

Ecosystem Functions and the Dynamic Atchafalaya River from the Old River Control Structure to the Continental Shelf

10 and 11 January 2007, Embassy Suites, Baton Rouge, Louisiana

The LSU Agricultural Center, School of Renewable Natural Resources and the Coalition to Restore Coastal Louisiana are proud to have organized this meeting devoted to the Atchafalaya River. The Atchafalaya River stretches only 135 miles from its origin to its mouth, yet only four rivers discharge more water to North America's coast. Water and sediment from the Atchafalaya River affect geomorphological, biological, and ecological processes across thousands of square miles of southcentral Louisiana in the floodway, delta, coastal marshes, and coastal waters. Along its length, the river influences millions of acres of wetland forests and coastal marshes that yield tremendous benefits in the form of oil and gas resources, timber, commercial and recreational fishing, hunting and non-consumptive wildlife use, and regional navigation. The Atchafalaya River Basin is managed partly for navigation but primarily as a floodway that receives water from the Mississippi and Red Rivers, and is undergoing rapid geomorphic changes as it develops as a distributary. Understanding this complex system is difficult because it is being changed by the Atchafalaya River itself and by people, intentionally and otherwise. The purposes of this meeting are to review what is known about the river and its associated environments, to report on recent and ongoing research, and to identify information gaps that complicate decision making by land managers, water managers, and policy makers.

The meeting is divided into seven sessions that consist of four or five presentations. Sessions were designed to foster a holistic understanding of the Atchafalaya River by avoiding focusing on traditional geographic or disciplinary subdivisions. Instead, each session is intended to provide examples of the effects of the Atchafalaya River on geologic and hydrologic processes as well as on flora and fauna from the Old River Control Structure to the Gulf of Mexico. We hope this challenging arrangement will enrich our understanding of the Atchafalaya River when we return to the geographic or disciplinary subdivisions that guide many of our routine activities.

Meeting Sponsors

Coalition to Restore Coastal Louisiana
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Mark Ford, Coalition to Restore Coastal Louisiana
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Bill Kelso, School of Renewable Natural Resources, LSU Agricultural Center
Andy Nyman, School of Renewable Natural Resources, LSU Agricultural Center
Natalie Snider, Coalition to Restore Coastal Louisiana

Ecosystem Functions and the Dynamic Atchafalaya River from the Old River Control Structure to the Continental Shelf

Thursday, 10 January 2008

- 8:00-8:30 Welcome
- 8:30-8:50 A Historical View of Events Surrounding the Controversy of the Old River Control Structures (Hale, USACOE)
- 8:50-9:10 Sedimentation Patterns Within the Central Atchafalaya Basin, Louisiana (Hupp, Demas, Kroes, Day, and Doyle)
- 9:10-9:30 Hydrology of Forested Wetlands in the Atchafalaya River Basin (Day, and Doyle)
- 9:30-9:50 Trends in Wildlife Use of Atchafalaya Delta Wildlife Management Area, Louisiana With Emphasis on Dredged Material Islands (Carloss, Lejeune, and Creef)
- 9:50-10:10 Observation of Saltwater Intrusion into the Atchafalaya Bay (Li, Roberts, Weeks, Stone, and Feng)
- 10:10-10:30 (break)**
- 10:30-10:50 Classification of Water Areas within the Atchafalaya Basin Floodway System Using Thematic Mapper 5 Imagery (Allen, Couvillion, and Constant)
- 10:50-11:10 Population Abundance, Movements And Size Characteristics Of Pallid Sturgeon From The Old River Control Complex, Louisiana (Reed, Dean, and Hartfield)
- 11:10-11:30 Plant Response to Microhabitat Changes Following Hurricane Disturbance. I: The Vegetative Cover (Keeland, Gorham, Weisbrich, Wells, and Mopper)
- 11:30-11:50 Plant Response to Microhabitat Changes Following Hurricane Disturbance. II: The Soil Seed Bank (Gorham, Keeland, Weisbrich, Wells, and Mopper)
- 11:50-12:10 Comparisons of Harmful Algae from the Barataria and Atchafalaya Estuaries and Nearshore Waters (Rabalais, Morrison, Mendenhall, Ren, Atilla, and Dortch)
- 12:10-1:10 (lunch)**
- 1:10-1:30 The Influence Of The Atchafalaya River On Wetland And Estuarine Functioning: Management Implications (Day, Lane, Twilley, Justic, Shaw, and Cowan)
- 1:30-1:50 Flooding and Hurricane Effects on Tree Growth in the Atchafalaya Basin (Doyle and Day)
- 1:50-2:10 Development of a Management Plan for Wild-Caught Crawfish in Louisiana (Huner and Konikoff)
- 2:10-2:30 Fish Research In The Atchafalaya And Wax Lake Deltas: A Review (Peterson, Thompson, Milan, and Shaw)
- 2:30-2:50 Hypoxia Offshore the Atchafalaya and Mississippi Rivers (Rabalais and Turner)
- 2:50-3:10 (break)**
- 3:10-3:30 Wildlife Management In The Atchafalaya Basin (Davidson)
- 3:30-3:50 A Study of Hydrodynamics, Salinity, and Waves in the Acadiana Bay System (Miller)
- 3:50-4:10 Marsh Loss Mechanisms where River Inflow is High and Subsidence is Slow: how Estuarine Marshes Can Erode even in The Virtual Absence of Wave and Tidal Energy (Nyman and McGinnis)
- 4:10-4:30 Hydrologic Influences on Carbon, Nutrient and Sediment Transport in the Atchafalaya (Xu)
- 5:00-7:00 Reception (some light appetizers and cocktails provided)**

Ecosystem Functions and the Dynamic Atchafalaya River from the Old River Control Structure to the Continental Shelf

Friday 11 January, 2007

- 8:00-8:30 Welcome
- 8:30-8:50 Rethinking the Atchafalaya Basin as a Reservoir of Ecological Diversity during Trying Times (Kemp)
- 8:50-9:10 Dendrochronological Analysis of Wetland Forest Productivity and Hydrology (Amos, Keim, and Doyle)
- 9:10-9:30 Bird Survey Of The Atchafalaya Basin, Louisiana (Fontenot and Huner)
- 9:30-9:50 Isotopic Signature of Nitrogen along the Atchafalaya River (BryantMason, Xu, and Altabet)
- 9:50-10:10 Oyster Production in the Atchafalaya/Vermilion Estuarine Complex: an Overview (Banks and Cook)
- 10:10-10:30 (break)**
- 10:30-10:50 The GIWW as a Distributary of River Water to Coastal Louisiana (Swarzenski)
- 10:50-11:10 Effects of Spatial Scale on Assessment of Dissolved Oxygen Dynamics in the Atchafalaya River Basin, Louisiana (Kaller, Kelso, and Rutherford)
- 11:10-11:30 How Does Flooding in the Atchafalaya River Basin Shape Young-Of-The-Year Fishes? (Halloran, Kaller, Kelso, and Rutherford)
- 11:30-11:50 Identifying Controls on Nutrient Removal in the Atchafalaya River Basin, Louisiana (Scaroni, Nyman, Lindau, DeLaune, and Keim)
- 11:50-12:10 Using Oral History in Environmental Conflict Resolution: Finding Common Ground—Lessons from the Atchafalaya (Condrey and Wood)
- 12:10-1:10 (lunch)**
- 1:10-1:30 The Use of Science in Natural Resource Planning and Management in the Atchafalaya Basin (Watson, van Maasackers, Faulkner, and Karl)
- 1:30-1:50 Invasive Aquatic Species in the Atchafalaya Basin (Thomas, and Walley)
- 1:50-2:10 Wax Lake Delta: Depositional Architecture, Delta Evolution, and Impacts Beyond Atchafalaya Bay (Roberts, Walker, and D'Sa)
- 2:10-2:30 break**
- 2:30-3:30 Panel Discussion: Richard Condrey (Professor, LSU), David Cresson (Executive Director, Coastal Conservation Association of Louisiana), Toni DeBosier (Louisiana Department of Natural Resources), Honorable Timothy Matte (Mayor, Morgan City), Rudy Sparks (Vice President of Lands and Timber, Williams Inc.), Mark Wingate (Project Manager, U.S. Army Corps of Engineers)
- 3:30-3:40 Thanks, Adjournment

Meeting Abstracts
Ecosystem Functions and the Dynamic Atchafalaya River
from the Old River Control Structure to the Continental Shelf
10 to 11 January, 2008, Baton Rouge, Louisiana

Abstracts are ordered alphabetically by first author, which may differ from the presenting author.

Classification of Water Areas within the Atchafalaya Basin Floodway System
Using Thematic Mapper 5 Imagery (10:30-10:50 Thurs.)

Yvonne C. Allen¹, Brady R. Couvillion¹, and Glenn C. Constant²

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²*U. S. Fish and Wildlife Service, Baton Rouge Field Office, Parker Coliseum, Baton Rouge, LA 70803*

Within the ABFS, there is a complicated structure of lakes, rivers, canals, and spoil banks that have formed by natural or made-made processes. The distribution and quality of water within each water management unit (WMU) is generally driven by water level and condition found in the main river channels flowing through the ABFS, but fluctuating river levels can result in very different patterns of water distribution among the WMUs. River level gages have been established at many locations throughout the basin but for practical and economic reasons, most of the gages are located along main river channels and bayous. Very little to no synoptic information has been available regarding the distribution and character of water away from these well traveled routes.

The amount, quality, duration, and flow rate of water in large part define the flora and fauna that are able to occupy the habitats throughout the basin. It is therefore critical to gain a better understanding of the dynamics of water distribution patterns within each WMU with changing river levels. As a first step toward describing water distribution on a basin-wide scale, we chose to use existing Thematic Mapper 5 (TM) imagery to determine the distribution of land, water and turbid water through time and at a variety of river stages. Under ideal conditions, satellite imagery can give a whole-basin snapshot of water distribution at a single point in time.

Dendrochronological Analysis of Wetland Forest Productivity and Hydrology
(8:50-9:10 Fri.)

J. Blake Amos¹, Richard F. Keim², and Tom Doyle³

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Modified river flows and subsidence of deltaic sediments have subjected many coastal swamp forests in the delta of the Mississippi River to greatly modified flooding and sediment and nutrient regimes. Many areas have become inundated at greater depth, duration, and frequency, and either receive drastically increased sediment and nutrients or have been disconnected from inputs.

To better understand how these changes are affecting ecosystems, we used dendrochronology of baldcypress (*Taxodium distichum* L. Rich.) at three sites in each of two contrasting swamps to compare the historical relationship of climate, hydrology and productivity. Both swamps are adjacent to long-term records of water levels, and are in similar topographic positions near lakes in backswamps of the Atchafalaya River distributary basin, but are subjected to substantially different hydrological conditions. We analyzed the historical responses of baldcypress radial growth to 111 years of climatic variables and 55 years of hydrological data. Growth in both swamps was positively correlated with cool, droughty conditions. Riverine flooding with sediment and nutrients was positively related to growth while backwater flooding was negatively correlated to growth. However, both swamps showed an initial increase in growth at onset of increased flooding followed by a great reduction of growth after several decades of continued frequent flooding. Further development of this tool will be useful to infer historical hydrology in forests where hydrological data are unavailable.

Oyster Production in the Atchafalaya/Vermilion Estuarine Complex: an Overview (9:50-10:10 Fri.)

Patrick D. Banks and E. Paul Cook

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Louisiana Department of Wildlife and Fisheries, Marine Fisheries Division

With salinities remaining well below the accepted range of tolerance for successful oyster production, the Atchafalaya/Vermilion estuarine area is not usually considered when discussing areas in Louisiana known for oysters. However, ample hard bottom and historic shell resources provide a large acreage of available reef habitat for successful larval recruitment. Despite low salinities that regularly remain below 5 parts per thousand (ppt), a reproducing population of oysters does exist each year, with concentrations heaviest around South Point of Marsh Island, along the south shore of Marsh Island, inside and outside of Southwest Pass of Marsh Island, and west of Southwest Pass in the T-Butte area. Biological sampling in the summer of 2007 resulted in concentrations as high as 35.5 oysters per square meter on reefs near South Point. Lesser and more ephemeral metapopulations are known to also exist along the southwestern tip of Point Au Fer Island and just south of Cypremort Point. We will provide an overview of the oyster population in the Atchafalaya/Vermilion area with comparisons to other Louisiana coastal areas better known for oyster production such as Barataria Bay.

Isotopic Signature of Nitrogen along the Atchafalaya River (9:30-9:50 Fri)

April BryantMason¹, Y. Jun Xu¹, and Mark Altabet

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Isotopic tracing provides a useful technique for analyzing flow pathways and residence times of nitrogen at watershed scales and in different reservoirs. Few recent studies have shown that

isotope ratios of riverine nitrogen species could offer an effective means to assess denitrification and nitrification processes. In this study we have analyzed isotopic composition of ^{15}N and ^{18}O of nitrate, nitrite and dissolved organic nitrogen at five locations along the Atchafalaya – Simmesport, Melville, Butte La Rose, Wax Lake Outlet, and Morgan City. The primary goal of the study is to assess denitrification process in the Atchafalaya through monitoring changes in the isotopic ratios between these locations and over time. This paper reports preliminary results from two sampling dates in April and May 2007. All samples had high concentrations of nitrate (107.6-162.4 μM), but no nitrite and very little ammonium. Nitrate $d^{15}\text{N}$ and $d^{18}\text{O}$ isotope ranged from 5.49 to 6.60 per mil and 4.46-5.59 per mil, respectively, at all sites, indicating that some nitrate processing may have occurred prior to infiltration into this system since these values differ from those for pure fertilizer nitrate, particularly with respect to $d^{18}\text{O}$. Delta ^{15}N was similar at all sites in the April sampling date but with a slight trend of decreasing $d^{15}\text{N}$ from the upstream sites to the outlets. Although this change in the May sampling date was not significant, the general trend may reflect the importance of higher water temperature, lower flow and increased biological activities of the swamp basin in denitrification. The preliminary results suggest that intense sampling in the summer, when this system has high water temperature and lower flow, may yield crucial insights into riverine denitrification occurring as the water moves downstream.

Using Oral History in Environmental Conflict Resolution: Finding Common Ground – Lessons from the Atchafalaya (11:50-12:10 Fri.)

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²*National Wildlife Federation, 14732 Sweet Wood Court, Baton Rouge Louisiana 70816*

The Atchafalaya Basin is an area of sweeping natural beauty and rich biodiversity under Army Corps of Engineers control. Despite a long history of public use, little of the Basin is publicly owned and much is used for extractable wealth. It is an American jewel subject to continuing human manipulations and conflicts.

In 1986 Congress enacted most of Governor Treen's 1982 plan for the Basin, ending decades of highly visible conflict and beginning federal purchase of 50,000 acres of the Basin for public use. By 2001, the 50,000-acre "goal" became a "cap", preventing additional public purchases and renewing the historic conflicts.

We gathered thoughtful oral histories of key players in the 1982 compromise, hypothesizing that they would provide guidance in the resolution of the current impasse. We identified four groups -- private landowners; extractors of oil, gas, and timber; public users; and regulatory agencies. We targeted one key individual per group to interview and obtained interviewee review and modification of our findings and Basin recommendations.

Concerns involving access and regulation emerged as our most important conflict-related findings. Our study resulted in four recommendations for further non-confrontational resolution of these Basin concerns: remove the cap and allow federal purchase from willing sellers; promote inter-agency cooperation and facilitate traditional activities; consider mediation and address legal issues; and become increasingly inclusive.

In this talk, we present our approach, findings, Basin-specific recommendations, and recommendations on the use of oral history in the resolution of other environmental conflicts, with an emphasis on Louisiana's coastal zone.

Trends in Wildlife Use of Atchafalaya Delta Wildlife Management Area, Louisiana with Emphasis on Dredged Material Islands (9:30-9:50 Thurs.)

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The Atchafalaya Delta is the only actively building delta in the Gulf of Mexico. The growth of the delta is the result of sediments being deposited by the Atchafalaya River channeling sediments from the Mississippi River. Sediments from the navigation channel are frequently removed by maintenance dredging conducted by the US Army Corps of Engineers (Corps) and placed to create and restore dredged material islands. The material from these dredging operations has been used by the Louisiana Department of Wildlife and Fisheries (LDWF) working cooperatively with the Corps and other state and federal agencies to create a series of dredge material islands on the Atchafalaya Delta Wildlife Management Area (ADWMA).

Subsidence, erosion, storms, and other factors are responsible for rapidly changing the configuration of the Louisiana coastline. Coastal wildlife habitat such as waterbird nesting and foraging sites, waterfowl wintering habitat and mottled duck nesting habitat are lost on an annual basis from these destructive forces. Many species of wildlife have taken advantage of the increasing wetlands on ADWMA from both naturally accreted and dredged material habitat. Dredged material islands have become important nesting sites for several species of colonial seabirds as well as mottled ducks. The high wintering waterfowl use of the area has made ADWMA the most utilized public hunting area in the state. White-tailed deer have populated many of the dredge islands in such numbers that an archery deer season has been implemented. LDWF has documented some of these trends in wildlife use of the area as well as public utilization of the resources.

Wildlife Management in the Atchafalaya Basin (3:10-3:30 Thurs.)

Paul Davidson

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The Atchafalaya Basin is a dynamic system with a wide variety of habitat types from north to south. Made up of both public and private landowners, wildlife management efforts are as diverse as the system itself. This paper will address current wildlife management from the perspective of several private landowners as well as state and federal agencies. The Black Bear Conservation Committee (BBCC) will interview biologists and managers from Roy O. Martin Timber Company, A. Wilbert Sons, Inc., Schwing Management, Inc, Williams, Inc, Miami Corporation, the Louisiana Department of Wildlife and Fisheries, the US Fish and Wildlife Service, and US Army Corps of Engineers to get their perspective of their management of Basin lands. From these interviews and

actual site visits, the BBCC will provide an overview of current wildlife management in the Atchafalaya Basin.

The Influence of the Atchafalaya River on Wetland and Estuarine Functioning: Management Implications (1:10-1:30 Thurs.)

John Day, Robert Lane, Robert Twilley, Dubravko Justic, Richard Shaw, and James Cowan

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Atchafalaya River discharge strongly influences the physics, chemistry, and ecology of Fourleague Bay and adjacent areas. Circulation is dominated by river discharge spring when residence time is low. The river introduces high amounts of sediments, nutrients and organic matter. Sediments initially deposited in the bay are redistributed to wetlands and the near-shore. Marsh accretion is high. There is net uptake of N by sediments and wetlands during high flow and a net release during low flow. The shallow bay is well-mixed with oxygenated surface sediments and low rates of P regeneration for most of the year. Stable isotope analyses show the river is an important source of organic material to the system. During high flow, chlorophyll and aquatic primary production (APP) are highest at the fresh-saline interface, along bay-margins and in tidal bayous draining into the bay. Light limits APP in fresher areas while nutrients are a more important in higher salinity waters. Annual phytoplankton production is about $400 \text{ g C m}^{-2}\text{y}^{-1}$. Zooplankton egg production is high (12-70 eggs female⁻¹d⁻¹), correlated with chlorophyll, and often >50% of daily APP. Both resident and offshore-spawned, larvae of estuarine-dependent species show clear salinity responses. Larval fish were transported into and retained within bay. Ontogenetic shifts in habitat utilization with the bay and adjacent bayous appear to follow the seasonality in river discharge and chlorophyll concentration. Most of this work was supported by the Louisiana Sea Grant Program.

Hydrology of Forested Wetlands in the Atchafalaya River Basin (9:10-9:30 Thurs.)

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The Atchafalaya basin floodway is bordered by high levees to protect the surrounding landscape from flooding. The basin is also divided into sub-basins bounded by lower natural and artificial levees. Water flow through the basin tends to be channelized. Hydrological exchange between sub-basins and major channels occurs during high water overbank flooding as well as in small channels which reverse flow regularly to fill and drain the sub-basins with the passing of flood peaks. This limited exchange results in stagnation and hypoxic conditions, and the forested wetlands within the sub-basins are waterlogged for long periods of time. Hydrology within the forests is also influenced by rainfall, evapotranspiration, and subsurface drainage. We examined long term records of water level gages in the Atchafalaya River and other in-channel gages and compared them to data collected from continuous water level recorders we installed within the forested wetlands to measure flooding above the surface of the forest floor. We compared hydroperiods within the forests to the

hydrograph of the nearest source of riverine input to gain an understanding of the range of conditions within the forested environments in relation to the river connectivity of each site. The seasonality, depth, and duration of flooding within the forested wetlands control the composition of forest species and the flow of nutrients for sustained productivity. Riverine input also delivers sediment, which by its deposition causes gain in elevation, lowering flooding frequency and forcing change in forest composition.

Flooding and Hurricane Effects on Tree Growth in the Atchafalaya Basin, Louisiana (1:30-1:50 Thurs.)

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Flood and hurricane disturbance are primary agents of change driving forest establishment and destruction in the alluvial reaches of the Atchafalaya Basin of coastal Louisiana, USA. Flood conditions bring both increased hydroperiod and oxygenated, nutrient-enriched river water to backswamp settings that can augment or suppress forest and tree growth depending on the hydrogeomorphic setting, residency time, and tree species. Experimental results and tree ring data from the lower Atchafalaya Basin in Louisiana have verified that tree species and forest communities generally increase growth potential under nutrient-enriched riverflow. Studies of the effects of wastewater discharge into swamp forests also demonstrate enhanced forest production with higher nitrate concentration. Tree-ring records from multiple species chronicle past floods and hurricane events that alter stand density, soil amendments, and water quality sufficiently to cause abrupt growth in ring size and behavior in negative and positive ways. Release episodes in the tree ring record are mostly tied to recurring hurricane events and past logging harvests. Overall, the trees and forests of the Atchafalaya Basin are fairly young, usually less than 60 years of age, and susceptible to recurring disturbance from floods and hurricanes that contribute to high forest turnover.

Bird Survey of the Atchafalaya Basin, Louisiana (9:10-9:30 Fri.)

William R. Fontenot and Jay V. Huner

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Crawfish Research Center, University of Louisiana at Lafayette, Lafayette, LA 70504

We conducted this survey to assess 1) the composition and seasonal status of the Basin's bird community and 2) the best potential bird watching sites contained therein, with the overall objective of providing baseline data to be used in producing an Atchafalaya Basin Birding Trail guidebook. A secondary objective was to provide a foundation for additional bird research projects. The Atchafalaya Basin is North America's largest remaining River Swamp. However, various habitats are found within its historic boundaries. The habitats surveyed included River Swamp, Miscellaneous Open Water, Batture, Freshwater Marsh, Bottomland Hardwood Forest, Agricultural Lands, and Dry-Mesic Short-Grass. Between November 2001 and May 2004, observers engaged in over 415 individual surveying trips, accumulating 2000 hours of birding data, and recording a total of 270 bird

species for the period. The Atchafalaya Basin comprises about 4% of the state's area and is used by approximately 59% of its recognized avian fauna. As a consequence of this study, three eco-tourism events involving neotropical songbirds (spring); storks, wading birds, and shorebirds (summer), and southern Bald Eagles (winter) are held annually.

This project was funded by a grant provided by the Atchafalaya Basin Program within the Louisiana Department of Natural Resources and directed by Ms. Sandra Thompson.

Plant Response to Microhabitat Changes Following Hurricane Disturbance. II: the Soil Seed Bank (11:30-11:50 Thurs.)

L.E. Gorham¹, B.D. Keeland², G. Weisbrich³, C. Wells², and S. Mopper⁴

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Herbaceous and wood vegetation recovery following hurricane damage is dependent on several factors, including amount of damage, rates of individual and species survival, levels of advance regeneration, amount of natural invasion, and the soil seed bank. To study the impact the soil seed bank has on subsequent recovery we collected soil samples from 120 tree tip-up mounds, associated depressions, and adjacent undisturbed soil from two hurricane-impacted wetland forests, two years after Hurricane Andrew. We exposed these samples to three hydrologic treatments (dry, moist, and flooded) for two months and monitored plant germination. Soils originating from mound and depression microhabitat had significantly more plants germinate than the undisturbed soils. Species specific responses included *Boehmeria cylindrica*. and *Symphytotrichum racemosum* exhibiting significantly greater germination in undisturbed soils, whereas *Mitreola petiolata* was more frequent in the mound soils. To ascertain the effects of long-term hydrologic fluctuations on seed germination, we subdivided the original soil units into three groups and re-exposed them to one of the three hydrological treatments for an additional two months. In this second growth period, depression soils and moist conditions produced the greatest plant abundance. *Mitreola petiolata* was significantly more abundant in depression and mound soils than in the undisturbed microhabitat. This study shows that mound and depression microhabitat serves as a seed repository within two years of the blowdown. In addition, hydrologic conditions influenced the species and numbers of individuals which were able to germinate and grow from the seed bank.

How Does Flooding in the Atchafalaya River Basin Shape Young-Of-The-Year Fishes? (3:30-3:50 Thurs.)

B.T. Halloran, B. T., M.D. Kaller, W.E. Kelso, and D.A. Rutherford

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It is believed that fishes in riverine systems have evolved to exploit the seasonal advance of floodwaters. Though the proximate effects of overbank flooding include: (1) the resetting of nutrient cycles; (2) stimulation of primary production; (3) robust zooplankton communities; and, (4) increased hydrological connectivity; it is unclear if the arrival of a floodpulse results in successful fish recruitment. Although, the cue for floodplain-dependent fish reproduction is thought to originate from a rising springtime hydrograph; post-flood conditions are often highly unstable and, as a result, potentially lethal for newly hatched fishes with limited motility and strict physiological thresholds.

In the Atchafalaya River basin (ARB), LA., a sub-optimal physicochemical backcloth (i.e., widespread chronic hypoxia) often overlaps with the peak spawning times of many fishes. Yet, the adult fish community in the ARB is consistently strong, indicating that young-of-the-year survivorship is high. To examine the structuring affects of floodwaters on recruitment, we examined the yearly distribution of larval fishes in limnetic (open water) and floodplain environments. Regardless of flooding regime, we were unable to document abundant and speciose ichthyoplankton communities in recently flooded backwater microhabitats. Our observations found that the most dominant taxa have protracted spawning cycles with larvae that appear to be able to withstand a wide degree of variation in water quality regardless of the scale of inundation. Consequently, reproductive “hedging” for the proper combination of physicochemical and/or flow “windows” might be a disadvantageous approach in hydrologically unpredictable ecosystems, such as the ARB.

Development of a Management Plan for Wild-Caught Crawfish in Louisiana (1:50-2:10 Thurs.)

Jay V. Huner and Mark Konikoff

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From 182,000 to 23,000,000 kg of wild crawfish are harvested in Louisiana annually, with most coming from the Atchafalaya Basin in the south-central part of the state. Fifteen hundred licensed fishermen harvest crawfish annually. With average values of \$1.25-1.45 per kg, a good season represents a valuable economic engine from fishermen to end users. The rapid development of crawfish aquaculture in the region over the past quarter century served to stabilize crawfish supplies.

Unlike other commercial fisheries, both finfish and crustacean, no management plan has been developed for wild-caught crawfish. The Louisiana Crawfish Promotion and Research Board has provided us with funding to develop such a plan. The overall factor controlling wild-caught crawfish production is the annual watering and dewatering cycle of the Atchafalaya Basin controlled by the volume of water within the Mississippi River system because the Atchafalaya Basin is its main

distributary. Summer and fall droughts impact survival of brood crawfish and hatchlings in burrows and the availability of nursery areas.

Widespread misunderstandings of basic crawfish biology of the harvested crawfish have resulted in misguided regulations on trap meshes and demands for “seasons.” A further complication is the social-legal issue of access to crawfish on private lands when they are seasonally flooded. Actions directed towards reducing habitat deterioration are adversely impacted by the rapid deposition of sediments within the Basin.

Sedimentation Patterns within the Central Atchafalaya Basin, Louisiana (8:50-9:00 Thurs.)

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Sediment deposition and storage are important fluvial geomorphic processes that shape landforms, support riparian ecosystems, and provide ecological services, yet documentation and interpretation of sedimentation processes remain incomplete. The central Atchafalaya Basin suffers from high sedimentation in some areas and hypoxia in others. We established 20 floodplain transects that reflect the depositional environments and monitored general and local sediment deposition patterns over a 3-year period (2000-2003). Deposition rate, sediment texture, bulk density, and loss on ignition were determined near artificial markers located along transect. Mean sedimentation rates ranged from 2 to 42 mm/yr, percent organic material ranged from about 7 to 28 percent, percent sand (>63 microns) ranged from about 5 to 44 percent, and bulk density varied from about 0.4 to 1.3. The sites were categorized into 5 statistically different groups based on sedimentation rate; these were categorized by parameters that include hydroperiod, source(s) of sediment-laden water, hydraulic connectivity, flow stagnation, and local geomorphic setting along transect (levee vs. backswamp). Low elevation (long hydroperiod), high hydraulic connectivity to multiple sources of sediment-laden water, and hydraulic damming (flow stagnation) lead to the highest amounts of sediment trapping; the converse in any of these factors typically diminish sediment trapping. Results suggest the area potentially traps 6.72 billion kg of sediment annually; 820 million kg represent organic materials. Thus, the Atchafalaya Basin plays an important role in sediment storage, including the sequestration of carbon. Findings on local sedimentation patterns may aid in management of flow to control sediment deposition and reduce hypoxia.

Effects of Spatial Scale on Assessment of Dissolved Oxygen Dynamics in the Atchafalaya River Basin, Louisiana (10:50-11:10 Fri.)

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Low levels of dissolved oxygen (DO) are potential stressors of fishes and invertebrates in freshwater and marine systems. Because of the incredibly productive nature of the Atchafalaya Basin (ARB), microbial decomposition in backwater areas with limited flow often results in potentially stressful, if not lethal, DO levels throughout much of the ARB during and after the annual flood pulse. In order to better guide the development of water management projects, we investigated the relationship between dissolved oxygen and a suite of potential structuring variables. Considerable research suggests that for many ecological phenomena, spatial scale is critical to properly interpreting ecological relationships. Therefore, using continuous monitoring data collected from 2000-2007, we used a variable selection procedure to construct statistical models to describe the relationship between dissolved oxygen level and several potentially important predictor variables at three spatial scales; the entire sampled area of the ARB, individual water management subunits (WMSs), and individual sampling sites. Goodness of fit statistics suggested that our analyses best described the relationship between dissolved oxygen and structuring variables at the WMS scale. Further, at the WMS scale, water temperature, stage height, and, to a lesser extent current velocity, appear to be the most important variables in setting dissolved oxygen levels. We suggest that management decisions at the WMS scale will offer the greatest potential benefits for improvement of DO conditions in the ARB.

Plant Response to Microhabitat Changes Following Hurricane Disturbance. I: the Vegetative Cover (11:10-11:30 Thurs.)

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In August 1992 Hurricane Andrew caused extensive tree uprooting and soil upheaval in the Atchafalaya Basin of southern Louisiana. To study the impact on the herbaceous and woody vegetation recovery associated with mound/depression microhabitat, we selected 120 tree tip-up mounds from two disturbed sites. In 1994, 1996, and 1998 we surveyed plant diversity and species presence/absence on tip-up mounds, associated depressions, and adjacent undisturbed soils. Initially, mounds supported significantly greater herbaceous plant diversity than either undisturbed or depression soil microsites. One-third (20 out of 60) of the herbaceous plant species observed on the three micro-habitat types were found exclusively on tip-up mounds. Over time, however, diversity decreased on mounds and increased in depressions and on undisturbed soils. A significant increase in vine species over time was observed in mound and depression microsites. Depression

microsites, however, supported significantly fewer vine species than mounds and undisturbed soils throughout the study period. The number of tree seedlings increased through time at Site A, and at both sites, there were more seedlings in undisturbed than in the mound or depression habitats. The tipped tree species and viability status had significant impacts on mound degradation rates. Mounds associated with uprooted but viable trees had significantly slower degradation rates than mounds associated with uprooted trees that died.

Rethinking the Atchafalaya Basin as a Reservoir of Ecological Diversity during Trying Times (8:30-8:50 Fri.)

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The Quaternary geology of the Atchafalaya River provides insight into how this unique river and its lacustrine deltaic basin can contribute to the success of efforts to sustain Louisiana's coastal wetlands and enhance the reliability of flood protection measures proposed for coastal communities. The basin through which the Atchafalaya flows is commonly discussed as an emergency river flood outlet, a critical way station for migratory birds, a wetland system under assault, or an underused nutrient sink, but it has other important systemic functions that have not been explored. The Atchafalaya Basin has played a role in the past as a refuge for deltaic and estuarine biota during periods of rapid sea level rise and channel abandonment. Today it also supports species that are facing extirpation as a consequence of habitat destruction on the Mississippi and Red Rivers. We discuss how recognition of the Atchafalaya Basin as a reservoir of ecological diversity might influence future management of this system.

Observation of Saltwater Intrusion into the Atchafalaya Bay (9:50-10:10 Thurs.)

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Atchafalaya River discharges 30% of the freshwater from the Mississippi River which results in an almost entirely fresh Atchafalaya Bay in spring. A one-month deployment of two tripods equipped with multiple equipments was made in the central Atchafalaya Bay between the Atchafalaya River mouth and the mouth of the Wax Lake for the study of the hydrodynamics and suspended sediments. Data from these deployments were collected between March 20 and April 19, 2006. The first tripod was about 3 and 2 km to the Atchafalaya River delta and the Wax Lake delta, respectively. The second tripod was about 2 km from the Wax Lake delta and 6 km southwest of the first tripod. The instruments include Seabird SBE 16plus conductivity and temperature sensor with dissolved oxygen, acoustic Doppler profilers, five additional temperature sensors deployed at different depths, and OBS. Data from a nearby WAVCIS station are also examined in combination with data from the two tripods. It is found that two episodes of what appeared to be events of saltwater intrusion occurred during the 1-month deployment. These events appear to be associated

with an increase of salinity of about 2 PSU and a decrease of dissolved oxygen, a fact which, we hypothesize, is caused by the increased stability of the water column when a bottom density current is developed. By examining the tide stage, it is apparent that these saltwater intrusion events occurred after a high water slack and lasted for 0.5 to 2 hours, respectively.

A Study of Hydrodynamics, Salinity, and Waves in the Acadiana Bay System (3:50-4:10 Thurs.)

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The Lower Atchafalaya River empties into Atchafalaya Bay and influences the Acadiana Bays system along the southwest coast of Louisiana. The system — Atchafalaya Bay and four bays to the west — receives most of its freshwater from the Atchafalaya River through the Wax Lake Outlet and Lower Atchafalaya River discharges.

Since the 1930s the system has changed from a brackish to a primarily freshwater environment and has experienced major waterway construction and mining of oyster reefs and shell deposits separating the western bays and the freshwater sources. Many attribute the freshening of the bays to the removal of this barrier. To understand the dynamics of the system, Taylor Engineering, Inc. developed two-dimensional depth-averaged numerical hydrodynamic and water quality models of the system. The models — calibrated for existing conditions using data from local sensor stations — examined seasonal variations of tide, river discharge, and wind as driving forces. The models also simulated the restoration of oyster and shell reefs and pre-1940 tributary configurations to examine their influence on the salinity of the system. The study results suggest that changing freshwater discharge rates, rather than oyster reef mining, caused most of the historical variations in salinity.

A parallel study applied a two-dimensional spectral wave model (STWAVE) and calibrated the model with site-specific data. The study found that the muddy bottom dissipated the waves during normal conditions and high frequency storms. The addition of a bottom dissipation term to the STWAVE model simulated this effect.

The Louisiana Department of Natural Resources funded this study.

Marsh Loss Mechanisms in Areas with High River Inflow and Slow Subsidence: how Estuarine Marshes Can Erode Even in the Virtual Absence of Wave and Tidal Energy (11:30-11:50 Fri.)

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The central Louisiana coast is similar to many estuarine marshes elsewhere in that subsidence is relatively slow and riverine inputs of freshwater and sediments are relatively high.

Marsh loss occurs, albeit very slowly, but why does it occur at all under these conditions? Successive aerial photographs and/or satellite imagery from central Louisiana and elsewhere reveal that much of this marsh loss occurs adjacent to small, scattered ponds farthest from larger tidal channels. We previously showed that this pattern of marsh loss was unrelated to plant stress, and appeared to proceed via erosion. Here we report the results of (1) studies to determine factors controlling soil strength and erosion in marsh soils adjacent to ponds, and (2) a comparison of erosion rates between managed and unmanaged marshes. We found that soil strength was unrelated to amounts of mineral sediments or dead organic matter in soil but was related to live organic matter; i.e., living roots, in soil. We also found that the effects of natural drought and management on erosion depended upon pond depth. Erosion was unaffected by natural drought and management where ponds were deeper than the live rooting depth of adjacent emergent vegetation. Factors that reduced water level, such as management or natural drought, reversed erosion where ponds were shallower than the live rooting depth of adjacent emergent vegetation. These relationships among soil strength, live rooting depth, and pond depth might explain marsh loss patterns in many areas, and might develop anywhere sea-level rise causes marsh vertical accretion to exceed pond vertical accretion.

Fish Research in the Atchafalaya and Wax Lake Deltas: a Review (2:10-2:30 Thurs.)

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Most of Louisiana's deltaic coastal marshes are currently in the erosional phase of delta cycling with the exception of the recently formed (since late 1970's) delta islands in Atchafalaya Bay. The marshes and channels of these delta islands are dominated by freshwater from the Atchafalaya River. The juxtaposition of these freshwater marshes and mud flats within a tidal, estuarine bay provides a unique fisheries habitat. Sampling in the early 1980's resulted in a diverse fish assemblage of freshwater, estuarine and marine species within this emerging delta. Although delta islands have continued to grow through natural processes, particularly in the Wax Lake delta, the Atchafalaya delta islands have been extensively modified as a result of maintenance dredging for the navigation channel and a CWPPRA project on the west side of the delta. Since 1999, we have conducted a series of studies in the Atchafalaya delta to examine the fisheries utilization of these constructed wetland islands, particularly by sport fish. We have also conducted experimental manipulations of these created wetlands to increase tidal access and thereby increase fisheries utilization of these wetlands. Our current study is designed to compare fish assemblages from the "natural" Wax Lake delta to those from the "altered" Atchafalaya delta to help assess the functionality of these created wetlands. Through the course of these studies, we have collected over 100 species of fish (freshwater to marine) from this mosaic of delta habitats, using a variety of sampling gears including seines, trawls, flume nets, and electro fishing.

Hypoxia Offshore the Atchafalaya and Mississippi Rivers (2:30-2:50 Thurs.)

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The Mississippi and Atchafalaya rivers are the primary sources of fresh water, nitrogen and phosphorus to the northern Gulf of Mexico. The MR empties onto a relatively deep shelf and the plume separates rapidly from the bottom and expands laterally as its waters flow from east to west. The AR enters into Atchafalaya Bay, a broad shallow embayment, then to a shallow, broad continental shelf. The influence of the Mississippi and Atchafalaya outflows is evident in down-plume surface waters in salinity, suspended sediments, nutrients, chlorophyll biomass and bottom water hypoxia. Seasonal hypoxia in this region is the result of the strong and persistent stratification coupled with the high organic production that is fueled by river-derived nutrients. Data transects off Terrebonne Bay (TB) and Atchafalaya Bay (AB) depict long-term conditions, with regard to salinity, nutrients, chlorophyll biomass, and hypoxia. Lower surface salinity is more pronounced on TB than on AB, but each shows a spring-summer lowering of salinity across the shelf. The surface dissolved inorganic nitrogen is composed primarily of nitrate-N for both transects with high nearshore concentrations on AB and periodic peaks in ammonium-N. Higher concentrations of chlorophyll *a* in surface waters on TB occur after the winter-early spring peak in nitrate-N. The general pattern for AB is for higher chlorophyll *a* in surface waters nearshore to mid-transect increasing through spring to maximal concentrations in summer. The development of hypoxia on TB occurs earlier in spring compared to AB in summer and extends into September as opposed to August for AB.

Comparisons of Harmful Algae from the Barataria and Atchafalaya Estuaries and Nearshore Waters (11:50-12:10 Thurs.)

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The LUMCON Phytoplankton Group has conducted surveys of harmful algae based on a list (updated from Dortch et al. 1999) for a decade, and has developed a reasonably good understanding of the HABs occurring in south Louisiana and some of the factors that may influence them. The HAB presence/absence/abundance differ with salinity, nutrient, and turbidity levels. In the fresher end member of the Barataria estuary, cyanobacteria are more likely to be present; these are known to produce toxins that are detectable in these waters. Field and experimental results have identified factors in changes in phytoplankton communities (including HABs) as a result of diverted Mississippi River water into the upper end of the Barataria estuary. In the higher salinity areas of the Barataria estuary the HAB community consists primarily of dinoflagellates, many of which are toxin producers, and a toxin producing diatom. Less is known of the HAB composition of the Atchafalaya

estuary. In the offshore waters of these two estuaries there are many instances of harmful algal blooms, consisting primarily of dinoflagellates and diatoms.

Population Abundance, Movements and Size Characteristics of Pallid Sturgeon from the Old River Control Complex, Louisiana (10:50-11:10 Thurs.)

Bobby C. Reed, Jan C. Dean, and Paul Hartfield,

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Pallid sturgeon *Scaphirhynchus albus*, were state protected in Louisiana from all fishing exploitation beginning May 1990, and listed as a federally endangered species by the USFWS in October of 1990. Since their discovery below the Old River Control Complex (ORCC) in 1991, the sturgeon population has been sampled almost annually through 2007. The ORCC includes two U.S. Army Corps of Engineer water control structures which can be opened to release water from the Mississippi River through an outflow channel to the Atchafalaya River and eventually to the Gulf of Mexico. The Atchafalaya River is the primary tributary for the Mississippi River, and the ORCC is the main control point for these water releases. The greater ORCC area also includes a hydroelectric plant and a lock for barge traffic between the Mississippi, Red and Atchafalaya rivers. Thus, the ORCC pallid sturgeon population is an open population.

About 650 pallid sturgeons have been taxonomically identified during this time period, with most being measured, marked and released unharmed. Over this same time period over 600 pallid X shovelnose hybrids have also been identified, indicating that hybridization of the two species in the lower basin is more widespread than previously thought. Examination of the pallid sturgeon size structure reveals that the southern population is reproducing and that recruitment is occurring on a regular basis. While some age information is available, southern pallids are smaller in size than their northern counterparts, averaging 841 mm FL and 2683 grams in wt. A total of 33 pallid sturgeons have been recaptured at the ORCS since 1991, with the latest population estimate for the area being 259 animals (95% C.I. = 170 to 355). In the spring of 2007, 24 pallids were implanted with sonic tags and are now being tracked, both actively and passively (stationary sentinel receivers) throughout the Atchafalaya River in order to determine seasonal movements/migration patterns.

Wax Lake Delta: Depositional Architecture, Delta Evolution, and Impacts beyond Atchafalaya Bay (1:50-2:10 Fri.)

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The Wax Lake and Atchafalaya Deltas together reflect an important event in the Holocene history of coastal Louisiana, switching of Mississippi River discharge to the Atchafalaya River and

delta-building at a new site along the coast. Although the diversion of Mississippi River water and sediment down the Atchafalaya course is controlled to around 30%, the Wax Lake and Atchafalaya bayhead deltas represent the embryonic stage of a new major Mississippi River delta lobe. Recent geophysical and vibracoring studies of the relatively unmodified Wax Lake delta indicate that during the spring flood when deposition is maximized, Atchafalaya Bay is full of freshwater and delta-building takes place in an unstratified water body by turbulent jet flow. Time-series air photographs (1973-2002) indicate that the delta evolved to its present configuration by progradation and compensational stacking of sand-rich bar complexes (1-1.5 m thick, 1.3.5 km long, and 1-2 km wide). As bar complexes evolve through extension and aggregation, flow divergence occurs forming new bar complexes adjacent to and seaward of the abandoned complex. Subaqueous levees weld bar complexes as channel extension occurs. Side-scan sonar and core data suggest density underflow deposition may be taking place. However, an instrumented tripod placed at an active channel mouth (spring 2006) did not detect such flows during the monitoring period. The Wax Lake delta is composed of ~ 70% sand-sized sediment. Sands represent < 20% of the Atchafalaya River sediment load. The remaining suspended load is transported out of the bay to distances as far as 75 km offshore when aided by cold front passages in the early spring. Fine-grained sediments (pro-delta facies) form low angle clinofolds that mark seaward progradation on the inner shelf opposite Atchafalaya Bay. When advected westward with the dominant inner shelf longshore drift these fine-grained sediments are responsible for the prograding mudflats along the eastern chenier plain and thick fluid mud deposits on the inner shelf.

Identifying Controls on Nutrient Removal in the Atchafalaya River Basin, Louisiana (11:10-11:30 Fri.)

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The Mississippi and Atchafalaya Rivers are the major sources of freshwater and nutrients to the Gulf of Mexico. Increased nutrient loads from these rivers, primarily in the form of nitrate, have caused increased eutrophication in the Gulf. Previous research suggests that the Atchafalaya Basin removes some of these nutrients before they discharge into the Gulf. As sedimentation associated with the Atchafalaya River fills in lake habitat, lakes transition to cypress swamps, and ultimately to bottomland hardwood forests. Resulting from this natural succession, there may be a change in the capacity of the Basin to remove nutrients. We recently initiated studies to quantify nutrient removal in the Atchafalaya Basin based on storage in the soil and biomass, and via denitrification in the three distinct habitat types: lake, cypress swamp, and bottomland hardwood forest. Preliminary results indicate that denitrification rates differ throughout the basin, and this difference can be explained by habitat type. Evidence suggests that hydrology partially determines the capacity for nutrient removal.

The Gulf Intracoastal Waterway as a Distributary of Freshwater to Coastal Louisiana Wetlands (10:30-10:50 Fri.)

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Since the early 1900's, an extensive network of levees built for flood control have prevented the direct inflow of Mississippi River into most delta plain wetlands in south Louisiana. The supply of freshwater and sediment needed by these wetlands to flourish and keep pace with sea-level rise has been reduced and, in many places, completely eliminated. Within the last 50 years, the GIWW (Gulf Intracoastal Waterway) has become the largest distributary of Mississippi River water to coastal Louisiana wetlands. The GIWW is a major east-west trending ship channel traversing the entire Louisiana coast. Following natural hydraulic gradients, the GIWW captures water and sediment from the southward flowing Lower Atchafalaya River and Wax Lake Outlet, and distributes this river water to points 30 to 50 miles east and west of the intersections. The water in the Atchafalaya River mostly originates from the Mississippi River. The passive GIWW flow is controlled by seasonally changing differences in water surface elevations between the Atchafalaya River and adjacent watersheds and becomes predictable when stage of Lower Atchafalaya River at Morgan City is above 3 ft NAVD88. The GIWW has become the largest and frequently only source of Mississippi River water to many parts of coastal Louisiana. The ship channel functions like a freshwater diversion, but on a much larger scale in terms of volume and reach.

Invasive Aquatic Species in the Atchafalaya Basin

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Recent invasion of Basin waters by fishes and plants portend major ecological changes. Grass carp *Ctenopharyngodon idella* populations have increased since the 1970's, and beginning in the early 1980s, commercial fishermen noted increasing populations of bighead carp *Hypophthalmichthys nobilis* and silver carp *Hypophthalmichthys molitrix* (together, the bigheaded carps). However, populations of the big-headed carps appear to be increasing at a much slower rate than that occurring in the Midwest, possibly due to intermittent reduced seasonal availability and limited suitability of backwater habitat for juvenile fish. In 2002, harvester reports of sporadic captures of "different-looking" grass carp indicated the possible presence of black carp *Mylopharyngodon piceus*. Since then, eight black carp have been collected from sites connected to the Basin. As fecund diploid specimens, these fish indicate a likely reproducing population that threatens molluscan species-of-concern. Although statewide reported commercial landings of grass and bigheaded carps have been as high as 80,000 lbs/yr, limited market demand results in many captures being discarded. Infestation of Basin sites with the floating aquatic fern common salvinia *Salvinia minima* was reported in 2005, and by May 2006 hundreds of acres of backwater sites experienced 100% coverage. A study conducted in 2005 and 2006, suggested that *S. minima* had the greatest impact on the native plant community, exhibiting inverse abundance relationships with many native species. The study also showed that the percent

coverage of invasive plant species was greater than native plant coverage over all aquatic habitat types in the Basin. Such sites invariably exhibit reduced water quality, decreased vessel accessibility, and non-flowing areas are often anoxic. During summer 2006 specimens of giant salvinia *Salvinia molesta*, usually considered more noxious than *S. minima*, were discovered within habitats of the Basin. Like it has in other infested water bodies worldwide, *S. molesta* is expected to exhibit large impacts on the water quality and native plant community with subsequent expansion in the basin. A number of other aquatic invasive species have been identified at sites in and near the Basin, including water hyacinth *Eichhornia crassipes*, hydrilla *Hydrilla verticillata*, alligatorweed *Alternanthera philoxeroides*, paragrass *Brachiaria mutica*, and apple snail *Pomacea canaliculata*.

The Use of Science in Natural Resource Planning and Management in the Atchafalaya Basin (1:10-1:30 Fri.)

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Application of scientific knowledge in environmental decision making is often a complicated process. The interaction of multiple stakeholders, competing resource uses, varying imperatives across political boundaries, and complex ecological drivers and stressors of ecosystem goods and services are magnified at watershed or landscape-level spatial scales. Many inherent components in our legal and administrative institutions can marginalize scientific information when resolving multifaceted resource management issues. In this environment, new approaches for the effective use of science in natural resource management are needed. The MIT-USGS Science Impact Collaborative (MUSIC) is exploring how methods such as collaborative science and joint fact finding can be used in addressing the management issues present in the Atchafalaya Basin. We are analyzing how scientific information is translated into resource planning and management for the Atchafalaya Basin as part of a case study. Our hypotheses are: 1) science is constrained by each agency's authorities and mandates; and 2) numerous institutional barriers stand in the way of a more interdisciplinary, integrated approach to the conduct and use of science. We will discuss the results of the case-study effort and describe potential collaborative approaches for facilitating the use of sound science in the Atchafalaya Basin.

Hydrologic Influences on Carbon, Nutrient and Sediment Transport in the Atchafalaya (4:10-4:30 Thurs.)

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The Atchafalaya River pours 197 cubic kilometers of water into the Gulf of Mexico each year, representing over 20% of the total freshwater inflow to the world's ninth largest ocean from the U.S. continent. This principle, 220-km-long distributary of the Mississippi River is confined by levees on its east and west sides, encompassing a 4,678 square-kilometer basin with bayous, canals, lakes, backwater swamps, and bottomland forests. The water level within the swamp river basin can fluctuate as much as 6 meters on a yearly basis, creating a fundamental domain for hydrologic connectivity, flood pulses, and nutrient and sediment transports in the Atchafalaya. Despite intensive research during the past two decades, hydrology and hydrologic influences in this large floodplain system remain poorly understood and efforts to improve the basin's water quality have not met with a great deal of success. For instance, although sedimentation from the Mississippi silt-rich water has been attributed to the detrimental effects in the river-floodplain connectivity, water quality and aquatic habitat conditions, it is largely unknown how much sediment actually is retained in the basin each year. This paper presents recent studies on long-term (1978-2004) riverine inflows and outflows of water, carbon, nutrient, and sediment in the Atchafalaya, and discusses what management options are available, ecologically beneficial to both the Atchafalaya River Basin and the Northern Gulf of Mexico.