Environmental Restoration in the Atchafalaya Basin: Boundaries and Interventions.

by

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SUBMITTED TO THE DEPARTMENT OF URBAN STUDIES AND PLANNING IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER IN CITY PLANNING
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2009
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Submitted to the Department of Urban Studies and Planning on March 19, 2009 in Partial Fulfillment of the Requirements for the degree Master in City Planning

ABSTRACT

The Atchafalaya River is a 135-mile long river in Louisiana. This makes it the largest distributary of the Mississippi. In this thesis, I will review the ways in which the Atchafalaya Basin is described as a complex system by the two agencies that are responsible for its management, the US Army Corps of Engineers and the Louisiana Department of Natural Resources. Different stakeholders understand the Basin in a variety of ways. My question is how the different views of the Basin impact its environmental restoration and management. I answer this question by describing how the agencies transform elements of the Basin into maps, plans and various management activities by relying on science, aerial photography, and long-time residents of the Basin. I will argue that a central aspect of successful environmental restoration is that communication among different stakeholders must create a shared discourse to frame the main issues in the Basin. In the Atchafalaya Basin, this means that environmental restoration cannot be successful without some level of consensus among the stakeholders about what the Atchafalaya Basin is, how it has developed and which environmental qualities are present in the Basin today and which ones need to be restored.

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The Atchafalaya Basin

Source: USGS, Fact sheet 019-99

1. Understanding the Atchafalaya Basin

1.1 Introduction

The Atchafalaya River is a 135-mile long distributary of the Mississippi River and is part of a complex system of swamps, bottomland hardwoods, and bayous. It carries sediments that are central to the ecological processes in the floodplain and the coastal wetlands of Southern Louisiana. The Old River Control Structure, a system of dams and canals, divides the water from the Mississippi and Red Rivers, and sends 70% down the Mississippi and 30% down the Atchafalaya. Without this structure, the Atchafalaya would likely become the main canal for water from the Mississippi to the Gulf of Mexico. The Old River Control Structure essentially makes the Atchafalaya into a human-controlled floodway for the Mississippi. Thus, the river is an important part of the flood-protection system that serves New Orleans and other areas in the coastal region of Louisiana. The Atchafalaya Basin is considered the heartland of the Cajuns, an ethnic group that has played a significant role in the development of Louisiana's distinct culture. The river is also a shipping route and at the mouth of the river is a coastal area that is home to substantial oil and gas resources. Timber and fisheries are other still other economic activities that are directly impacted by the Atchafalaya River. This complex mix of environmental, economic and cultural uses make the Atchafalaya Basin both a focal point for political controversy and the subject of a great many scientific studies. The Louisiana Department of Natural Resources and the United States Army Corps of Engineers have plans to manage, preserve and enhance the Atchafalaya Basin. Scientists from a variety of organizations such as Louisiana State University, the Louisiana State Department of Fish and Wildlife, the United States Geological Survey and private research organizations are all working to analyze the various elements of this complex environment.

My personal involvement in the Atchafalaya Basin in some ways started on August, 29th 2005, the day Hurricane Katrina made landfall in Louisiana. During the summer of 2005, I was an intern at the Consensus Building Institute (CBI) in Cambridge, MA. CBI is a not-for-profit organization that specializes in environmental conflict resolution. The catastrophic failure of the flood-protection measures of the United States Army Corps of Engineers (USACE) and the broader implications of the hurricane for the coastal environment of Louisiana, were still unclear in those days, but the discussions around the office centered on the inevitable conflicts that would arise in the aftermath of this disaster. After that internship, I decided to apply to the environmental planning program at the Massachusetts Institute of Technology, in large part to better understand the dynamic between competing interests in environmental disputes. While at MIT, I started working with a research-group that focuses on the use of science in complex environmental disputes, the MIT-USGS Science Impact Collaborative (MUSIC). The United States Geological Survey operates the National Wetlands Research Center in Lafayette, LA, and through my involvement with MUSIC, I was asked to work with a local USGS scientist to analyze how science plays a role in the management of the Atchafalaya Basin. To me it was clear that this question had become even more pressing in the wake of Hurricane Katrina, since the Atchafalaya Basin plays a vital role in the flood-protection measures for the cities of New Orleans and Baton Rouge. But besides flood-protection and navigation, which are the two long-standing missions of the Army Corps of Engineers, a new mission for the Corps has emerged in the Atchafalaya Basin, namely environmental restoration[1]. The notion that some of the natural processes in the Atchafalaya need to be restored is prominent in both the State's and Army

[1] This responsibility was outlined by Congress in the 1996 Enigineering Regulations 1130-2-420 and 1130-2-550.

Corps' Master-plans[2]. The widespread presence of activities such as oil and gas development, timber industry and commercial fishing ensures that there are competing interests in relation to the way in which this restoration of natural processes is carried out. Increased flooding in some areas could restrict a timber company's ability to access its resources for example, while it may increase a fisherman's seasonal catch.

In this thesis, I will review the ways in which the Basin is described as a complex system, understood and constructed in a variety of ways and how environmental restoration as a policy-goal and management practice relates to these descriptions. I will argue that a central aspect of successful communication among different stakeholders is that they must find or create a shared discourse to frame the main issues in a particular conflict if they are to reach a mutually acceptable way of proceeding. Discourse is defined here as *"a specific ensemble of ideas, concepts, and categorizations that are produced, reproduced and transformed in a particular set of practices and through which meaning is given to physical and social realities"* (Hajer, 1995: 44). In the Atchafalaya Basin, this means that environmental restoration cannot be successful without some level of consensus among the stakeholders about what the Atchafalaya Basin is, how it has developed and which environmental qualities are present in the Basin today. A series of interrelated research questions will inform my analysis and the answers will support this argument. These questions include how the boundaries around and within the Atchafalaya Basin are drawn and which categories actors use to describe the natural and cultural processes in the Atchafalaya Basin. How are human interventions in the system differentiated from changes caused by non-human agents? My core research question is: *How do the central governmental actors represent the Atchafalaya Basin as a complex system and what implications do their*

[2] See for example the preface to the State Masterplan on page I and the first page of the US Army Corps Masterplan, which outlines its mission.

choices have for the environmental restoration efforts in the Basin? I will start to answer this question by briefly describing the Atchafalaya Basin, particularly the stories surrounding the two master-plans for the Basin – one prepared by the US Army Corps of Engineers and the other by the Louisiana Department of Natural Resources. Not all the important decisions regarding the management of the Basin are outlined in these plans, nor is all the relevant scientific information contained in them. I will restrict my focus to only those questions deemed most important by policy-makers and scholars in the area in relation to the preservation, conservation, restoration, maintenance, management and development of the Atchafalaya Basin[3]. These questions relate to the natural and legal boundaries in the Atchafalaya Basin, how the history of the Basin and its inhabitants should be understood, and what the appropriate role for sediment should be in the Basin. All of these questions are intimately related to past scientific inquiries, and continue to be studied by scientists and other researchers.

By showing that *"(scientific claims)…are always potentially open to deconstruction, particularly in the policy-arena, where conflicts among competing interest groups and organizational cultures routinely impede consensus building or closure around any particular account of "reality"* (quotation marks in original, TvM)*."* (Jasanoff, 1996: 181) I hope to allow for a re-thinking of the role of knowledge in resource management decisions that takes better account of the ways in which science tends to be deconstructed in the policy-arena.

1.2 Theoretical Framework

My research question builds on two assumptions: 1) that the way in which scientists represent the empirical world is the result of interactions among scientists, their research objects,

[3] These tasks are described in the US Army Corps Masterplan as the purpose of the plan.

policy-makers and those who fund research; and 2) that scientific representation plays an important part in decision-making, since management plans are based on, or at least reflect, the thinking of scientists.

The notion that scientific representation can be understood as the product of a particular way of viewing the empirical world, and that scientific views are socially mediated, is one of the tenets of *social constructivism.* This has implications for policy-making, since *"*(…) *our understanding of real situations is always mediated by ideas; those ideas in turn are created, changed, and fought over in politics."* (Stone, 1989: 282). Scholars such as Bruno Latour[4], Thomas Gieryn[5], Michel Callon[6], Wiebe Bijker[7] and Sheila Jasanoff[8] have developed numerous ways in which the relationship between researchers and the things they study can be described and analyzed. These conceptual schemes allow for an understanding of scientific inquiry that moves beyond categories such as "good versus bad", "sound versus junk" or "true versus false;" instead, these authors have provided descriptions of the ways in which scientists and engineers relate to each other, to their research and to policy makers. Such "thick" descriptions of science have forced people in the field of policy studies to reevaluate their models of how scientific information can and should be used in the policy process. My thesis is an attempt to create

[4] Latour, Bruno and Woolgar, Steve (1979). *Laboratory Life: the Social Construction of Scientific Facts*, Sage, Los Angeles, USA.
[5] T.F. Gieryn, "The Boundaries of Science," in S. Jasanoff et al., eds., *Handbook of Science and Technology Studies* (Thousand Oaks, CA: Sage Publications, 1995)
[6] M. Callon, "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay," in J. Law, ed., *Power, Action, and Belief: A New Sociology of Knowledge?* (London: Routledge and Kegan Paul, 1986)
[7] W. Bijker, T. Pinch and T. Hughes, eds., *The Social Construction of Technological Systems*: *New Directions in the Sociology and History of Technology* (Cambridge, MA: MIT Press, 1987)
[8] S. Jasanoff, ed., *States of Knowledge: The Co-Production of Science and Social Order* (London: Routledge, 2004)

another thick description of the scientific analysis that has been used to shape resource management policy in the Atchafalaya Basin.

The idea that the production of scientific information has an impact on, and is impacted by, social and political forces is an important theme within the field of Science and Technology Studies (STS). Within this discipline, scientific description is not regarded as a neutral activity, but rather as a process that involves choices about where to draw boundaries, what to include and exclude, and how to classify that which is being described. This notion of scientific description as a social activity informs many of the stakeholder involvement processes used to engage scientists and other stakeholders in public deliberations. In research regarding innovative democratic governance – or civic engagement -- a central question is how decision-making ought to incorporate scientific information while maintaining transparency and ensuring opportunities for meaningful participation by citizens. Both STS and civic engagement point to the importance of a shared understanding of the problems that face decision-makers. When one believes that *"In the world of policy there is always choice about which causal factors in the lineage to address, and different choices locate the responsibility and burden of reform differently."* (Stone, 1989: 296), these choices become extremely relevant to policy analysis. How scientists and citizens that are involved in planning in the Atchafalaya Basin understand and discuss the environmental, social and economic issues in the region are therefore influenced by the scientific representations that are chosen, as well as by the distribution of power, prior relationships, and institutional demands. Many of the regulations and practices that govern the management of the Basin explicitly refer to their grounding in scientific knowledge, making that field one of central interest.

The production and presentation of scientific information is important because it names the threats to an area as well as the opportunities for improvement. As such, scientific descriptions of the ecosystem and its operations have an important impact on the discourse regarding acceptable levels of risk and appropriate trade-offs. The history of the differences between cost/benefit analysis as practiced by the US Army Corps of Engineers, the US Bureau of Reclamation and the US Department of Agriculture[9] provides an example of the ways in which quantification, as a method of representation, is enormously important: *"Cost-benefit analysis was intended from the beginning as a strategy for limiting the play of politics in public investment decisions. (...) The transformation of cost-benefit analysis into a universal standard of rationality, backed up by thousands of pages of rules, cannot be attributed to the megalomania of experts, but rather to bureaucratic conflict in a context of overwhelming public distrust."* (Porter, 1995: 189).

Different stakeholders use different representational tools to describe the systems at work in the Atchafalaya Basin. Foresters talk about land-types based on categories of species and the relative health of trees, whereas geologists, using high-altitude photography, classify flood zones in the Basin according to water depth and the typical duration of flooding. The Army Corps of Engineers, on the other hand, has its own hydrological model of the basin that it uses to determine how it ought to operate the flood-control systems already in place. These are efforts to classify the same Basin and quantify the same ecosystem operations in various scientific terms, but are based on very different assumptions about what the boundaries of the system are and what is important to the people who use the resources in the area. They also have important implications for who is defined as a legitimate stakeholder and what are considered valid

[9] T. Porter, *Trust in Numbers* (Princeton, NJ: Princeton University Press, 1995), Ch. 7 ("U.S. Army Engineers and the Rise of Cost-Benefit Analysis"), pp. 148-189.

critiques or reasonable trade-offs. A detailed analysis of the similarities and differences between each of these methods of representation will inform the answer to my research question and will provide insight into the ways that scientists influence policy and the ways in which decision-makers think, speak and act in the Atchafalaya Basin.

1.3 Methodology

The methods I have used to answer my question consist of semi-structured interviews with participants and decision-makers in the Atchafalaya Basin and an analysis of the causal stories[10] presented by the scientists and other stakeholders. I have formally interviewed Toni Deboisier, forester at the Louisiana Department of Natural Resources (LADNR), Stephen Faulkner the United States Geological Survey (USGS), and Lamar Hale at the United States Army Corps of Engineers (USACE) and have spoken informally to more than 25 people involved in the Atchafalaya Basin. Through these formal and informal interviews I trace the methods of representation being used as well as the ways in which these stakeholders think these models influence the discourse.

The second part of my research involved attending the conference *Ecosystem Functions and the Dynamic Atchafalaya River from the Old River Control Structure to the Continental Shelf*[11]. During this two-day event, I observed the interactions among the relevant scientists, policymakers and interest groups and saw firsthand how their interactions were shaped by their discourse and the causal stories they brought with them.

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[10] For a detailed description of the different types of causal stories and how they interact with scientific research see D. Stone. (1989) "Causal Stories and the Formation of Policy Agendas," *Political Science Quarterly* 104(2): 281-300.

[11] At this conference I had many informal conversations with people involved in the Atchafalaya Basin, and was able to see their presentations on the processes in the Atchafalaya Basin. For a full list of all the presenters and participants, see: http://www.crcl.org/images/Atchafalaya_Symposium_Program.pdf Accessed on 10/30/2008.

2. The Basin and Its Boundaries

2.1 Where is the Atchafalaya Basin?

2.1.1 The Atchafalaya River

A core question that needs to be answered when studying how decision-makers represent the Atchafalaya Basin is what the boundaries of that Basin are considered to be. Since the Atchafalaya River can be assumed to be at the center of the Atchafalaya Basin, I will briefly describe the boundaries of the River, before providing a description of the Basin.

To the North, the Atchafalaya River begins where the Red River and the Old River meet. This is where mile zero of the Atchafalaya River is defined. This confluence is constrained by a complex of concrete barriers and low sills, generally referred to as the Old River Control Structure (ORCS). This complex creates a barrier between the Atchafalaya and Mississippi Rivers that allows the United States Army Corps of Engineers (USACE) to manipulate the flow of water through these Rivers. By law[12], it is established that 70% of the combined flow of the Red and Mississippi Rivers is directed through the Mississippi, and 30% through the Atchafalaya River. On the Eastern and Western sides of the Atchafalaya River are levees. Before 1880, the Atchafalaya River was bounded by a number of factors such as smaller ring-levees built by settlers; alluvial ridges created though sedimentation processes as a result of seasonal flooding and elevated areas such as the hills. In the 1880's people started to reinforce some of those ridges to prevent flooding. These levees are on the banks of the river today, and are maintained primarily to make navigation on the River possible during periods of low and normal water levels. The Mississippi flood of 1927 led to a more formal, and federally funded effort to build

[12] The original legislation that allowed the Army Corps of Engineers to work in the Basin was the Flood Control Act of 1928 (PL 391/70). The Legislation that authorized the construction of Old River Control ad mandated the 70/30 split was the 1954 Flood Control Act (PL 780/83).

levees along the Mississippi. As a part of that plan, the Atchafalaya River was designated as a floodway that should be capable of transporting 1,500,000 cubic feet per second during a hypothetical flooding event, known as Project Flood[13]. Between 1954 and 1963 additional levees were built, called protection or guide levees, further away from the River, to allow for water storage in the case of large floods. These guide levees are up to 40 ft. tall and are up to 35 miles apart in some places. These boundaries create a large area between the normal riverbed of the Atchafalaya River and the guide levees that consists of swamps, forests, and other areas that are inundated in large flood-events to prevent catastrophic flooding of cities like New Orleans and Baton Rouge. To the South, the Atchafalaya River ends in the Gulf of Mexico in a deltaic zone that consists of bays, sand banks and smaller rivers and streams. This area, which is south of Morgan City, is usually referred to as the Lower Atchafalaya River and the Atchafalaya Bay. Most of these boundaries are the result of human ingenuity and were constructed and maintained over the last 65 years as part of the Atchafalaya Basin Floodway System (ABFS). The ORCS, the guide levees and Morgan City bound not only the river, but also commonly form the boundaries around what is referred to as the Atchafalaya Basin.

2.1.2 The Atchafalaya Basin

The boundaries of the Atchafalaya Basin are not as stable as they might appear. Famously, the ORCS was seriously compromised in the 1973 flood, and it almost collapsed, which would have removed the boundary between the Mississippi and Atchafalaya Rivers. More recently, the State of Louisiana has defined the boundaries of the Atchafalaya Trace Heritage

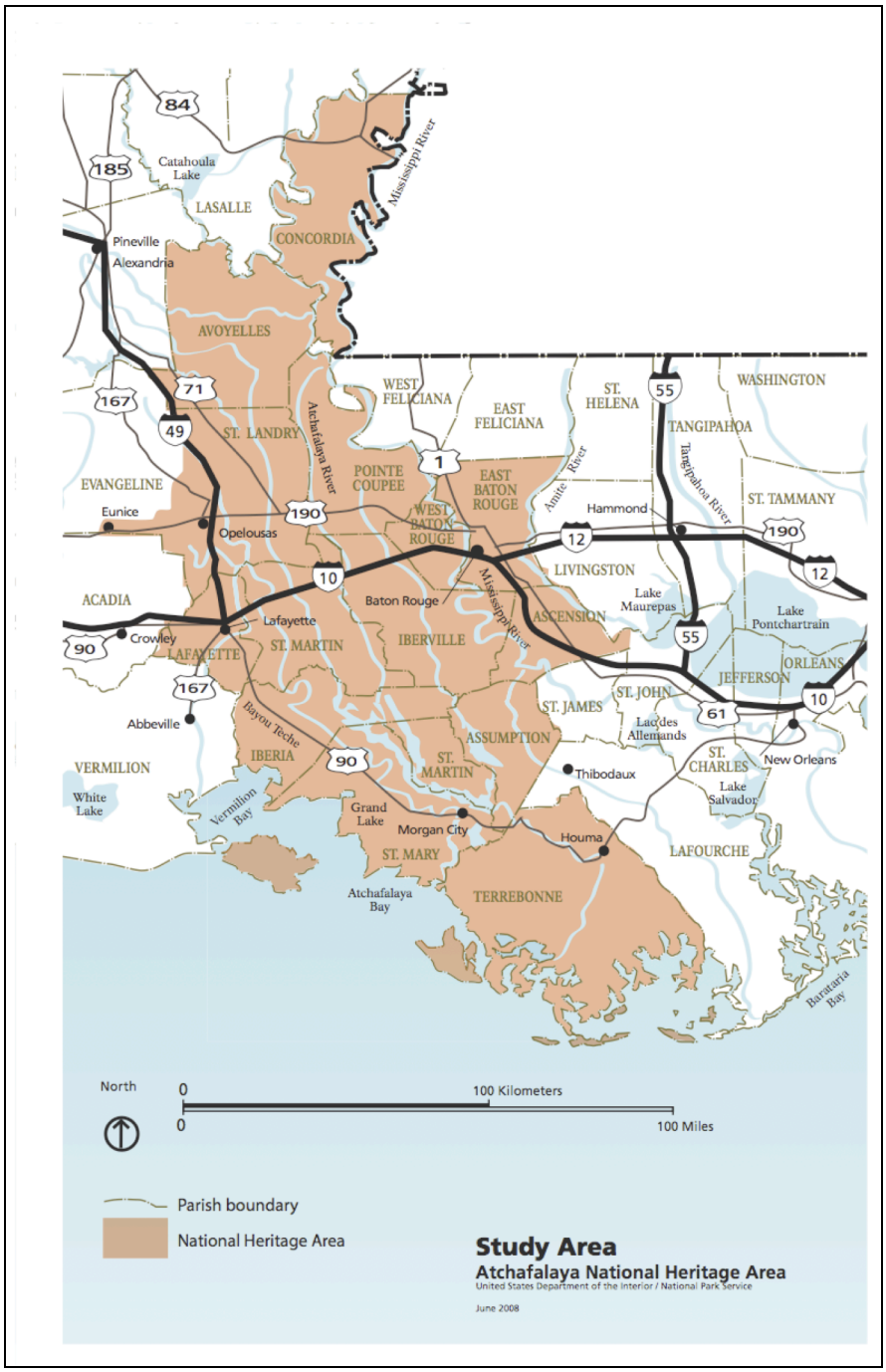
[13] For an entertaining description of the history of the Old River Control Structures and the role of the Atchafalaya Floodway in Mississippi floods, see McPhee. J, *The Control of Nature* (Farrar, Strouss and Giroux, New York, 1989)

Area as comprising thirteen parishes in south-central Louisiana[14] (see Figure 1). This is a very different way of defining the "Atchafalaya", but the differences between a natural and a cultural definition are far from clear. More subtle changes in the boundaries of the Atchafalaya Basin are occurring on a daily basis. Due to sediment accretion at the outlets of the Atchafalaya River into the Gulf of Mexico, the landmass in this area is increasing, resulting in a gradual growth of the Atchafalaya Basin. Sedimentation in the northern part of the Atchafalaya Basin is causing the disappearance of the ecosystem most closely associated with the Atchafalaya Basin, namely cypress-swamps. The stability of these boundaries is an especially important question when policymakers have to choose how to define the Atchafalaya Basin since significant investments of public resources are being made in an attempt to restore the Basin.

One approach to defining the boundaries of the Atchafalaya Basin is described by the Army Corps of Engineers, which stated in its 1982 Feasibility Study for the ABFS that: *"The Atchafalaya Basin comprises the southern portion of the study area. It is bounded by alluvial ridges that mark the positions of the meander belts of ancient Mississippi River courses. The Teche Ridge forms the Western and Southern boundaries while alluvial ridges along Bayou des Glaises, the Atchafalaya River (from its head to Simmesport), and Lower Old River define the basin on the North. The eastern boundary is formed by ridges along the Mississippi River, extending from the head of Old River to Donaldsville and by ridges flanking Bayou Lafourche from Donaldsville to Houma."* (USACE, 1982: Vol. II A-61). These boundaries are all the result of processes that occurred prior to the settlement of the area by European descendents. Yet, in the context of defining the Basin, humans also constructed these boundaries. When described like this, the Atchafalaya Basin comprises over 1 million acres.

[14] Louisiana Department of Culture, Recreation and Tourism (2002), Heritage Area Management Plan.

Fig.1 The Atchafalaya National Heritage Area.



Source: Louisiana Department of Culture, Recreation and Tourism (2002), Heritage Area Management Plan.

This definition of the Basin is largely based on the alluvial ridges that are the result of the meandering of the Mississippi River as described in the scientific literature[15] on the history of the Mississippi. Today, these ridges no longer define the Atchafalaya River and new definitions of the Basin have emerged as a result of these new boundaries. A different way of defining the boundaries of the Basin was used in the Louisiana State Master plan, which states: *"The Atchafalaya Basin encompasses 838,000 acres. The area is bounded by Simmesport on the North, Morgan City on the South, and on the East and West by protection levees."* (LADNR, 1998: 3-1). Humans constructed all these boundaries over the last 100 years, since Simmesport and Morgan City are cities, and the Army Corps as part of the ABFS constructed the Eastern and Western Atchafalaya Basin Protection Levees (WABPL and EABPL in Figure 2). This definition of the Atchafalaya Basin, therefore, reflects the constructed nature of the Atchafalaya, but it also limits the scope for environmental restoration considerably. In the USACE Master plan, published in 2000, a more restrictive variation of this definition appeared which stated that: *"This Master Plan is a synthesis of many authorities and projects related to the area referred to as the Atchafalaya Basin, but focuses primarily on those that are subsumed under the title of the Atchafalaya Basin Floodway System, Louisiana project (ABFS)."* (USACE, 2000: 1-1). The plan goes on to state that: *"The ABFS area covered in this Master Plan is roughly defined as that area south of U.S. Highway 190, with the exception of the Atchafalaya River Landing, Simmesport, Louisiana, project, situated between the East and West Atchafalaya Basin Protection Levees, and extends to the vicinity of Morgan City. It encompasses an area of some 595,000 acres."*. (USACE, 2000: 1-1). So even though the Army Corps acknowledges that the

[15] See for example: Adams, R. D., and Baumann, R. H., (1980), Land building in Coastal Louisiana: Emergence of the Atchafalaya Bay delta: Center for Wetland Resources, Louisiana State Univ., Baton Rouge. And: Gagliano, S. and Van Beek, J. (1975) An approach to multiuse management in the Missisippi Delta system, In: Broussard, M, (ed.) *Deltas, Models for exploration.* Houston Geological Society, Houston, Texas.

ABFS is only a part of the Basin, this part is being considered for purposes of environmental management and restoration is directly tied to the boundaries of the ABFS.

Fig. 2 Main Features of the Atchafalaya Basin Floodway System

Source: US Army Corps of Engineers, http://www.mvn.usace.army.mil/ Accessed on 08/09/2008

2.1.3 The area between US-190 and I-10

The features of the ABFS not only restrict the flow of water, they also influence the sedimentation that is a central process shaping the Atchafalaya Basin. Currently, the sedimentation process converts cypress-tupelo swamps into bottomland hardwood forests in large parts of the Basin. This effectively reduces the size of the Atchafalaya Basin considered for environmental restoration, since the environmental features that are valued in the Basin are the "wet and wild" character of the cypress swamps[16]. So the Atchafalaya Basin is not only a geographic area, it is also a type of landscape. This is clearly reflected in the purchase of environmental easements by the USACE. These easements are one of the main methods for the environmental management and preservation of the Atchafalaya Basin. The State Master plan describes these easements as follows: *"The goal of the Environmental Protection portion of the easement is the preservation of the wet and wild environmental appeal of the lower floodway by prohibiting the destruction of habitat through the conversion of land to other uses and providing control over the method of cutting timber by controlling clearcutting and promoting sustained yield forestry practices.* (…) *The Corps of Engineers has purchased from landowners the right to enforce certain developmental control and environmental protection on approximately 31,500 acres. This land is located in the Basin between U.S. 190 and I-10."* (LADNR, 1998: 5-1). This decision to purchase land between U.S 190 and I-10 is influenced by the stipulation that the USACE can only acquire land from willing sellers. At a more conceptual level, it also forms a distinct definition of the Atchafalaya Basin as not only a geographical area, but also as a certain type of landscape. To the North of U.S. 190, much of the land is in agricultural use, and therefore it does not display the "wet and wild" characteristics that are considered typical of the Atchafalaya. For the purpose of environmental restoration, it simply means the area North of the

[16] See LADNR, 1998: State Master Plan, page: 5-1.

U.S. 190 is not considered part of the Basin. Much of the land between U.S. 190 and the I-10 is protected as part of the Indian Bayou Wildlife Management Area, the Atchafalaya National Wildlife Refuge, or the Sherburne Wildlife Management Area. These areas are actively protected, but since the I-10 forms a physical barrier that obstructs North-to-South water flow through the Basin, the area North of I-10 is also rapidly changing from a swamp to a dry area with some lakes. Attempts to restore the flow of water from North of the I-10 to the southern part of the Basin are ongoing, but it is unclear if these efforts will be successful.

2.1.4 Conclusion

The Army Corps, in its 1982 feasibility study of the ABFS used maps that included areas north of Simmesport, and south of Morgan City. The newly produced map of the State's Atchafalaya Program excludes the Lower Atchafalaya River and the other outlets to the Gulf of Mexico south of Morgan City. The description of the shrinking of the Atchafalaya Basin is more than a history of maps and boundaries. What is and is not part of the Atchafalaya Basin defines the boundaries of current and future investments in environmental restoration. The geographical "shrinking" of the Atchafalaya Basin reflects the creation of boundaries such as levees, but also changes in land-use patterns and forest-types. Cypress trees are considered emblematic of the Atchafalaya Basin, and environmental restoration efforts focus on the protection of these trees and their habitat. These different approaches to the definition of the Atchafalaya Basin, either based on historical flood patterns, existing physical boundaries of the Atchafalaya River, or type of landscape, have implications for the environmental restoration of the Basin. The definition affects who is considered a potential seller when easements are purchased. The varying definitions also impact landowners in the Basin with regard to restrictions on how they can

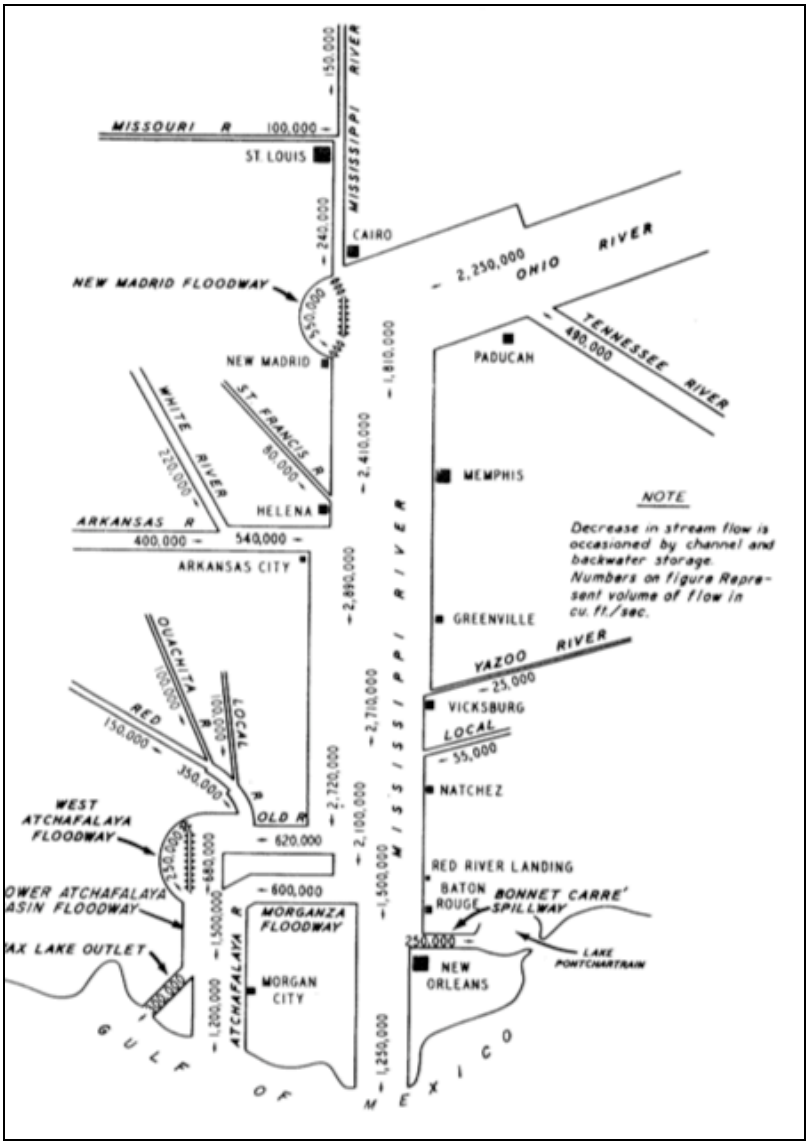
manage their lands. These boundaries also impact which areas are considered for restoration and which are not, simply because they fall outside of the Basin. How and why the agencies involved in the restoration effort ended up using this particular set of boundaries will be described in more detail in section 3 of this thesis when I look at the management plans that guide the restoration effort. Before moving to the restoration efforts, I will first describe the relationship between sedimentation, forest-types and the boundaries of the Atchafalaya in more detail. These relationships are crucial when trying to understand the management of the Basin. The definition of the Atchafalaya Basin is not only tied to its external boundaries, but also deeply connected to the various processes that make it a special area. So in order to understand the attempts at the restoration of the Atchafalaya Basin more fully, one needs to understand not only where the Basin is, but also what it is made of, and how its various components interact.

2.2 What is the Atchafalaya Basin?

2.2.1 The Atchafalaya network

The history of ambiguity about the boundaries of the Atchafalaya can be found in maps of the Atchafalaya Basin. But beyond the discussion over *where* the Atchafalaya Basin is, there also are different definitions of *what* the Basin is. Maps play an important role in the discussions over the Atchafalaya Basin and its functions, both as a natural system and as a resource-rich area. One of the key functions of the Basin is that of a floodway. The Army Corps produced a map of the floodway function of the Basin in 1982 (See figure 3, source: USACE, 1984 ABFS EIS). This map shows the "project design flood." Since the ABFS was created to function as an emergency overflow area during Mississippi River floods, this map indicates how many cubic feet of water the river was designed to hold per second (cfs.).

Fig.3 The Atchafalaya Basin as a floodway.



Source: USACE, 1982 *Atchafalaya Basin Floodway System, Louisiana, Feasibility Study, Main Report and Final Environmental Impact Statement Volumes 1-4* Mississippi River Commission, New Orleans District, Jan. 1982

Flood protection is one of the central missions of the Army Corps of Engineers, and this stylized, abstract map shows the function of the Atchafalaya in this respect. The role of the Atchafalaya in a technological complex that is protecting New Orleans and Baton Rouge from Mississippi

floods like the one that occurred in 1927 is an important aspect in the relationship between the river and the people that use it. But the Atchafalaya Basin is more than a floodwater storage area. The Atchafalaya Basin is also a kind of factory. Many people depend on the Basin for their livelihoods. Trees grow and are then cut down and sold as timber, crawfish spawn and are then caught and sold, and oil and gas are extracted from the soil. The Basin is also used and described by ecologists, foresters and hydrologists. They classify land-use types, species of trees and the composition of different patches, and assess the flow of sediments through the river. The Atchafalaya Basin is therefore also a kind of laboratory, where scientists count trees, take soil samples, and test water. Some of the results that emanate from this laboratory are then used to maintain it, change it or restore it. These, and other, ways in which the Atchafalaya Basin works play an important role in the conflicts among different stakeholders.

2.2.2 The Atchafalaya Basin as a site of conflict

The ambiguity about the boundaries of the Atchafalaya Basin does not only relate to the geographical definition of the area. The constantly changing water depths, the process of sediment accretion and erosion, and the more gradual changes in the elevation of the entire area all contribute to the ongoing shaping and reshaping of boundaries that are at once physical, political and legal. The State of Louisiana is tasked with maintaining all navigable waterways in the Atchafalaya (except for the channels of the ABFS, since that is a Corps project) and does so mainly by dredging the streambeds. The material that is dredged from the bottom is usually disposed on the banks of the waterway, which reinforces the boundary between water and land. In dredging these waterways, the State is actually producing legal boundaries, since all navigable streams are by definition public, and therefore state property, usually referred to as the state

water bottom. But the dynamic sedimentation processes in the Atchafalaya complicate matters: *"In the State of Louisiana, the State owns, claims, maintains those streams to the average low water line, so that's the boundary line. Then the situation of accretion enters into it. As that stream fills over time that average low water line in some cases just disappears, there's no standing water in it year round."* (employee of USACE, interviewed by author 01/16/08). So, the sedimentation process converts a state-owned navigable waterway into privately owned land. This has a direct impact on recreational and professional fishermen, who find that they are no longer able to reach certain areas of the Basin, since that would involve trespassing on private lands. Conflicts between private landowners, such as timber-companies and the craw-fishermen that have long inhabited the Atchafalaya Basin revolve around issues of access, water depth and sedimentation.

2.2.3 The relationship between sediment, water depth and access in the Atchafalaya Basin

The relationship between private landowners in the Basin, people using the navigable waterways for commercial and recreational purposes, and the State of Louisiana cannot be properly understood without taking the sediment into account. The definition of the boundaries between private and public parts of the Basin is tied to the sediment, and the water depth over time. In principle, all navigable waterways are open to the public, since they are considered state property, or state water bottom. But sediment accretion changes the hydrological, and therefore legal, status of these streams constantly. As Lamar Hale from the US Army Corps explains: *"When the initial public surveys began in the United States in the development of what they referred to as the townships, at that time those surveys were made, the navigable streams were designated as public streams and given to the state. That is referred to as the state water-*

bottom" (Interview with author, 01/16/08). The importance of the relative elevation and water depth in different areas in the basin is therefore both legal and physical. As water levels rise and fall in the Atchafalaya Basin, restrictions on access continuously change as well. This creates tensions between different users of the Basin. Many longtime residents of the Basin are engaged in commercial craw fishing, an activity that requires access to a large enough part of the Basin to provide a reliable source of income. As sediment accretion changes the physical and legal boundaries of which areas are accessible to craw fishermen, conflicts between landowners and fishermen arise. Efforts to describe elevation, water depth and sedimentation patterns are, therefore, not only attempts to generate a stabilized understanding of the Basin's ecology, these descriptions also become maps of the legal boundaries in the Basin[17]. The Louisiana Land Office produces maps of the Basin that outline the various levels of public access based on satellite imagery[18], but these maps have little or no impact on the movements of longtime residents of the Basin.

The role of science in attempts to stabilize the boundaries in the Basin needs to be understood from a legal, political and scientific perspective. In order to further analyze these complexities, I view the scientific efforts in the Atchafalaya Basin as part of an interdependent network, which includes the people that work, study and recreate in it[19]. Also included in this network are the sediment, water movements and tree species that shape the relationships between the people that work, study and recreate in the Basin. In describing the scientific efforts in the Basin, I am therefore less interested in their relationship to general methodological principles in

[17] This description of the production of legal and scientific stabilization of the boundaries in the Basin is based on the concept of co-production as outlined in: Jasanoff, S., *Handbook of Science and Technology Studies* (Thousand Oaks, CA: Sage Publications, 1995),

[18] For example, see http://doa.louisiana.gov/slo/Atchafalaya_Basin_Map.htm, accessed on 9/30/2008

[19] This description is based on Actor-Network Theory, as outlined in M. Callon, "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay," in J. Law, ed., *Power, Action, and Belief: A New Sociology of Knowledge?* (London: Routledge and Kegan Paul, 1986)

the relevant literatures, but more in the ways in which science influences the relationship between user groups, legal and physical boundaries and sedimentation processes. This approach to science is based on agnosticism on the part of the observer, generalized symmetry and free association, as outlined by Michel Callon[20]. The determination of whether or not a particular stream has dried up, and if so for how long it has been dry and whether or not it will remain so is difficult to make, and this is where the need for stabilization arises. Historical photographs, survey data, and aerial photography play an important role in defining the boundaries of the Atchafalaya Basin. This information is used to assess past conditions in the Basin and transform those conditions into an enduring description. Survey crews made the first attempts at quantification of elevation, but new technologies have changed the way in which the stakeholders attempt to stabilize the understanding of the elevation in the Basin. Satellite imagery, high altitude LIDAR (Light Detection and Ranging) imaging, and aerial photography now allow people to look at the Basin from a new perspective.

The boundaries between sediment and water in the Atchafalaya Basin are not easy to stabilize from a scientific perspective either. An employee of the Army Corps mentioned the high altitude photography: *"It's a great tool, it's the best we have. As far as LIDAR, it's a very good tool. But unfortunately the LIDAR that was flown over the Atchafalaya Basin was flown at three different times. There was a significant difference in the water levels each time it was flown, so you can't match the images. For one little section of it, it may be great. But you can't get a complete picture of the entire basin."* (Interview with author, 01/16/08). Efforts to use this type of high altitude view of the Basin to stabilize the boundaries between water and sediment

[20] This description is based on Actor-Network Theory, as outlined in M. Callon, "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay," in J. Law, ed., *Power, Action, and Belief: A New Sociology of Knowledge?* (London: Routledge and Kegan Paul, 1986)

continue despite these problems. The United States Geological Survey (USGS) is using Synthetic Aperture Radar (SAR) to quantify changes in water level and depth of water. The changes in the Basin can be tracked since: *"The radar-satellites go over the Basin, I think, weekly, or bi-weekly, over the location. So we will match up the dates that the satellite overpasses the Atchafalaya with site-specific measurements of elevation of both the water, the soil surface and then the gauge reading so we can calibrate."* (Employee of USGS, interview with author, 01/14/08). Transforming the boundaries of the Atchafalaya into maps that are easy to use is complicated in more ways than one: *"There are some problems with access. There's a lot of land that's in private hands and you can't get on that land to measure a lot of times. We're often restricted to public lands so there might be some specific condition we'd like to measure."* (Employee of USGS, interview with author, 01/14/08). The implications of the elevation and hydrology research that is being conducted extend beyond the legal boundaries between state and private lands. The cypress trees that are so characteristic of the Louisiana swamps thrive in certain hydrological conditions, and the ability to observe those conditions using satellite imagery allow policy makers to impose restrictions on private landowners who want to harvest those trees. The USGS is working to create this technology, which would result in a new type of disciplinary perspective for the State of Louisiana. Here, the boundary between scientific capabilities and policy-making is blurred. Without the tools to classify different areas as more or less suitable for cypress trees, the State would be unable to impose restrictions on timber harvesting. However, USGS defines itself as a science agency, and this boundary between science and policy is reiterated in this project: *"This is a real research project. We don't know if we can do it. It's a hypothesis."* (Employee of USGS, interview with author, 01/14/08). This boundary between real research and policy-making is important to maintain in an environment

like the Atchafalaya Basin, where landowners seek to protect their investments and generate revenue. In this context, all attempts to transform elements of the Basin into knowledge, through satellite photography, or tree-counts by foresters, or water quality samples is potentially political, in the sense that the decision-makers can use that information to support management efforts. So the cypress trees in the Atchafalaya Basin are important to what the Basin is, but their role in defining the Basin differs. For timber companies, they are a source of revenue, for researchers, they can be an important element in their understanding of the ecological process in the Basin, and for others the cypress trees can be the embodiment of Louisiana's wetlands. Sediment also plays different roles in the Atchafalaya, either constructing private land, as an indicator of water quality, or as a boundary between wet and dry.

2.2.4 Conclusion

There are many different ways in which the Atchafalaya Basin is understood and described, and in this section I have only mentioned a few. The Atchafalaya Basin can be viewed as a floodway that is critical to the ability to "pass the Project Flood" as a part of the Mississippi River and Tributaries system. The Basin can also be seen as a unique swamp-environment containing a specific combination of cypress trees, wet/dry dynamics and a composition of species that cannot be found elsewhere in the United States. The Basin can be, and has been described as characteristic of the disappearing Southern swamp, an environment that features prominently in many depictions of what Southern life is all about. In an attempt to remain brief, and focused on the "official" representations of the Basin, I have not even scratched the surface of the Basin as a site of cultural significance to the Cajuns who settled there centuries ago, or of the Native American tribes which have been there even longer. The Atchafalaya can also be

described as a biodiversity hotspot, where many species of trees, plants and animals thrive that cannot survive elsewhere. The Basin is a site for scientific research, and is sometimes viewed as a large-scale laboratory, where scientists and engineers experiment. Last but not least in this partial overview of different understandings of the Atchafalaya Basin, I will mention that the Basin is a place where people work and play. The Basin provides many people with their livelihoods, from timber production to craw-fishing, and from selling hunting licenses to renting out boats and kayaks. The Atchafalaya is a site of intense economic competition, and this competition is influenced by the actions of the management agencies.

With all of these different, and sometimes competing representations of the Basin in mind, the basic argument I have made thus far is that there are deep and important connections between the different ways in which people view the Atchafalaya Basin and the conflicts that arise in the Basin. These are disputes over access to private land, how to best use the natural resources in the Basin and how to shape efforts to manage it. The scientific view of the Basin as containing different categories of habitat and the management perspective on protecting cypress are interdependent. The Army Corps' perspective on the Atchfalaya as a floodway and the landowners' ability to generate revenue by growing, harvesting and transporting timber cannot exist in isolation. From a theoretical standpoint[21], in the previous paragraph I began to describe the scientific efforts in the Atchafalaya Basin as part of an Actor-Network, in which different actors, like agencies, organizations and individuals represent, or *translate*, the various elements in the Atchafalaya Basin, like the cypress trees, the sediment and the crawfish in different ways. This *sociology of translation* can be expanded to the other actors in the Basin as well. To clarify

[21] This description is based on Actor-Network Theory, as outlined in M. Callon, "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay," in J. Law, ed., *Power, Action, and Belief: A New Sociology of Knowledge?* (London: Routledge and Kegan Paul, 1986)

this way of understanding the different views of the Basin, I will briefly describe the four moments of translation that French sociologist Michel Callon describes as they apply to the Atchafalaya Basin:

1 *Problematization:* This is the moment when a researcher, or in this case any actor describing the Basin, tries to define the nature and problems of the Basin in a particular way, suggesting that those problems would be solved if all the other actors would agree on a research or policy program through which the problems could be engaged.

2 *Interessement:* This moment consists of a series of processes in which the actor attempts to describe and prescribe the roles of the other actors in a proposed research or policy program. The formation of a technical committee to study one element of the Basin can be described in these terms.

3 *Enrolment:* This occurs when an actor engages other stakeholders to fulfill a particular role. Inviting particular agencies and representatives of stakeholder groups to join a technical committee, and asking them to present their views are examples of such a moment.

4 *Mobilization:* The final moment in the translation of an Actor-Network like the Atchafalaya Basin is when an actor ensures that the spokesmen for other groups of stakeholders are actually speaking on behalf of those groups, and can successfully be engaged when action is required based on the research and/or policy program.

Based on this *sociology of translation,* it becomes clear that when the various actors in the Basin are describing the Basin in a variety of ways, they are also constantly trying to raise interest in their particular description, research program or policy proposal -- trying to enroll

other actors in the particular parts that are prescribed by their view of the Basin, and attempting to mobilize those actors. The competing descriptions of the Basin are therefore translated into different ideas about what the main problems in the Basin are, who should be involved in solving them, what the proper roles for those stakeholders are, and how to use to resources of those actors to achieve desired outcomes. Whenever an agency or organization tries to initiate a new effort in the Basin, it can be expected that the other stakeholders will be reluctant to become engaged in an exercise that might re-define their own understanding of the Basin, and their role in it. This back and forth has contributed to a stalemate among some stakeholders in the Basin. The only progress that can be made is slow, fairly marginal and incremental.

Since the different descriptions of the Basin translate into different definitions of who should do what, when, and how, it is relevant to point out that there are also some important common elements in all of the descriptions of the Atchafalaya Basin. Important elements are the dynamics between wet and dry, and sediment and water, as I described in paragraph 2.2.3. Cypress trees and crawfish are important parts of the Basin, both from a natural and a cultural perspective. But Old River Control and the East and West Protection Levees are also part of any telling of the Atchafalaya story. Any attempt to describe the Atchafalaya Basin, either by using aerial photography or by transcribing oral history, cannot be successful without including these elements. The two agencies that are central to this thesis, the Army Corps of Engineers and the Louisiana Department of Natural Resources, have different views of the Basin. The central role of the floodway in any description of the Atchafalaya by the Army Corps can be juxtaposed with DNR's focus on natural resources and their protection.

2.3 The Narrowing Boundaries of the Atchafalaya Basin

The two agencies that are central to the environmental restoration efforts in the Atchafalaya Basin are very different. The Army Corps is a large, federal bureaucracy that is traditionally focused on flood-protection and navigation, and has more recently begun to include environmental protection and restoration in its procedures and projects. The Louisiana Department of Natural Resources is a far smaller state agency with a real focus on nature, and more broadly on environmental issues in the State of Louisiana. So far, I have approached the environmental restoration of the Basin by answering two, seemingly simple, questions.

The first one is how the Atchafalaya Basin is described in terms of its location. I found that there are actually multiple answers to that question, all of which are sensible and correct, depending on one's viewpoint. The Atchafalaya Basin can be defined as a cultural area, as is the case in the Atchafalaya Trace Heritage Plan. The Army Corps' EIS described the Basin as the area from the Mississippi to the Gulf, in which the Atchafalaya River used to meander before the construction of the protection levees. The most common description now is basically synonymous with the floodway, from Old River to Morgan City, between the protection levees. Even within those boundaries, distinctions are made between the "typical" Atchafalaya cypress-tupelo swamp, and other areas that no longer represent this particular natural environment. So one finding based on my question "where the Atchafalaya Basin is" is that there are actually multiple Atchafalaya *Basins.* For the environmental restoration efforts a more significant conclusion is that the overlapping use of these boundaries has actually considerably shrunk the area that is considered part of the Basin. This shrinking is exacerbated by limited access to private lands, and legal and scientific uncertainty over the status of navigable waterways.

Conflicts over access and use of the resources in the Basin point to the second question I posed, namely what the Atchafalaya Basin is, or more accurately, what it means to some of its users. I did not seek to answer this question for all the users of the Basin, but chose to focus on the views of those directly working on the restoration efforts. Broadly speaking, the views of the larger group of stakeholders range from regarding the Atchafalaya Basin as an almost sacred space which contains the last, best examples of a Southern swamp, to a completely instrumental view of the Atchafalaya Basin as a source of extractable commodities that needs to be managed to maximize output. The dynamic nature of the Atchafalaya Basin and its environmental processes complicate stable legal and scientific descriptions of the entire Basin. The ways in which the Basin is described and categorized have direct implications for the ability of the state to protect, maintain and restore the Basin[22]. Changes in the waterways and swamps of the Atchafalaya can physically and legally restrict access to parts of the Basin. These changes can also limit scientists' ability to view and describe the Basin, even when using high altitude imagery, since the images cannot be checked against measurements on the ground. The "shrinking" of the Atchafalaya Basin as a result of the different definitions of the Basin as described in this chapter is therefore exacerbated by this combination of legal and physical boundaries within the Basin. Private landownership, restricted access, and changing conditions all contribute to this development.

The next question I will pose relates to how the agencies responsible for environmental restoration actually describe and implement their tasks and goals in the face of these diverse and complex boundaries.

[22] The risks associated with large-scale state intervention based on scientific understandings are pointed out in Scott, J.C *Seeing Like a State* (New Haven: Yale University Press, 1998)

3. The Impact of Boundaries on Environmental Restoration

3.1 What are the Goals of Environmental Restoration in the Basin?

3.1.1 Management Plans

Two documents outline the official goals and strategies for the environmental restoration of the Atchafalaya Basin, namely the US Army Corps of Engineers *Master Plan for the Atchafalaya Basin* and the Louisiana Department of Natural Resources' *State Master Plan*. The *State Master Plan* was completed in 1998 and the Army Corp's plan in 2000. The Army Corps' Master Plan outlines the legal framework within which it operates and management tasks assigned to the Corps in the Atchafalaya Basin. The Corps engages in a variety of management activities in the Basin, such as operating the floodway, but also constructing boat-ramps, purchasing easements to prevent development and acquiring land from willing sellers.

The recent history of the Corps' efforts to restore the environmental qualities of the Atchafalaya Basin is closely tied to the Corps' 1982 Environmental Impact Statement on the Atchafalaya Basin Floodway System. In that EIS, the Corps outlined its goals for the ABFS. The plans for environmental improvement of the Basin revolved around water management units, or WMU's: *"Natural processes and human actions have combined to produce distinct environmental and hydrological subdivisions within the Lower Atchafalaya Basin Floodway. These areas have been identified as management units for the purpose of formulating individual water management plans to retain or restore unique environmental values of an individual area."* (USACE, 1982: 34). The 1982 EIS was the first instance in which these water management units were identified as central to attempts to restore the Atchafalaya Basin. Four broad design-rules for the restoration of WMU's were mentioned in the EIS:

- *Water regimes are restored as closely as practicable to historical overflow patterns.*
- *Proper water movement occurs through the units.*
- *Sediments movement and deposition in the units are restricted.*
- *Nutrients and organic matter are supplied to the estuaries area and the Gulf of Mexico."* (USACE, 1982: 34).

These broad rules were intended to provide the underpinning for restoration efforts in the Basin. But funding sources for this type of restoration were limited, and opposition to some of the elements arose. As a result, the water management plans for the individual areas, and the actual implementation of these restoration goals had still not been started in 1998, when the State released its Master Plan.

The State of Louisiana prepared its Master Plan for the Atchafalaya in 1998, and the concept of the WMU's was also central to efforts at environmental restoration. The State's goals for water management were slightly different from those of the Army Corps: *"The State's principal interest is to restore, where possible, and to preserve, where feasible, the natural habitat that has made the Atchafalaya Basin a national treasure, a part of Louisiana's culture, and an educational, and an economic and recreational asset for the public."* (LADNR, 1998: 6-1). This is a very broad description of the goals, and a more detailed set of goals is also provided: *"Therefore, the goal of the management units is to pro-long the expected life of some habitats that may become scarce through time (primarily aquatic and cypress/tupelo habitats) by managing sediments, while at the same time achieving a healthy water circulation pattern that will maintain or restore water quality."* (LADNR, 1998: 6-1). Based on this Master Plan and its formulation of the goals for environmental restoration, the State planned and executed several

projects through its Atchafalaya Basin Program. Most of these projects were recreational, like building boat ramps and a walking trail to improve access to the Basin. The notable exception to the recreational nature of the State's projects to date is the Bayou Postillion project. In 2005, a three-mile long stretch of sediment was dredged to allow water to flow through the Bayou again, and removing the sediment was intended to improve water quality. However, environmental groups have questioned the goals of this project, alleging that the Bayou was dredged so that local landowners could use it to barge cargo[23]. The permit that allowed this project is currently under a legal challenge led by an environmental organization, *Atchafalaya Basinkeeper*. Given this ongoing litigation, and the fact that is impossible to evaluate this project within the scope of this thesis, I will focus on the restoration efforts that are currently being planned and executed, namely those that are led by the Army Corps of Engineers. It is important to note that the difficulties surrounding this project exemplify the legal and physical boundaries that I have described throughout this thesis, and the importance of garnering support from all relevant stakeholders to prevent legal challenges. The state has announced and started to implement a new planning process for environmental restoration projects in the Basin[24]. This process falls outside of the scope of this thesis, but it is important to mention that it remains fully separate from the Army Corps' restoration efforts.

Despite the fact that the restoration processes remain largely separated between the State and the Corps, the differences between the Corps' original vision and the State's Master Plan were actually significantly reduced when the Army Corps reformulated its goals in its 2000 Master plan for the Atchafalaya Basin. Several types of improvements were described in the 1982 EIS to

[23] For a more detailed description of the history of the Bayou Postillion project, and the different points of view see: http://www.businessreport.com/news/2008/oct/06/paradise-lost-indt1/ Last accessed on 11/23/2008.
[24] For the press release announcing this new process, see: http://dnr.louisiana.gov/sec/execdiv/pubinfo/newsr/2008/0926sec-abp-october-meetings.ssi Last accessed on 11/23/2008.

achieve the goals this restoration of unique environmental values. These improvements included: *"dredging entrance channels, constructing low levees or dykes around prospective units, and installing weirs in the inlet and outlet channels to control flows."* (USACE, 1982: 36). In the Corps' Master Plan of 2000, the improvements that were proposed in the 1982 EIS were no longer considered beneficial since they could result in increased stagnation of water in the WMU's. So the Corps' 2000 Master Plan continues: *"Therefore, management unit goals are now redefined as restoration of historic north-to-south flows to the greatest extent practicable, while managing or redirecting sedimentation for the purpose of improving water quality and circulation within the units."* (USACE, 2000: 3-18). This reformulation was even more restricted to hydrological interventions than the original formulation in the 1982 EIS. The Corps also reformulated the history and purpose of the WMU's as: *"Implementation of water management unit feature is intended to compensate for adverse impacts to Atchafalaya Basin aquatic habitats resulting from flood control and navigation* (…). *Natural processes and human activities have combined to produce 13 hydrologically distinct areas in the ABFS, where water regimes could be managed to mimic historical water overflow patterns to improve water circulation."* (USACE, 2000: 3-18). Three important differences emerge from this new description of the WMU's, First and foremost; the language about the management units as compensating for adverse impacts is new. Secondly, the WMU's are now only described as hydrologically distinct, whereas in 1982 they were described as hydrologically and environmentally distinct. The third change from the 1982 description is that the definition of these units is now tied to the ability to manage water in certain ways, whereas in the original statement the purpose was the creation of a management plan. These three differences might be subtle, but they reflect the Corps' focus on

hydrological manipulation, as opposed to broader environmental restoration as outlined in the State's Master plan.

3.1.2 Water Management Units

Two WMU's were identified in the 1982 EIS as *pilot units* in which this approach would be tested. Detailed plans for these pilot units, Buffalo Cove and Henderson WMU's, were developed following congressional authorization in 2000[25]. In the Corps' Master Plan of 2000, it was decided to replace Henderson as a pilot unit with Flat Lake, because of *"Flat Lake's greater potential for significant improvement, as well as its greater public support."* (USACE, 2000: 3-18). What form this public support took is not described in the Master Plan, but this clearly shows the difficulties in setting "natural" goals for environmental management. The mention of *public support* as a factor in the decision to focus on Flat Lake signifies that agencies have to be responsive to a variety of factors, and cannot prioritize based on expert opinions alone. In collaboration with the Southern University Center for Social Research, an outreach effort was organized and they *"* (…) *collected information, recommendations and concerns to improve the water flow and quality of the Flat Lake Water Management Unit (WMU)"* [26]. In seeming contradiction to this quote from the Corps' Master plan, an Environmental Impact Statement was actually developed for Buffalo Cove, and another is currently being developed for Henderson WMU, but not for Flat Lake. The uncertain status of Flat Lake is reflected in Figure 4[27] where Flat Lake is referred to as a pilot WMU, but not highlighted as such.

[25] For a list of all relevant legislation, see: http://www.mvn.usace.army.mil/pao/visitor/atchpfs.htm Accessed on 09/05/2008
[26] See: http://www.subr.edu/socialresearch/flatlakearchive/flatlake.htm Accessed on 09/05/2008
[27] Source: http://www.mvn.usace.army.mil/pd/projectsList/ProjectData/118002/Maps/Management%20Units.jpg Accessed on 09/05/2008

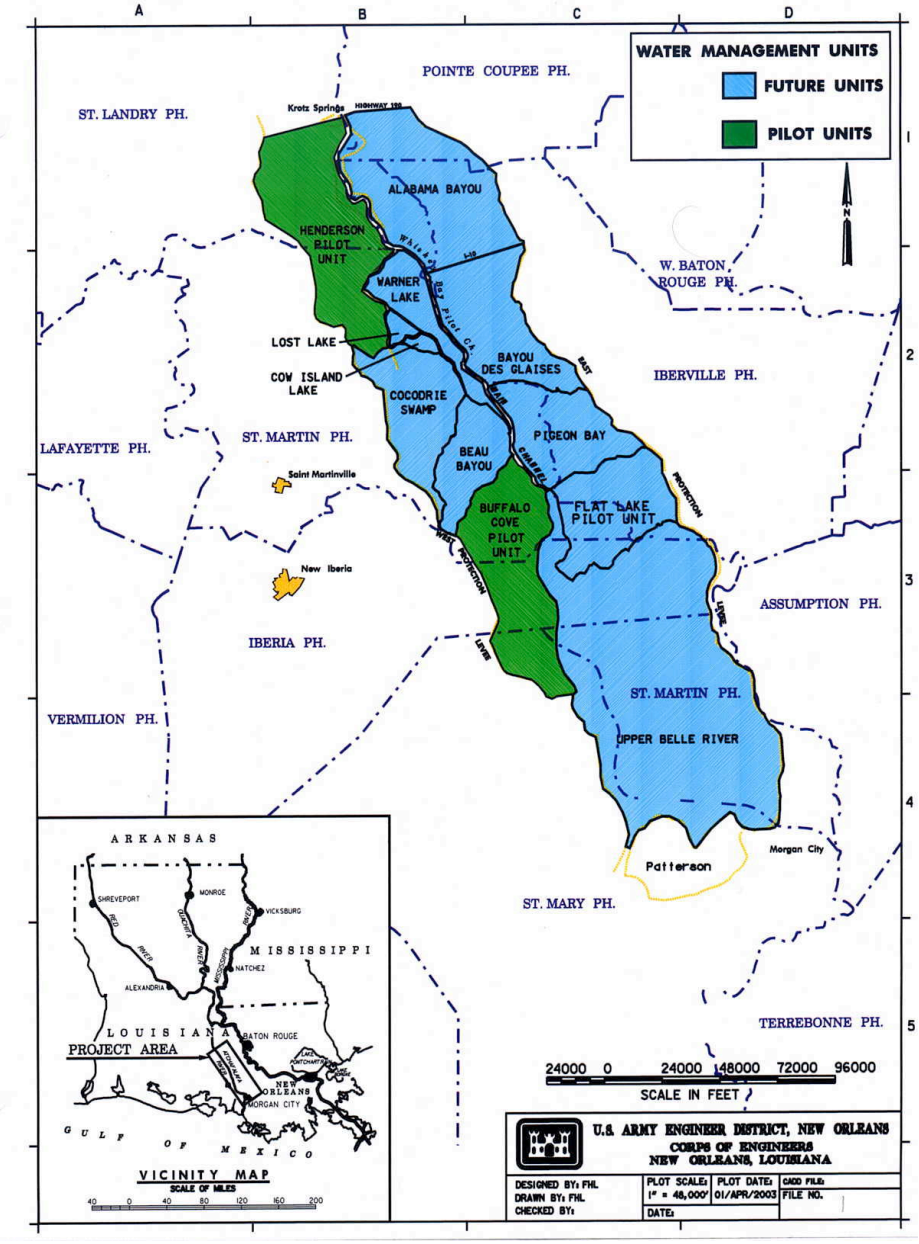
The management plans for Buffalo Cove and Henderson contain WMU-specific *elements,* as the interventions are called. An element can be anything from a cut or a gap in an existing bank next to a canal to a new water input structure. Activities in the Atchafalaya are focused on the Henderson and Buffalo Cove pilot-WMU's for now and will be described in more detail in section 3.2.3. The Army Corps invited other stakeholders to participate in the planning for the Henderson and Buffalo Cove WMU's. This process produced the following list of criteria for the restoration efforts in Buffalo Cove: *"Given the fact that almost 18 years have past since receipt of congressional authorization for implementing the BCMU features, the resource agencies agreed that the short-term strategy for implementing the BCMU should be to start construction as soon as possible before additional critical habitat is lost. Therefore, elements to be considered, formulated, and designed were identified based on several parameters:*

1. *Elements can meet one or more of the four objectives.*
2. *Elements are located in areas where real estate acquisition appears readily available.*
3. *Elements are located in areas that would be easily accessible from the river or other existing access areas. This would minimize mobilization costs, reduce impacts and negate lengthy permits, and thereby simplify environmental compliance.*
4. *Elements are located in areas that would complement the work being done in adjacent areas.*
5. *Elements can be designed based on existing information."* (USACE, 2003: 29).

It seems that the planning process involving the resource agencies led to a reformulation of the goals as they were stated in the 2000 Master Plan. The elements of the restoration of the Buffalo Cove WMU are further detailed in the EIS, and for each element a description of how it relates to the broader goals (improving circulation, restoring north-to-south flow, reduce sediment deposition) is provided. The addition of these criteria reflects the Corps's focus on

improving water quality, but they also reflect some of the fundamental challenges of working in the Basin, most prominently the lack of specific information, the difficulty of gaining access to certain areas and the high level of interconnectedness between the different elements of the Basin.

Fig.4 The Water Management Units in the Atchafalaya Basin.



Source: United States Army Corps of Engineers, Undated, List of Projects.

This brief history of the plans for the environmental restoration of the Atchafalaya Basin shows how the stated goals and target areas of environmental restoration have shifted over time, and the proposed interventions have changed as well. These plans can be understood as the first moment in the *sociology of translation*, the problematization in which the management agencies define the nature of the Basin and its problems, and thereby prescribe their own role in its restoration. But management plans can only tell part of the story of how environmental restoration is put into practice.

3.1.2 How Understanding Nature Changes the Goals of Restoration

The challenges associated with recreating natural systems in the Atchafalaya Basin are evident in the changes and the differences between both the State and Army Corps Master plans. The historian Martin Reuss, in his history of the Atchafalaya Basin *Designing the Bayous*, writes that: *"For over 200 years, a combination of natural forces and human intervention has shaped the Atchafalaya Basin."* (Reuss, 2004: 3). This distinction between natural forces and human intervention lies at the heart of most the efforts at managing, protecting and developing the Atchafalaya Basin that are outlined in the Master plans for the Basin developed by the USACE and LADNR. However, calling something natural is more than a mere descriptive statement about its origins, or its relationship to human beings.

The use of the word nature implies a paradoxical value-judgment, as described by William Cronon: *"On the one hand, people in Western cultures use the word "nature" to describe a universal reality, thereby implying that it is and must be common to all people. On the other hand, they also pour into that word all their most personal and culturally specific values: the essence of who they think they are, how and where they should live what they believe to be*

good and beautiful, why people should act in certain ways." (Cronon, 1995: 51). The constant struggle over defining what is "natural" about the Atchafalaya has direct implications for what needs to be preserved, restored or improved within the context of the dramatic human interventions that have taken place since 1900. An employee of the USACE describes the importance of the construction of the history of the Basin: *"The language in the authorization says to restore to historical conditions as much as practical. So if you want to talk about historical conditions, just pick a date. And maybe we can get it to that, and maybe we can't."* (Interview with author, 01/16/2008). The Mission Statement of the State Master plan is similarly ambiguous about the natural history of the Basin: *"The mission is to conserve, restore and enhance (where possible) the natural habitat and to give all people the opportunity to enjoy the Atchafalaya Experience."* (LADNR, 2000: 2-2).

The more specific goals of restoration are a result of how the participants in these efforts understand the processes that shape the Atchafalaya, and the ways in which the restoration efforts are implemented. The conflict over the goals of the Bayou Postillion can be understood to show that differences in opinion over what is natural affect how people view the restoration the Basin. These differences can easily result in legal challenges. An employee of LADNR describes the boundary between nature and construction throughout the Atchafalaya in this way: *"There is actually nothing natural about the Atchafalaya Basin.* (…) *But I'll share with you that my thoughts are the system, is not, on its own,* [sic] *but because of the diversion of so much sediment in to the system; its successional period is being accelerated. So it is going trough what would be a natural process, but it's going trough it at a very, very accelerated rate. So you're seeing these bottomland forests, because of sediment deposition, they're going through species change and they're moving in a successional pattern, as they would naturally. So it's not an unnatural*

occurrence, it's just happening at a faster pace than people are prepared for it to happen." (Interview with author, 01/16/08).

This is obviously in line with the description of the State's goals to *"prolong the expected life of some habitats"* (LADNR, 1998: 6-1), but this statement also points at the difficulties of making decisions in an environment as dynamic as the Atchafalaya. The question of the restoration efforts in the Basin, and what these should entail, was answered with a reference to history: *"If we could consider moving back to the historic patterns that those levees no longer really afford us, with the levee system up, unless we got some sort of conveyance system to get sediment where it needs to be, I think we're going to have to do local manipulation of sediments."* (Interview with author, 01/16/08).

Local sediment manipulation is exactly what is being done today in the Atchafalaya Basin by the USACE. USGS and other agencies are providing technical support for this type of restoration. The reason for sediment manipulation as the specific intervention to restore nature points to the central place of sediment in the Actor-Network around the Atchafalaya. Attributing this central position to sediment requires that certain other actors, like USGS, in the network accept this problematization of the Basin. These other agencies have specific roles in the research and implementation of the management plans. As sediment manipulation becomes a central strategy in the environmental restoration of the Basin, certain scientists have an interest in participating in that process, and need to be enrolled in it, to use the second and third moments in Callon's *sociology of translation.*

3.2 The Practice of Environmental Restoration in the Basin

3.2.1 A Role for Scientists

The move from *problematization* to *interessement* in Michel Callon's Sociology of Translation starts at the moment when other actors are given a role in the further development of a plan. In the Atchafalaya, this moment can be observed once the goals of the environmental restoration are translated into questions that can be studied by scientists: *"One of our goals is to create interior circulation. And another goal is to control the sediment, and if the sediment is going to come in, let's try to direct it to some place where it may be useful to create this terrestrial environment. Let the bears have a good habitat, etc. etc. So those are our goals in the design."* (USACE employee, interview with author, 01/16/08). Given these goals, as described by employees of the Army Corps and LADNR, the lack of stable elevation information seems to be a major hurdle to its implementation. In the provision of this information, the scientists are expected to develop an interest in participating in the restoration process. A significant amount of information is required to change the elevated banks, created by dredging as well as other forms of sediment accretion, because they restrict interior flow in the swamps. Making cuts in these banks allows water to flow in ways it previously couldn't, which increases interior circulation. This circulation has beneficial effects for water quality and moves sediment. Water depth, flow rate and the elevation of sediment banks change regularly, and there is not much information on the "historical" flow-patterns in these swamps, making the decision about where to cut the banks very difficult. This is where satellite imagery, high-altitude photography and historical data provided by scientists become critical to the restoration effort.

The Water Management Units are the main scale at which the efforts to manipulate the sediment are defined. The development of a Supplemental Environmental Impact Statement for

the Henderson WMU provides a good example of how knowledge is used in the decision-making process regarding the environmental restoration of the Basin. The Army Corps has *enrolled* a team of experts, consisting of federal employees (US Army Corps of Engineers, the United States Geological Survey, the United States Fish and Wildlife Service,) state agency personnel (Louisiana Department of Natural Resources), and contractors to oversee the process and provide technical support (Tetra Tech and ERG). This committee gets together to discuss options for improving the flow of water through the WMU. At this point, the scientists who have provided information have an interest in the use of that information, and since they are on the committee, as part of Callon's third moment of translation, *enrollment*, they are able to advocate its use. The members visit the WMU to observe existing obstacles to water flow and try to gather information on previously existing flow patterns. During the committee meetings it was decided to implement a phased approach to the restoration of the WMU, by starting with the removal of barriers to internal circulation, then focusing on outlets and drains in the WMU, proceeding to deal with an existing control structure in the southern section of the WMU, and, finally, by considering a new freshwater input into the WMU. Aerial photography and geospatial information provided by the Fish and Wildlife Service was used to indicate where potential *elements* could be located. These suggested interventions, 53 in total after all members were asked to mark them on a map, were divided into groups and discussed by the committee as a whole. Based on these discussions, a final map with suggested interventions was prepared by USFWS. Then, a field trip was organized to see whether or not these interventions were feasible. Ultimately, this committee will develop an Environmental Impact Statement that outlines a "preferred alternative" for the restoration of the WMU. This statement comprises the fourth and final moment in Callon's translation, since this is the moment where the stakeholders will be

mobilized, since their involved in the technical committee can be expected to result in their support for the intervention.

In summary, the process through which the management plan is translated into WMU-specific plans can be understood by applying Callon's four moments of translation, namely *problematization, interessement, enrolment, and mobilization.* This process gives the other actors limited flexibility in their ability to perform the roles they desire in the environmental restoration of the Basin, since the basic description underlying the process is already set in the management plan. The stakeholders, through their participation in the technical committee, have an interest in the outcome of its work, which is what Michel Callon described as the moment of *interessement*. The stakeholders are then enrolled in the restoration process through their work on the committee and mobilized to implement the restoration strategy as it is outlined in the WMU-specific management plans. This process leaves very little room to problematize the issues in the Basin in a different way, or with a fundamentally different group of stakeholders. At one level, this is a necessary precondition to get anything done, since it is impossible to achieve any physical results without depending on a particular conception of the problems in the Basin. It does create a situation in which it is difficult to integrate efforts across WMU's and allow stakeholders to define the relevant scientific questions based on their own analysis of what is happening in the Basin.

In the final section of this thesis I will argue that a more inclusive and flexible process is needed to describe the Basin, in which the stakeholders are given a greater opportunity to design and enact their own roles, and mobilize their own resources to implement a restoration strategy. The next paragraph already begins to challenge the notion that the restoration of the Basin can be achieved by engaging a limited set of professional stakeholders in a narrowly defined way.

3.2.2 The Use of Local Knowledge in Re-creating History

The Atchafalaya Basin is home to about 10,000 people, and many of these people have a deep and enduring connection to the ecological processes that continue to shape the Basin. Living in an environment like the Atchafalaya Basin requires and generates an understanding of these processes in a thoroughly practical way. Whether this understanding is called local knowledge, Métis[28] or common sense, it is relevant to the practice of environmental restoration since it can provide a type of holistic insight into the detailed processes that are occurring that other types of information simply cannot. Many of the inhabitants of the Basin have deep roots there, stretching back generations to Cajun ancestors who settled in the area centuries ago. This makes the information from those residents even more compelling, since it spans a period of time into which scientific information can only provide limited insight. The information that can be generated by enrolling these stakeholders into the planning process is of a different nature than the scientific information that was discussed in the previous section, but it has clear value for the planning process.

During the process of outlining interventions and visiting the WMU to asses their feasibility, this important actor in the Atchafalaya Basin was enrolled in the Actor-Network: *"So the process we go through to develop the location of a cut is through personal experience and with the old-timers. People that have lived and worked there all their lives can tell you, you know, water used to flow from here to here, A to B to Z. And you do a good thorough analysis of that, to see if you can recreate it, and if you can it's fine."* (USACE employee, interview with author, 01/16/08). The memory of the old-timers plays an important role in the attempts to recreate history in the Atchafalaya Basin, but there are problems associated with this method: *"A*

[28] This concept is used in: Scott, J.C *Seeing Like a State* (New Haven: Yale University Press, 1998)

lot of folks that we've talked about remember the Atchafalaya Basin as just one huge lake. Then there are other folks that remember those drought years when the Atchafalaya would dry up. Sometimes two or three years straight and then you would see flooding again. And this sort of long term pulsing, if you will, is what gave us that healthy rich environment that we had for so long." (employee of LADNR, interview with author, 01/16/08). Different people clearly remember the Atchafalaya differently, and that can be explained only in part by the time-periods that are discussed. The Basin is remembered as being very different from what it is at present. The history of the Basin, and its natural health in bygone years, is given a voice through the so-called old-timers.

The boundary between nature and intervention, between history and the current successional pattern that is "too fast," can be found in the planning documents for the Basin, in the maps of the Basin that include and exclude certain features based on these boundaries. The "old-timers" play a crucial role in spanning that boundary, and in the process allowing for the recreation of a history. The enrollment of the old-timers as stakeholders and the mobilization of their expertise raise an important set of questions about the accuracy of the information they provide, how that accuracy can be checked, and how and when they are selected to participate. The use of local knowledge in government planning is commonly described as a necessary and positive[29] attribute of large-scale interventions, and I subscribe to that general view. In this case however, it seems that this type of knowledge is only mobilized at a very late stage of the process, and with a very limited scope. Again, the sociology of translation provides insight into this process, since the long-time residents of the Basin are given a limited interest in the planning process, and when they are enrolled, they are given a very narrowly defined role regarding the

[29] See for example: Scott, J.C *Seeing Like a State* (New Haven: Yale University Press, 1998)

information they can provide. It seems that this source of information can be mobilized in a more effective way, especially given the diversity of views regarding what the Atchafalaya was, is and should be. The restoration of the Basin can benefit from incorporating more sources of information at an earlier stage of the planning process, and the old-timer are an important example of such a source.

3.2.3 Cuts, Gaps and Sediment Traps

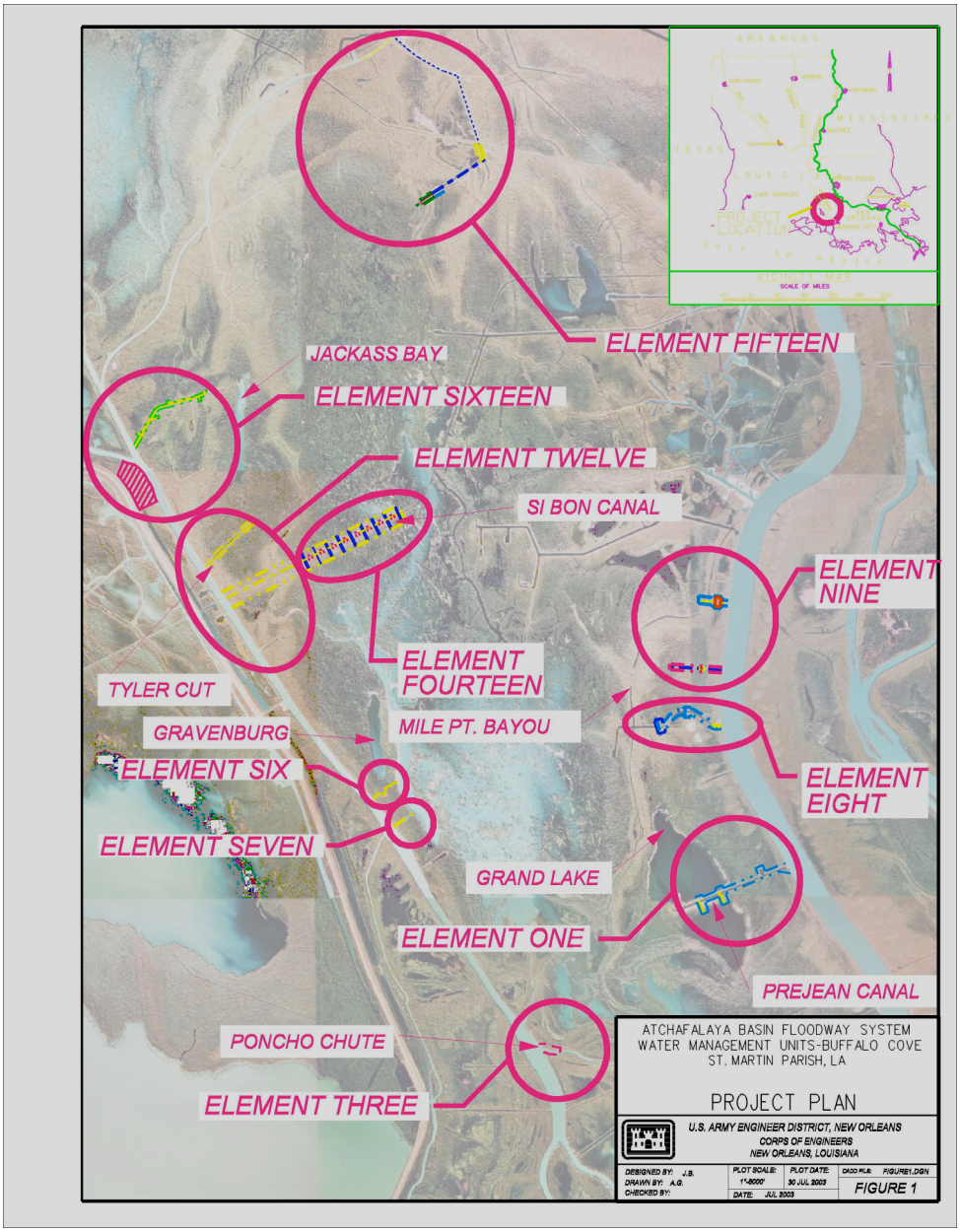
The restoration efforts of the Army Corps and the State of Louisiana have mainly revolved around sediment manipulation. Based on the Masterplans, both agencies have, separately, gone through a process of setting goals, gathering information from scientists and old-timers and identified specific interventions in particular places. The State's main restoration effort to date, in Bayou Postillion has already been discussed within the context of this thesis, so in this section I will focus on the Corps' physical interventions that have been implemented at the time of writing of this thesis.

The planning process in the Buffalo Cove Pilot Water Management Unit has resulted in the identification of 10 elements. These elements, their goals and their projected impacts, are described in the environmental assessment that the Army Corps prepared[30]. Figure 5 shows the exact location of these interventions within the WMU. The objective of each of the elements, both as it relates to the hydrology of the WMU and how it relates to the overall goals of the restoration effort, is described in detail in the environmental assessment. These elements consist of sediment traps (No. 6 and 7), designed and placed to capture sediment and prevent it from

[30] United States Army Corps of Engineers Environmental Assessment, *Atchafalaya Basin Floodway System,* Buffalo Cove Management Unit, Water Circulation Improvements and Sediment Management Initiatives, Iberia and ST. Martin Parishes, LA, EA # 366

accreting throughout the WMU, cuts and gaps in existing banks to allow the increased north-to-south flow of water throughout the WMU (No's 1, 8 ,12 and 14), and the introduction of water from outside of the WMU into it (No's 9, 15, and 16).

Fig. 5 The Elements of the Restoration of Buffalo Cove WMU.



Source: USACE, Environmental Assessment, Atchafalaya Basin Floodway System, Buffalo Cove Management Unit, Water Circulation Improvements and Sediment Management Initiatives.

The southern-most element, no. 3, allows for an easier outflow of water from the WMU through Lake Fosse Pointe Cut by building a small closure that restricts water flow through Poncho Chute. Elements 6 and 7 are both closures to restrict flow out of Bayou Gravenburg into Lake Fosse Pointe Cut. Together, these elements reduce the inflow of sediment into the WMU, redirect water flow to areas with low dissolved oxygen, and increase overall flow through the WMU by introducing new water from outside of the WMU and removing restrictions on outflow of water.

The Environmental Assessment includes a monitoring program that focuses on water quality improvements that are expected to occur as a result of these interventions. As the Assessment stipulates: *"The measurable goals are as follows: 1) reduce the levels of the average annual water column hypoxia established at previously monitored sites by 50 percent, 2) increase water movement (velocity) in a north to south direction to a velocity greater than 0 feet per second, 3) limit sediment accretion to less than 1 inch per year in the areas of influence 200 yards or more from water inlets or bank shavings, as well as the open water areas of Jackass Bay, Bayou Gravenburg, the remnants of Grand Lake near Prejean Canal, and the area to the east of Poncho Chute; 4) introduce water into the unit at lower river stages in those areas influenced by water inlet projects.* (USACE, 2003: 16). These measurements are the detailed, specific to the WMU, and dependent upon the availability of information from previous monitoring efforts. In a way, the broad goals of environmental restoration are reduced to this set of measurable goals of the actual interventions. This is a necessary process to focus on concrete changes, but the absence of any information on the tree composition and health in the WMU, or any effort to monitor the impacts of these efforts on cypress trees as part of the assessment by the

Corps seems removed from the overall goals of the project. The projected impacts of the elements on forested wetlands, fish population and other broader environmental conditions are described in general terms in the Environmental Assessment, but no monitoring program for these aspects is suggested.

The results of the interventions in Buffalo Cove have not yet been analyzed to the extent where they can be said to have been a success or a failure, but the monitoring program exemplifies the shrinking of the Basin, and the ever narrower definition of its restoration.

3.3 Conclusion

At first glance, the answers to the questions about where and what the Atchafalaya Basin is might seem obvious, disconnected from each other and irrelevant to the actual practice of environmental restoration. But the management plan for one of the pilot units, Buffalo Cove, shows how the interplay between the boundaries I described in the earlier sections restricts and directs the environmental restoration efforts in the Basin. The practical criteria that are outlined in the plan relate to the restrictions on access, the limited prospects for purchasing private land, and the limited information available. To enhance the availability of information during the implementation stage, an interesting new view on the environmental history of the Basin is introduced, that of the long-time residents of the Basin. This practice exemplifies the need to involve the other stakeholders in the Basin in defining the history, present and future of the Basin. In the final section of this thesis, I will outline an alternative process that will allow for a more systematic inclusion of the interests, views and resources of long-time residents of the Basin and other stakeholders who are currently given only very limited roles in the restoration of the Basin, such as craw-fishermen, institutional landowners and people who use the Basin for various types of recreation. As many of the people I spoke with pointed out, there have been

numerous attempts to engage these, and other groups in the planning and implementation of restoration strategies in the Basin. Even a brief outline of the history of the Basin proves that point.

The current strategies are outlined in the Master Plans of the Army Corps and LADNR that outline the goals for environmental restoration in the Atchafalaya Basin. The Corps' plans draw heavily on the 1982 EIS and the Water Management Unit approach that was described in that report. Starting in 1982, the Army Corps of Engineers divided the Basin into *Water Management Units* and focused its efforts on two, later three, *pilot units,* namely Buffalo Cove, Flat Lake and Henderson. Simultaneously, the Corps narrowed its restoration focus on water quality improvements through sediment manipulation to increase internal flow in the back-swamp. A number of changes have been made in the 2000 USACE Master Plan that have amounted to a slightly narrower focus on hydrological issues, namely improving water quality through the manipulation of sediment, in the more recent plan. This narrowing of the scope of the restoration efforts can be explained in part by the time it took to start the actual restorations. The first WMU-specific management plan was created more than 20 years after the original EIS. At that point, there seemed to be agreement that to get anything done, the agency would have to focus on making small improvements. The inclusion of the criteria to decide which restoration efforts to undertake based on access, landownership, the availability of information and potential synergies shows how the original broader vision for restoration that was outlined in the EIS has narrowed. These criteria relate directly to the issues I have mentioned in the earlier sections. Land ownership and access are critical issues in the environmental restoration of the Basin, and the sedimentation processes and dredging efforts have a real impact on these issues. But for the purposes of environmental restoration, access and ownership are dealt with as a sort of

afterthought on the WMU level, and not in a more holistic way at the Master Plan level. Similarly, the interconnectivity between WMU's, and more generally between the different elements of the Basin is important to the success of environmental restoration, yet the approach to achieving such synergies is fragmented. Finally, the information requirement relates directly to the difficulties surrounding the creation of a sound understanding of the Basin. The fact that the creation of necessary information is not incorporated into the Master Plan, but rather that interventions are guided by the availability of information, is indicative of the problems of working in the Basin. This problem becomes even clearer when the work done in the technical committees is viewed as a process of translating scientific information to action. The four moments of translation, as described, allow for limited flexibility in defining the main scientific, legal and practical questions outside of the scope of the Masterplan. The participation of scientists and other stakeholders in important to the success of the environmental restoration of the Basin, but the are given a narrowly defined role in the process.

The Louisiana State Master Plan is broader in its definition of the goals of environmental restoration as is clear from its mission statement and vision for the Basin. The State Master Plan outlines a broader vision for environmental restoration in the Basin, but does not propose many specific actions to achieve this vision. The State's perspective on the restoration of the Basin is more explicitly focused on the protection of cypress-tupelo swamps, but since the Corps' activities are beneficial to those swamps as well, there seems to be little conflict over the sediment manipulation. The State presents a focus on the preservation of landscape types, mainly cypress-tupelo swamps. It is unclear how the State intends to achieve these goals, especially in the wake of the ongoing legal battle over the implementation of its most prominent restoration effort in Bayou Postillion.

There is limited cooperation between the Corps and the State. The goals of the State and the Corps are not mutually exclusive, since better water quality through sediment control can be expected to be beneficial to cypress trees as well. In light of these similarities between goals, and the level of difficulty of implementing the actual interventions, it seems counterintuitive that the two agencies maintain separate planning and implementation processes for the restoration of a single area. The stakeholders involved in the two processes are largely the same people and organizations, and the investment of time and resources in participating in to separate processes is significant. The State of Louisiana and the Army Corps of Engineers have different mandates relating to their responsibilities in the Basin, but the environmental restoration of the Basin falls within the scope of both of their mandates. There are historical, cultural and practical reasons for both agencies to maintain their respective capacity to plan and implement restoration activities in the Basin but it seems that, at this point in time, given the similarities in goals, there are real opportunities for effective and efficient collaboration on restoration projects.

Some of the challenges associated with working in the Basin are overcome by reaching out to the longtime residents of the Basin, who help the agencies to reconstruct history by pointing out how water used to flow. This use of local knowledge is an important key to the success of environmental restoration in the Basin given the lack of other sources of reliable historical information on flow-patterns in the Basin, and presents a way to improve the restoration efforts. The legal struggle over the Bayou Postillion project also shows the hazards of proceeding without a broad consensus on the goals and implementation of environmental restoration, since litigation can be time-consuming and costly to all parties involved. The current use of the knowledge of long-time residents is fairly limited, and largely restricted to formal proceedings like hearings and commenting periods on public documents. Towards the end of the

planning process some of these long-timers are asked for information about flow patterns and sedimentation, to increase the effectiveness with which interventions are located in a WMU. This use of local knowledge can be expanded to include more different types of information from the residents of the Basin, especially since many of them have a long history in the area, and can provide information about aspects of the Basin that other sources, like scientific knowledge cannot.

4. Taking action in the Basin: Pushing the Boundaries

4.1 What to Do about the Basin?

4.1.1 Critical Issues in the Restoration of the Atchafalaya Basin.

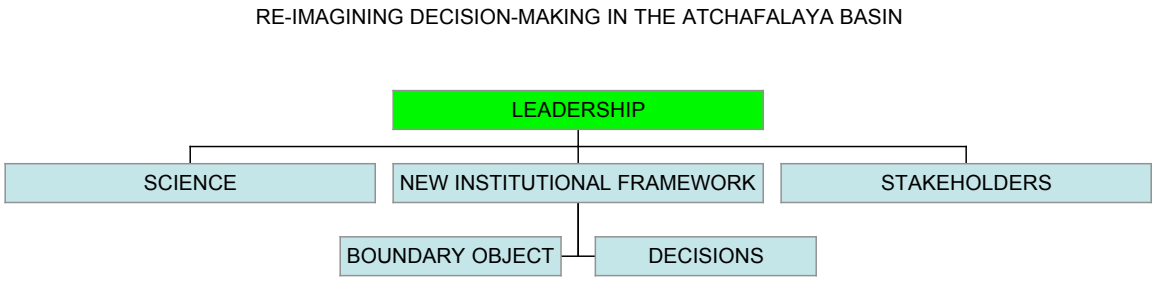
The United States Army Corps of Engineers and the Louisiana Department of Natural Resources and their respective Master Plans for the Atchafalaya Basin are the logical starting point for any strategy to enhance restoration efforts in the Basin. As I have described in the section on these respective plans, these two agencies have different mandates, different organizational cultures, different structures and they describe the Basin in different terms. Despite all these differences, the USACE and LADNR have converged on the notion that local sediment manipulation is an appropriate intervention to maintain the quality of the Basin. This configuration of the Actor-Network is not permanent, nor is it inherently stable, since the legislative, physical and environmental changes in the Atchafalaya Basin are swift and constant. I do view the ability of these two, very different, agencies to generate interest from other actors, develop roles for those actors and mobilize their resources in the face of the dynamism of the Basin, as a promising starting point to rethink the process of decision-making in the Atchafalaya. In plain words, if the Army Corps and the Louisiana Department of Natural Resources can work

together, it has to be possible to bring in other groups and organizations as well. This final section of my thesis is a sketch of how that could be achieved.

Many of the people I have met during my brief visits to Louisiana expressed a deep connection to the Atchafalaya Basin, and were frustrated with the slow progress and limited results of the current restoration efforts. This slow pace is especially disconcerting given the rapid nature of the changes occurring in the Basin, and the absence of a new vision or plan for the Basin. The fact that it took about 20 years to move from the concepts in the EIS to actual sediment manipulation does not bode well for future attempts to restore the Atchafalaya on a larger scale and with a broader set of goals. However, I do believe that the ongoing "shrinking" of the Basin, and the narrowing of the focus of the restoration efforts, both spatially and in terms of the proposed interventions, can be changed. For this type of change to take place, a number of critical issues will have to be addressed. In this chapter, I will outline the main steps of a process that can address the challenges to the environmental restoration of the Basin as I have described them in the previous chapters. These steps offer a path towards a more integrated, holistic approach to the restoration. The broad outline of this process is represented in figure 6. The process requires that the main stakeholders in the Basin have to re-imagine the Basin in some ways and come to an agreement on what the Basin is now, and what it could be like in the future. Clearly, the private landowners play a crucial role in the Basin, and will for a long time. This is all the more reason to involve them in any effort to restore the Basin, and do so at the earliest possible stage. As I have described, attempts at describing and protecting the Basin are ongoing, and are likely to improve the availability of information for the management and restoration of the Basin. These efforts, however, seem unlikely to fundamentally alter the developments I have described. Individual stakeholders can simply not change the way other stakeholders understand

and describe the Basin without engaging the other stakeholders in the development of a new understanding of the Basin. I believe any attempts to significantly change the course of the ever-smaller Atchafalaya Basin need to include all the main stakeholders, and be focused on a broad rethinking of where the Atchafalaya Basin is, what it is and how it can be restored.

Fig. 6 The Elements of a New Process.



The history of disputes between the various users of the Basin ensures that this would be no easy task, but public disputes of this kind have been solved before[31]. Such a process would require commitments from the main stakeholders and concerted effort to reach consensus on a number of the key issues. I believe that this kind of consensus can be the reached in the Atchafalaya as well when the following steps are taken.

4.1.2 How to Restore the Basin in the Face of the Shrinking Boundaries.

The physical, legal and social boundaries have limited the scope of the environmental restoration of the Basin. These boundaries also produce uncertainties that more and better scientific information, by itself, cannot reduce. Questions about which parts of the Atchafalaya Basin should be restored and how to improve water quality or how to slow the rate of sediment accretion in certain areas are social, legal and practical problems as much as they are scientific

[31] See: Susskind, L., and J. Cruishank, *Breaking the Impasse: Consensual Approaches to Resolving Public Disputes* (Basic Books, New York), 1987

ones. Given the complex interplay of these problems, the environmental restoration of the Atchafalaya Basin cannot be successfully implemented when the efforts remain small in scale, disconnected from one-another, and restricted to a small number of Water Management Units. The gradual shrinking of the areas in the Basin that are considered for environmental restoration undermines one of its central goals, which is to *"preserve ecological productivity as well as the many features that make the Basin unique."* (USACE, 1982: Vol. I EIS-4). A shared understanding of the legal, physical and institutional boundaries of the Basin and of the features that make the Atchafalaya Basin unique, are critical to successful restoration efforts in the Basin. This understanding should extend beyond the geographical boundaries of the Atchafalaya. The boundary between what is considered as a natural part of the Basin and what is considered a result of human intervention has to be addressed. This boundary directly informs what is considered essential to the restoration. The boundary between the historical condition of the Basin and the current situation has to be defined in some way if the goals of the restoration efforts are to become more comprehensive than limited efforts to manipulate sediment in some of the back-swamps. The role of sediment is important to any successful restoration effort, and sediment can be viewed as one of the central elements in the actor-network that makes up the Atchafalaya Basin. But other elements, such as cypress trees, crawfish and the economy they support can be viewed as crucial elements of the Atchafalaya Basin as well. Some of these elements are circumscribed by the phrase "wet and wild" in the State's master plan, but a more detailed description about which elements are critical to the history and future Atchafalaya Basin from an engineering, environmental, and cultural point of view is needed to move the restoration efforts beyond sediment manipulation. Such a description can take many forms, be it a report, a computer model, a geospatial tool or a set of objects. Some of the very basic elements of the

Atchafalaya Basin, such as sediment, water and certain kinds of trees play an important role in how all the stakeholders view the Atchafalaya Basin. Different communities describe these elements in a variety of ways. Conceptually, a description of these elements should perform the role of a boundary-object, essentially spanning the boundaries between the different users if the Basin and their perceptions of the different elements in the Basin: *"Boundary objects are objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual site use. These objects may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting social worlds."* (Star, 1989: 393). No single individual, or agency, can describe these attributes of the Basin in a way that meets the interests and beliefs of the people that are, or should be, involved in the Basin. The construction of this boundary-object, like a "State of the Basin" report or a geospatially explicit model of the Basin that includes different types of knowledge about the Basin has to be a transparent and collaborative exercise in and of itself, if the final product is to perform in this capacity.

4.1.3 Who should participate in the Restoration of the Basin?

Many people have a stake in what happens in the Atchafalaya Basin. The development of the State Master plan, the Corps' Master plan and the management plans for the pilot WMU's all included various forms of public participation and outreach. These efforts, like that of the

Southern University Center for Social Research[32], typically ended when the planning document was finalized, and have not included ongoing involvement in the implementation of the various plans. Currently, much of the detailed decision-making about the actual interventions, such as acquiring land and easements in the Basin and the manipulation of sediment, occurs between the Real Estate Division of the Army Corps of Engineers and any willing sellers, and within technical committees that are predominantly occupied by agency personnel and hired consultants. Sustained, active participation by all relevant stakeholders throughout the restoration process is critical to its success for theoretical and practical reasons.

The most basic argument for the active participation of these groups is that their lives are affected by the restoration efforts in the Basin, and that therefore they should have some practical influence in the decision-making. This is the most elemental formulation of the democratic ideal. But not every fisherman will be directly affected by the restoration work, and not every person that recreates in the Basin occasionally will be capable to fully participate in a decision-making process. However, those people are indirectly, but seriously affected by the restoration efforts can, and should be considered part of the public, and therefore their interests should be effectively represented in the decision-making[33] regarding the Basin.

A more instrumental argument for broad participation in the process is that a decision-making process cannot be effective in achieving legitimacy without including a variety of perspectives. Earlier planning processes in the Basin that excluded landowners, such as the Atchafalaya Basin Agency Management Group as described by Martin Reuss, were limited in their effectiveness as a result of the exclusion[34]. Land-ownership patterns and ongoing conflicts

[32] See for example: http://www.subr.edu/socialresearch/HendersonLakeWMU/index.htm

[33] The distinction between direct and indirect effects, and the notion of the public is based on the work of John Dewey (1927).

[34] For a detailed analysis of ABAMG and its relative strengths and weaknesses, see Reuss, M. *Designing the*

between different groups of stakeholders means that any decision that is not broadly supported is likely to be challenged in court, small in scope and scale or can be derailed through legislative efforts. Currently, most restoration efforts are limited to land that is owned by the Corps, or that is under an easement. This limits the geographical scope of the restoration, but it also limits the ability to understand and restore elements of the Basin that are critical to other stakeholders, namely those outside of the main agencies that are involved in these efforts. Since landownership and access are two key issues in the Basin, environmental restoration cannot become more comprehensive without active participation by institutional landowners and representatives of key user-groups, such as recreational and commercial fishermen, environmental groups and longtime residents.

Expanding the group of stakeholders that is directly involved in the decision-making around the restoration of the Basin does not mean that everybody that is somehow involved in the Basin should be included in every aspect of the restoration effort. Decision-making cannot be effective when different groups of people participate occasionally without committing to the process[35]. This effort could be strengthened by an assessment of the critical issues that are at stake in the Basin, conducted by somebody who is independent, credible and knowledgeable: *"A conflict assessment is an information-gathering exercise that produces recommendations regarding:*

- *who has a stake in a conflict or proposed consensus building effort,*
- *what issues are important to those stakeholders,*

Bayous. The Control of Water in the Atchafalaya Basin 1800-1995 (College Station, Texas A&M University Press, 2004)

[35] See Leach, W. Public involvement in USDA Forest Service policymaking: A literature review. *Journal of Forestry, 2006, 104*(1), 43-49.

- *whether or not it makes sense to proceed, given the institutional, financial, and other constraints, and*
- *if so, under what circumstances the key parties will agree to participate.*

(Susskind et al., 1999: 3)

Deciding who should be involved, whether or not somebody actually represents the group of stakeholders he/she speaks for and how to ensure a commitment to the process are critical questions in designing a decision-making process. Answering these questions requires a significant time-involvement and a thorough knowledge of process-design. This kind of expertise is rarely present inside bureaucratic or advocacy organizations, in part because their role precludes the kind of neutrality that is required to carry out this assessment in a way that is credible to all the stakeholders. This raises a key issue in the restoration of the Basin, namely who is to take the lead?

4.1.4 Leadership in the Restoration of the Basin

Most of the restoration efforts in the Basin are currently led by the Army Corps of Engineers, which has taken the lead in drafting and implementing the management plans for the pilot WMUs. Support is provided by a variety of state and federal agencies, such as the United States Geological Survey, the United States Fish and Wildlife Service and the Louisiana Department of Natural Resources. Tetra Tech, a private environmental engineering and consulting firm provides additional technical, logistical and administrative support. The Department of Natural Resources, through its Atchafalaya Basin Program, has also taken the lead on a number of environmental restoration projects, most notably the Bayou Postillion Project in Iberia Parrish. The fact that both the Army Corps and the Department of Natural

Resources provide leadership in different restoration efforts adds to their fragmentation, and makes it more difficult to engage other stakeholders. In addition, the existing group of stakeholders has serious constraints regarding time and resources to devote to the decision-making process regarding the restoration of the Basin as whole. Different consultants and personnel from various federal and state agencies are involved in these different efforts in relation to the Basin. Organizational and cultural differences between these agencies have led to misunderstanding and a fragmentation of the efforts to restore the Basin. If the environmental efforts in the Basin are to be streamlined, enlarged in scope and be supported by a broad range of stakeholders, I believe the two agencies should look for a "third party" to provide facilitated leadership. This will provide legitimacy, consistency, and expertise related to the process of the environmental restoration of the Basin, and it will also reduce the strain on limited resources within the agencies by streamlining the planning process for the Basin. Facilitated leadership could be provided by an environmental mediator, or by a person that could be hired by one of the involved agencies. The critical issue is that all participants should view the person as knowledgeable, independent, and trustworthy. A certain level of substantive knowledge about the Basin, its ecological, social and engineering attributes is necessary to allow such a facilitator to bring together the relevant stakeholders and help them design a process that will work through the critical issues. The independence, or neutrality of the facilitator is critical, since distrust and a lack of ongoing communication between certain stakeholders have impeded efforts to restore the Basin in the past[36]. The trustworthiness of the facilitator him, or herself, is important as well,

[36] A particularly insightful, and relatively recent example is that of ABAMG as described by Reuss, M. *Designing the Bayous. The Control of Water in the Atchafalaya Basin 1800-1995* (College Station, Texas A&M University Press, 2004)

since interest groups can only be expected to accept this kind of leadership when they don't feel that one of the agencies is "pulling the strings" behind the scenes.

During the planning process, the mediator can perform numerous functions at different stages of the process, such as inventing new options for potential solutions, proposing packages of existing solutions that meet the interests of different stakeholders, assisting with the writing and implementation of the final agreement[37]. Overall, a mediator can be looked upon to provide leadership, support and enthusiasm for a complex, and often contentious, planning process and to prevent the perception that the process is "hijacked" by any single stakeholder or agency.

4.1.5 Science in the Restoration of the Basin

The rapid changes and complex natural and social processes in the Atchafalaya Basin require detailed, specific and reliable information based upon which informed decisions about the restoration efforts can be made. Much of the current restoration efforts were originally outlined in the Corps' 1982 EIS for the Atchafalaya Basin Floodway System (ABFS), and this document remains a central source of information about, and a key description of, the Basin today. Obviously, a lot of information about the Atchafalaya has been gathered since the production of this EIS and a lot has changed in the Basin as well. Significantly, there has been a marked increase in the number of scholarly articles written about the Atchafalaya Basin in the last decade[38]. However, much of this new knowledge about important processes in the Atchafalaya Basin appears to be very specific regarding a particular location, like a WMU,

[37] For a more comprehensive description of assisted negotiation and the role of a mediator see: Susskind, L., and J. Cruickshank, *Breaking the Impasse: Consensual Approaches to Resolving Public Disputes* (Basic Books, New York, 1987)

[38] See Faulkner S., et al., "The Use of Science in Natural Resource Planning and Management in the Atchafalaya Basin. Presented at *Ecosystem Functions and the Dynamic Atchafalaya River* On: January 11th, 2008 in Baton Rouge.

within the Basin, and this has made it difficult to develop a broader, yet accurate, view of which, Basin-wide, developments are ongoing and relevant. The restoration of the Basin has benefited from this additional information but has also been limited in terms of scale and effectiveness since many fundamental questions about the Basin still go largely unanswered at the Basin-wide scale. The effects of changes in land use, climate change and the restoration efforts themselves on the quality of water and vegetation in the back swamps remain unclear. Furthermore, the existing scientific information on the Basin is scattered, hard to access and all relevant stakeholders do not always accept its legitimacy. Different agencies and organizations continue to produce, aggregate and disseminate relevant information on the Basin. Given this situation, a new Environmental Impact Statement for the Basin, however its boundaries would be defined, might seem like a potential solution. I believe however, that such an effort is unlikely to perform the function of the 1982 document, as the central, authoritative description of the Basin that guides policy-decisions in the Basin for over 25 years. Changes in technology, and the rapid developments in the Basin require a more flexible and dynamic approach to information gathering and use in the restoration of the Basin. Any efforts to integrate and disseminate relevant information on the Basin can only be considered salient when the information can be used to, authoritatively, answer questions relevant to the restoration to the Basin. This requires that all the participants in the environmental restoration of the Basin formulate research-questions together, and discuss how to answer these questions in a thorough, transparent and efficient way, guided by the scientists and experts that can actually provide these answers. A close collaboration between scientists, policy-makers and other stakeholders is required to ensure that the information generated is salient, credible and viewed as legitimate by all those involved. Currently, an effort led by the United States Fish and Wildlife service to integrate information

and represent it in a spatially explicit way, is underway. I believe this effort is supported by a number of key stakeholders in the Basin and can function as a starting point for a broader, integrated science strategy for the Basin. Without active participation from all relevant stakeholders, and significant agreement on the other issues such as the goals of restoration and the role of private land, this integration of information will be limited in its ability to transform the Basin.

4.1.6 A New Institutional Framework in the Atchafalaya Basin

The planning process that has led to the current restoration efforts dates back to the late 1970-ies and has been lacking in cohesiveness, meaningful and ongoing public participation and coordination between agencies. A multiplicity of public hearings, notices and newsletters adds to the confusion about the various planning efforts in and around the Basin, and runs the risk of creating a sense of fatigue among the stakeholders. Currently, important decisions about the restoration of the Basin are made in a variety of technical committees, ad-hoc groups and within agencies. There is a severe mismatch between the scale at which processes occur within the Basin and the institutional framework that exists to manage the entire Basin. Effectively, there is no institutional framework that governs the Basin and allows for regular, informed discussion among stakeholders about the future of the Basin. There is, however, a strong interest in the Basin from a wide variety of stakeholders and a large number of separate efforts to engage the Atchafalaya and its problems. In the absence of a comprehensive institutional framework, two courses of action broadly seem possible to improve on the existing situation. The first is the creation of a new forum for discussion and decision-making about the Basin. The second possible course of action is to improve, enhance and expand an existing forum like a committee or steering group. This could be achieved either by inviting new stakeholders to the process, or

by expanding the range of issues that are discussed within an existing framework. In order to use the current level of engagement and interest in the Basin, a decision-making process that looks at the entire Basin, involves all relevant stakeholders, focuses on answering important questions and is supported by sufficient resources can result in a more successful environmental restoration of the Atchafalaya Basin. Either one of these courses of action can be lead to *fair, efficient, stable* and *wise* decisions[39]. Certain perennial issues in the Basin, such as the 70/30 split, or more generally the management of the ORCS, access to private land for recreational and commercial fishermen, and the acquisition of land in the Basin, are likely to come up in any discussion of the future of the Basin. The recent work, led by the USFWS to develop an integrated scientific assessment of the Basin seem to open a window of opportunity to reengage some of these fundamental issues in light of the ongoing efforts to restore the Basin, by defining the boundaries of the Atchafalaya Basin in a collaborative way, involving all relevant stakeholders and generating salient information. But the type of model that the USFWS is developing can only be expected to start operating like a boundary-object if it is part of a broader effort to authoritatively answer questions about the Basin that all the stakeholders consider relevant. An important example for the way in which such a decision-making process can function is provided by the literature on Joint Fact Finding[40], which underlies much of the recommendations offered in this section. The key elements of a Joint Fact Finding process are:

1. Ability to develop consensus on the basic scope and scale of the issue.
2. Inclusion of all relevant stakeholders into decision-making.

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[39] This set of criteria for decision-making in public disputes is based on: Susskind, L., and J. Cruickshank, *Breaking the Impasse: Consensual Approaches to Resolving Public Disputes* (Basic Books, New York, 1987.

[40] John R. Ehrmann and Barbara L. Stinson. 1999. "Joint Fact-Finding and the Use of Technical Experts" *in The Consensus Building Handbook: A Comprehensive Guide to Reaching Agreement*. Lawrence Susskind, Sarah McKearnan, and Jennifer Thomas-Larmer, eds. Thousand Oaks, CA: Sage Publications.

3. Presence of a neutral facilitator who can lead the process.
4. Joint development of the key questions that are required to enable informed decisions.
5. Commitment to reach consensus on the development of new scientific knowledge when necessary.

A new institutional framework in the Atchafalaya should incorporate these elements, so the decision-making regarding its restoration will be based on a shared idea of where the Basin is, what it is, and what it should become. In summary, I believe that answering the relevant questions surrounding the environmental restoration efforts can lead to the creation of a meaningful forum in which the central issues in the Basin can be discussed in an informed, problem-solving oriented way. Based on the conflict assessment, the group of stakeholders, assisted by the mediator, should design a process that includes a broad definition of the Atchafalaya Basin, an integrated science-strategy, and will allow the group to build consensus on key issues, without necessarily requiring total agreement on all of them.

4.2 Conclusion

The Atchafalaya Basin is a complex place, both environmentally and politically. I am fully aware that any effort to engage with such a place is bound to be fraught with difficulties, and is likely to provide surprises and disappointments. I am not the first person to write about this place in an attempt to better understand it, and perhaps help other people engage with it as well. Mark Twain, John McPhee, John Barry and Martin Reuss have all written elegantly and insightfully about this part of the world, and I am greatly indebted to their insights and inspiration. I am, and most likely will remain, an outsider to the Basin and its processes. If anything, I hope this thesis will allow some of the people that are insiders to view the Basin from a new, or different perspective.

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