would become the world's largest sulphur mine nine miles west of Lake Charles in Sulphur, Louisiana. With all of these developments, Lake Charles was a growing city at the turn of the century, but very slowly. Most of the labor and capital was still concentrated in agricultural sectors. The population was only 6,680 and growing slowly, with only 850 people employed in industry (U.S. Census Bureau 1960; Lane 1959; Ferguson 1931).

Lake Charles Attractions

This all changed with the discovery of oil fields in East Texas. In January 1901, the discovery of oil on Spindletop near Beaumont, Texas, began the oil rush in the Gulf Coast area. Spindletop was a colossal find, as it yielded 80,000 barrels of oil per day, compared to the usual “big” producers of the day (50 barrels per day). Lake Charles was in a perfect geographical location to exploit this new industry, adding to the city’s traditional exports of rice and timber. Oil and natural gas resources along the Gulf Coast are located primarily near geologic structures known as salt domes. These are uplifted columns of salt left over from the Jurassic-era evaporation of a shallow Gulf of Mexico. The salt is uplifted in columns by the weight of the sediment layers above it. As it rises, it bends the sediment layers upward, and the oil within the layers flows towards the salt column. The impermeable salt layer then traps the oil. Spindletop is the name of a hill that forms the top of a salt dome uplift, and salt domes are common near the coasts of both Louisiana and Texas. Geologists and wildcatters soon realized that drilling around salt domes was the best bet for oil, and they set to the task all along the Texas and Louisiana Gulf Coast.

Thus, by the early twentieth century, Lake Charles had three major economic operations: oil, timber, and rice. The city was located on major road (U.S. Highway 90) and rail lines that passed from Houston through to New Orleans, offering a trade connection for all of these resources with the two biggest cities of the Gulf Coast region. However, Lake Charles, unlike Houston and New Orleans, did not have a deep-water port. The city had its own natural waterway, the Calcasieu River, which was not suitable for heavy navigation. During the 1920s, the residents began to protest the fact that, while farmers grew most of the Louisiana rice within sixty miles of the city, they had to ship it out of ports in Beaumont and New Orleans (Lane 1959). Also at this time, the lumber industry was quickly depleting the virgin timber stands around the city, highlighting the need for industrial diversification. A deep-water port would bring regional, national, and international trade opportunities that Lake Charles desperately needed.

City leaders appealed to the federal government for funding, but the authorities refused. The city then decided to issue bonds and raise the money for the port and deep-water channel themselves. Lake Charles was the first city in the country to accomplish this feat, and the Port of Lake Charles (known officially as the Lake Charles Harbor and Terminal District) opened on November 30, 1926, to much fanfare and celebration. It incorporated 95 square miles along both sides of the Calcasieu River, with 48 miles of frontage on deep water and 18 miles on shallow water (Lane 1959, Little 1965). The new deep-water channel in the Calcasieu River provided two outlets to the Gulf of Mexico. The first went south to the Intracoastal Canal, then west to the Sabine River and south to the sea via Port Arthur, Texas. The other route, which reduced the distance to sea from 75 miles to 33 miles, went straight down the Calcasieu River and the new Calcasieu Ship Channel crossing Calcasieu Lake to the Gulf (Figure 1). The stage was now set for the industrial expansion of Lake Charles. The oil trade was booming, and both petroleum and the more traditional industries of the area now had a direct outlet to the rest of the world through the Port of Lake Charles. The Port would end up being “one of the principal factors in the development of the industrial section of the trade area” (Lane 1959: 31).

The port was not the only factor to attract industry to Lake Charles. City leaders extolled the proximity to the oil fields, and the extensive transportation network that connected the city to the rest of the world. This included Highway 90, which ran east and west along the coast and connected to northern routes, and the Intracoastal Canal (easily accessible thanks to the new port) which offered quick access to the entire Mississippi River system without threat of U-boat attack (Lane 1959). Two major rail lines also connected the Lake Charles area to the rest of the country: Watkins’ line to the north connecting to Kansas City and St. Louis, and an east-west line connecting to New Orleans (and the Mississippi River) and all of Texas. The city also could be (and eventually was) connected by a direct pipeline to Sour Lake, Texas. Sour Lake was a major pipeline hub through which Lake Charles could receive crude oil through a myriad of pipeline systems stretching across the country.

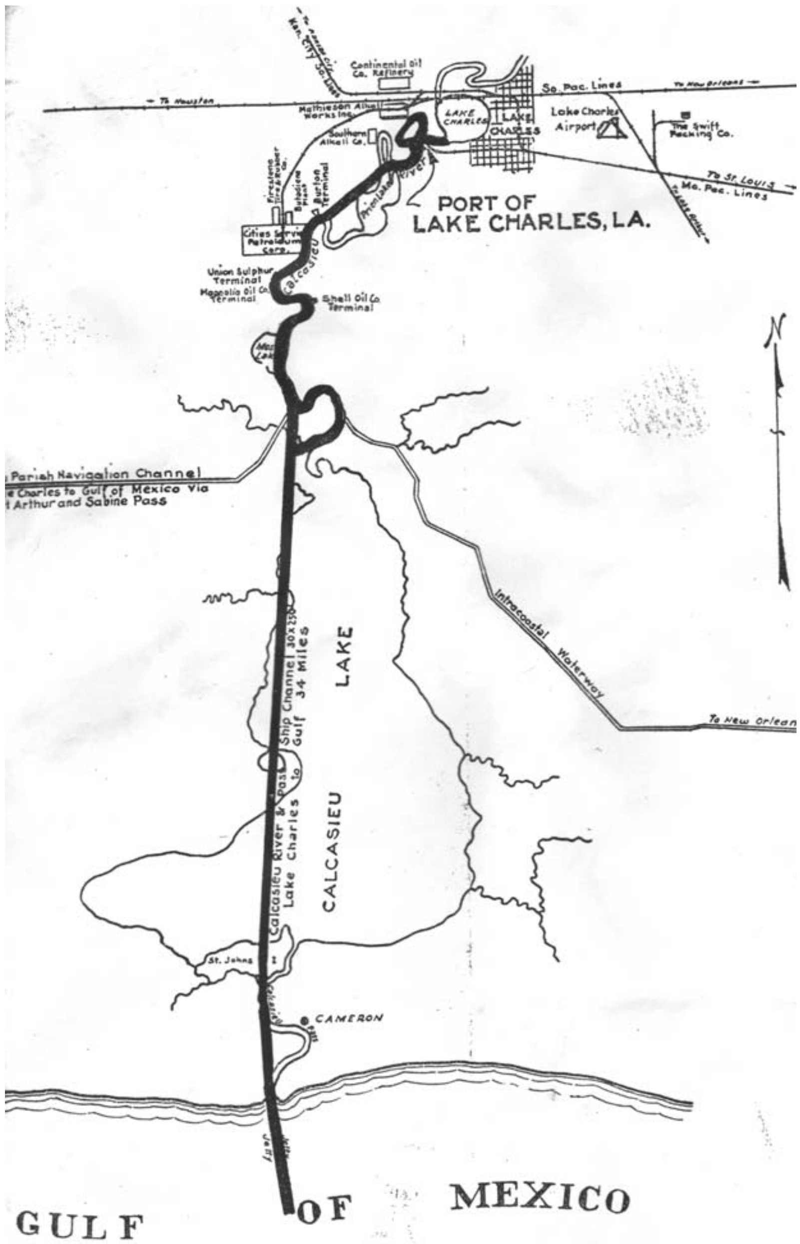

Figure 1. Calcasieu Ship Channel
(Source: Lake Charles Association of Commerce 1948)

For finished products, the city eventually would have a direct connection to the War Emergency pipeline near Beaumont, Texas, which would allow express shipment to the east coast (Foster 1944). The enticements of cheap natural resources and low-cost transport to the Midwest and Northeast would eventually make the Gulf Coast a major center of the petroleum and petrochemical industry (Little 1965). Lake Charles would be a major part of this industrial region, and one well worth studying.

Why Lake Charles?

Despite the distinctive industrial qualities of the Lake Charles region, the academic literature on it is rather thin. Three master's theses from Louisiana State University focus on the growth of the city. These are history writings, however, and are limited to a dry listing of facts. The first, from 1931, demonstrates the history of the growth of the city from its founding through the 1920s. The second, from 1959, contains the industrial development of the city, but focuses solely on the economic impacts of this growth. The third, a 1967 thesis, concentrates on the political development of the city. These works were useful in gaining a general sense of the history and industrial growth of the city, but did not offer much in terms of exploring the social impacts of this growth. Furthermore, they did not delve into the topic of the water pollution produced by the new industry (Cagle 1967; Lane 1959; Ferguson 1931). The geography and environmental history literature on the area suffers from a geographic bias: most academic writings on the Gulf Coast petroleum and petrochemical corridor stop at the Louisiana border, focusing primarily on the Upper Texas Gulf Coast (Colten 2001; Pratt 1978). This region is the heart of Gulf Coast petroleum and petrochemical growth, and deserves attention and study. In addition, the industrial zone between Baton Rouge and New Orleans ("Cancer Alley") has garnered much attention. As one of the few industrial agglomerations with a major city downstream, the area is a common subject of pollution research (Allen 2003; Colten 2000). However, Lake Charles is stuck in between these two more notable industrial agglomerations, and is nearly absent from the literature, save a few one- or two-page treatments (Cowdrey 1983: 113; Markowitz & Rosner 2002: 230). A wonderful example of this geographic gap is Joel Goldsteen's (1993) book *Danger All Around: Waste Storage on the Taxes and Louisiana Gulf Coast*. In his review of the impacts of industrial waste landscapes on surrounding communities, he uses both the upper Texas Gulf Coast area and the two parishes surrounding Baton Rouge as case studies. Lake Charles, an important industrial landscape in between these two agglomerations, receives hardly a mention.

The Lake Charles area deserves study beyond simple historical facts and reviews of the economic benefits of industrialization. It deserves a thorough review of the geographic, social, and economic factors behind local industrialization, along with how this process fit into the greater industrialization of the South. It also deserves a study of the negative consequences of industrialization, and how both local and state governments, along with the citizenry, reacted to these consequences.

Consequently, the first aim of this thesis is to trace the development of an industrial landscape in Lake Charles. Lake Charles and Calcasieu Parish had a rural, agricultural landscape prior to industrialization. Industrialization brought considerable change, converting the area into an urban industrial landscape. The transformation came very quickly, as companies hastily built plants to produce war materials for the Second World War. This was a common theme in most of the South, and I will compare and contrast Lake Charles to the general Southern industrialization experience (Scranton 2001; Dewey 1999; Cobb 1993; Cobb 1984). Second, I will examine whether the primacy of wartime production goals was enough to suppress pollution concerns for the duration of the war. Trade literature of the day suggests that industry was willing to set aside pollution concerns for production goals ("Industrial Waste…" 1945: 117; Mohlman 1945: 20). This research will question whether the citizens of Lake Charles were also willing to do this. Next, this paper will investigate the role of local and state government institutions in the industrialization of the city and pollution abatement efforts. Was government's focus on promoting industrial growth or protecting the citizenry from harmful pollution?

In general, I will investigate reactions from both government and citizen to the developing pollution threat. Industry in the city was a major source of water pollution, and the rapid social and economic shifts caused conflicts between the established population who relied on (now-threatened) local natural resources and the new industrialists, workers, and the governments who courted them. Additionally, I will examine the focus of pollution related issues in Lake Charles. Much of the literature on industrial and urban pollution focuses on effects on public health (Melosi 2000; Tarr 1996; Pratt 1980; Tarr 1985). In fact, Melosi (2000) argues that Northern states implemented public health policy in reaction to pollution threats much earlier and much more quickly than in the South. Colten (2006), while studying a rural are in northeastern Louisiana, offers a possible explanation by highlighting the particularly Southern focus on local natural resource protection. This research will first examine whether urban citizens in Lake Charles were just as likely to take action against new pollution problems as rural Louisiana citizens were. Second, this research will investigate whether pollution problems were addressed as natural resource issues in the urban Lake Charles area, or if the larger population necessitated a concentration on public health.

Sources

As source materials, I used not only the corpus of historical geography and environmental history literature, but also many primary, archival materials. Of these materials, there were four main sources: the Calcasieu Parish Police Jury, the Louisiana Department of Fish and Wild Life, the Calcasieu Parish Court, and the Louisiana Stream Control Commission. I also used the Census Bureau's Country Business Reports and Census of Manufactures to trace the growth of the city's industry. I examined these historical records and reports for the years between 1940 and 1960, when the industrialization of Lake Charles was in full swing. I restricted my research to this period because I wanted to examine reactions to pollution before the environmental movement of the 1970s brought these issues into the national consciousness.

The Calcasieu Parish Police Jury (hereafter CPPJ) is the governing body for the entire parish, so they deal with all land transactions, infrastructure, and citizen complaints for any unincorporated area of the parish. The Police Jury houses the minutes of all their meetings in an archival vault. Police Jury clerks noted keywords of subjects and topics for each meeting, and organized these keywords into index in the beginning of each book. I scanned this index for relevant keywords such as the names of industrial corporations or "pollution" or "Calcasieu River." This resulted in a wealth of information, which helped me to trace the construction of an industrial landscape in the city.

The Department of Fish and Wild Life (hereafter DWF) played a major role in this research because they were, like in many southern states, the agency primarily responsible for water pollution control. Most of the DWF information came from the Department's biennial reports, which served as a summary of the Department's activities. However, they most likely also served as a method of proving worthiness for continued funding to the Louisiana legislature.

I used these with caution, but was encouraged to see that at certain points, the DWF was not afraid to castigate the legislature for lackluster pollution abatement legislation.

The Calcasieu Parish Court lies at an important intersection of citizen and state. Lacking any comprehensive state pollution law, citizens' only legal course of action was a nuisance lawsuit, filed in Parish Court. Consequently, I searched the case records of the parish court for the twenty years of my focus. The vast majority of cases involved worker's compensation claims, but I was able to find a few pollution-related suits. However, case records sometimes do not offer much information on the motivations or reasoning behind occurrences in the case. Some cases against industry ended with no more explanation than that the plaintiff dropped all charges.

The Louisiana Stream Control Commission (hereafter SCC), created by the state legislature in 1940, consisted of representatives from DWF, the attorney general's office, and the state public health service. Its duty was to regulate water pollution in the state that could harm fish or public health, so they began direct dealings with industry as soon as agglomerations began to form. For this research, I used the minutes of SCC meetings and correspondence between SCC members, industry, and citizens. The SCC no longer exists, but the Louisiana Department of Environmental Quality now houses all of this information. Fortunately, The LDEQ scanned all of the available SCC documents into a computer database that is easy to search. Unfortunately, not all of the information survived long enough to be entered. The meeting minutes are somewhat sparse in the 1940s, and the earliest meetings simply offer a brief description of what occurred instead of a full transcript. The correspondence is also lacking. The majority of surviving SCC correspondence relates to the Mathieson Alkali Works. There are only three or four letters pertaining to the Cities Service Corporation, who operated what was by far the largest refinery in the area. Nothing at all is available for Continental Oil Company, and many other Lake Charles industrial companies. Fortunately, the Mathieson material offered a glimpse into early, wartime reactions of both citizens and government to growing industrial pollution. In addition, Colten (2005; 2000) has written about the reactions of the SCC to pollution in other portions of the state, so I was able to compare and contrast this with the SCC's action in Lake Charles.

The Census data was somewhat more difficult to work with, as anyone who has worked with Census data knows. Making sense of the data to trace Louisiana's industrial (and petroleum/petrochemical industry) growth was an uphill battle. Through the 1940s, two separate data sets were available: the Census of Manufactures and the County Business Patterns. Only towards the very end of the decade did the two agencies responsible for this data attempt to coordinate their efforts. In addition, the Census Bureau is constantly adding new categories and removing or merging old ones. For instance, in 1949, the County Business Patterns created a separate category to list industrial workers who were involved in administrative and auxiliary units instead of the actual manufacturing processes. The addition of workers to this new category and removal from old categories gives the false impression that employment dropped during this period in many categories. Despite this, the transformation of Lake Charles into an industrial city was significant and rapid enough to be plainly obvious in the Census data.

Organization

Several extensive background chapters will precede the local case study. These build the essential foundation for the more detailed examination of Lake Charles and help situate it as an example of Southern, petrochemical industrial development that had to deal with the environmental consequences of its operation. Chapter 2 will provide a review of the growth of

American industry in the early twentieth century. This expansion of scale will offer a preview of the economic, social, and geographic forces that led to in the industrialization of Lake Charles during the middle of the century. A discussion of industrial location theory and the factors that drive expanding companies to locate in certain places begins the chapter. The last half of the chapter focuses on the growth of the petroleum industry throughout the United States, and the factors that accelerated this growth. Chapter 3 will begin to shrink the scale of research, by focusing on industrial growth in the South. Local, state, and federal government incentives led to the industrialization of this historically agricultural region. These incentives, their effects, and the differences between traditional industrial areas of the country and the South will be a major concentration of this chapter. This discussion will help illuminate the attractive qualities the South (and Lake Charles) held for incoming industry. The chapter will also begin the discussion of the negative effects of industrialization, namely pollution. Chapter 4 will focus on this waste, especially that caused by the petroleum industry. The discussion will also include waste treatment methods prevalent in the first half of the twentieth century. I will then compare this information with data on waste streams and waste treatment methods in Lake Charles during industrialization. Chapter 5 will feature an introduction to the reactions of citizens and government to new pollution threats. This will act as a base from which to study the reactions of the Lake Charles government and populace to the pollution caused by industrialization. Chapter 6 will discuss the industrialization of the Lake Charles area, and Chapter 7 will examine the reactions of local and state government, as well as the citizenry of Lake Charles, to the industrial pollution.

Chapter 2
Industrial Expansion in the Early Twentieth Century

The early twentieth century witnessed a new sort of industrial expansion in America. The fledgling petroleum industry was booming, and breaking all the rules of traditional American manufacturing and industry. Since the birth of the country, industrial efforts had been concentrated in the Northeast. At the beginning of the 19^{th} century, industrialists from England settled in the Northeast and used their knowledge to spark the American industrial revolution. With the expansion of railroads, the traditional manufacturing belt expanded to include the Northeast’s culturally similar border areas in the Midwest as well (Peet 1997). This area had ready access to nearby coal and other minerals, along with easy transportation on rail and the Ohio and Mississippi Rivers. At the turn of the twentieth century, however, traditional textile and steel manufacturing of the Northeast/Midwest had new competition from the petroleum industry. Oil companies first extracted crude in Pennsylvania, which quickly became important to urban areas in the Northeast and coal-poor areas such as the West and Southwest. Soon demand would arise from all parts of the country (Pratt 1980). The burgeoning petroleum industry would fuel the growth of the classic Fordist economy in the United States. Fordism consisted of the principles of mass production and consumption, and the petroleum industry both became a vehicle of mass production as well as a source of energy for the rest of the Fordist economy. Technical changes within this industry and others would increase labor productivity and wages, which would then fuel a growth of consumer mass markets (Tickell & Peck 1992). These markets would consume not only petroleum products, but also products that were manufactured using petroleum products.

While Fordism originated in the Northeast and Midwest, it quickly spread throughout the country (Peet 1997). The petroleum industry echoed this pattern of decentralization. Though oilmen drilled the first wells in the Northeast and Midwest, the discovery of Spindletop in eastern Texas would shift the focus of the petroleum industry to the coast of the Gulf of Mexico. Oil companies began flocking to the gulf coast, and shipping their oil by barge to the Northeast, their new largest market. After World War I, there was a rapid expansion in refining, with U.S. refining capacity increasing threefold between 1918 and 1929. Most of this growth occurred on the Gulf Coast and ended years of industrial dominance by the Northeast and Midwest. The petroleum industry led the way in what would prove to be the decentralization of industry in the United States.

Industrial Location

When oilmen discovered the gulf coast oil fields, it seemed an easy choice for companies to move both production and refining facilities to the South. However, choosing a location for a new industrial site is not as simple as measuring distance to a resource material. Many calculations and smaller decisions are required before choosing a site, and a new branch of study named location theory focused on this problem. Alfred Weber developed the first models and theories, known as classical location theory. These were simplistic and focused mainly on minimizing transport costs. The key decision was where to locate the plant as one part of the "location triangle," which included the source, industry, and market. These theories also assumed an isotropic plain of uniform land costs and transport costs across the country. Soon, economists were developing complex models that incorporated multiple products and location rent fluctuations (Stevens & Brackett 1967). To today's audience, these models may seem single-minded; they focused solely on production costs, transport costs, and markets. The discussion of industrial location most certainly had changed since the early twentieth century. Modern geographers and economists discuss industrial growth and expansion not only as a product of industrial decisions and economic trends, but also in relation to more complex variables such as culture (Peet 1997). However, during the period this paper covers, Weber's location theory was the basis of nearly all industrial location discussions. For this reason, we will focus on Weber and his immediate successors.

Weber's theories focused mostly on the costs faced by industry. Weber stated that the three components of cost were input, processing, and delivery. Input included the costs of the raw materials plus transport from the source, and delivery consisted of the cost of transport to market. Processing costs included the factory itself, machinery and upkeep, wages, electricity and gas, and taxes. Firms needed to find ways to keep all three of these costs low. Two effective strategies for realizing this goal were to create economies of scale and/or economies of agglomeration, both of which would figure prominently in industrial decentralization and the rise of the petroleum industry.

An economy of scale entails a lowering of production costs through an enlargement of operations. Weber (1984) wrote that there are three reasons larger productions facilities are more efficient. First, the division of labor is greater with a larger work force. Workers only have to learn one task, do not waste time switching tasks, and have lower salaries because of their lower skill level. Companies can mechanize simpler tasks more easily, precluding the need for workers in the first place. Secondly, larger companies can use larger and more plentiful machines, thus increasing production output. Finally, economies of scale require proportionally fewer reserves (spare materials and parts) than smaller operations, because for a given risk, the level of required reserves rises more slowly than the level of output (Weber 1984). Economies of scale were very important to the industrial growth of the gulf coast. Most of the refineries and plants built there were the largest of their day, such as the Cities Service refinery in Lake Charles. By 1950, six of the twelve largest U.S. refineries were located on the Gulf Coast.

While economies of scale offer lower processing costs, economies of agglomeration offer lower transport costs. Economies of agglomeration arise when factories locate in a cluster, or at least fairly near to each other. If the firms sell intermediate products to each other, they save on transport costs because of the short distances. In addition, because of the higher demand for transportation services in such a small area, these services are better developed and of lower cost due to high competition. They also develop an economy of information because of more rapid, easier communications. This allows them to share information that will allow the agglomeration to run more smoothly as one unit (Weber 1984). Economies of agglomeration grew quickly along the gulf coast. By 1950, the gulf coast claimed 34 percent of the refining capacity of the United States. All of this refining power clustered in four major agglomerations: Houston-Texas City, Beaumont-Port Arthur, Baton Rouge, and Lake Charles (Parsons 1950).

Economies of scale and agglomeration would both factor heavily in decentralization and the new industrial landscape of the gulf south, but one of the most important factors in gulf coast industrial growth was the abundance of raw materials. According to Weber, a major location decision facing industry was whether to locate closer to the raw materials or to the market. In their much-cited book *Why Industry Moves South*, Glenn McLaughlin and Stefan Robock apply Weber's question of materials vs. market to Southern industrialization. For the petroleum industry, they argue that, in theory, there was little to attract companies to resource-rich areas far from the market. There was little weight lost between crude oil and finished products, so a location near crude reserves would not significantly reduce transportation costs (McLaughlin &

Robock 1949). In fact, nationwide, refineries tended to locate near markets because demand was far more stable than supplies at any given oil field. This tendency, however, did not occur on the gulf coast (Parsons 1950). In Louisiana, the wealth of raw materials was the primary attractive feature to the petroleum industry (McMichael 1961). Material-oriented gulf coast plants were, in fact, able to save on transport costs because of their location. A material-oriented location allowed industry to avoid backtracking when delivering multiple products to multiple markets, as the petroleum and petrochemical industry does. If the plant was located near one market and needed to ship a product to another market near the raw materials source, this backtracking would double their transport costs. Secondly, the easy access to water transport enjoyed by Gulf Coast industry made for more economical product shipment (McLaughlin & Robock 1949).

In reality, industrial location decisions are more complex than proximity to markets or raw materials. Other important factors include differences in land prices between the heavily urbanized Northeast/Midwest and the rural South. The South had more (and cheaper) land available in desirable areas, such as river basins where industry would have easy access to an abundance of water for processing and cooling. In fact, most Southern industry would locate far from the city center, on large tracts of land bought by industrial corporations. Consequently, the southern industrial landscape looked quite different from the congested factory districts of the Northeast and Midwest (Parsons 1950).

Yet another factor that allowed industrial relocation in the South was a fall in transportation costs, initiated by the introduction of more efficient infrastructure (Weber 1984). The rail companies faced new competition from trucks as the nation’s highway system spread to southern states, and larger, improved ships and barges were able to service the gulf coast area thanks to the Intracoastal Waterway. In McMichaels’ study, the industries surveyed listed both sources of water and transportation infrastructure very high on the list of Louisiana's attractive features. In fact, McLaughlin and Robock report that the Cities Service Corporation selected Lake Charles as a location because of its excellent transportation infrastructure and ample supply of fresh water (McLaughlin & Robock 1949). In fact, water transportation would become a crucial factor in the industrialization of the entire gulf coast. By 1950, eight gulf coast ports (including Lake Charles) placed among the top fourteen American deep-water ports in terms of tonnage (Parsons 1950).

Large refineries such as those along the gulf coast required labor, and the availability, attitude, and wage demands of industrial labor were all factors that companies considered in a location decision. Generally, the South's labor force had many characteristics that industry found desirable. There was a labor surplus due to the mechanization of agriculture, and there was a significant wage gap between southern and northern states. In addition, the vast majority of southern labor was non-union. Organized labor had made some gains in the South prior to World War II, but after the war company managers worked to nullify these advances. Unions then made repeated efforts throughout the next few decades to organize southern labor, but all of these campaigns ultimately failed. Historians have placed the blame for this on company executives and southern state governments, which were extremely effective at resisting organization. State governments departed from the national norm, and maintained laws that prohibited bargaining among public employees. Southern industry was more than willing to harass (sometimes through violence) or fire union supporters, and close plants that supported unionization. This resistance continued even into the 1980s (Minchin 2005).

Even factors as seemingly insignificant as climate were critical to industrial location decision. The South had much milder winters than the Northeast and Midwest. How this factored into location decisions had much less to do with the comfort of employees than with economic concerns. The mild winters of the South meant that companies did not need to weatherproof vast amounts of buildings, pipelines, and equipment or insulate them against freezing temperatures. This resulted in a significant savings during the construction of plants and infrastructure.

All of these types of factors, as well as the larger size of modern corporations, allowed decentralization and the growth of Southern industry to occur. These desirable aspects are known as *specification factors*- characteristics that make one industrial location advantageous to another one. Industrialists only consider these factors subsequent to *capability factors* – characteristics that make an industrial location possible (Storper, Walker, & Widess 1980). The focus on these industrial location factors, as well as extensions of Weber's industrial location theories, played a major role in the movement of the petroleum industry to the gulf coast.

Growth of the Petroleum Industry

By 1920, petroleum demand was skyrocketing. The petroleum industry previously had focused on producing kerosene for lighting. However, with the growing numbers of automobiles and other internal combustion engine-powered machinery, the industry soon switched their focus to gasoline. As demand for gasoline rose (tripling between 1915 and 1921), oil companies were able to meet the country's needs with far fewer facilities, and less crude oil, than they previously thought. Not only were economies of scale and agglomeration taking hold to increase efficiency, but industry was also creating new technologies at a rapid pace.

The first refineries extracted products from crude oil through simple distillation. They would heat the oil until certain products, known as fractions, vaporized. These vapors would pass through cooling tubes where they could condense and workers would collect them. Gasoline is the first fraction extracted using this process, followed by naphtha, kerosene, gas oil, and finally heavy oil. Refineries could further process heavy oil to create wax, grease, asphalt, or fuel for industrial boilers. This distillation process, though, was rather unsophisticated, as operators could not precisely control the distillation temperatures. They also had to peer through "look-boxes", using only visual estimates of color and density to judge when the proper fraction was being distilled. Soon, refiners developed a new, more efficient method known as thermal cracking. This method used pressure, along with heat, to divide larger hydrocarbon molecules into the smaller, more useful fractions. In 1914, Indiana Standard was the first company to utilize this method in their refinery. Thermal cracking resulted in more gasoline per barrel of crude oil, and a smaller amount of the less desirable kerosene and gas oil. In fact, refineries could transform almost all of the gas oil fraction into gasoline (Gorman 2001). Cracking procedures became so popular that between 1919 and 1941, the proportion of gasoline derived from cracking units rose from 16 percent to 51 percent. By the late 1930s, refiners developed catalytic cracking, which made the process even more efficient using catalysts. This new process also increased the scale of operations by allowing continuous-flow processing, instead of only processing one batch of crude oil at a time. Furthermore, the use of catalysts allowed for processing under much less extreme temperatures and pressures (Chapman 1991). Refiners were not only able to increase the amount of usable products, but also to improve their quality. The development of alkylation units allowed refiners to combine light gases in larger molecules, which resulted in a gasoline with a much higher octane.

These advances in petroleum refining contributed to a massive industrialization of the country in the four decades between 1920 and 1960. In fact, between 1929 and 1954 there was a 60 percent increase in manufacturing employment, while the total value of industry in the United States quadrupled (Fuchs 1962). In the petroleum industry, the total number of refineries actually dropped, from 508 in 1927 to 355 in 1950. Despite this, productivity increased, from 2.3 million barrels per day to 6 million barrels per day, due to economies of scale, economies of agglomeration, and increasingly efficient processing.

One of the most influential factors in the growth of the petroleum industry was federal funding for wartime mobilization. This massive federal investment was a component of the emerging Fordist economic regime, which included a social democratic welfare state (Tickell & Peck 1992). After the Depression, the federal government became intimately involved with the growth of state economies, especially in the South. World War II became another opportunity for the federal government to assist the states with economic growth. Private companies had doubts over whether plants built to fulfill specific wartime needs would be profitable after the war, so the federal government funded the construction of these facilities through the Defense Plant Corporation (DPC). The DPC was a sub-agency of the Reconstruction Finance Corporation (RFC), whose greater task was to help fund the war effort. The DPC paid for the construction of industrial facilities (a $7 billion total investment), which it then leased to the operating companies. Of all the funds invested towards industrial expansion for the war, 80 percent came from the federal government (Witte 1943). By the end of the war, the DPC would own between 10 and 12 percent of the nation's total industrial capacity (Duryee 1942, White 1949).

Much of the federal investment went towards the petroleum industry, and helped accelerate the ongoing process of decentralization (Melosi 2000). World War II was America’s first massively mechanized war effort, and thus required an enormous surplus of petroleum products. Between 1939 and 1945 there was a 29 percent increase in operating capacity, mostly funded by federal programs (Chapman 1991). The federal government upgraded numerous plants and refineries, but much of the federal investment went to building new plants. These plants were bigger than any built before, and boasted the most sophisticated equipment, controls, and processes of the time. The war effort required these new high-tech plants because the federal government had identified multiple petroleum products as strategic war materials, and asked the petroleum refining industry to switch their focus from supplying the nation's motorists to supplying these specialty products. First, the nation's air forces required unprecedented amounts of high-octane aviation fuel, and this called for substantial changes in both processes and equipment at the nation's refineries. They needed not only to increase output, but also to produce gasoline of a much higher-octane specification than ever before. Refiners achieved this goal first by increasing the tetraethyl lead content, but "the most important result of the aviation fuel program was to accelerate the introduction of the new technology of catalytic cracking" (Chapman 1991: 72). The war effort also required toluene for the manufacture of explosives, and the same catalytic cracking processes that produced aviation gasoline could create toluene. Catalytic cracking allowed refiners to transform more of each barrel of crude oil into high-octane and high-quality products, but these products were not in demand during peacetime. Industry would have introduced them into the process stream much more slowly if not for the needs of the war economy.

However, the wartime product that had the most significant impact on the petroleum industry was synthetic rubber. Japanese forces had overrun the sources of most of the world's natural rubber supply in southeast Asia and the south Pacific. Because of this, the United States needed to find a reliable source of synthetic rubber quickly. Luckily, companies were already researching ways to create synthetic rubber before the war. The Germans had produced small quantities of synthetic rubber during World War I to overcome a rubber shortage. Since then, research on synthetic rubbers had a high priority in Germany. In the interwar period, American companies built on German research to develop their own synthetic rubbers. Their motives were more commercial than political, as they hoped to create rubbers with unique properties for niche and specialty markets. They focused on creating synthetic rubber from petroleum instead of from coal, as German companies were doing. This would be a much cheaper process, but it took years to perfect. The key intermediate for making synthetic rubber was butadiene, and a Joint American Study Company plant in Baton Rouge, Louisiana was able to convert petroleum refinery products into butadiene by the mid-1930s. Unfortunately, the process they developed was too expensive to create a product that could compete with natural rubber, and synthetic rubber seemed to be an unprofitable pursuit. As war loomed, however, American companies recognized the possible strategic significance of synthetic rubber, and intensified their research. The creation in 1940 of the Rubber Reserve Company, a federal agency that purchased and stockpiled natural rubber, helped confirm their hunch. By 1942, when the Japanese had overtaken the rubber plantations, the United States government had developed a plan for the creation of a national synthetic rubber industry. The federal government, through the Defense Plant Corporation, would fund the construction and operation of new butadiene and synthetic rubber facilities. Production of most of the butadiene and other intermediates, such as styrene, would be the overseen by petroleum companies, while the copolymerization and fabrication would be performed by rubber companies (Chapman 1991).

Another positive effect of the war effort was the cooperative environment that allowed the development of these new processes and procedures. All of the petroleum companies were working towards the common goal of winning the war. Consequently, the diffusion of information was much swifter than it would have been during peacetime. Companies shared results from government-funded research, as all involved parties agreed that this was essential for meeting wartime production goals. Patriotism notwithstanding, operators of these government-funded plants cooperated because they knew that they would hold a very favorable position in the post-war economy. The federal government planned to sell all of these war plants back to the private sector after the war. Particularly in the petroleum refining industry, many of the government-built plants were an integrated part of the refining facility, which meant that refining companies would have a significant advantage over other potential post-war bidders.

In fact, World War II and the subsequent federal wartime investment had such an impact on industry both during hostilities and in the post-war economy that one could describe it as the catalyst for what C. Freeman (1987) calls a technological revolution. Changes in an economic sector constitute a technological revolution if they result in new branches of the economy and new product groups. They also must affect other branches of the economy by transforming methods of production and cost structures (Freeman 1987). The wartime changes in the petroleum industry constituted a technological revolution not only because helped increase the scale and efficiency of refining methods, but also because they signaled the beginning of the petrochemical industry. Thousands of new organic chemical products were on the market after World War II, and the petrochemical industry would become a major force in post-war America (Melosi 2000). It would also revolutionize many other sectors of industry and the economy with its intermediate products. For instance, plastics, synthetic fibers, and synthetic rubbers would become a major part of consumers' lives, and would modernize production and packaging processes for many other industries. All of this change would be even more significant for the Gulf Coast, as the petroleum and petrochemical industries grew to become a major economic force in the region. The intermediate products of these industries would link the area with markets across the country and the world.

Thus, the petroleum industry was at the forefront of the decentralization of industry in America. Growing demand for petroleum products such as gasoline facilitated the growth of this nascent industry. Eventually wartime demands resulted in accelerated technical advances and growth, funded by the federal government. During World War II, and especially post-war, the Gulf Coast would emerge as the top choice for mobile companies looking for a place to expand. Its low-cost resources, cheap land, cheap labor, and access to transportation would draw many industrialists. The ensuing growth would transform parts of an entire region from a rural agricultural landscape to an urban, industrial one and link the region to the rest of the country and the world.

Chapter 3
Industry Comes to the South

When industry turned its eye towards the South in the early twentieth century, Southern governments saw an opportunity for progress and modernization. They saw a chance to turn what was historically a rural, poor, agricultural region into one that could compete with the rest of the country economically. With the onset of the Depression, however, this excitement quickly turned to desperation, and local and state governments would do anything to bring jobs and capital to their area. This led to the movement known as business progressivism, which combined boosterism and government reform (Cobb 1993). Boosterism consisted of local officials and members of the business community placing advertisements, mailing promotional materials, and making personal visits to industry leaders, all for promoting their particular city or state. They compiled statistics on available labor forces and tax rates, searched out possible sites for industrial facilities, and made promises of free buildings, low taxes, and low-wage workers. By the 1940s, almost every Southern state had this type of program (Wright 1986). An interesting example of this was the Florida Industrial Air Tour. In 1946, the Florida Chamber of Commerce promoted a tour from the air of industrial sites that had gone idle since the end of the war. They hoped that this glamorous event would convince Northern executives that Florida was the ideal place for expansion (Cobb 1993). As well as promoting their areas, government officials were also attempting to modernize state and local governments, and improve public facilities and infrastructure, all in the hopes of attracting industry. The Depression had given Southern governments a new notion of their responsibilities in the economic growth of their state, and they now flung themselves headlong into the fight to attract industry. The notion behind these state-sponsored campaigns to recruit industry was that economic growth could solve the problems of the South. With an influx of capital and jobs, governments thought they could improve roads, public education, and public health services (Cobb 1984). This prolonged commitment to industrial growth had its roots in the agricultural modifications caused by the Depression and the boll weevil's destruction of the cotton economy.

Incentives to Industry

One enticement local and state governments offered to incoming industry was a tax exemption plan. Louisiana's industrial development program, designed to attract "large-scale industrial development," kicked off with this method of indirect subsidy (Rainey 1967: 4). A 1936 state constitutional amendment exempted all new industry from state and local ad valorem taxes for ten years (State of Louisiana 1955). The amendment passed by an 87 percent majority. It also created the Department of Commerce and Industry to oversee the program and negotiate contracts with new industry. The Department additionally supervised an advertising campaign used to attract manufacturers by promoting Louisiana's natural resources, climate, non-union labor, and the tax exemption program (Rainey 1967). The program, however, would not accept just any company. In an effort to promote industrial diversification and protect existing industry, the state did not allow companies that would compete with nearby industries to participate. Only if the company received the written permission of the local competing industry could it apply for the exemption:

> No exemption shall be contracted for any new manufacturing establishment in any locality where there is a manufacturing establishment actually engaged in the manufacture of the same or closely competitive articles without the written consent of the owner of such existing manufacturing establishment... (State of Louisiana 1955: 257).

One of Louisiana's most valuable features was its agricultural diversity, which protected against a devastating loss of jobs and revenue in case of disaster. As environmental historian Albert Cowdrey writes, "...the simplest ecological systems are the easiest to destabilize, since they lack the multiple checks of more complex ones" (Cowdrey 1983: 110). It seems that state legislators were showing impressive foresight in attempting to extend this safety net to industry in Louisiana. However, the Board of Directors of the Department of Commerce and Industry held the final judgment of what industry was a “competing” industry. It tended to interpret competitiveness very loosely, along with the definition of a business applying for the program as a “manufacturing establishment” (Rainey 1967). By 1950, the state had given 1,059 exemptions on industrial properties worth $573 million. However, industry still considered Louisiana a high-tax state because, once the exemption expired, the plant was assessed at 100 percent of the property value. In other states that figure was much lower (Cobb 1993).

The tax exemptions, while well meaning, were controversial across the South. Critics argued that tax exemptions relinquished the only universally beneficial result on industrial expansion. New jobs only benefit those who have them, but thousand or millions of dollars in taxes can benefit the whole community. Critics argued that these funds were especially crucial because of the extra services required by industrial expansion. New workers were arriving along with the modern industrial complex, and these citizens required more roads, schools, hospitals, and other services. Defenders of the exemption plan argued that if it did not exist, industry would simply not come, and no new jobs would be created. They viewed the loss of industry taxes as an acceptable sacrifice for a new payroll, and reminded the critics that the exemption would expire in five or ten years. Location theorists, on the other hand, claimed that tax exemptions were not even a concern for relocating industry. They believed that industry leaders were more worried about services available for their workers, services that would suffer if there were an increase in population with no increase in tax revenue. In fact, some companies even insisted on paying their fair share, such as when International Paper turned down an already-approved bond issue for a new pulp mill in Natchez. For the most part, however, companies accepted the tax exemptions, even if it was not their primary motive for choosing the location (Cobb 1993).

For Louisiana, many agree that the tax exemption program was not a major factor in the industrialization of the state. In an impressive master's thesis, Ronald Rainey addresses this issue by combining many studies of the state's industrial inducement program with economic data. He concludes that the program most likely accounted for less than 10 percent of industrial investment in the state. He also argues that the program most likely did more harm than good by depriving the state and local governments of much-needed tax revenue. In twenty-five years of the program, the state gave exemptions on $4.6 billion worth of investment. For the years 1956-1965, details on which industries received exemptions are available. Using this, Rainey shows that the attempt to attract diverse industries was also an abject failure, with the large majority of exemptions (65 percent) going to the petroleum and petrochemical industries. The next industry on the list was the electric power industry, with a paltry 10 percent. The dominance of the petroleum and petrochemical industries in this program is also evident in Rainey's estimates of the revenue losses for 1961. He estimates that parish governments lost a total of $13 million in that year. Calcasieu Parish, filled with petroleum and petrochemical industry, accounted for $2.1 million of that loss, or 16 percent (Rainey 1967).

A second method of attracting industry was to offer subsidies on industrial sites, buildings, or equipment. For example, governments would subsidize the construction of a new factory building and offer the building to an interested industrial firm, often at little or no cost. By providing a specially made building, state and local officials made relocation as painless as possible for Northern industries. The Depression years saw the most desperate, and sometimes dishonest, subsidizations to attract industry. Sometimes governments illegally deducted the funds to subsidize the buildings from worker's paychecks. Another scheme was to appropriate public money to construct buildings ostensibly for municipal use, such as town halls and community centers, using the buildings once for their intended purpose, and then selling or giving them to incoming industry (Cobb 1984).

One of the most prominent and impressive government subsidy programs was Mississippi's Balance Agriculture With Industry, or BAWI. The act containing the BAWI program, proposed by the governor, passed in September 1936. It allowed municipalities to issue bonds, known as industrial development bonds, for financing the construction of industrial buildings. The governor gained support for this bill, argued by some to be unconstitutional, by framing it in the language of the New Deal, which had done so much good for the citizens of the state in years past. He reasoned that providing employment was a legitimate way of providing for the general welfare, and was therefore within the domain of state and local governments. Economists argue about how much of an impact BAWI had on the location decisions of incoming industry in Mississippi. The administrators of the program were quick to take credit for all the employment gains of the period, but others contend that Mississippi's vast supply of cheap labor was more important in industrialists' location decisions. However, the fact remains that industrial employment in the state rose dramatically during the BAWI period, and the wages brought to the state far exceeded the investment in the program. By 1950, over 10,000 employees worked at plants that had taken advantage of the BAWI program, and the amounts of bonds issued only totaled 3 percent of the total wages of these workers (Cobb 1993).

Louisiana modeled its industrial development bond program after Mississippi's BAWI and programs in other states such as Kentucky, Alabama, Illinois, and Tennessee (Rainey 1967).

A 1952 amendment to the state constitution allowed city and parish governments to finance the construction of facilities for incoming industry through bond issues:

> Any parish, ward, or municipality of this State, in order to encourage the location of or addition to industrial enterprises therein may incur debt and issue negotiable bonds...and use such funds derived from sale of such bonds...to acquire industrial plant sites... or acquire or construct industrial plant buildings...and may sell [or] lease...to any enterprise locating or existing within such parish, ward, or municipality.
>
> (State of Louisiana 1955: 315).

This program held multiple advantages for all involved. Rental payments by industry were deductible as a business expense, interest on the bonds was exempt from federal income tax, and industrial property owned by local governments was exempt from ad valorem property taxes. However, bonds were generally used only by smaller cities to attract small to medium sized firms. The majority of bonds issued attracted industries such as food and forest products. In addition, most of the bond issues were very small, thus the incoming industry probably only served the local area. Rainey concludes that this program, like the tax exemption, attracted little industry that was not already intent on locating in Louisiana. By 1963, twenty-three states had similar programs. The spread of these programs negated any advantage Southern states may have gained from adopting them. However, the program operated at no cost to the local community, thus doing no harm. (Rainey 1967).

The third method of attracting industry was for local business leaders to offer loans to new industry. These businessmen organized themselves into groups known as private development corporations or local industrial development corporations, and raised public money to finance the loans. This type of group first appeared in 1916 in Louisville, Kentucky, and soon became increasingly common throughout the South, especially in the years after World War II. In 1962, the Louisiana amended the act authorizing industrial development bonds to allow private development corporations within the state (Rainey 1967). They usually dealt with smaller businesses, and not only offered loans, but also sometimes constructed buildings, which they then rented to new companies. They frequently worked with a limited amount of capital raised by community and business donations. Thus, they generally made medium-term loans to businesses, and only made new loans once enough of the money was paid back to cover the new loan (Cobb 1993).

This group of industrial incentives, however, also had negatives consequences. First, incentives put communities in a bad bargaining position. The communities had invested so much in the industry already that they would do anything to keep it, especially if it was the only industry in town. In addition, subsidies tended to attract industries that needed subsidies the most, which were usually low-wage operations. These industries produced very little growth because of their small size and low wages. The community found it harder to attract more industry because of the slow growth. They would then create more subsidies and incentives, generating a cycle that produced almost nothing worthwhile for the community. This also meant that, although industrial growth may have brought economic progress to some parts of the South, it did not bring much social progress. The South was still dependant on labor-intensive, low-wage, extractive operations, and thus retained its antebellum status of a peripheral, almost colonial, region. This is evident in that the main sales pitch of community leaders to industrialists was the cheap, non-union labor, along with cheap raw materials and resources. That many of the incoming industry’s products did not remain in the region was especially apparent for the petroleum industry, as the vast majority of the finished products from the Southern refineries flowed by pipeline or barge to the Northeast. Thus, Northern industry could expand to the South to take advantage of cheap raw materials and underpaid, non-union labor, and at the same time, their new communities gave them free buildings, tax breaks, and anything else that would convince them to stay.

These extractive, low-wage industries were also not the kind that promoted the rapid urban growth for which everyone had hoped. Consequently, pre-WWII Southern cities remained dependant on agriculture, and the social and political status quo remained. Industry could continue drawing its labor from a pool of poor, rural workers, paying them very little, and never have to worry about unionization. Even though the South was industrializing and growing during the 1930s, during this period the wage gap between the South and the North actually increased. In 1907, the average Southern wage was 86 percent of the average Northeastern wage, but by 1932, it had dropped to 74 percent. It would take another World War to bring the South out of this stagnation. Federal investment for wartime mobilization during the 1940s closed the wage gap to previous levels, bringing the percentage back up to 84 percent of the average Northeastern wage. The industries that flooded in during World War II were more technically complex industries, such as petroleum refining, airplane manufacturing, and chemical munitions production. These offered higher wages than the textile mills which became prevalent in the South during the 1930s (Cobb 1993). In addition, the federal government funded their construction, so the businesses that ran them were less concerned with cutting financial corners.

Federal Influence

Traditionally, economic and sociological theorists have stated that federal government intervention in regional economic development is unnatural, and discount the state's ability to affect this sort of growth. Gregory Hooks, however, joins a growing list of researchers who argue that the federal government has had a significant influence on regional economic development (Hooks 2001). The most prominent example of this is the federal defense program, especially during World War II. The economic mobilization for World War II was unique, and had a major influence on the industrialization of the South. During the war, the federal government spent $4 billion on Southern military facilities and $4.4 billion on Southern war-related industry. This investment expanded the South's industrial capacity by an estimated 40 percent (Cobb 1984). Farm laborers and sharecroppers poured out of rural areas to join the industrial boom. Low-wage agricultural opportunities were fast disappearing, and millions of people were looking for work. Luckily, federal investment gave these people somewhere to go (Wright 1986).The federal wartime expansion was not restricted to the South, and by the end of the war, the federal government owned 40 percent of the entire nation's industrial assets. Hooks finds that, overall, the South was actually the focus of *fewer* federal industrial investments than the rest of the country. At the time, the weaponry needed for the war was not too different from products already manufactured by American industry. Since the industrial base already existed in the Northeast and Midwest, it was much easier to convert these plants for wartime needs than build completely new plants in an area with less infrastructure. Thus, the federal government directed much of their investment towards these traditional manufacturing areas. Because of the non-industrial character of the pre-war South, however, federal investment may have had a more lasting impact on the region than on other regions. Investment in the Northeast and Midwest only served to expand the concentration of mature industries in urban areas, which may have contributed to later deindustrialization. In the South, however, the investment may have contributed to the creation of a manufacturing base and infrastructure to support it (Hooks 2001). The model proposed by Crump (1989) of cumulative causation holds that the original siting of an industrial facility in a region gives that region an advantage in securing future contracts, along with the influence a new industry had on the rest of the community, such as on population, services, and the commercial sector. When Hooks (2001) applied this model to his research on the South, he found that though the region received proportionally less investment than the rest of the country during the war years, the federally funded facilities in the South were much more likely to stimulate industrial growth over the next forty years than facilities in non-Southern cities.

Southern Industrial Growth

Federal wartime investment was part of what became a massive industrialization of the South. Between 1929 and 1954, employment in the manufacturing sector shot up 60 percent. During this time, the South and West experienced a higher industrial growth rate than the national average. At the same time, the Midwest remained unchanged, while the Northeast experienced a large loss of industry. These two regions still maintained their industrial domination, but they were not as influential as they were in 1929. Victor Fuchs' book *Changes in the Location of Manufacturing in the United States since 1929* breaks each region into smaller sub-regions, and traces their industrial character from 1929 to 1954. He utilizes the U.S. Census regions, dividing the South into the south Atlantic, the west south central, and the east south central (Figure 2). He writes that this period was favorable for all three sub-regions: between 1929 and 1954 they all showed higher industrial growth than they had between 1904 and 1929. During this period, they also surpassed the national industrial growth rate. In addition, manufacturing employment in the South was more evenly distributed in 1954 than it was in 1929, suggesting that the decentralization of industry was a success. In fact, Fuchs found a positive correlation during this period between the rate of industrial growth and the tendency for industry to become less concentrated. Before this time, the concentration of industry in the Northeast and Midwest resulted in other states becoming very dependant on one, or possibly two, industries. By 1954, however, many states enjoyed the security of hosting many different types of industry, which helped protect the state's population in case of a downturn in one economic sector. This also meant that states' industrial structures skewed less extremely towards either end of the favorable/unfavorable spectrum. Economists refer to a state's industrial structure as favorable if it contains dynamic, high-growth industries, such as the high-tech industries that moved into the South during World War II. The decentralization of industry allowed states to host industries with a range of structures, which resulted in higher growth rates and even more economic security.

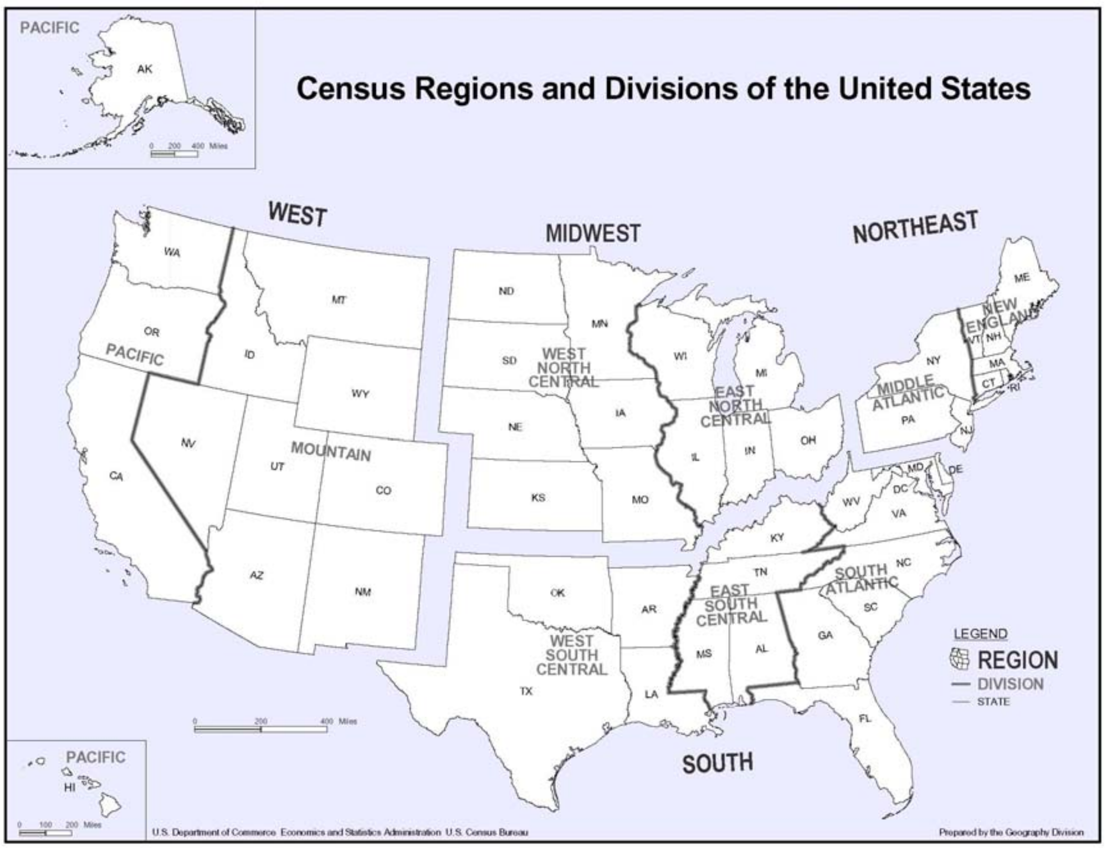

Figure 2. Census Regions
(Source: U.S. Census Bureau 2007)

Wartime industrialization affected the West South Central (Arkansas, Louisiana, Oklahoma, and Texas) more significantly than the East South Central (Kentucky, Tennessee, Alabama, and Mississippi). Between 1929 and 1954, the west south central accounted for only two-fifths of the industrial growth of the South as a whole. However, during the post war period (1947-1954), the west south central was responsible for four-fifths of the industrial growth of the South. In fact, the West South Central was second only to the Pacific region (California, Oregon, and Washington) in terms of the rate of growth in industrial employment during that time. Federal investment in the region had a major influence on post-war growth, and many of the benefits went to Texas and Oklahoma. These two states not only had rapid growth during this period, but also a vast improvement in industrial structure. The chemical and aircraft industries moved into the west south central during World War II, and concentrated their operations in Texas and Oklahoma. The chemical industry also moved into Louisiana and Arkansas, though at a much lower concentration than Texas and Oklahoma. The chemical and aircraft industries were fast growing, thus improving the states' industrial structure, and were largely accountable for the increase in employment, adding 47,000 and 42,000 jobs, respectively. However, two states in the western south central, Arkansas and Louisiana, maintained unfavorable industrial structures overall, and thus experienced industrial growth rates approximately equal to the national rate. Louisiana did experience a boom in the petroleum industry, along with growth in the fast-moving chemical industry, but the rapid growth of the upper Texas gulf coast quickly outpaced the state's two industrial agglomerations at Baton Rouge and Lake Charles (Fuchs 1962).

While not keeping up with the upper Texas gulf coast, Louisiana (and Lake Charles) were seeing large amounts of industrial growth, especially in the petroleum and petrochemical industries. In 1947, Calcasieu Parish had two chemical plants that employed between twenty and ninety-nine people each; along with four chemical plants and two petroleum refineries, that each had over 100 employees (U.S. Bureau of the Census 1950). By 1958, the parish hosted five petroleum refineries, (one of which employed over one thousand people, and two of which employed between 500 and 1,000 people) along with a number of smaller refineries and chemical plants (U.S. Bureau of Census 1958). The County Business Patterns report shows additional employment numbers for the parish, but the quality of the data is mediocre at best. Employment in petroleum refining is not available until 1951, even though it was a well-established economic sector by then. Data for the younger chemical industry becomes available in 1948. The reports thus miss the war years and early post-war period, when much of the quickest growth was occurring in Lake Charles. Nonetheless, they show a steady climb in employment. The petroleum refining sector employed just over 3,000 people in Calcasieu Parish in 1951, and employment number grew to just under 4,000 by 1959. The chemical industry data is much more complex. New products were entering the market constantly, and every few years more sub-categories appeared under the heading of chemical manufacturing. In addition, many companies operated both petroleum refineries and multiple chemical units. The companies frequently shut down individual chemical units or revamped them to produce different products. Thus, the definition of who was working in the "chemical industry" at any one time is questionable. This explains the odd nature of the chemical employment data. In 1949, there was a sudden drop of 600 employees in the chemical industry, but by the next year, the numbers had returned to previous levels. Notwithstanding this aberration, employment in the chemical industry hovered just above 2,000, and grew slowly but steadily throughout the 1950s (U.S. Department of Commerce 1946; U.S. Department of Commerce 1948; U.S. Department of

Commerce 1949; U.S. Department of Commerce 1951; U.S. Department of Commerce 1953; U.S. Department of Commerce 1959).

McMichael (1961) has shown that industry came to Louisiana primarily because of natural resources, and Fuchs' research supports this. Fuchs asserts that the petroleum and chemical industries shifted from the Mid-Atlantic to the West South Central and Pacific regions mostly because of the draw of cheap natural resources. The chemical industry used petroleum and natural gas as the major components of its final products, both of which the western Gulf Coast had in abundance. The area also had surpluses of limestone, sulphur, salt, and water, all of which the petroleum and chemical industries required for operations. These natural resources played more of a factor in the industrial growth of the western south central than did the surplus of cheap labor, which was a greater asset to the eastern south central and Atlantic south regions. In fact, Fuchs attributes one-third of all interregional shifts in petroleum industry employment to the draw of abundant natural resources (Fuchs 1962).

I should make two points here. First, the industrial mobility and shifts that resulted in the industrialization of the South did not generally involve the physical movement of companies and plant facilities. There was not a surge of companies packing up everything and moving to the South. Industrial mobility usually meant that companies that had traditionally remained in the long-established industrial areas of the Northeast and Midwest were now opening new plants in the South. They hired new administrators, executives, and workers, and built new equipment, but the corporate headquarters usually remained in the Northeast or Midwest. If the Midwest and Northeast seemed to be industrially stagnant during the first half of the twentieth century, it was due to the unfavorable industrial structure caused by the multitude of mature industries. These industries showed proportionally less growth than the fledgling, favorably structured South.

Second, some have made the argument that the South was simply “catching up;” that an area historically lacking industry was finally large enough to support it. However, if this were so, other non-industrial states would have shown similar growth during this period. In fact, five of these states (North Dakota, South Dakota, Nebraska, Montana, and Wyoming) showed comparative industrial losses (Fuchs 1962). The factors behind the industrialization of the South were too complex for explanation by this simple “catching up” theory. Even though Southern states had been attempting to lure industry for decades, the social, political, and economic changes that came about in the late 1930s and 1940s finally resulted in significant industrial growth. Two of these factors were the scarcity of low-wage opportunities and the “aggressive state-level political pressure for the South’s ‘fair share’ of military spending” (Wright 1986: 240).

Many factors facilitated the industrialization of the South. It was a large, populous region with abundant natural resources that fit the demands of new twentieth-century industries. Transportation infrastructure was growing (e.g. the Intracoastal Canal, pipeline networks), which allowed industry greater access to resources and markets. Cheap labor was readily available in this area, which was still adjusting to the agricultural changes brought by mechanization, the Depression, and the boll weevil. Local governments, reeling financially from these changes, committed themselves to saving the South through industrial growth.

Pollution for Progress

When heavy industry came to the South, it was a much different experience than the industrialization of the Northeast and Midwest. Industrialization in the South largely consisted of outsiders invading to take advantage of natural resources and cheap labor (Cowdrey 1983). The South was thus still unable to shake its position as a colony of Northern business. In addition, industry in the Northern traditional manufacturing areas generally grew within or near extant metropolitan areas. In the South, however, the vast majority of industrialization occurred in rural areas or cities much smaller than the Northeast/Midwest. Companies, especially those in the petroleum industry, focused their location decisions on proximity to natural resources and rural surpluses of farm labor. The growing Southern transportation infrastructure allowed companies to build in rural areas. In many cases, the location was so desirable to industry that infrastructure was created solely for the manufacturer.

Lake Charles is an excellent example of all of these aspects of Southern industrialization. In the early twentieth century, it was a small, rural city with a labor surplus due to the mechanization of agriculture and the downturn of the forest industry. Lumber companies moved into the area in the 1890s from the already-cut Northern forests, and quickly began denuding the western Louisiana landscape. In 1892 alone, the Lake Charles sawmill cut 150 million board feet of lumber. Some of the larger mills in the region could cut an entire section of land in a few weeks, and by 1905, two thousand miles of logging railroads had spread throughout the western Louisiana (Stokes 1957). By the 1930s, however, the lumber industry was on the decline in this region. The labor surplus this created, along with the wealth of natural resources, would be very enticing to incoming industry. Local leaders were more than pleased to have industry in their town, and constructed infrastructure to ease the transition. Parish government constructed the Cities Service Highway, west of Lake Charles, as a direct path from Highway 90 (the major east-west thoroughfare) to the new refinery. In addition, a housing development company constructed an entirely new community, known as Maplewood, to house company employees (Ross 1990).

The influx of industry to take advantage of all of these incentives contributed to many changes in Southern society. In 1929, the Southern per capita income was a paltry 47 percent of the national average, but by 1948, that number had risen to 64 percent (although half of that growth came between 1940 and 1945, spurred on by the federal wartime investment). Industrialization in the 1940s finally brought some significant changes to the South, including massive shifts in the work force. The percentage employed in agriculture dropped from 35 percent to 22 percent, and the percentage employed in manufacturing increased from 15 percent to 18 percent. The population of Southern cities also grew by 30 percent during this period. The trend continued into the 1950s, so that the change from 1940 to 1960 is even more dramatic. The South's population shifted from a rural majority (65 percent) to an urban one (58 percent), and by 1960 agricultural employment had dropped to 10 percent of the workforce (Cobb 1984). With urbanization and industrial growth, however, comes an increase in pollution sources, especially water pollution. This would quickly become a problem requiring the attention of the authorities. Nevertheless, the political and economic leaders of Southern states were thrilled about this modernization and economic growth; it had been the driving force behind thirty years of recruitment efforts. The last thing they wanted to do was slap regulations onto the industry they had worked so hard to attract. With so much local money invested in these firms, it was not very likely that local governments would question them about their waste disposal programs. Consequently, the fact that industry was needed so badly by Southern cities seemed to guarantee for them regulation-free operation.

Although some Southern states did pass a few pollution regulations and give some state agencies authority over pollution, they still gained a reputation for accommodating industry and looking the other way when confronted with pollution problems. The shift from a rural, agricultural landscape to an urban one was dominated by industry focused on intensive resource extraction, and resulted in major environmental modifications and pollution. Many of the resources, especially petroleum, were located within the great Southern river swamp complexes and the modification or draining of these (willfully done for the sake of industrial progress) meant the loss of an important natural landscape. These river swamps functioned as a natural filter of silt, organic materials, and toxic chemicals, as well as serving as reservoir and habitat for an entire biotic community (Berry & Horton 1974). The fact that many Southern governments looked the other way while this type of destructive activity was occurring has led many scholars to conclude that the South experienced great economic growth because of lax pollution regulations. In fact, "before 1972 polluters had little to fear from any level of government", argues Albert Cowdrey (1983: 175). Examples are easy to find; in central Florida, the phosphate industry significantly reduced air quality through its emissions. Industrial leaders were extremely resistant to any pollution regulations, and held much economic and political power over the area and the state. Unfortunately, the state government's reluctance to confront industry "was more typical than extraordinary" (Dewey 1999: 602).

In Louisiana, the Stream Control Commission was also guilty of this reluctance. In 1940, the Louisiana legislature formed this group, and appointed representatives from the Department of Conservation (later known as the Department of Fish and Wild Life), The State Board of Health, and the Attorney General's office as its members. The mandate of the Stream Control Commission was to

> …have control of waste disposal, either public or private…into any of the lake, rivers, and streams of the state...and of the coastal waters of the Gulf of Mexico…for the prevention of pollution thereof tending to destroy fish life, or to be injurious to the public health or the public welfare or other aquatic life or wild or domestic animals and fowls.
> (State of Louisiana 1940: 1370)

Despite their given mission, the SCC consistently allowed industry to use the waters of the state as a dumping ground. Members were especially lenient with industry along the Mississippi

River, allowing companies to use it as an industrial sink throughout the 1950s and 1960s (Colten 2000). The body generally maintained a cooperative relationship with industry, and only stepped in during cases of serious pollution, usually the kind that would constitute a public relations threat for both industry and state government. These piecemeal, ad hoc responses would become the norm for state governments as a whole, with officials consistently focusing their efforts on one type or instance of pollution instead of addressing industrial pollution control as a whole (Colten 2001).

At the local level, government was more sympathetic to people affected by pollution. Local judges and juries usually sided with rural landowners in early Louisiana pollution cases, but refused to confront industry; they "sought to compensate those who suffered from industrial pollution while refusing to impose injunctions on manufacturing activity" (Colten 2000: 144). In addition, once industry filed an appeal, state-level appellate judges usually reduced the amounts awarded to the plaintiffs (Colten 2000). Industry also had support from the state legislative and executive branches. The Louisiana governor's office was extremely powerful and legislators held very long terms, meaning that both of these branches of government were extremely susceptible to monetary influence from the agricultural or industrial lobby (Allen 2003). Some of the only actions the state government took that infringed on industrial operations were acts passed in the 1910s and 1920s to protect farmers using irrigation from oilfield brine discharges (Colten 2000).

The access to power enjoyed by incoming industry, along with the fact that tax breaks and development programs attracted almost exclusively low-wage, extractive industries, meant that nightmares of radical social change remained unrealized. These industries, while bringing unprecedented economic growth to the region, kept the political/social/racial hierarchy firmly in place (Scranton 2001). Without radical change, the Southern states maintained their image of “good ole boy” politics: corrupt and wasteful officials lining their pockets with money from the agricultural, business and industrial lobbies. This image, along with the concentrated efforts of these local and state governments to attract industry and their general dismissal of the pollution problem that would follow, led many to conclude that the South accepted pollution in exchange for economic progress.

The impression of a great Faustian deal, however, is at least partly a myth. While state leaders may have shied away from environmental regulations for fear of being labeled anti-development, the presence or absence of these regulations was generally not a concern in industrial location decisions (South 1986). Even if regulations were present, industrialists usually did not take them seriously because of the nature of local and state politics; industry leaders knew they could use their influence to reduce or remove the regulations. In addition, the costs of regulation were not a great enough percentage of total site costs to worry industrial firms (Storper et el. 1980). A 1922 industrial handbook listed possible lawsuits and regulations as a concern, but placed it seventh on the list of important industrial location factors, well below other issues such as transportation infrastructure and proximity to natural resources (Gorman 2001). The weak position of state regulators is evident in the actions of the Louisiana Stream Control Commission. The act that created the SCC decreed that the body should “establish pollution standards for lakes, rivers, streams, and other waters of the State” (State of Louisiana 1940: 1371). In 1958 correspondence C.A. Burns, the chief chemist of the Columbia-Southern Chemical Corporation in Lake Charles, requested information from the SCC on stream pollution law or regulations pertaining to the Calcasieu River. Kenneth Biglane, executive secretary of the SCC, assured Mr. Burns that the regulatory body did not have set standards for any stream in Louisiana, but rather evaluated each application for waste disposal individually (Biglane 1958).

Without standards, the SCC members decided whether each addition to the pollution load would render the waterway unsafe. The American Petroleum Institute would later utilize this same strategy in their argument against pollution regulations. Throughout the twenty years between 1940 and 1960, SCC members consistently approved waste disposal applications on both the Mississippi and Calcasieu Rivers (Colten 2000; SCC Minutes 1940-1960). With this record, if the SCC was a factor in industrial location decisions, they most likely served as another reason for industry to locate in Louisiana.

Moreover, the myth of "pollution for progress" incorrectly assumes that the general citizenry were part of the deal. Colten (2006, 2001) has shown that this was not the case, at least in Louisiana and Texas, where he traces "the details of internal struggles at the local scale" which are usually glossed over by "sweeping claims that the southern states ignored environmental concerns" (Colten 2001: 162). On the upper Texas Gulf Coast, wartime industrialization had increased the amount of pollution flowing into waterways, eventually "attracting the displeasure of Lone Star sportsmen" (Colten 2001: 146). The Texas Game, Fish, and Oyster Commission took heed of the public cry and shouldered the responsibility for pollution regulation enforcement. However, conflicting state policies and limited resources for enforcement meant that industry continued to flow in while pollution abatement efforts remained inconsistent, despite the public outcry.

A similar situation arose in Louisiana. The first federal intervention into water pollution issues was at the tiny Corney Creek in the northern part of the state. An interstate water dispute had arisen over oilfield waste from Arkansas that was flowing into Louisiana. The brine and oils were ruining the sportfishing in Corney Creek and Corney Lake, and the locals were very upset. They brought the issue to the parish police juries who then took the case directly to federal authorities, suggesting their lack of faith in state authorities' willingness to punish industry (Colten 2006). This lack of faith was well founded, from the SCC's cooperative relationship with industry to the state appellate courts' reduction of awards in pollution nuisance suits. Colten's research does show that, despite the nonchalance of state authorities, rural citizens in Louisiana took offense to, and action against, new pollution threats. This paper will investigate many of the same issues. The major difference, however, will be that Lake Charles was a quickly growing urban area at the time of industrialization, while Corney Creek was still very rural.

Industrialization generally conjures images of urban areas, but industry had a major impact on rural areas as well, especially the petroleum industry. Oil companies relocated to the South to be near the oil reserves, but refinery location decisions more often revolved around transportation infrastructure. Thus, two facets of petroleum industry emerged: production and refining. Production facilities (oil wells and pumps), situated anywhere oil was found, were very likely to impact rural areas. Refineries usually located beside rivers, or in urban areas with established transportation infrastructure, for easy transportation of crude and finished products. This research will examine whether urban citizens in Lake Charles were just as likely to take action against new pollution problems as rural Louisiana citizens were.

Regional Differences in Pollution Control

The South as an industrial zone is very different from the traditional manufacturing areas of the Northeast and Midwest. The South developed much later, with different industries, and for much different reasons. The region also showed unique responses to the pollution that followed industrialization. In the 1930s, the Northeast and Midwest produced 75 percent of United States sewage, along with producing the greatest concentration of industrial wastes (Melosi 2000). It was a much more densely populated region, with many large cities obtaining their water supply from the same rivers, lakes, and harbors that other cities and industry were using as a dumping ground. Consequently, for most of the region, public health was the first and primary concern in regards to municipal and industrial pollution. Most of these states assigned their public health service the primary duty of monitoring and enforcing pollution regulations. In the South, however, public health was not such a concern, at least as far as municipal pollution was concerned:

> For the most part, larger rivers in the humid South could dilute the relatively small discharges from the modest-sized interior cities while the regions largest cities – New Orleans, Washington, and Houston – had no downstream neighbors to speak of.
> (Colten 2006: 608)

Lake Charles could be included in this list, as it had no downstream neighbors except for a few small fishing towns near the coast. However, the Calcasieu River is not a diluting machine like the Mississippi. It has a very low gradient and becomes a tidal stream during periods of low rainfall, actually flowing backwards during high tides.

With public health out of the picture, at stake were wildlife, agriculture, and other natural resources. These were community resources: people survived on local crops, wildlife, and fish, and the destruction of these would seriously damage a community's livelihood. The Corney Creek case demonstrates this point quite well. Sportfishing was not simply a hobby for northern Louisianans; it was a tradition, a source of food, and a way of life. The threat to sportfishing was such a serious issue for citizens that they fought until they successfully secured federal help. This was not a small task for a rural Louisiana parish. This was just as serious an issue in southwestern Louisiana. Gay Gomez's book *A Wetland Biography: Seasons on the Chenier Plain* traces the importance of wildlife and fish in the lives of people living in the marshes south of Lake Charles, downstream of what would become a large industrial agglomeration. All year, these people's lives revolved around the natural resources in their environment. Different seasons brought cattle herding, rice and citrus farming, hunting, fishing, and trapping. They farmed, hunted, and fished for subsistence, but also for the market: the oyster and shrimp industries were a major part of the economy. However, by the 1920s and 1930s, these rural citizens had lost some economic opportunities. The Mexican pink worm devastated cotton crops and the Migratory Bird Treaty of 1918 outlawed killing certain waterfowl for market sale. This decline coincided with the arrival of the oil industry, and many men went to work in the oil fields. Those who stayed behind focused more on cattle herding, hunting, and fishing for subsistence, and harvesting oysters and shrimp for the market. Thus, while industry was congregating upstream, a large community of people was still surviving on the natural bounty of the marshes, rivers, and Gulf.

The state government's first actions against industry focused on these natural resources. As early as the 1910s, the state passed regulations against polluting water used for irrigation or fishing. This bill, however, was a compromise that only restricted oilfield brine releases during rice growing season. Despite the compromise, the bill had teeth. In 1912, the state took action against an oilfield operator whose brines had destroyed rice crops (Colten 2000). In 1924, the legislature passed another bill that prohibited large releases of brine year-round (State of Louisiana 1924). Thus, for most Southern states, natural resource protection was a priority, and they gave wildlife and fisheries departments authority over pollution monitoring. In Louisiana, this responsibility fell on the Department of Conservation (soon renamed the Department of Wild Life and Fisheries), that would later become a participating member in a new Stream Control Commission. In Texas, the administration gave the Game, Fish, and Oyster Commission authority to enforce pollution law. State regulations forbid pollution of surface waters as a whole; consequently, these agencies had to shift their focus quickly from conservation to environmental protection, as they now also had to protect populations of non-game species (Colten 2001). Both the Louisiana and Texas departments, however, had found it difficult enough to fulfill their previous duties; now they also had to be the pollution police for the entire state. Chronically underfunded, they hastily turned to a more cooperative relationship with industry. In many cases, industrial groups even funded the investigations, which put the objectivity of the studies into doubt.

Thus, through the concentrated recruitment efforts of local and state governments, industry began moving to the South in the early twentieth century. However, progress was not as sweeping as it seemed, as most of the industries recruited paid low wages and brought little social change to the region. It took the Second World War and massive federal investment to bring in fast-growing, high-wage industries to the South. While the South did not receive as much investment as other regions, federal dollars had a greater influence on the mostly rural South, accelerating the forces of modernization and urbanization. With this growth, though, came industrial and municipal pollution issues, which state government only addressed in a piecemeal fashion in cooperation with industry. The South thus gained a reputation of having sold its environmental soul to the Devil in exchange for industrial progress. Upon examination, this mantra proves to be a myth, or at least an oversimplified generalization, for two reasons. Pollution regulations (or the lack thereof) were actually not a factor in industrial location decisions, and there was a history of objection to industrial pollution at the citizen and parish level. Additionally, Southern objections to pollution were fundamentally different from traditional manufacturing areas in the North, in that they focused on natural resources instead of public health (Colten 2006).

Chapter 4
Waste Disposal in the Petroleum Industry

Petroleum Industry Pollution

The industrial wastes, especially from the petroleum and petrochemical industries, that began affecting Southern states offered a much different and much larger problem than normal municipal waste. These industries use large amounts of water for cooling, processing, and waste removal, much more so than a normal city would require. They are typically located along a river, stream, or other watercourse to take advantage of the constant source of water. However, taking in and using this much water from a stream or river means that the same amount of water much be discharged to that same watercourse, usually carrying waste products. Sometimes the water picks up pollutants and waste simply through contact during processing, and sometimes refinery operators use the force of the water discharge stream to remove waste products, much like flushing a toilet. Industrial companies typically relied on the force of this water to dilute their wastes, and hopefully not cause any environmental or health problems. Because of the massive needs of industrial complexes and their large amounts of effluent, by 1974 water-using industry in the United States created three to four times as much waste as the sewered population. Half of this came from four major industries: paper, steel, organic chemical (including petrochemical), and petroleum (Berry & Horton 1974).

The multiple types of waste discharged by the petroleum industry presented their own unique set of waste disposal problems. Weston et al. (1953) list the various types of waste produced by this industry in their book *Waste Disposal Problems of the Petroleum Industry*. This book also reviews what activities produce each type of waste and how industry or municipalities can deal with the wastes.

The first type of waste listed is free oil. Simply, this is crude oil or oil distillates, which leak from pipes or valves. Leaks and spills usually occur during transfer from one transport method to another, such as from pipes to truck or barges. They can also occur during routine maintenance. Gravity separators and skimmers can remove the floating oil from the surface of the water. Emulsions are another type of oily waste produced by the petroleum industry. They are more difficult to remove because they do not float on top of they water; they are distributed throughout the bulk of the water stream. They can develop in waste pipes and sewers when close contact occurs between water, oil, and some emulsifying agent. Because the emulsified oil does not float on top of the effluent stream, skimmers and gravity separators will not catch it, and it will flow with the rest of the stream to the release point. If an emulsion reaches a water body, however, turbidity and dilution will cause the emulsion to break and the oil to rise to the surface. Thus, free oil that was not immediately apparent in the waste stream can appear in the water body receiving the effluent.

One treatment involves caustics or organic chemicals. These can change the pH of the water, thus breaking the emulsions and causing the oil to float to the top where skimmers can remove them. Other special chemicals such as phenols, creosols, and methanols, can also cause problems if released into the environment. This category of petroleum wastes can emulsify oil or increase the biological oxygen demand in the water body. Their effects are usually severe enough to justify attempts at recovery and re-use. Acidic wastes, another common petroleum industry by-product, usually come from the sulfuric acid used as a treating agent and catalyst. The acid sludge left over after use of the sulfuric acid can actually be re-used a few times before disposal is necessary. The use of many different products, chemicals, and materials in the petroleum industry result in leftover sludges and solids. These sludges and solids comprise another category of industrial wastes, and industrial companies must deal with them in a special way. They usually accumulate at the bottom of tanks and cooling towers, and industry cannot release them into sewers or waterways due to their high concentration of the offensive material. When sludges and solids are removed, any usable oil is extracted from them, and they are subsequently buried or burned.

Water used in the petroleum industry can also become a pollution hazard. Actually, water used for cooling is what makes up most of the waste stream, and it can easily become contaminated with oil during cooling processes or with the introduction of other wastes to the sewer system. Water used for washing of oils, tanks, vessels, and towers can obtain a severely alkaline pH. To avoid disturbing the pH of the water body receiving the waste stream, these alkaline waters can be stored in tanks or ponds and slowly released into the waste stream. Water used for the removal of human waste at the plant can also cause problems. It cannot be recovered and re-used, so must be discharged to the sewers. If released to the same sewers as the rest of the refinery wastes, however, it can interfere with the separation of oily wastes from the waste stream. Ideally, industrial companies should release it to a different, separate sewer system from the one that carries the refinery wastes, but the construction of two separate sewer systems can be a costly endeavor.

Pollution Parameters

With so many different types of pollution coming from so many different sources, scientists and officials usually have a difficult time discovering which offensive material is causing problems, much less finding the guilty party. The multitudes of pollutants, along with their interactions with the water and organic materials in the river or stream, create infinite variations and variables that make it difficult to quantify exact amounts of pollutants. In addition, before 1940 there was no good system for classifying wastes. Investigators would sometimes simply classify them (in very generic terms) by their effect on the waterway, noting whether wastes impeded filtration, increased bacterial content, affected taste and odor, or reduced water quality (Melosi 2000). In these early years, scientific analysis of polluted waters consisted only of simple measures of terms of hardness, turbidity, color, and presence of certain minerals and chemical such as salt, chlorine, and sodium chloride (Tarr 1985). Over the years, scientists discovered more measures that could provide a common yardstick of quantifiable variables related to industrial water pollution. These parameters offered some clues to the type of wastes present. A pH measurement, for example, can offer indications of the presence of acidic or alkaline wastes, along with their level of concentration and toxicity. Acidic readings can indicate presence of strong acids used by industry for the dissociation of organic and inorganic compounds. Alkaline readings usually come from spent caustics containing sodium, calcium, and potassium salts. Once these caustics have lost all of their strength, industry generally discards them as effluent. Another measure is the amount of solids present in the water. These solids can be organic or inorganic, and dissolved or suspended in the water stream. Dissolved organics cause the most problems, as they can create odd colors, odors, and tastes even at low concentrations. Another analysis method measures surface-active property, which is the tendency of a material to concentrate along the surface of the water. When certain materials do this, it can reduce surface tension and result in the emulsification of dirty and oily materials. Temperature is also a simple measurement that can indicate the presence of industrial effluent. Even if no toxic or otherwise polluting materials are present, heat pollution can cause problems for aquatic species and for downstream cities and industries that are using the water. If people believe toxic materials are in fact present, they can perform a bioassay test to determine the toxic effects on microorganisms (Department of Interior 1970).

The most significant category of both municipal and industrial pollutants, especially in the petroleum and petrochemical industries, is organic material. Municipal waste consists almost solely of biological organic wastes in the form of sewage. Industrial wastes include organic wastes if the industrial processes utilize natural materials. This is the case in both the petroleum and petrochemical industries, which both use petroleum, natural gas, and other natural resources as their primary materials. The parameter most often used to measure the amount of organic pollutants is oxygen demand. This measurement method has been in use since the beginning of the twentieth century; the Public Health Service concentrated on oxygen demand when surveying the Ohio River in 1913 (Tarr 1985). Whenever Lake Charles industry sent a waste disposal application to the Stream Control Commission, the oxygen demand of the wastes was usually the main topic. Oxygen demand is a measure of the amount of dissolved oxygen that would be required for bacteria to break down the amount of waste present in the water. Whenever industry or municipalities release organic wastes into water bodies, aerobic bacteria begin to break down the wastes. Because the bacteria produce harmless by-products, this is a process is likened to a natural “self-cleaning” of the water body. However, to do their work these bacteria require oxygen. If a large amount of organic waste is present, more bacteria will grow and will need more oxygen. If enough waste is present, the oxygen demand will be so high that the bacteria will use all of the dissolved oxygen. This leaves none for other organisms in the water, who suffocate. Fish kills are a commonly seen result of high oxygen demand and low oxygen supply (Berry & Horton 1974). Researchers have actually developed multiple measures of oxygen demand for determining the amount of organic wastes present in a water body. The oldest and most common is Biological Oxygen Demand (BOD). This is the measure, as discussed above, of oxygen required for bacteria to break down wastes naturally. BOD is the basis of most historic and modern effluent quality standards. Scientists originally used BOD to measure the effect of sewage on water bodies. Once industrial wastes became a problem, researchers began to speak of the BOD of organic industrial wastes in terms of population equivalent (PE), which nonprofessionals could more easily understand. Population Equivalent is a measure that compares the BOD of industrial waste to that of municipal waste. Researchers can then describe industrial waste as having the same effect on a water body as a city of a certain population. Once the use of chemicals to break down wastes became common practice, researchers began to use Chemical Oxygen Demand as a measurement parameter. This is simply a measure of the oxygen required for the chemical oxidization of wastes (Department of Interior 1970).

Effects of Pollution on Water

A large quantity of industrial waste can have many undesirable effects on a water body. The first, and most obvious, effects are aesthetic. Some of these are visible, such as foam on the water's surface. Oily wastes create a visible iridescent sheen on the surface. Wastes from synthetic rubber manufacturing can include bits of rubber that float on the surface. One of the most offensive aesthetic effects, however, is odor cause by anaerobic decomposition (Department of Interior 1970). Once the biological oxygen demand is high enough, and oxygen levels low enough, aerobic bacteria cannot function. Anaerobic bacteria do not require oxygen for decomposition, and thrive in environments such as this. They begin breaking down the organic wastes, along with the remains of aquatic organisms killed by the lack of oxygen. Unlike aerobic bacteria, which produce harmless by-products, anaerobic bacteria emit objectionable substances such as methane and hydrogen sulfide (Berry & Horton 1974). Hydrogen sulfide is one of the most common culprits in complaints about taste. The organic chemicals themselves also cause taste problems. Phenols usually cause the most issues. When municipalities chlorinate water containing phenols for domestic consumption, the process creates dichlorophenols, which give the water a medicinal taste. This can occur even if the phenols are present is amounts as small as one part per billion. Other chemicals, such as chlorinated hydrocarbons, organic acids, and sulfides, can cause taste problems. Taste problems are not limited to just the water; industrial wastes can also cause odd or oily tastes in fish, making a water body useless for commercial or recreational fishing.

There are also many biological effects of industrial waste. A high biological oxygen demand causes an oxygen deficit, which is deadly for all sorts of aquatic organisms and microorganisms. A change in environmental conditions and microbial populations such as this favors one group of organisms over another and can significantly alter food chain and reproductive patterns. Water temperature can multiply the effects of a high BOD. If the water temperature is high, this not only inhibits oxygen transfer, but also increases the rate of bacterial action (Department of Interior 1970). This can mean that streams with a high water temperature can recover from light pollution loads more quickly. Heavy pollution loads, however, have a more pronounced effect on water bodies with warm temperatures, as they run out of oxygen and move into anaerobic decomposition more quickly. These elevated water temperatures are commonly present in warm summer months. The temperature can be elevated year-round, however, if industry is releasing water that they have heated during processing (Berry & Horton 1974).

Industrial waste can also have direct toxic effects on organisms. Some fish kills are caused not be a lack of oxygen, but simply by too high a concentration of toxic materials. When present in drinking water, these materials can also be toxic to land-borne animals and humans, with high enough concentrations causing acute health problems. Usually though, health problems are chronic, caused by long-term, low-dose exposure. These problems most commonly appear as cancer in humans. Polluted water, if used for irrigation, can also ruin crops. Sodium, present in industrial caustics, can affect agriculture by reducing soil permeability. If authorities suspect problems due to polluted water, they can use fish to measure the toxicity of the water. Fish are easy to use and control in a laboratory setting, and have a valid, quick, and easily observable response to water-borne toxins.

All of these negative effects can ruin a water body's usefulness to society. Residents can use waterways and water bodies as recreation sites, for activities such as swimming and fishing. These activities are important to the locals, and bring in outside money when people travel to use the area for recreation. Polluted waterways can also affect residential land development, as the highest land and home values are usually near water. If the water is a health threat or has offensive aesthetic qualities, land values nearby will drop. Contaminated waterways can also become a hindrance to navigation. Oily wastes floating on the water present a fire hazard, and acidic wastes can prove corrosive to metal ship hulls. In addition, polluted waterways can have a detrimental effect on industry. If too much industrial effluent in present in the water, it cannot be used as a source for cooling and processing. Thus, unchecked waste disposal can come back to haunt industrial companies by eventually reducing their plant efficiency and ability to operate (U.S. Department of Interior 1970).

Industrial Waste Treatment in the Early Twentieth Century

E.F. Eldridge's (1942) book *Industrial Waste Treatment Practice* offers a glimpse into industrial waste treatment practices in the first half of the twentieth century. He published the book in 1942, a time when the expansion of the petroleum industry was in full swing. Eldridge divides industrial wastes into two main groups: those that industry can utilize, and those that require treatment. Industrial wastes requiring treatment are usually liquids that carry diluted or emulsified wastes. There is no easy way to extract the wastes for reuse, so they must be disposed of. However, if the concentration or toxicity is too high, treatment is first required. This category of wastes includes organic wastes, toxic wastes such as phenols, and inert wastes such as refinery oils and tars.

The treatment of these wastes falls into six categories: disposal by dilution, disposal by irrigation, primary treatment, chemical treatment, secondary treatment, and chlorination. Disposal by dilution consists of simply trying to lessen the waste's impact on the receiving waterway by releasing it with large amounts of water. Disposal by irrigation is a similar method, but instead of using the "natural forces of purification available in water," it uses the "same forces available in the soil" (Eldridge 1942: 39). Workers spread the waste across a cultivated field, where filtration, biological action, and oxidization serve as natural treatment methods. For effective treatment, the soils must have a high permeability and be cultivated often to keep the natural forces operating. Eldridge states that sometimes crops are cultivated in the fields, but "this practice is not generally looked upon with favor by health authorities" (Eldridge 1942: 42).

Primary treatment involves the physical removal of wastes from the wastewater stream. Screening and sedimentation are two methods used to remove the waste in this way. Screens filter out large debris, and a sedimentation tank allows suspended solids to settle out of the waste stream, leaving sludge at the bottom of the tank. These processes remove approximately 60 percent of solids, but only 24 to 40 percent of the wastes with high oxygen demands (Douglas 1983). In 1930, the API published a recommended design for an oil-water separator, and this quickly became the most common method refineries used to prevent oily wastes from entering a receiving stream (API 1990). Both of the major oil refineries in Lake Charles (Continental and Cities Service) reported using oil-water separators of API design, as well as settling tanks to remove any solids in the waste stream (Roy 1944; Flood 1941).

Removal, however, only concentrates the waste; it still must be disposed of. Incineration is the most frequently used method, although this simply shifts the disposal medium from the water to the air. Engineers did not develop chemical treatment fully until the 1940s, when cheaper chemicals, better equipment, and more sophisticated methods made it feasible. One of the main chemical treatment methods is coagulation or flocculation. When solids in suspension in the wastewater stream are too light to settle on their own for sedimentation or screening, waste engineers must use this method. Chemicals added to the water force the solids to coagulate and settle, allowing for their removal. Chemical treatment also bridges the gap between primary and secondary treatment methods. If too much waste is present for primary treatment to be effective, but not enough is present to justify the costs of secondary treatment, the more inexpensive chemical methods are used.

Secondary treatment consists of a few different methods. Biological filtration is similar to the screening methods of primary treatments. However, filters only remove the coarsest particles; biological action is responsible for the majority of waste disposal. Bacteria act on the wastes much as they do in the natural self-cleaning process of a waterway. In this setting, however, their action is more efficient and operates on a smaller time scale (Eldridge 1942). Activated sludge is another secondary treatment method that is much more precise. Plant operators mix bacterial organisms with settled waste sludge. They then aerate the sludge with mechanical agitators and allow it to settle again, creating an even larger sludge. The operators repeat this process frequently to create an activated sludge, which they then use to purify incoming wastes (Douglas 1983). Biochemical treatment is a secondary treatment developed in the 1940s. It is an offshoot of the activated sludge method, but with the addition of chemicals. Waste engineers add ferric chloride or ferric sulphate to the mixture to trigger coagulation. This speeds up the breakdown of the wastes and results in a much more efficient treatment. Another waste treatment method using chemicals is chlorination. The addition of chlorine to the waste stream not only reduces the biological oxygen demand, but also reduces corrosion of the treatment equipment, sterilizes the waste stream, and controls odors and flies. However, if phenols are present in the waste stream, chlorination can cause problems. Chlorinated phenols can cause distinct, offensive odors and tastes in the waste stream. If the waste is released to a waterway with a downstream municipal water intake, the population will notice the unpleasant taste and odor at concentrations as low as 0.02 parts per million. Other chemicals used in refinery processes, such as mercaptans and sulphides, can also cause taste and odor problems at low concentrations. Ethyl mercaptan can produce a foul taste at a concentration as low as one part per fifty billion (Eldridge 1942).

Industry generates wastes that require these complex treatment methods through equally complex processing methods. Almost from the moment the crude oil enters the refinery, plant processes are producing wastes. The first step in refining is to wash the crude oil with water to remove any brine left over from the drilling process. The refinery releases this water, now carrying a high concentration of salt, into the sewer system for disposal. Brine alone, even without any oily wastes, can ruin irrigated crops and drinking water, kill fish and wildlife populations, and cause corrosion on any metal structures in the water. After washing, the crude oil flows to fractionation towers, where processes extract five fractions: gasoline, kerosene, distillate, gas-oil, and residue. Refineries process the first three further to remove excess materials such as hydrogen sulphates, mercaptans, and gums. These materials join the waste stream for disposal. The residue travels to a fractionating chamber, where it is “cracked.” Cracking is a method using either heat and pressure or a chemical catalyst to break down molecules and extract different lighter products from heavy products such as fuel oil and crude oil residue. The residue passes through the chamber, which extracts gasoline, light oils, and heavy oils. The oils pass through again, which extracts even more gasoline. This gasoline is treated with caustic soda, and sometimes also with sulfuric acid. The acid sludge and spent caustic left over from this process flow to the sewer. These acid sludges were the most serious waste disposal problem for refineries in the 1930s; the API estimated that refineries released 55,000 to 110,000 tons of acid sludges in 1932 alone (API 1990). The fraction stream continued through the refinery, and sodium plumbate is added in what is known as the doctor treatment, which removes sulphides and mercaptans. Workers then release the spent doctor and sludges to the sewer. Some refineries, however, avoid this waste problem by substituting a copper chloride filtration process, which results in much less waste. The final treatment for all gasolines recovered in the refinery is a washing with water, which subsequently flows into the sewer (Eldridge 1942). Thus, almost every step in the refining process results in some form of waste, most of which are released into water bodies for disposal.

Even though information about refinery operation and technology was widely distributed and well known, information on how much waste refineries generated was very hard to come by in the early twentieth century. The U.S. Public Health Service estimated that for every barrel (forty-two gallons) of crude oil processed, the petroleum industry generated one thousand gallons of waste. They estimated that, because 80 to 90 percent of this waste was unpolluted cooling water, 100 to 200 gallons of the per-barrel waste stream was polluted effluent. In an unpublished report of the Michigan Stream Control Commission, one Michigan refinery produced about 68 gallons of waste per barrel of crude oil. Table 1 shows that the vast majority of this waste stream consists of wash water from the gasoline. This water has a very low phenol content in parts per million. However, because the quantity released is so large, this wash water is the source of the bulk of the phenols released at this location. In this instance, a seemingly harmless proportion of pollutants actually become a problem because of the quantity produced.

Table 1. Phenol Content of Refinery Wastes

Waste Source	Volume gal. per 1,000 bbl.	Phenol Content		
		Parts per million	Lbs per 1,000 bbl.	Percentage of total
Desalting	4,000	4	0.13	0.5
Spent caustic (skimming)	35	1,500	0.44	1.7
Spent doctor (skimming)	35	2,500	0.73	2.8
Spent caustic (cracking)	150			
Condensate of raw-gasoline condenser	1,300	2	0.02	0.1
Wash water from gasoline	59,000	50	24.60	93.0
Wash water from agitators	4,000	15	0.50	1.9
Total	68,520		26.42	100.0

(Source: Eldridge 1942: 341)

Another significant problem in waste management during this time was that the wastewater stream was continuous, but the spent caustics, acids, sludges, and other solutions entered the stream in batches. This prevented the safe dilution and distribution of harmful effluent in the waterway, and increased the toxicity, biological oxygen demand, and other harmful effects of the waste stream (Eldridge 1942).

Municipal vs. Industrial Waste Management

Waste management practices (for all types of waste), have consistently revolved around one issue: where to dispose of waste. This question predated any questions of the makeup of waste or of possible treatment practices, and over the years, cities and industry have made multiple shifts in the medium, or "sink," that they use for disposal (Tarr 1996). Municipalities disposed of wastes on land until the early twentieth century, when there was a shift to using water as a sink. This shift relied on the commonly held idea that running water would purify itself (Tarr 1996). Dumping to running water at least provided a type of "out of sight, out of mind" solution. As long as a city's water intake was upstream from its waste disposal point, the populace had no reason to worry. Of course, the waste became a problem for cities located downstream. By the mid-twentieth century, water-borne municipal waste had become such a contentious issue between cities that another sink shift occurred, and some cities began disposing of their waste on land again (Tarr 1996). For industrial wastes, however, the sequence of sink shifts was not so clear-cut. Industry alternately used land, air, and water as a sink throughout the nineteenth and twentieth centuries. Efforts to restrict industrial water disposal, however, began in the 1930s and 1940s. Some industries shifted to a land sink as a result, but most continued to dispose of their wastes in waterways (Colten 2004). A water sink offered the most efficient way to quickly dilute and dispose of the massive amount of wastes that industrial plants were capable of producing.

Municipal and industrial wastes management also differed on the issue of treatment. Prior to 1920, treatment of industrial wastes was not a major issue. Many people believed these wastes only constituted an indirect threat because they would impair a stream's ability to oxidize and purify municipal sewage (Tarr 1985). By 1942, E.F. Eldridge reports that municipalities had made rapid progress in sewage treatment, but industry had made almost no progress in the treatment of industrial wastes. At that time, The U.S. Public Health Service reported that industrial pollution was equal to the amount of pollution generated by the entire U.S. population.

In many cases, wastes generated by the industrial sector of a city far exceeded the amount of sewage generated by the city. Specific treatment for these industrial wastes was not a priority. In many cities, if industrial wastes received any treatment, industry simply sent them through the municipal waste treatment systems. For some cities, industry generated so much waste that it was the primary focus of the municipal treatment facility (Eldridge 1942). However, engineers designed these treatment facilities to deal with municipal sewage, not industrial wastes. Thus, these treatment processes were not optimal for the more noxious and toxic industrial wastes.

Surveys by the U.S. Public Health Service (USPHS) in the 1950s give us some of the actual numbers related to municipal and industrial waste. In 1951, the USPHS reported that more than 22,000 sources of pollution existed in the United States. This included 11,800 municipal sources and 10,400 industrial sources. Despite 9,300 treatment plants working to treat these wastes, the Public Health Service estimated that industrial and municipal wastes released in the nation's waterways were the equivalent of raw sewage from 150 million people. It also estimated that 6,600 municipal sources and 3,500 industrial sources required either a new treatment plant or addition to an existing one. It listed seven thousand other needs as unascertained, with the majority of these listed as industrial (USPHS 1951b).

Lack of data on industrial waste would become a common theme in the Public Health Service reports. In fact, the 1951 report stated that the full impact of industrial pollution was not yet determined. Of the 10,400 industrial waste sources listed, only 6,000 produced organic wastes that were measurable by domestic sewage standards. Of those, detailed information on only 2,000 was available. Of the remaining 4,400 industrial waste sources, 2,400 discharged inorganic wastes that were not quantifiable in terms of population equivalent, and 2,000 simply did not report on their waste discharges. As a result, The Public Health Service only had concrete numbers on the effect of waste discharges for one-fifth of American industry (USPHS 1951b). While the USPHS was not able to get much information on the actual pollution load, they were able to find information on who was treating their pollution and who was not. The information they did receive was not very comforting, as only 2,595 of the industrial waste sources were treating their waste. Four thousand more did not give out any information about whether they were treating or not. Of the industries with treatment, the USPHS reported that under half of the plants had adequate operational capacity and satisfactory operations (USPHS 1951b).

Most of the gaps in industrial effluent data came from Southern states, and most of the treatment plants for industrial waste were located in the Northeast/Midwest industrial zone (USPHS 1951b). A USPHS report on drainage basins in the Southwest and Lower Mississippi River regions confesses that the data have wide gaps and are inadequate for discovering the scope of basin-wide pollution issues. The USPHS was hopeful, however, that the data would be sufficient for instituting local corrective measures (USPHS 1951a). The report blames the general confusion and lack of treatment facilities partly on war priorities during industrialization: "during World War II, activities in the field of pollution abatement suffered considerable setback due to the necessity for diverting material to the war effort" (USPHS 1951a: ix). There had been some post-war progress, with eight industrial treatment plants built between 1946 and 1950. However, the report lamented slow action on needed projects, and stated that pollution abatement was still lagging far behind pollution. The blame fell on Southern state governments for "...lack of state agency action, inadequate legislative authority, limited technical staffs, and insufficient funds for the administration of aggressive pollution control" (USPHS 1951a: xii). In fact, the purpose of this report was to advocate for a focus on river basins and interstate compacts rather than individual state legislation, especially in the South.

Waste Disposal in Lake Charles

The data on waste streams in Lake Charles is perhaps some of the worst in the USPHS reports. What we do know is that in Lake Charles, both municipalities and industry used the Calcasieu River basin as their sink. With a drainage basin encompassing 4,100 square miles, the Calcasieu drains a good portion of southwestern Louisiana. The river is 215 miles long, with multiple tributaries such as Whiskey Chitto Creek, Barnes Creek, West Fork, Bayou D'Inde, and Bayou Verdine. The city of Lake Charles sits forty-five miles from the mouth of the river, and the river is navigable up to ninety-seven miles from its mouth. The area receives an average of sixty inches of rainfall a year, but during the late summer and early fall rainfall can be much lower. During these times, the flow of the river can be as low as a few hundred cubic feet per second. Closer to the Gulf, tidal action affects the river during these low-flow periods, and the river flows backwards during high tides. This often-miniscule flow is not the best for dilution of wastes; municipal or industrial. Table 2 presents stream flow data for the study period at Kinder, Louisiana. Kinder is about 30 miles upriver from Lake Charles, and is the closest place with detailed historical stream flow data covering the years of industrialization. Refineries in the area used substantial amounts of water for processing and cooling, and discharged this water back to the river. Even if the discharge was free of oily wastes and toxins, the water temperature was much higher and the oxygen level much lower. Once the Calcasieu began flowing backwards on an incoming tide, Lake Charles refineries inadvertently took in the same water they had just discharged downstream. After a few rounds of this, the water in the Calcasieu was completely devoid of oxygen. Add municipal and industrial wastes that further reduced dissolved oxygen levels, and fish kills often occurred. Table 2 shows that every year had periods in which the stream flow in the Calcasieu was very low. In addition, some years, such as 1942-4, 1948, 1951-2, 1954, and 1956 had low average flow for the entire year.

Table 2.
Daily Stream Flow Data by Year, Kinder, LA

Year	Mean Daily Stream Flow	Maximum Daily Stream Flow	Minimum Daily Stream Flow
1940	2,914	60,800	278
1941	4,575	31,700	446
1942	1,750	19,400	477
1943	1,070	8,680	248
1944	1,542	20,200	280
1945	3,100	27,600	359
1946	4,145	28,500	468
1947	3,221	35,600	265
1948	1,788	10,900	201
1949	3,822	30,900	262
1950	3,972	43,000	413
1951	1,322	9,500	168
1952	1,968	29,600	284
1953	4,589	166,000	248
1954	1,470	46,500	192
1955	2,609	38,600	213
1956	1,463	15,200	140
1957	2,098	23,600	170

*All figures are in cubic feet per second

(Source: Slack 1993)

Unfortunately, the only solid information the USPHS reports have on wastes being released to the Calcasieu deals with municipal waste. The 1951 report listed only six major sources of municipal waste in the Calcasieu basin. These sewage systems served a population of just over 70,000 people. Only five of the municipalities had adequate treatment plants, but this covered 90 percent of the population served. For 1957, the USPHS released another, more detailed report, this time an itemized inventory of municipal and industrial waste facilities across the country (USPHS 1958). This report listed twelve sources of municipal waste in the Calcasieu River Basin, but information was not complete for all of the listings (Table 3).

Table 3.
Municipal Waste Sources in the Calcasieu River Basin, 1968

Waste Source	Population Served	Treatment (Type)	Population Equivalent (After Treatment)	Downstream Uses of Water
Calcasieu parish Sewer District #1	ND	Yes (ND)	ND	ND
Leesville-Camp Polk		Yes (secondary)	ND	Livestock water, fishing, wildlife, navigation
DeRidder	5,000	Yes (ND)	1,000	Livestock water, fishing, wildlife, navigation
Oakdale	5,500	Yes (secondary)	1,650	Domestic supply, industrial supply, livestock water, irrigation, fishing, wildlife, navigation
DeQuincy	3,200	Yes (primary)	ND	ND
Westlake	3,000	Yes (secondary)	900	ND
Sulphur	5,000	Yes (secondary)	ND	ND
Maplewood	3,800	Yes (secondary)	600*	ND
Greenwich Terrace	3,500*	Yes (primary)	600*	ND
Lake Charles Air Force Base	1,920	Yes (secondary)	575	ND
Lake Charles Plant A[1]	35,000[1]	Yes (secondary)	ND[1]	Irrigation, fishing, navigation
Lake Charles Plant B	15,000	Yes (secondary)	3,000	Irrigation, fishing, navigation

ND = No Data
* – 1951 data
[1] – 1951 data for Lake Charles Plant A shows a population served of 53,000, with a treated PE of 5,000. Lake Charles Plant B was built after 1951, and the waste load split between Plant A and Plant B.

(Source: USPHS 1958, 1951)

For industry in the area, the data is in pieces. However, it allows us to get a partial idea of what type and amount of wastes industry was releasing. The 1951 USPHS Drainage Basin

Report states that eleven industrial pollution sources existed in the Calcasieu basin. It does not give the companies' names, simply the type of wastes produced. Note that due to the diversity of processes and products and any one plant, multiple types of waste can come from any one waste source. Of these eleven sources, nine produced organic wastes, but a population equivalent (of 440,000) was only available for one of the plants. Five plants produced inorganic wastes and one had wastes of an undetermined type. Of the eleven waste sources, three had treatment plants with satisfactory treatment, one was in need of a new plant, two were in need of additions to existing plants, and five had undetermined needs. Through these treatment plant data, we discover that the plants in need of additions were a chemical products plant that discharged 7,000 gallons per minute (gpm) of wastewater, and the other, with the previously mentioned population equivalent of 440,000, was a petroleum refinery. The report lists the plant that required no treatment under the category of paper and allied products. The plants whose needs were undetermined include a lumber production business, two chemical products plants, an oil production operation that extracts 3,600 barrels (bbl) per day, and a petroleum products plant that uses 10,000 barrels of crude per day. Using these limited numbers to discover the types and amounts of wastes discharged into the Calcasieu is difficult. Data was not available for many plants, and plants that submitted data did so anonymously and in multiple, differing formats (gpm, PE, bbl/day).

This problem continued in the USPHS's 1957 waste facility inventory. The report listed only fourteen facilities as releasing their waste to the Calcasieu River or one of its tributaries. Twelve of these were the municipal facilities listed in Table 3. The other two waste sources were industrial companies, but data is limited. The first is Lake Charles Petroleum Chemicals, Inc., which only offered that its waste flowed to Bayou d'Inde, and that it was treated. The company reported that it had a waste treatment plant designed to handle a maximum of 100,000 gallons per day with a PE of 1,000, but offered no data on actual waste discharge or treatment. The second company listed was the massive Cities Service Refinery. It offered no data except that its waste flowed to the Calcasieu River, and that it was treated. In addition, company officials may have only been reporting the human waste the plant produced, as they only listed a simple septic tank as their treatment method for their waste. None of the other plants known to be operating and discharging waste into the Calcasieu River Basin gave their information to the inventory. In fact, this seemed to be a statewide problem. Only nine industries reported information for the inventory in Louisiana, making Louisiana's section of the report only five pages long. For the few industries that did report, they gave only estimations of their waste's population equivalent. In contrast, Arkansas took up twenty-six pages of the inventory, listing many dozens of industrial sites. The listings gave detailed information and spanned different industries, with information from petroleum production, refining, meatpacking, canning, and other food industries (USPHS 1958).

It is hard to know who to blame for the lack of information about Louisiana industry. We know that the USPHS reports, at least, were cooperative efforts between federal and state officials. For the 1957 inventory, the USPHS stated, "the active cooperation of the state water pollution control agencies in collecting these data is gratefully acknowledged" (USPHS 1958: iii). Either the SCC is to blame for not collecting the data, or industry is blame for refusing to provide it. Unfortunately, I found no mention of the inventory in SCC records. These records also do not offer much direct information on the amounts of waste disposal in the Calcasieu basin. To begin with, records of the SCC meetings are sparse through much of the 1940s. When SCC members mention Calcasieu waste disposal applications in meeting minutes, many times they do not discuss exact amounts of waste. For the most part, the actual applications with these data are missing.

It is possible to glean some hard data about waste disposal from the SCC's meeting minutes and correspondence. I will convert all measures into cubic feet per second (cfs) for comparison with stream flow data. The first hard data available from the SCC is from 1948, involving the Cities Service refinery. In a letter to the refinery's manager, the chairman of the SCC reports on wastewater samples taken at the plant. The SCC's calculations show that at the time, Cities Service was releasing 470 cubic feet per second of waste with high BOD (12 parts per million). The SCC chair explained that this much waste could easily cause a problem, especially in the summer when stream flow can be as low as 600 cubic feet per second. The SCC records also offer information about the wastes of the Mathieson Chemical Corporation In 1954, Mathieson sent forms to the SCC detailing all of the wastes released to the Calcasieu. This was not an application for new waste disposal, but rather a statement of wastes sent "in accordance with [a] request…" from "some time ago" (Nevell 1954). The list of wastes is shown in Table 4. Mathieson discharged the wastes in three groups. The wastes from Group A flowed to impounding reservoirs to cool the wastes and settle out some solids. They then flowed out to the Calcasieu River, but only during the months of October through February. This was done to avoid disrupting rice irrigation, which occurs during the spring and summer months. The wastes in Group B experienced a high degree of dilution because of the large amount of cooling water that was part of the group. They then flowed to the Calcasieu River through a private ship slip owned by the company. Sixty thousand gallons per hour (2.23 cfs) of cooling water diluted the wastes from Group C. Some of these wastes caused a reaction that pulled some solids out of solution. Mathieson diverted the waste stream to a swamp where the solids settled out of the

Table 4.
Wastes Discharged by Mathieson Chemical Corporation, 1954

Group	Type	Temperature	Content Added	Flow (GPH)	Flow (CFS)
A	Soda Ash Processing	200 F	Dissolved/suspended solids; chlorides	92,000 GPH	3.41
	Shell washing	Ambient	Silt; Calcium carbonates; dissolved/suspended solids	90,000	3.34
	Boiler water	200 F	Suspended solids; Calcium carbonates; chlorides; sulfates	600	0.02
	Brine purification	ND	Chlorides; calcium carbonate	450-600	0.02
B	Boiler blowdown	200 F	Chlorides; dissolved solids; phosphates; silicon dioxide; sodium hydrogen sulfite; calcium carbonate	5,400	0.20
	Service waters (floor washing, etc)	Ambient	Alkali; silt	Unknown	Unknown
	Boiler water	200 F	Suspended/dissolved solids; chlorides; sulfates; calcium carbonate	800	0.02
	Boiler blowdown	200 F	Dissolved solids; calcium carbonate; chlorides; sulfates; phosphates; silicon dioxide; sodium sulfite	2,230	0.08
	Condenser/heat exchanger cooling water	10 to 60 above ambient	None	5,000,000	185.55
C	Process clean-up	Ambient	Hydrazine; aniline	50	<0.01
	Lime kiln scrubber	104-122 F	Suspended solids; Calcium carbonate	300,000	11.13
	Cooling tower	Ambient	Suspended solids; calcium carbonate; chlorides; sulfates; phosphates; silicon dioxide	200	<0.01
	Cooling water	Unknown	None	60,000	2.23

ND = No Data

(Source: Stream Control Commission 1954) stream before the rest of the waste flowed to the Calcasieu River. Unfortunately, this report contains no data on the BOD or any other adverse effects of this waste on the receiving waters. However, if we remove the unpolluted cooling water, we see that Mathieson was discharging approximately 18.2 cubic feet per second of polluted effluent.

Additionally, we can use the estimate developed by the U.S. Public Health Service to calculate approximately the amount of wastes other companies in Lake Charles were producing. The USPHS estimated that for every barrel of crude oil processed, refineries produced one thousand gallons of waste. Because the vast majority of that was cooling water, only one hundred to two hundred gallons were actually polluted effluent. The Continental Oil Refinery was equipped to process 16,000 barrels per day (Flood 1941). Using the USPHS estimate, this refinery was producing anywhere from 1.6 million to 3.2 million gallons of polluted effluent per day. This is equal to 2.4-4.9 cubic feet per second of harmful waste. The Cities Service refinery in Lake Charles processed 70,000 barrels of crude per day when it first opened. Using the USPHS estimate, we can calculate that the refinery was probably dumping seven million to fourteen million gallons of waste per day. These figures are equivalent to 10.8-21.6 cubic feet per second of polluted effluent.

Chapter 5
Reactions to Waste

Legislative Attempts and the Rise of the API

People knew of the harmful qualities of industrial waste since the turn of the twentieth century; this was no surprise. As soon as the Gulf Coast oil boom began, people noticed the effects of oily wastes. Oil companies stored their finds in wooden tank and earthen pits which were vulnerable to leaks and spills. Companies also spilled oil when transferring it from storage to trucks or barges for transport. When kerosene and gasoline were the only valuable by-products of crude oil, many companies simply dumped the leftover product onto the ground or into rivers and lakes. Some plants even used this leftover crude as fuel to power their plants, even though burning it caused large amounts of air pollution (Cobb 1984). No one needed to measure this pollution in terms of biological oxygen demand or parts per billion; it was visible and offensive. Floating oil in harbors, rivers, and on beaches was responsible for killing fish, birds, oyster beds, and for floating fires. Knowledge of the problem even spread nationwide when the Hudson River caught fire in 1921; newspapers nationwide carried the story.

Around the time of the Hudson River fire, local and state governments were attempting to address the new pollution problems. A New Jersey congressman used the publicity of the event to gather support for a bill banning oily waste discharges. Congressmen around the country took the cue and began proposing multiple similar bills. All of this legislation, however, simply showed the inexperience of the congressmen in dealing with industrial waste issues. They did not realize that this complicated issue required more than simply banning oily wastes. The American Petroleum Institute, working in the interest of its members, quickly pointed out the vague and contradictory nature of many of the bills. For instance, the definition of oily wastes was not clear-cut; no one knew the amount of oil in wastewater that would result in the categorization of effluent as oily waste. Refinery operators argued that it was impossible to eliminate all oil from wastewater. The API also noted that in many of the bills, it was illegal to dump oily wastes into a stream or river, but legal to dump directly to the municipal sewer system. This was regardless of whether municipalities had designed their system to handle and treat oily wastes (Gorman 2001).

Vague definitions and contradictions were only the beginning of the problems the government faced in this early stage of combating pollution. No government officials or agencies had any proper technical understanding of the long-term processes and consequences of oil pollution. No legal procedures were in place to regulate or punish offenders. In addition, no effective institutions existed to deal with the pollution problem. Jurisdiction, if extant, fell across many different agencies, few of which had the time or resources to spend on oil pollution. Many state government agencies (fish and game, public health, conservation, and harbor districts) addressed small portions of the problem, but none counted it a major responsibility. On the federal level the Army Corps of Engineers, the Public Health Service, the Bureau of Fisheries, and the Bureau of Mines all had limited jurisdiction over the problem. Like the state agencies, none saw it as one of their major functions. In typical “pass the buck” fashion, none of the agencies took the lead on the problem or helped to coordinate the others (Pratt 1980, Pratt 1978). This is not, however, to insinuate that government officials of the time were bumbling, incompetent idiots. In fact, as Joseph Pratt writes,

> Such problems were to be expected when a political structure inherited from a much simpler age attempted to respond to difficult problems brought about by the very large production of a relatively new product by corporations operating on a scale previously unknown to the region. (Pratt 1978: 9)

Continued public outcry led to federal hearings in the early 1920s. Government leaders even joined in the call for regulation, but their ideas were rooted in a conservation ethic. They were upset at the wasted revenue caused by spilled oil that never made it to market. They also worried that, if wasteful practices continued, domestic oil supplies would run out in ten or fifteen years. However, it proved to be impossible to find a compromise between advocates of regulation and the petroleum industry. Regulation advocates still argued for a complete ban of oily wastes, eschewing any talk of measurements or levels of pollution. Legislators had already passed a ban on discharging oily wastes from ships, and these advocates argued that it was only fair and logical to ban wastes from the refineries at which the ships docked. The refiners continued to argue that it was impossible to eliminate oil completely from their wastewater. This standoff resulted in the Oil Pollution Act of 1924, a useless piece of legislation that only served to reinforce the ban on oily ballast discharges from ships. The act, seen as a victory for the oil industry, only forbade discharges from ships in coastal waters. It completely excluded land-based industrial plants, along with ships on navigable rivers and the Great Lakes (Pratt 1980, Gorman 2001).

So began an era in which the oil industry dominated all discussions and knowledge of technical, pollution, and regulatory issues. The API became a powerful organization, and took a lead role in all of these discussions, once it realized it could control the flow of information (Melosi 2000). The organization funded oil companies' research, along with participating in many "cooperative" studies with various government agencies. The government agencies usually played a minimal role in the studies due to their lack of technical knowledge. This deficit of expertise, plus a lack of funding, forced the agencies to work *through* the oil industry to find the causes and effects of pollution. However, the API held final editing control over the studies, which resulted in a wealth of technical information, but little to no public policy changes (Pratt 1980). This was mostly because it was especially slow to research problems that could result in changes that members did not support. This selectiveness stifled creative research that could show the broader implications of pollution and help plan for the long-term growth of the industry. Confusion also erupted over which research companies should share, and which they should keep secret. Many companies did not want to lose their competitive edge by sharing all of their information with the API, and thus, the entire industry. In 1924 (the same year as the Oil Pollution Act) the API published its first set of official industry standards, which they viewed this as the most useful way of disseminating all of the new information on manufacturing techniques. The standards focused on increasing useful products and reducing waste. These standards were based on what Hugh Gorman (2001) called the efficiency ethic. Efficiency ethic adherents held that pollution was merely a product of poorly designed industrial processes. They trusted that scientific advancements would eventually allow them to find uses for all of their current waste products. This would improve their economic efficiency and automatically reduce pollution loads, thus eliminating any need for federal or state regulation (Gorman 2001; Hays 1959).

These standards, along with the continuing arguments with regulation advocates, helped to entrench the efficiency ethic as the primary strategy used to fend off complaints. The petroleum industry and the API argued that this strategy was justified, both economically and environmentally. They argued that, in line with conversation practices of the day, it would preclude the need for “costly, complicated legislation” (Gorman 2001: 22). In their view, pollution was simply the result of inefficient, poorly designed industrial processes. To improve the efficiency of the plant, engineers would need to design processes that would extract a greater amount of usable products from the crude oil. The API argued that, since this would increase profit for the plants, this was something on which engineers were already working. Improving efficiency in the plants would also lead to a reduction in waste, and thus, less pollution. This normal business practice of attempting to increase profit was consequently, in the view of the oil industry, serving the public good along with functioning as a form of self-regulation.

The movement of the API into the waste disposal arena continued throughout the 1920s and 1930s. The Army Corps of Engineers issued a report stating that coastal water quality had improved since the passage of the 1924 Oil Pollution Act. However, the report also asserted that refinery pollution was still a problem, as it was interfering with the decomposition of municipal sewage and threatening fish and shellfish populations. The Corps suggested either recovery devices at refineries to reduce discharges, or a complete discharge ban (Gorman 2001). This report, along with resurrected legislation attempts, prompted a practical response from the API. Their technical committees put together a report claiming that 181 plants emitted no pollution at all. For ninety-three other plants that were polluting, the committees made recommendations for changes that would supposedly fix the problem. This "good-faith" promise, along with a great deal of behind-the-scenes political bargaining, resulted in the failure of the pending legislation. The technical committees promised to continue this policy of self-regulation by making frequent recommendations on waste disposal procedures to offending plants. Of course, giving the petroleum industry free rein on regulation meant that they could be as harsh or lax as they wanted. In addition, companies were only given recommendations; if the suggestions were not viewed to be cost-effective, they usually were not implemented (Gorman 2001). Legislators proposed another bill to ban oily discharges in 1930, and the API responded once again with self-regulation, by publishing a multi-volume manual on the disposal of refinery wastes. The manual called for three pollution-reduction strategies: more efficient oil separators, better sewer design, and the recovery and reuse of spent chemicals. The API also discussed other measures of pollution besides oil concentration, such as biological oxygen demand, pH, color, turbidity, and taste-causing agents (API 1930). This was the first time any industry experts had come close to suggesting what would eventually become the backbone of environmental regulations: standard setting (Gorman 2001). However, the API stated that they believed it was impractical for the government to set standards, as every case should be considered separately. Their excuse was that one must consider the unique ways others utilized the receiving stream, along with the specific types of waste for each individual case (API 1930). This would become the backbone of the API's argument against pollution regulations.

Instead of worrying about standards, most operators simply attempted to keep discharges below the level at which they would become obvious to the public. This was easy to do if the effluent did not have taste-causing characteristics. However, the manual did not have much effect on waste management in the industry. Refinery operators saw the upgrades as a significant expense with not much return. By 1940, most refineries had not met the goals set out by the API, and many who achieved waste reduction did so by diluting their waste with more cooling water. They were releasing the same amount of waste, but they made it less noticeable. The API released multiple technical manuals every few years, but they were essentially identical. Though they offered more information about improved waste treatment methods, it was up to the refineries to implement these methods or to ignore them. The reports also continually refused to admit that oil pollution was detrimental to streams. They repeated the same arguments about analyzing each stream pollution case separately, because wastes may or may not be harmful depending on the characteristics and uses of the waters, and the characteristics of the wastes (API

1953; API 1949). This flawed logic was the equivalent of the “If a tree falls in the forest...” question. If a refinery pollutes a stream that no one uses, is it really polluted? Thus, refineries and chemical companies based their standards on the proximity of the waste stream to public water intakes. If noxious tastes and odors caused complaints, plants were more likely to enforce standards. However, if no municipalities were downstream to offer complaints, the refineries were able to continue their practices (Gorman 2001). This suggests that the API was not interested in either environmental quality or economic operations of plants. They were merely concerned with preventing federal regulation, and they were in the perfect position to do so. They had a monopoly on power and technical knowledge in the arena. Consequently, they could define the boundaries of debates on pollution controls and limit the focus of any investigations. They did not see themselves, however, as brash polluters, but as proactive in the fight to reduce waste. In their view, if a refinery was comfortable with the amount of material they wasted and no one in the public complained about the effects, there was no problem.

The federal government made a feeble attempt to regulate water pollution in 1948 by passing the Federal Water Pollution Control Act. The act called for the federal government to get involved in pollution abatement, but only if it involved a watercourse that crossed state boundaries. The surgeon general could then attend to the problem if pollution from one state endangered public health in another state. However, even if this occurred, the surgeon general could only provide modest technical and financial assistance. The act authorized him to “notify the polluter and appropriate state agency of the problem and specify a time limit for its abatement” (Milazzo 2006: 20). If he got no response, he could send a second notice, and then convene a public hearing board to discuss abatement measures. If the polluter still ignored the recommendations, the Federal Security Agency could request that the attorney general file suit, but only if the state in which the pollution originated gave consent. However, the state usually was not motivated to do so, as it was usually more concerned about the economic impact of abatement than about the protests of downstream neighbors (Milazzo 2006). Thus, the act attempted to pave the way for federal action in water pollution abatement, but was completely ineffective because of its weak enforcement methods. Congress granted the law a three-year extension in 1953, but its other actions showed that it did not intend to support enforcement efforts. The appropriations committee cut off funds to state pollution control programs, along with loans for construction of water treatment plants. By 1955, not a single abatement order had been issued under the act's provisions, and the appropriations committee denied an increase in funding for enforcement, stating that the act was almost unenforceable. The only positive effect of the law was that it provided funding for research into water pollution issues (Milazzo 2006).

Consequently, there was a distinct lack of detailed federal requirements in the waste disposal arena between 1940 and 1960, and this left manufacturers accountable for their own disposal practices (Colten 2004). State authorities did not object to this situation, however, as they vehemently opposed federal regulatory authority (Melosi 2000). The API took control of the flow of information and technical knowledge, which allowed them to deflect further criticism and attempts at regulation. At the same time, the petroleum industry was growing at a faster rate than ever before, and "wartime industrial expansion [had] sacrificed waste treatment to military priorities" (Colten 2001: 147). Additionally, the petrochemical industry was developing as a viable, separate industry. Many new products had come out of the wartime research of the petroleum industry, and demand was increasing for these products. Several major petroleum companies moved into petrochemicals, along with the multitude of new startups. This increase in output for the petroleum and petrochemical industries meant an increase in waste and waste management problems.

Public Reactions

Joseph Pratt attributes most of the environmental problems of the first half of the twentieth century to the combination of this massive industrial growth and little planning, foresight, or regulation. He defines four "missed opportunities" of the 1920s. First, researchers should have monitored the long-term effects of the waste problem. Secondly, policy makers should have created stronger, better-funded public institutions that could have dealt with these pollution issues. Finally, two changes in attitude would have been required. Oil industry leaders should have reassessed their attitudes towards their responsibility in controlling pollution, and government leaders should have loosened their reliance on business-dominated cooperative efforts. These missed opportunities led to a backlog of problems that were difficult to solve because

> "environmental problems neglected during the introduction of an energy source must be adjusted after the society has become organized around this form of energy, often through much disruption and discomfort." (Pratt 1980: 29)

The petroleum industry had become such an integral part of the infrastructure that it would be much too difficult and expensive to change the way it functioned just for the sake of pollution abatement. The "missed opportunities" that led to this situation, however, were merely part of a larger overall problem: a failure to address waste management problems in a systematic way during the early twentieth century. Instead, industry leaders and government officials created ad hoc solutions for problems they viewed as temporary. Thus, a lack of dedicated comprehensive pollution policy characterized the first half of the twentieth century. This situation existed mostly because the people most affected by the pollution did not have access to government officials, whereas the oil industry enjoyed “direct, systematic access” (Pratt 1980: 60). When pollution affected the public, they usually responded in the same way. They first registered complaints with institutions that had some authority over pollution. Only when the problem was great enough to threaten the public image or political power of the oil industry was the problem taken seriously. Then, government authorities would create a temporary arena to study the problem, usually with cooperation from industry.

By the 1950s, however, this cooperative system was beginning to show its weaknesses, and federal government officials finally had to up the ante. The Corney Creek case was the first example of federal intervention into a state’s pollution problem. By 1957, residents and local groups in northern Louisiana were still complaining to governmental organizations about their pollution issues, specifically the decline of local sportfishing. Brine and oily wastes released from Arkansas oil fields had been making their way across the border into Louisiana through Corney Creek for years, killing fish and making the water unsafe for cattle and crops. This case demonstrated a few characteristics of pollution control in the South that differed from other parts of the country. First, local residents viewed the state government as uncooperative. They complained to parish officials, who then took the claim to the federal government. In the case of Corney Creek, residents had two extra reasons to push for federal intervention. Corney Lake was an impoundment of Corney Creek created in 1938 under a federal Soil Conservation Service program, and federal authorities still managed it. Secondly, the pollution problem was an interstate issue, with both state governments seemingly unable to control the pollution. The other Southern characteristic that Corney Creek demonstrated was a focus on pollution’s damaging effect on community natural resources, such as fish, wildlife, and agriculture, instead of dangers to public health. Although the U.S. Public Health Service would be investigating the matter, Corney Creek residents were concerned primarily about the loss of their fundamental cultural activities: hunting and fishing (Colten 2006). Regardless of the focus, Corney Creek was the first major example of federal intervention in local pollution matters. Colten (2006), and others, posit that Corney Creek was chosen for the first federal interstate pollution intervention because of its rural nature. They specifically avoided the Midwest/Northeast industrial corridor at first, because they wanted an "easy win" on which to field-test the process. Corney Creek was the first salvo in what would soon become a major federal push to reduce pollution.

Federal intervention, however, did not occur spontaneously. It was the result of a growing public outcry over increasing amounts of industrial pollution. When industrial corporations made decisions based on economic self-preservation, the public had to deal with the social and environmental consequences of those decisions (Douglas 1983). The idea that pollution was the "price of progress" was at the base of efficiency ethic, which also asserted that continued progress would reduce the initial pollution. By the 1950s, however, the efficiency ethic was losing steam. The "price of progress" idea came to a head during World War II, when nationalistic and patriotic concerns dominated. Now, the rhetoric asserted, "progress" was required to save the world from fascism. During this period industrial growth accelerated without the same acceleration in pollution control (Melosi 2000). The public was well aware of the growing pollution problem, but were told that it had to wait until after the war, because at no time would industry be more necessary than wartime. Trade literature of the day offers multiple examples of this attitude, as writers addressed pollution as a post-war problem. Many article titles and subtitles include statements such as "…public clamor for clean streams has forced anti-pollution legislation to a number one spot for postwar action" and "When war production ends, stream pollution will receive more attention" ("Industrial Waste…" 1945: 117; Mohlman 1945: 20).

However, in the post-war era, America saw a substantial growth in its middle class. The baby boom, along with its growing suburbs full of affluent middle-class workers, resulted in a population with more free time on their hands. This growth in leisure time meant a growing demand for recreation, much of it outdoors. Man's natural affinity for water led him to the nation's streams, lakes, and oceans, where he could see the damage done by oil pollution. Now most of America was witnessing the pollution problem first hand, not just the anglers, hunters, naturalists, and conservations leagues (Berry & Horton 1974). Consequently, attention on the problem, along with a public outcry for change, increased by orders of magnitude throughout the 1950s and 1960s. Industry's monopoly on research, legislation, and regulation was beginning to loosen. However, industry did still have a firm hold on its workers, so they were not able to add their voices to the ones who were complaining. Unions were still very rare in southern industry, thus denying southern workers a chance to organize against growing industrial pollution problems. Evidence suggests, however, that even if unions had been common in the South, they might have not been involved in environmental issues. Organized labor nationwide was largely opposed to environmental regulation, and generally saw themselves as the antithesis of the environmental movement. They were afraid that environmental regulations would cost precious industrial jobs. In fact, the BASF lockout in Geismar, Louisiana demonstrates the very late arrival of union to environmental issues. This 1984 struggle was one of the first major examples of unions working with environmentalists in the South (Minchin 2003).

The long, arduous process of implementing effective water pollution control, and wresting power from the hands of the petroleum industry began in the early twentieth century, and has continued to the present. Public attention to the problem increased over the first half of the twentieth century, bringing more light to the problem. People recognized that self-regulation by industry was failing, and that federal intervention efforts had been far too weak and fragmented. They continued to press for better control of petroleum industry wastes, as they had for fifty years. Thus, the popular account of a sudden environmental consciousness from the public, along with "environmental law springing full blown from the U.S. Congress" after Earth Day in 1970, is a vast oversimplification of a complex process nearly one hundred years in the making (Davies & Mazurek 1998).

Chapter 6
The Industrial Landscape of Lake Charles

Lake Charles and the War

One of the first industrial companies to take advantage of the new amenities offered by Lake Charles was the Mathieson Corporation. This company earned the title "the father of Lake Charles Industry" for its role in starting the city on its way to becoming one of the major Gulf Coast industrial centers. In 1933, the Mathieson Corporation announced that they would build a plant in Lake Charles, and by 1936, it had completed the massive Mathieson Alkali Works. At a total cost of 7.5 million dollars, the plant was the first industry located on the new deep-water channel (Little 1965, Jones 1967). It produced caustic soda, soda ash, salt cake, ammonia, and soda bicarbonate. These industrial products are "essential to the glass, soap, rayon, textile, and oil industries, and are among the basic chemicals most widely used" ("What the Chemical…" 1942: 22). The Mathieson plant was also one of the first examples in the country of industrial expansion for World War II. In early 1942, Mathieson accepted a Defense Plant Corporation contract to begin construction on two new plant expansions at their site in Lake Charles: a synthetic ammonia plant and a magnesium plant ("Another Look at…" 1942). The magnesium plant used mined deposits of dolomite ore, which were then ground and treated with calcium chloride to produce magnesium chloride. Mathieson then used ammonia from its ammonia plant to put the magnesium chloride through an electrolysis process, the result of which was magnesium and chlorine ("What the Chemical…" 1942). The output for the magnesium plant was 36 million pounds annually, much of which other industries used in the manufacture of airplanes and bombs ("Another Look at…" 1942). Many of the other substances Mathieson produced were also vital to the war effort. Ammonia was important for the manufacture of fertilizers and plastics. Chlorine, although useful as a weapon, was also a water purifier, a bleaching agent for textiles and paper, and a raw material used in the manufacture of vinyl chloride plastics and synthetic rubbers.

The Mathieson Alkali Works was the first heavy industry into the city, but oil refineries would prove to be the most prominent new feature in the Lake Charles industrial landscape. The Continental Oil Company was the first to build a major oil refinery in the area. Announced in 1940, the plant commenced operations in 1941, with an initial capacity to process 7,000 barrels of crude oil per day. Continental sited the plant, along with Mathieson, across the Calcasieu from the city of Lake Charles. In a 1964 study of industrial land uses in Calcasieu Parish, the Arthur D. Little firm concluded that many industries located across the river partially because of the significantly lower effective tax rate in that area, known as Ward 4 (Little 1964). The Continental refinery was a very modern operation, utilizing techniques developed just before the outbreak of the war that minimized waste during the refining process. The excess and lower-quality gases that are the result of many refining processes were, at this plant, “reformed and combined to produce motor fuel and … plant fuel,” making this “one of the most efficient ever constructed” (Flood 1941: 34). The refinery originally cost $4 million to build, but soon expanded to take advantage of the vast local resources. Continental began pumping in additional resources from the Ville Platte Oil Field and Tepetate Oil Field north of Lake Charles, amounting to about 10,000 barrels a day of crude and 6,000 barrels a day of PBC (propane-butane-casinghead) stock. The company added another pipeline to take advantage of the oil from the Jennings Field south of the city, and by 1950, the plant’s investment had grown to $27 million. The plant produced motor and aviation fuel, which were essential to the war effort, along with diesel and tractor fuel, kerosene, heating oil, and heavy residual fuel oil.

The refinery with the biggest impact on the city during this wartime expansion period, however, was the Cities Service Refinery. Announced by the Defense Plant Corporation in 1942, it began production in early 1944, as one of the very few completely new complexes built for the war effort (Jones 1967). One of the biggest industrial complexes ever built, industry and public alike hailed it as an engineering and technological marvel. The oil refinery initially only fulfilled the need for 100-octane aviation fuel, but the Defense Plant Corporation soon supplemented this with attached butadiene, synthetic rubber, anhydrous ammonia, and magnesium plants (along with a railroad and electricity generation facility). The DPC funded this agglomeration because of the amenities Lake Charles had to offer, but the site was not their first choice. When Cities Service administrators and engineers were looking for a plant location, they initially chose St. Rose, Louisiana. A Cities Service terminal was already located in this small town just upriver from New Orleans. However, other refineries had already claimed all of the supplies of crude extracted from and shipped to this area. Cities Service began looking for another site, but they had very specific needs. They initially required 600 acres, with more available nearby for expansion. They also required a supply of 70,000 barrels of crude oil per day, along with a supply of cheap natural gas to power the refinery. For processing and cooling, they would need a source of 206,000 gallons of water per minute, equivalent to the needs of a city of 3.25 million people. Finally, the refinery would require stable land, a deepwater ship channel, and adequate land transportation routes (Land 1994). The officials began looking at the Texas Gulf Coast, but the Louisiana administration (headed by Governor Sam Jones from Lake Charles) began a campaign to lure them back to Louisiana, specifically, to Lake Charles. The Cities Service officials claimed that they would save between $400,000 and $750,000 in taxes by locating in Texas rather than Lake Charles. In an extraordinary example of Southern boosterism, Governor

Jones countered this by making a personal visit to Cities Service headquarters in New York City. With no real authority to do so, he promised Cities Service that the legislature would repeal a one-cent-per-barrel refining tax, and that the city of Lake Charles would provide a ten-year full tax exemption. This was part of Jones' agenda of focusing on postwar economic growth even before the war ended. He meant to take advantage of wartime industrialization and get as many federal dollars as he could for Louisiana. He was also the first governor to break the Long family dynasty in Louisiana politics. He believed that the Longs had developed Louisiana in a welfare state, and wanted to shift citizens' dependence from the state to industry by bringing in industrial jobs (Cocreham 1971). To do this, Jones planned to attract industry by advertising the state's natural resources and new political climate. Speaking to the state's Economic Development Committee in 1943, he worried about the loss of jobs after the war. He proposed draining and cultivating more land, and increasing forest production, oil production, refining, and chemical manufacturing. He even spoke of attracting industry to use Louisiana's sources of clay and peat (Jones 1943). In the case of attracting Cities Service, Governor Jones came through on his promises. The ten-year exemption passed almost unanimously in a vote by the people of Calcasieu Parish, and the legislature repealed the refining tax, albeit after a long fight on the floor. The political maneuvering paid off, and Cities Service decided to build the plant in Lake Charles. Governor Jones was later happy to take full credit for the industrialization of the city, and his friends were willing to give it. One of his advisors later wrote a short, but glowing, biography that claimed a direct connection between Jones' company headquarters visits and the industrial growth of the city (Jones 1967; Cocreham 1971).

The plan for the Cities Service plant initially met some resistance, however, as it was one of the few brand new plants built, at a cost of $80 million. People wondered why the government spared no expense to build this facility, when another they could upgrade an existing facility for a lower cost. Defenders of the plan argued that the facility was justified due to the "immediate, demanding necessity brought about by the war" (Foster 1944: 84). Assistant deputy of the Petroleum Administration for War Bruce Brown stated that he approved the project because "it gave promise of producing a very large quantity of aviation gasoline with a moderate use of construction materials at a very low cost" ("War Plant Yields…" 1943: 24).

Planners sited the refinery west of Lake Charles at Rose Bluff, a plateau above the Calcasieu River. Borings showed the 2,300-acre site to have the stable land needed for supporting the heavy refinery equipment. At 18 feet above sea level, it was also safe from flooding, unlike most of southwestern Louisiana. The M.W. Kellog firm won the contract to build the massive facility, and construction turned out to be a colossal undertaking. The contractors hired 11,000 construction workers, who put in 20 million man-hours of work. Quick-thinking entrepreneurs bought used school buses and created their own bus lines to transport workers to the site. Some workers came from as far away as Lafayette (80 miles) and Ville Platte (100 miles). Cities Service even built a planned suburban community, Maplewood, to house its workers. On a cleared one square mile plot of land, they placed 789 one-, two-, and three-bedroom homes for workers to rent (Land 1994). By the end of construction, the Cities Service Refinery consisted of 114 buildings, 385 general process towers and tanks, 4,095 controls on twenty-four control boards, 800 pumps, 2.5 million linear feet of pipe, 6 million linear feet of tubes, 140 oil storage tanks capable of storing five million barrels, and three main docks on the Calcasieu River Channel (Land 1994; Foster 1944). Planners carefully designed the docks to keep waiting times to a minimum during the demanding war period. They constructed two docks for tankers and one for barges, with loading capacities of 17,000 barrels per hour of gasoline and unloading capacities of 52,800 barrels per day of crude oil (Foster 1944). They also incorporated a tank farm of twenty 80,000-barrel petroleum tanks that already existed on the site into the facility. The large size of the facility was necessary because of the massive outputs required by the war. The refinery had a processing capacity of 70,000 barrels of crude oil per day, while the butadiene plant produced 55,000 short tons of butadiene per year. To increase the efficiency of the plant, and increase the output, Cities Service had separate laboratories for the basic refinery and the butadiene plant, along with a small pilot plant. New ideas and processes took shape in the labs, and then engineers tested them in the pilot plant. In all, the Cities Service facility would produce 25 percent aviation-grade (100-octane) gasoline, 21 percent butanes, 13 percent 80-octane gasoline, 11 percent motor gasoline, 8 percent kerosene, 11 percent furnace oil, and 11 percent fuel oil (Land 1994). This suggests what a great priority the war effort had over domestic fuel needs.

The Cities Service Refinery presents an effective example of an economy of scale, where enlarging the size of operations lowers production costs. War planners, wanting the most efficient output of war fuels and materiel, built the biggest plant they could imagine. The U.S. government was impressed with the initial success and efficiency of the operation; they soon directed the Defense Plant Corporation to supplement the Cities Service refinery plant with butadiene, synthetic rubber, anhydrous ammonia, and magnesium plants (Jones 1967). An economy of agglomeration also began to develop in Lake Charles with the concentration of other industries. Different levels of industry congregated in places that would expedite the creation of finished products, thus further lowering production costs (Figure 3). The Continental Oil and Cities Service refineries located in Lake Charles because of the city’s proximity to needed resources.

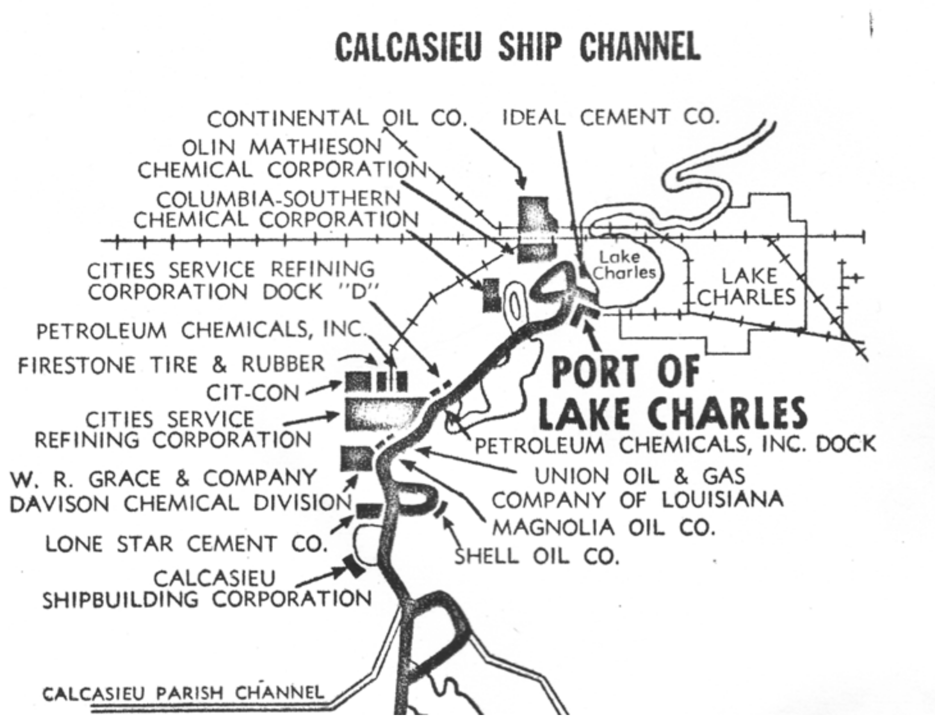

Figure 3. Economy of Agglomeration
(Source: Charles 1958)

When Firestone Tire and Rubber Company moved into Lake Charles, they did so for the same reasons, but their primary resources were the oil refineries' finished products. Cities Service had just constructed their massive butadiene plant, providing a convenient source of the materials Firestone needed to create synthetic rubber. The Firestone Corporation was literally across the street from their needed resources. This lowered transport costs, thus lowering total production costs and creating an economy of agglomeration. The Firestone plant opened in 1943, located right next to the Cities Service Refinery on the Calcasieu Ship Channel, and was able to produce 60,000 long tons of synthetic rubber per year (Jones 1967). With this plant, Firestone became the first company to manufacture synthetic rubber in a government-owned plant. It was one of several the company would build around the country for the war effort (the War Production Board set a production quota of 338,000 tons of synthetic rubber for 1943), and this expansion would secure the company an even more advantageous position in the post-war economy ("Chemical Industry Playing…" 1942). In fact, all of the companies that operated plants in Lake Charles would assume full ownership after the war, so their motivations were most surely not only of the patriotic variety.

All of this wartime expansion had a significant effect on the character of Lake Charles. When an Allied supply mission toured the industrial facilities of the area, they were more than impressed. They defined industrial expansion in the city as the conversion of a pine forest into four "great war plants including the largest aviation gasoline refinery in the world" (Allied supply mission… 1944, 12-A). War industries totaling $200 million in investments had been located along the Calcasieu River and Ship Channel in Lake Charles, and this permanently changed the city's landscape and character. First, it changed labor availability in the city immensely. The Bureau of Labor Statistics stated that the effect of the war on the Lake Charles area began with the arrival of troops and personnel to the many Army camps that surrounded the area. The real growth, however, began with the construction of the plants. In May 1943, at the height of the construction period, more than 13,000 workers were involved in construction projects in Lake Charles. Once the plants were finished, numerous manufacturing jobs became available. By the end of 1943, 4,900 people worked in manufacturing, and this number generally increased, with fluctuations, to 5,100 by fall of 1944. This is more than a doubling of the pre-war manufacturing numbers of 2,100 (Department of labor… 1945).

Arthur D. Little's 1965 report on prospects for further industrial development in the city claims that not only was the available amount of labor a great attraction for industry, but also the character of the labor was the best any industry could hope for. The report states that skilled workers were plentiful and diverse in their specialties. It also states that labor relations are the best along the Gulf Coast, with Lake Charles having fewer days lost to work stoppage than any other city in the region (Little 1965). There was one major work stoppage, but it was unusual in that it did not address working conditions or wages. In 1945, Cities Service workers went on strike to protest high rents in the Maplewood neighborhood. Although developers created this neighborhood for the sole purpose of housing Cities Service employees and their families, the Cities Service Corporation stated that they did not own or operate Maplewood and had to no connection with the rents charged. The Maplewood Housing Company was actually in charge of rents, but the workers felt the most effective way to get their message across was through a strike at the refinery. Tensions immediately rose, as it was still wartime and a critical war products plant was in danger of shutting down. Louisiana governor Jimmy Davis appealed for federal intervention, and President Truman sent a representative from the Petroleum Administration to mediate, along with a stern message from Secretary of the Interior Harold Ickes. Finally, on April 11, 1945, Truman sent 150 Army military police into the Cities Service refinery. Six days later, the men of Maplewood voted to return to work, and this incident remained the only major work stoppage in the area for years (Ross 1990).

Post-War Growth

Growth in one economic sector results in growth in other sectors, according to the model of cumulative causation. New manufacturing workers need new housing, schools, shops, infrastructure, and services. This is evident in the growth of population and of other services in Lake Charles. The city, and the whole parish, developed an accelerated growth rate in the 1930s, when industry began to move in. At this time, the parish contained only 1.38 percent of the state's population. Beginning in 1940, however, the parish began to grow at a much higher rate than both the state and the entire nation. Construction workers moved in to build the new plants, giving Calcasieu Parish the highest growth rate of all parishes in Louisiana. Most of the workers came from the surrounding parishes, many of which soon developed a marked negative growth rate. Additionally, most of the incoming labor force was young. Fifty percent of the Lake Charles labor force was under thirty-five, compared to a national average of 38 percent (Little 1965). Thus, many of these workers were just beginning families, so the birth rate in the parish experienced a marked increase (Little 1964). From 1930 to 1940, the population growth rate in Calcasieu Parish was 27.9 percent, but by the 1940-1950 decade, it had jumped to 58.6 percent. The rate increased even further, to 62.3 percent, during the 1950-1960 decade. By 1960, the parish contained 4.47 percent of the state's population (Little 1964). For a rural portion of a state with sixty-four parishes, this is an unusually high number. According to former governor Sam Jones in the *Centennial History of Lake Charles* (1967), in 1940 agricultural income equaled five times manufacturing income. By 1950, however, industrialization had reversed these figures. This trend continued for the next two decades, and by 1967, manufacturing income was twelve times that of agricultural income. In this time, the number of industrial companies in the Lake Charles area had increased from three in 1942 to sixteen in 1967. In the same period, individual plant units had increased from three to forty-five. To accommodate all of the new workers and their families, the city built an astonishing thirty-four new public school buildings between 1940 and 1950 in the greater Lake Charles area (Jones 1967). This large investment in public education paid off, as Arthur D. Little, Inc. reports that by 1965 the average level of schooling for the population of the city had increased rapidly. In fact, Lake Charles was catching up to the national average level of schooling, while Louisiana as a whole was still lagging far behind (Little 1965).

Growth of the industrial sector in Lake Charles did not stop or slow down after the war. Companies who had been running the plants purchased them from the government and expanded them, while new companies were also moving in and purchasing facilities. These expansions resulted in a larger amount of finished products, but also more byproducts for which there was no market. However, the newly burgeoning petrochemical industry moved in to fill this need. The result was more agglomeration and a shift from war production to production of peacetime products and petrochemical stock. The Mathieson Corporation offers a good example of this quick expansion. Mathieson Corporation began expanding their Alkali Works facility as soon as the war ended. They also bought an anhydrous ammonia plant and converted it to produce the makings of fertilizer. By 1947, their soda ash capacity had doubled the 1940 figure. In 1948, the company built a sodium nitrate facility to work with the products from the nitric acid plant they bought from the Defense Plant Corporation after the war. Just before the company merged with Olin in 1954, they built a hydrazine plant. Ten years later came the construction of the world's largest ammonia plant, so that by 1967 the Mathieson facility was ten times as big as it was when first built in 1934. Other companies, old and new, also joined the push to expand. Continental Oil, now known as Conoco, enlarged its facilities, moving heavily into petrochemicals, so that by 1967 its capacity was nine times as much as it was in 1941. Firestone purchased its facility from the DPC in 1955 for $13 million, and expanded it so that by 1967, it was four times as big as it was in 1943. Cities Service and Conoco also joined forces to buy a refinery, which they dubbed the Cit-Con Refinery. Columbia Southern Chemical, a new company later known as Pittsburgh Plate Glass (PPG), bought a magnesium plant. With no viable peacetime use for magnesium, however, they converted the plant for petrochemical manufacture. Other companies took over the infrastructure attached to the industrial area. Gulf State Utilities Company bought the power plant that ran the industrial complexes. Kansas City Southern and Southern Pacific railroad companies even bought the railways that serviced the plants.

Two companies that moved in to Lake Charles in the 1950s offer more examples of economies of agglomeration. The Lone Star Cement Company built its facility in 1956, using local clay and shell to make cement. Mathieson also used local shell as one of its production materials, and Lone Star bought the shell that Mathieson considered unusable. Hercules, Inc. built a polypropylene plant in 1959 to make plastics. This company made their product from the propylene that Columbia Carbon produced across the street. In turn, Columbia Carbon got its source materials from the Cities Service Refinery, which was just across another street. These two examples show how agglomeration can benefit all levels of industry. In Lake Charles, new industrial neighbors offered not competition, but a market for finished goods and waste products.

Local officials approved of this industrial development as beneficial for Lake Charles and Calcasieu Parish. They did all they could to encourage more industrial expansion and agglomeration. The Davison Chemical Division of the W.R. Grace Company constructed a facility in Lake Charles in 1953, and the story of their arrival demonstrates the eagerness of local officials concerning incoming industry. In 1951, representatives arrived in Lake Charles on a Wednesday to begin scouting for a suitable plant location. They gave local officials a list of requirements. The Port of Lake Charles already provided their first requirement, deep-water access. Local authorities took care of their second and third requirements in only one day. The company needed an industrial tax exemption, which the city and parish government officials immediately offered, and a railroad to the site. One of the local officials made a quick call to a friend at the railroad's main corporate office, and had an agreement arranged by Thursday. They also quickly helped choose a site for the refinery, suggesting an area called Vincent’s Landing.

The last requirement seemed to be the toughest: representatives needed assurance that they would have clearance from the Stream Control Commission to use river water for processing and waste removal. Local officials worked hard over the weekend, and secured clearance from the SCC by Sunday. As a result, it only took local officials from Wednesday to Sunday to meet all of the demands of the W.R. Grace Company. By 1953, the company completed construction on their plant, which produced sodium silicates and catalysts for petroleum catalytic cracking. The plant would soon be the main supplier of catalysts for almost all of the Gulf Coast refineries (Jones 1967).

With economies of scale and agglomeration in full swing, and local officials doing all they could to attract new companies, by the mid-1960s Lake Charles had taken on a distinctly industrial flavor. The best indications of this come from a series of reports by the firm Arthur D. Little, Inc. The firm presented the reports to the Lake Charles Harbor and Terminal District as guides on how to attract even more industry to the city. Two reports presented on April 17, 1964 were titled “An Economic Base Study of Calcasieu Parish” and “The Role of Industrial Promotion in Calcasieu Parish’s Development.” The former gave a basic review of the demographics of the area, and the latter reviewed the economic incentives offered by local and state governments to industry wishing to locate in the Lake Charles area. The final report, dated June 1, 1965 is entitled “Prospects for Industrial Development in Calcasieu Parish,” and reviews some of the history of industry in the city along with many of the capability and specification factors of the area.

Most importantly, the Arthur D. Little reports review, and quantify, the massive industrial growth of the city, along with showing some major factors that may have influenced this growth. The reports begin by stating that, since 1944 when Cities Service built their facility, petroleum refineries have employed more people in the manufacturing sector than any other business in Lake Charles. In an effort to explain why so much of the petroleum and petrochemical industry chose Lake Charles, the authors then review the promotional efforts of local and state officials. They believe that the first major promotion that influenced the continuing industrialization of the city was the ten-year tax exemption offered to incoming industry. Police Jury records show how they implemented this exemption in Lake Charles. In a May 5, 1942 meeting, the Calcasieu Parish Police Jury discussed the new Cities Service project, along with possibilities for other Defense Plant Corporation projects. Local business leaders urged the Police Jury to consider a ten-year tax exemption. They argued that the tax exemption would be instrumental in the DPC's choosing Lake Charles as the site for more plant projects. They extolled the benefits the new plants would bring, such as added payrolls and economic stability. Police Jury members complied with their wishes, issuing in the same meeting Ordinance B-471, which called for a parish-wide special election on the matter of exempting new industry from all general and special taxes. Voting occurred on July 14, 1942, and the proposition passed nearly unanimously, with 1,062 voting yes and 13 voting no (Calcasieu Parish Police Jury 1942). The second major promotion began with the 1952 state constitutional amendment that allowed cities to finance industrial development projects. Now Louisiana cities were free to issue bonds to pay for new plant facilities, with the only restrictions being that the bonds must be less than twenty percent of the total community assessment, and that two state boards (the Bond & Tax Board and the Commerce & Industry Board) must review and certify the bonds (State of Louisiana 1955). The report states that by 1964, nineteen plants had utilized this provision, receiving a total amount of $12,630,000. A third promotion for industrial development was a financing plan available through the Lake Charles Harbor and Terminal District (LCHTD). Like in the plan offered by the constitutional amendment, the LCHTD could issue bonds for property purchase or building construction. This plan had a clear advantage over the municipal bonds, however, as no public voting was required, and there was no limit to the bond's size. In addition, for the municipal bonds, any local competing industry would have to give their consent for the city to issue the bond. For bonds issued by the LCHTD, this was not the case (Little 1964).

Arthur D. Little, Inc. gives these promotions some of the credit for the massive continuing industrialization of the Lake Charles area in the 1950s and 1960s. They begin their quantification of this industrial growth by stating that the character of the Gulf Coast at this time was one of rapid growth in general. The 1950s were the beginning of a post-war boom for the area, with the major portion of the growth between the years 1954 and 1958 (subsequent to the 1953 amendment). The reports attribute most of this growth to the rise of the petrochemical and chemical industries. By 1962, thirty-four of the seventy-five new American petrochemical plants were located on the Gulf Coast. Calcasieu Parish and Lake Charles received much of this growth. In the ten years after 1955, investment in the petrochemical industry rose 17 percent per year in Calcasieu Parish, compared to national average growth of 12 percent per year. Investment in the area was not limited to new companies, either. Both Cities Service and Continental Oil moved into the petrochemical arena, extracting and selling aromatics from their product stream. Cities Service produced orthoxylene and Continental Oil produced benzene, further diversifying its operations (Little 1965). All of this new activity continued to increase employment. Jobs in the chemical plants and refineries rose 28 percent from 1950 to 1960. From 1956-1962 the industries accounted for 32.4 percent of new jobs created in the parish. In the same period, this industry took an even more dominant hold over the manufacturing sector in the parish. In 1950 petroleum and petrochemical jobs accounted for 68.7 percent of manufacturing jobs in the parish, but by 1960, this figure rose to 73.8 percent. These two industries also were extremely high-capital industries, bringing in not only jobs, but also large amounts of capital and investments. From 1956-1962, they accounted for 71.9 percent of the manufacturing capital expenditures (Little 1964).

Of course, there is another side to all of this industrial development. As Martin Melosi wrote, "It stands to reason that two factories in close proximity compound the stress on the environment" (Melosi 1980: 8). In Lake Charles, multiple companies were building, then expanding, numerous plants, each producing several different types of waste. None of the Arthur D. Little reports mentions anything about the environmental impact of this new economic development.

Chapter 7
Reactions to Pollution in Lake Charles

The true focus of this research is the reaction, from both government and citizen, to the increasing water pollution load in Lake Charles during industrialization. Lake Charles had developed from an agriculturally based small city to a quickly urbanizing, heavily industrial zone in the span of 20 years. Industrialization brought people, jobs, economic prosperity, and trade links with the world. Unfortunately, it also brought heavy pollution loads, and transformed the river, which had been the heart and lifeblood of the city for many years. People used the river for watering cattle, commercial and game fishing, bathing, swimming, and transportation. Pollution also affected the river's use as an industrial water supply, which was its original appeal for many of the companies moving to Lake Charles. This chapter will trace the actions of the both government and citizen during the rise of industry and water pollution in Lake Charles. It will investigate whether wartime priorities were powerful enough to overshadow growing pollution threats. It will also examine whether local and state government were more dedicated to promoting industrial growth or to protecting citizens and natural resources. Finally, it will look into the focus of any pollution abatement movements to find if they focused on public health or on natural resource protection.

Industrialization and the Government

When industry began to arrive in the city, companies had to deal with both local government and state government. The local governmental body was the Police Jury. In Louisiana, police juries are the local governmental authority for areas of the parish that are not within city limits. Since virtually all Lake Charles industry was outside of the city limits, industrial companies were under the authority of the Calcasieu Parish Police Jury (CPPJ) rather than the City of Lake Charles Government. Consequently, the meetings of the CPPJ served as an important intersection between government and industry. The minutes of these meetings reveal not only the pace of industrialization in the city, but also local officials' lack of concern over growing pollution problems.

Analysis of these minutes shows that the Calcasieu Parish government demonstrated many of the distinct characteristics of southern local governments dealing with new industrialization. First, the members showed an enthusiasm for, and a willingness to cooperate with, new industry. This cooperative attitude would become a common characteristic of governmental dealings with industry in Lake Charles. The CPPJ is the authority in all land and infrastructure matters throughout the unincorporated parish. Thus, any time industry needed to build a road, a dock, rail lines, or pipelines, they had to consult this body. Keen to promote economic growth, Police Jury members happily approved any request industry made. In fact, between 1940 and 1960, the body denied only one request for industrial expansion. By 1944, the CPPJ had given the Defense Plant Corporation carte blanche to lay pipeline over, under, or alongside any road in the parish without consulting the members. Table 5 demonstrates the dominance of industrial infrastructure issues in Police Jury meetings.

Table 5.
Issues addressed by the CPPJ related to industrialization, 1940-1960

Infrastructure	Pollution	Watershed Development	Taxes	Labor	Fishing	Federal Controls
63	15	6	4	1	1	1

(Source: Calcasieu Parish Police Jury 1940-1960)

The CPPJ also looked out for industry economically, holding a special election in 1942 that resulted in the ten-year tax exemption for new refineries and chemical plants. Additionally, in 1949, the CPPJ protested the proposed relaxation of government requirements for using synthetic rubber. The jury members feared that cheaper natural rubber would flood the market, and force local butadiene and synthetic rubber manufacturers out of business. They thus went on record numerous times in defense of industry (Calcasieu Parish Police Jury 1942; Calcasieu Parish Police Jury 1949).

The state agency that industry dealt with when moving into Lake Charles was the Louisiana Stream Control Commission (SCC), as its task was to review all waste disposal applications for Louisiana waterways. In practice, though, this state body became a rubber-stamp for industrialization, much as the CPPJ was. The SCC was also very bureaucratic, and if there was a problem with the wastes a certain company produced, the SCC's never-ending correspondence, resolutions, and meetings would bog down the issue for months or years. For example, in 1948 the SCC came to the conclusion that waste from the Cities Service compound was polluting the river to an unacceptable degree (SCC Minutes, August 10, 1948). They sent a notice to the company, which replied much later with a report refuting the SCC's claims. The report simply stated that, while the SCC's test had shown no dissolved oxygen in the water, the test performed by Cities Service engineers *had* detected dissolved oxygen. It took a year for the issue to come up again. In 1949, an SCC member complained that the Cities Service report still had not addressed the accusation that the high temperature of the waste was a problem. Instead of flexing their regulatory muscle with a corporation that was apparently giving it the run-around, the SCC merely decided to continue its correspondence with the company and hope for voluntary compliance (SCC Minutes, July 25, 1949). Earlier letters from the SCC to Cities Service reveal this unwillingness to directly confront polluting industry: "it is recommended... that the objectionable features of…wastes be reduced so as not to remain too close to maximum tolerances" (Cusachs 1944).

Part of the problem was the SCC's basic philosophy on waste disposal. They viewed streams and rivers as diluting machines that were the perfect sink for industrial wastes. In fact, two of the Commission's "salient observations on regulations" were that "not all industrial effluents are harmful" and that "it is recognized that the stream completes the treatment for many industrial wastes" (Fiztner 1962: 2). This may have been true to some degree for a massive waterway such as the Mississippi (for which they also rubber-stamped almost all waste permits), but the Calcasieu was a nearly tidal stream at Lake Charles. Dilution relies on substantive water flow, so applying the SCC's policies to the Calcasieu was inappropriate. This was not a problem for the board, and they continued to approve waste disposal on the Calcasieu. Many times, they approved permits without any knowledge of the effect the wastes would have. Companies reassured them that prior sampling and studies were unnecessary, since there was no way to know the effect of wastes until industrial facilities were online. The board would then approve the permit and rely on a later review to determine if there was a problem with the waste (SCC Minutes, August 5, 1959). Of course, it would be nearly impossible to convince the company to shut the plant down once it was already operating. At the same time it was doing this, it also was noting that the Calcasieu was "already loaded to the gills" with industrial waste (SCC Minutes, August 5, 1959). Two years later, the SCC rejected an application for a Lake Charles company that was making the same argument about prior studies being unnecessary (SCC Minutes, November 21, 1961). It seemed the board had finally realized the magnitude of wastes industry was releasing into the Calcasieu. However, even with this admission, the SCC stuck to their strategy of dilution as the solution.

The state government agency that had much more direct contact with industrialization and waste pollution in Lake Charles was the Department of Wild Life and Fisheries (DWF). This agency (known as the Department of Conservation prior to 1944) held much of the responsibility for water pollution monitoring and enforcement. However, during the war years, when industry was quickly growing in Lake Charles, the DWF was having manpower problems. The war effort drained not only the available pool of expertise but also tightened the department's budget significantly. Biennial reports published during the war are full of frustrated complaints of lack of funds and workers. Field forces of all divisions of the DWF were at an absolute minimum, making it nearly impossible to find those responsible for pollution problems. Its reports list many of the investigations as unfinished. DWF only completed studies through enlisting the help of the very industries that it was investigating for pollution. In fact, the agency resigned itself to working cooperatively with industry. They believed that "public interest in the problem is merely the sum of the special interests" (Louisiana Department of Wild Life & Fisheries 1943: 168). Since 1940, the DWF dealt with representatives from industry, and in 1941, they began bimonthly meetings with technical personnel from petroleum refineries. Even with the department's financial and personnel shortcomings, they showed remarkable foresight into pollution problems in Lake Charles. At the beginning of industrialization, DWF had already focused investigations on the Calcasieu River because of saltwater intrusion problems. Three field workers performed a survey in 1942, demonstrating that the deepening of the ship channel had intensified saltwater intrusion from the Gulf. By 1943, however, the field workers had "resigned," possibly due to the war. The DWF was forced continue the study by depending "largely on sampling and analysis by the cooperating interests," that were "representatives of the rice, oil, and manufacturing industries" (Louisiana Department of Wild Life & Fisheries 1943: 167). The oil industry was the common culprit in salt-water contamination cases, so their contribution is suspect at best. The results of this study (which found that salt-water intrusion was the major culprit, with oil field and industrial wastes only “minor” sources) were made all the more suspicious by the fact that the Association of Commerce assembled and tabulated the results.

By May of 1943, however, DWF found enough funds to place a full-time field representative in Lake Charles, partially in response to pleas from the Police Jury. The pleas were mostly due to the Police Jury’s fear of losing authority in the parish. CPPJ members felt that the State Commisioner of Conservation, who they believed was much too friendly with the oil companies, had superseded their authority over the pollution of their waterways (CPPJ Minutes April 7 1942). They wanted an expert placed locally to assist with pollution investigations; this way they could have a say in local pollution matters. The DWF field man was placed “in this now highly industrialized area” primarily to inspect oil fields, refineries, and rice irrigation waters. He had an enormous job ahead of him, as he was to inspect all waste disposal practices in a six-parish region around Lake Charles. He quickly adopted a cooperative method, meeting with refinery technical staff to discuss ways to improve treatment. After a year, the language he used in his reports still left much to be desired in terms of convincing the public that he had made significant progress in pollution control:

> Problems have been discussed; the establishment of fellowships to determine the immediate and cumulative effects of refinery wastes on fishes, has been proposed and practically agreed upon. (Department of Wild Life & Fisheries 1945: 222)

Even at this early stage of industrialization, local DWF agents considered the water problem severe enough to warrant the attention of state authorities. It recommended a “long-term plan based on sound engineering and economic principles” (Louisiana Department of Wild Life & Fisheries 1943: 168). That it included economic principles in the plan suggests that it viewed industrial expansion as inevitable, and had resigned itself to limiting the damage caused. The

DWF also knew how difficult this task would be. It wrote that, first, quickly increasing competition for the limited water resources would complicate this long-term plan. Secondly, the lack of information about the water supply, present water resource use, and future needs would be a serious problem. In fact, the department did not have enough money to make the direct observations required to collect this basic information. They relied on federal agencies, such as the U.S. District Engineer's office and the U.S. Weather Bureau for much of its data. It also obtained information from the Calcasieu Salt Water Survey, a cooperative made up of the Lake Charles Association of Commerce and agricultural, manufacturing, and industrial interests (Louisiana Department of Wild Life & Fisheries 1943). DWF officials argued for this long-term plan because, historically, they had seen exactly the opposite. They wrote that the state legislature had a penchant for short-term, unrelated legislation and quick-fix projects. They feared that after the war, when construction would stop and the locals would really feel the effects of the new industry, the number of these quick-fix projects would explode. If this happened, DWF would only have time and money for these types of projects instead of for research that could lead to long-term smart environmental planning. DWF finished out the war years with continued desperate calls for more funding for studies, enforcement, and field workers. They knew that dealing only with industry representatives would not stop pollution. They also concluded that continued industrial growth with no pollution control would eventually create a water quality situation that would prevent industry from operating (Louisiana Department of Wild Life & Fisheries 1943).

By 1947, the DWF declared that oil pollution could be the most dangerous factor to Louisiana biological resources. The same year, Department officials created the Coastal Waste Control Section, made up of boats that could check oilfields and refinery outflow sites for oil pollution. The Division of Research and Statistics also received a budget increase, which they stated was crucial to study the “multiple effects of industrial waste” that threatened not only fish, but also the entire food chain (Louisiana Department of Wild Life & Fisheries 1947: 327). All of these advances came just in time for a great drought in the summer of 1947. Citizens reported fish kills all over the state, even in waterways without significant industrial pollution. Dying vegetation clogged the waterways, thus increasing the biological oxygen demand and asphyxiating aquatic life. The situation was particularly bad near Lake Charles, due to the desperately low flow of the Calcasieu. Once the tide began flowing out, the slug of oxygen-free water that had developed near industry waste outfalls moved downstream to Moss Lake, where it trapped and asphyxiated most of the fish in the lake. At the end of the 1946-47 biennium, the Department of Wild Life and Fisheries continued to express frustration with its mandate. It complained of meager funds and understaffed field offices. The writers of the biennial report stated that their main task remained cleaning the discharge from industrial plants. They conceded, however, that it was very difficult to convince industry to change its established practices, especially if the transition would be an expensive one. Consequently, the DWF stayed true to its reluctantly cooperative stance in stating that it hoped to be able to promote the industrial development of the state and preserve fish and wildlife at the same time (Louisiana Department of Wild Life & Fisheries 1948).

By the 1948-49 biennium, The Department of Wild Life and Fisheries agents were slightly more optimistic. In terms of water pollution regulation enforcement, they had shifted into an investigative role. They let the Stream Control Commission handle the enforcement and litigation, as the SCC’s legal powers were, in their view, more efficient and effective. No fish kills occurred on the Calcasieu for the summer of 1949, although this was more attributable to favorable weather conditions than progress in pollution control. However, the DWF agents had pinpointed the culprit of the Moss Lake fish kills. They believed that the Cities Service refinery was the most culpable for these events, and placed additional blame on Cities Service for contamination of rice irrigation water in the area. Technical personnel at the refinery investigated the problem along with members of DWF and the SCC. They determined that the release of small amounts of waste with a very high biological oxygen demand, rather than a continuous, low-BOD release caused the contamination. Refinery technicians promised that they were addressing the problem. The DWF report also stated that there were indications that industry executives were beginning to realize the public-relations implications of their waste disposal methods (Louisiana Department of Wild Life & Fisheries 1950). The hopeful tone of this suggests that DWF, still feeling restricted by toothless legislation and meager funding, had to continue relying on cooperative methods and simply hope for voluntary industry compliance.

In 1950-51, DWF investigations had focused almost exclusively on southwest Louisiana. This area had two large refineries, multiple heavy chemical plants, three pine products plants, and a large number of oilfields. The two refineries alone accounted for half of the state’s total refining capacity. Because of this industrial concentration, DWF agents undertook a complete biological and chemical investigation of the Calcasieu drainage system. They were slowly gaining a better understanding of the processes at work in this river system, and believed that the oilfield and refinery operators were becoming more responsible. Increased use of impoundments for a more consistent, slow release of high-BOD waste led DWF to conclude that pollution abatement efforts in the area were progressing satisfactorily (Louisiana Department of Wild Life & Fisheries 1952).

Industrialization and the Citizen

The reactions of citizens to industrialization in the parish were somewhat similar to the reactions of DWF. Locals showed concern over the effect on industrial wastes from the moment the first wartime plants arrived, as their familiarity with oil field brine and its effects on agricultural irrigation made them skeptical observers. These citizens turned to their local and state leaders for assistance, but the results were generally disappointing. Citizens began as early as 1942, demonstrating that wartime production priorities were not as much a concern to them as the protection of local water resources. In April of that year, the presidents of two local farming and cattle associations wrote letters inquiring about the release of chlorides from the Mathieson Alkali Works. They received reassurances that the company was impounding these wastes during the rice-growing season (Glenn 1942). By 1944, the famous Seaman A. Knapp, the very man who had helped bring the rice industry to southwestern Louisiana, was involved in pollution discussions. He sent multiple letters to SCC members concerning industrial wastes in the Lake Charles area (Knapp 1944a; Knapp 1944b). He became involved that year in a pollution issue involving Mathieson Alkali Works. The company was discharging so much calcium carbonate sludge that the wastes had settled and form a bar in the middle of the Calcasieu, which could possibly have proven hazardous to navigation (Knapp 1994c). Three months after the problem developed, Mathieson closed the waste outfall and claimed they were designing a better system (Hudson 1944). Later that year, property owners along Bayou d'Inde sent a petition to the SCC about the condition of the bayou. They complained that wastes from nearby butadiene and synthetic rubber plants rendered the bayou void of aquatic life for a three to four mile stretch (SCC Minutes, September 14, 1944). The SCC sent an inquiry to Cities Service, who was the major source of wastes in the bayou at that time. The company reassured the board that they had employed a full time professional to study and control the plant's waste disposal system. These incidents, along with a 1945 discussion of the combined trade waste in the Calcasieu, makes evident that the members of the SCC were well aware of what industry was dumping into the river and the effect it had (SCC Minutes, September 24, 1945). Nonetheless, for (at least) the next fifteen years, they approved ever-growing discharges of waste into the river.

CPPJ meetings also served as a sounding board for citizen complaints. The topic of pollution from the new refineries, however, never emerged until two years after the end of WWII (Calcasieu Parish Police Jury 1947). In March 1947, War Department engineers called a public hearing in the nearby town of Jennings. The purpose of the meeting was to discuss proposals for stream improvements and address the more established problems of salt-water intrusion and flooding, but stream pollution was also on the agenda. Ironically, many residents who planned to attend were not able due to road flooding (Mermentau hearing… 1947). A committee made up of CPPJ members did make it to the meeting, and what they heard inspired them to focus on refinery water pollution for the next few months. At the next meeting, members passed a resolution stating they would petition the SCC, the Corps of Engineers, and the Louisiana Stream Conservation Commission to enforce existing laws to stop the pollution of the Calcasieu. In a July meeting, the Police Jury strengthened the resolution with testimony from citizens. Nine residents attended the meeting and spoke about the condition of the Calcasieu River. Almost all of the witnesses were fishermen, and attested to their new inability to find healthy fish:

> In the week of May 17, Fred McCloy gave me fish which he said he caught in local waters. Said fish had such an oil taste it could not be eaten. Frequently I make boat trips down the Calcasieu River to Cameron and nearly always see oil slicks on the river. I frequently see oil coming out of Bayou d'Inde [a tributary of the Calcasieu River], sometimes ½" thick. (Graves Castle, Lake Charles resident)

> Bayou d'Inde formerly contained many game fish; now there are none there. There is always oil on the water of the Bayou d'Inde unless the tide takes it out. At Old Town Bay there is always a showing of oil which comes from the Gillis Oil Field. There is a vast amount of timber which has been killed by substances put in the water at Old Town Bay in the Moss Bluff area, and adjoining the Mathieson Alkali Works, Inc., property. Formerly there were many fish in Old Town Bay, now very few. (Frank Kelly, Lake Charles resident)
>
> (Calcasieu Parish Police Jury Minutes 1947)

Most of the citizens knew the exact waste discharge points for the large refineries, such as Cities Service and Mathieson Alkali Works, and reported many dead fish near these outfalls. There was a severe drought during that summer, so stream flow was very low and refineries used up all of the dissolved oxygen. The Police Jury used this evidence to go on record as opposing the "indiscriminate killing of aquatic life" (Calcasieu Parish Police Jury 1947). Members sent copies of the new resolution to the SCC, Louisiana Conservation Commission, and Corps of Engineers.

Throughout the 1950s, citizens continued to complain about the quality of local waters. Bayou d'Inde and Bayou Choupique, two small tributaries of the Calcasieu, were the subject of many complaints. Landowners near Bayou Choupique complained that overflow of tainted water from the bayou was ruining their crops and pastureland. Bayou d'Inde ran through an oil field and the middle of a large industrial agglomeration, and both contributed to its pollution. Residents consistently reported oil slicks and foam on the surface of the water, along with fish kills and dead timber on the banks. The Calcasieu received the wastes carried in these two bayous, along with wastes expelled directly to the river from refineries such as Cities Service. Anglers continually complained about the quality of the river water. In 1954, they requested that the police jury outlaw commercial fishing in the Calcasieu, Moss Lake, Prien Lake, and Lake Charles, and declare the areas sportfishing-only zones. They cited the decrease in fish stocks over the previous ten years as the reason for this petition. Fishing was not the only recreational activity affected by industrial pollution; in 1956, the Police Jury had "No Swimming Allowed" signs posted on the riverbank in an area park. Throughout this period, residents from downstream Cameron Parish were also weighing in with their complaints. They requested an investigation by a state legislative committee in 1948, which the legislature granted. Witnesses appeared before the committee in a July meeting and testified that pollution from upriver was ruining the oyster and shrimp harvests (Norton 1948). By 1960, the problem was no better, and residents complained to the CPPJ that pollution was still ruining their shrimp and oyster harvests in Calcasieu Lake. Jury members responded by promising to petition the state legislature for funds to study the problem (Calcasieu Parish Police Jury 1960). However, even with all of these complaints, the focus of the CPPJ was on promoting industrial growth. If a pollution issue arose, CPPJ members discussed it for one or two meetings, and then dropped it. The most the CPPJ ever did was to write a letter or adopt a resolution with no real consequences. The data from Table 5 illustrates the lack of focus on pollution issues compared to industrial infrastructure.

While the Police Jury, the DWF, and the SCC offered places for citizens to voice their concerns about water pollution, the Parish Court offered relief that was more direct. Citizens could file a nuisance suit against offending polluters, and hope to receive an injunction or monetary compensation. Surprisingly, in Calcasieu Parish this was not a common practice for water pollution problems. Between 1935 and 1964, only two water pollution nuisance suits came before the Calcasieu Parish Court. In 1950, six citizens sued Mathieson Alkali Works because of a broken pipeline. The pipeline, which carried brine that seeped into the surrounding ground, ruined the local water well supply. Some citizens fell ill, one ruined his car by washing it with the salty water, and the water destroyed a number of water heaters and clothes washers. The neighborhood had to dig a new well, and looked to the parish court for compensation. The judge in the case ordered Mathieson to pay for the replacement of the well (*Cole v. Mathieson Alkali Works* 1950).

The other nuisance suit occurred six years earlier, and dealt not with industrial waste but with resource extraction. In mid-1944, Mathieson Alkali Works submitted an application to the Corps of Engineers for dredging in Lake Charles, Prien Lake, and Indian Bay. Seventy-five thousand cubic yards of clamshells rested at the bottom of the water bodies, and Mathieson wanted them. Their processing required only three raw materials, and shell (from which they produced lime) was the most important. The Alkali Works was one of only seven in the country to produce alkalis from ammonia-soda. The Mathieson executives claimed that competition was high and profit margins low, so they needed to keep production costs down. Extracting shell locally was one way to do this. Once William Gorham and twelve other residents of the shorelines of these water bodies found out about the plan, however, they sued in parish court to stop the dredging. They stated in their suit that the clams kept the water clean, and were a valuable natural resource. With dredging operation muddying the waters, and without the clams to clean it, the plaintiffs claimed that the water would be unsuitable for swimming, bathing, boating, and fishing. They reminded the court that these were all important local activities and that servicemen from the armed forces bases nearby enjoyed these waters, invoking a twinge of patriotic guilt. Citizens also brought the suit to the attention of the Parish Police Jury, who joined the suit as a plaintiff. Soon afterward, the commissioner of DWF joined the suit as a defendant. The DWF (back when it was the Department of Conservation) had given Mathieson the right to all Calcasieu Parish clam beds, and the commissioner offered to defend that contract. The Bogue-Chitto Pearl River Soil Conservation District also joined the suit as a defendant. They had just built a $35,000 shell-crushing plant in Slidell, Louisiana, and claimed that if the plaintiffs won, they too would lose their primary source of clam and oyster shells. Despite all of the support for the defendant, the court ultimately found against Mathieson. The judge ruled that their contract with the Department of Conservation was unconstitutional, and issued a permanent injunction against the dredging (*Gorham v. Mathieson Alkali Works* 1944).

The other nuisance suits brought against refineries and other Lake Charles industry did not involve water pollution. Citizens brought two suits against the Continental refinery for damage to nearby homes cased by the ignition of excess chemicals. The plaintiffs suddenly dropped both these after Continental denied any wrongdoing (*Lejeune v. Continental Oil Co.* 1964; *Scott v. Continental Oil Co.* 1964). Other residents brought two suits against the same refinery for damage to homes caused by windborne carbon black deposits. Local residents complained that carbon black settled on their homes, yards, and cars. They claimed that it ruined car paint, clothesline laundry, walls, floors, and posed a health hazard. The first suit saw the judge deliver a compromise settlement, reducing the amount awarded from $38,510 per home to $20,000 per home. He also ruled that the plaintiffs could not sue again for one year (*Daigle v. Continental Oil Co.* 1959).

Thus, in Calcasieu Parish, citizens rarely brought suits against industry. Only twice was this method successful. In the other cases, the plaintiffs suddenly dropped the suit without explanation, or the judge reduced the award and refused to offer an injunction. This suggests the power a large industrial corporation held over common citizens. These multimillion-dollar companies most likely had an stable of high-priced lawyers at their disposal, while citizens had to band together into groups of twelve or fifteen to even bring a case to court. One telling example of this power is that the Cities Service Corporation retained the services of a law firm headed by Sam Jones, the former governor of Louisiana who was so instrumental in bringing industry to Lake Charles. One can only imagine the sort of political connections this man had, and to face him and a large national corporation in court must have seemed a foolish venture.

Summary

This research has found that, first, wartime priorities were not enough to take the focus away from growing pollution threats. Locals had been dealing with the threat of brine pollution for years, so they did not think twice of complaining when the large refineries and chemical works moved in and began discharging wastes. Secondly, both the local and state governments gave lip service to protecting citizens from industrial waste, but in reality, their focus was on promoting industrial growth. The Stream Control Commission discussed waste issues with industry, but did not push very hard for reform, and almost never fully used their powers. The Department of Wild Life and Fisheries was extremely concerned about industrial wastes in the area, but shortages of money and labor forced them into a cooperative relationship with industry. The Calcasieu Parish Police Jury gave citizens an arena for complaints, but their record shows that they were much more concerned with industrial expansion. Finally, the focus of any anti-pollution sentiment was on preservation of natural resources instead of public health issues. The establishment of the Department of Wild Life and Fisheries as the main pollution investigation and enforcement agency shows a particularly southern focus on protection of natural resources. In addition, any time pollution issues surfaced at CPPJ or SCC meetings, or in any correspondence, the only consequences discussed involved natural resources. People complained of fish kills, sick cattle, ruined crops, and bad oyster and shrimp harvests. The nuisance suit concerning the fouled well was the only time public health became an issue. Even though the municipal water supply did not come from the river, people used the water for bathing, swimming, boating, and other forms of recreation, as well as a supply of fish and other edible aquatic creatures.

Chapter 8
Conclusion

Several factors coincided with, and facilitated, the growth of the petroleum industry in the first half of the twentieth century. First, economic and technological changes resulted in dramatic expansion of the industry. Demand shifted from kerosene to gasoline, and increased exponentially thanks to the burgeoning automobile industry. Second, these transportation developments also changed the face of industrial location decisions. Improved infrastructure allowed oil companies to locate further from markets, and closer to raw material sources. Third, the petroleum industry received a colossal boost from federal wartime investment. The government required production of many special materials, and was willing to fund the construction of specialized facilities to produce them. This also included an investment in research that, along with information sharing in the name of patriotism, advanced the technology of petroleum refining and petrochemicals far faster than peacetime. This growing industry required more land for expansion, and higher costs in the Northeast and Midwest caused them to look elsewhere. Fourth, Southern local and state governments were busy with boosterism, offering multiple incentives to industry. The governments touted the gulf coast as the preferable location for the petroleum and petrochemical industry. Natural resources were abundant and inexpensive. The rural nature of the South meant that land was plentiful, unoccupied, and cheap. Agricultural mechanization left a large, non-union workforce looking for employment. All of these factors contributed to the decentralization of American industry and the exponential growth of the petroleum and petrochemical industries in the South.

Lake Charles offers a ideal example of the expansion of these industries to the South. Before industrialization, it was a typical Southern small city with a small population and an agriculturally based economy. When industrialization occurred in Lake Charles, it coincided with, and was a part of, the rapid expansion and decentralization of the petroleum industry. The Lake Charles case is also typical of the South in that the state, parish, and city administrations made heavy use of incentives to lure industry to the area. They argued that Lake Charles was the ideal location for industrial investment. The area had abundant land, especially on the western side of the Calcasieu River, which had a higher elevation and was less prone to flooding. The city also had a labor surplus because of the mechanization of local agriculture operations. The major attraction, however, was the cheap natural resources, and access to water transportation. Local and state government also offered multiple tax breaks and subsidies to incoming Lake Charles industry, which was a common practice in Southern states. However, the greatest catalyst for industrial growth in the city was World War II federal investment. The most obvious example of this is the Cities Service Refinery, which the federal government built for the production of war supplies. In general, federal investment attracted high-tech, high-wage industrial operations to the city, and hastened the formation of infrastructure and an industrial economy. These subsidized improvements would serve to encourage further industrial growth, which became a common pattern across the South.

Industrial growth in the Lake Charles area quickly transformed a rural, agricultural landscape into an urban, industrial one. This expansion also brought water pollution, a devastating addition for an area so dependent on natural resources and the environment. Previous research, however, argued that the South accepted pollution for economic progress. This argument had even more strength in Louisiana, a place with a reputation for corrupt government. This research attempts to show that though people generally accepted this argument, the truth behind it is not so simple. First, the “pollution for progress” idea may hold true for the local and state governments involved, but not for individual Louisianans. As soon as refineries moved into the area, citizens noticed the unpleasant effects on local water bodies. While wartime priorities were reason enough for industry to put off pollution control measures, patriotism was not sufficient to silence local citizens. They began complaining to the Stream Control Commission in 1942, even before the construction (in Lake Charles) of the largest aviation gasoline refinery in the world. Parish officials were somewhat sympathetic to citizen complaints, but they continued to promote industrial growth at the expense of water quality. In addition, the state charged two of its agencies with protecting the citizens and natural resources of the state, but they failed miserably. The Stream Control Commission focused on facilitating economic growth rather than protection of water quality, even though it received regular reports of fish kills and other problems. The Department of Wild Life and Fisheries exhibited commendable forethought and concern about the ad hoc, lackluster manner in which the state administration and legislature were addressing environmental issues. However, a lack of funding would force it into a cooperative strategy that resulted in dubious industry-led investigations and little to no enforcement of water pollution regulations. Unfortunately, local citizens did not generally file nuisance suits, although this could have proven the most efficient way to stop offensive polluters. Finally, the reactions of Lake Charles citizens to the new pollution revolved around private property and community resource protection rather than public health. Thus, Colten's (2006) claim that Southern environmental issues focused on natural resources applies to not only rural Southern areas but also urbanizing industrial zones. In summary, this research demonstrates a fundamental conflict between development-minded government institutions and a population interested in protecting natural resources. The responses of citizens to pollution in this industrializing Southern city expose an underlying popular dissatisfaction with pollution-tolerant policy.

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Vita

Zack DeLaune was born in Pineville, Louisiana, on October 19, 1981. He attended both Pineville High School and Lafayette High School before moving on to Louisiana State University. There he was a member of the Honors College and completed an undergraduate honors thesis before receiving a Bachelor of Science degree in psychology. After spending a summer in India teaching English and six months working in New Orleans, he returned to Louisiana State University and joined the geography graduate program. He will graduate in December 2007 with a Master of Arts degree.