WAX LAKE DELTA

Architecture of [Wet] Land Building
LSU ARCH 7004 Research

LSU Coastal Sustainability Studio

Louisiana State University

The challenge of sustaining the ecological, settlement, and economic framework of the coast is one of the Gulf South's most pressing issues. The mission of the LSU Coastal Sustainability Studio is to address this challenge.

The Coastal Sustainability Studio (CSS) is a trans-disciplinary program of the College of Art & Design, College of Engineering, and the School of the Coast & Environment. At CSS, scientists, engineers, and designers come together to intensively study and respond to issues of settlement, coastal restoration, flood protection, and the economy. CSS brings together disciplines that normally work separately to respond to critical coastal issues in a comprehensive way.

The CSS approach centers on supporting resilient human communities in the dynamic Gulf of Mexico environment. These communities face tremendous challenges, many of which are not being solved because the various disciplines alone cannot cope with the complexity and enormity of the problems. CSS was created as a trans-disciplinary institute for this reason and works to envision and design sustainable systems that reduce vulnerability to increased storm strength, coastal hazards, habitat degradation, and global environmental change.

The LSU Coastal Sustainability Studio provided financial, planning, and institutional support for the course. CSS works to envision and design sustainable systems that reduce vulnerability to increased storm strength, coastal hazards, habitat degradation, and global environmental change. The results of this design experimentation provide a sound basis for major policy decisions for adaptation through more sustainable land-use planning protection, and education

Studio collaborations with Dr. Robert Twilley, executive director of the Louisiana Sea Grant Program.

Work complied by Kelli Cunningham, LSU Architecture + Landscape Architecture Graduate Student. Kayla Bosarge LSU Architecture Graduate Student and Jennifer Trippett. Photos by Shelby Doyle, Jennifer Trippett, Ana Orosco, and the students of ARCH 4993.

Top Right, Wax Lake Delta, Shelby Doyle

Bottom Right, Mudscapes, CSS entry and finalist in the 2014 ONE Prize.


MAPPING CRITICAL DEPENDENCIES:
MAPPING CHANGE:
THE WATER SYSTEM


SITE THREE:
LAKE PONCHARTRAIN ENCLOSURE
SITE TWO:
MYRTLE GROVE DIVERSION
SITE ONE:
ISLE DE JEAN CHARLES CRESCENT
OPEN WATER
ACCUMULATING SEDIMENT
HEALTHY WETLANDS
ESTABLISHED LAND

Instructors

Shelby Elizabeth Doyle is a Visiting Assistant Professor at Louisiana State University School of Architecture and a Research Fellow at the LSU Coastal Sustainability Studio. Her research examines architecture's potential agency and disciplinary relevance to the urban future of the Gulf South. This research began a 2011-2012 Fulbright Research Fellow based in Phnom Penh, Cambodia entitled City of Water: Architecture, Infrastructure, and the Floods of Phnom Penh and can be found at cityofwater.wordpress.com. She holds a Bachelor of Science in Architecture from the University of Virginia and Master of Architecture degree from the Harvard Graduate School of Design.

Kiel Moe, a registered practicing architect and associate professor of architecture and energy at Harvard Graduate School of Design, was named one of two 2014–15 Nadine Carter Russell Chairs. Moe is codirector of the Master in Design Studies program and the Energy, Environments & Design Research Lab at HGSD, where he teaches and coordinates core design studios, seminars on forms of energy, and lectures on architecture and energy. His research and design practice centers on an agenda for design and energy that is at once more ecologically and architecturally ambitious, focusing on both buildings as manifestations of large-scale energy systems as well as overlooked and discrete thermal parameters in buildings that yet have great impact on the power and thermodynamic depth of architecture.

Course Description

ARCH 7004 is the fourth architecture studio in the six---studio sequence Master of Architecture Program at LSU. The Wax Lake Delta, Louisiana serves as a site for the course. The US Army Corps of Engineers constructed a diversion channel in 1942 directing sediment to the Wax Lake resulting in measurable (wet)land building during the last 70 years. The studio will propose designs for the flagship Louisiana NERRS facility in the Wax Lake Delta. The 50,000---square---foot facility will include office space, laboratories, classrooms, educational spaces, exhibition space, and a dormitory. This book is a collection of data created and catalogued by the students for building within a deltaic condition.

ARCH 7004 Students

Alexis Malone
Kathleen Autilio
Kayla Bosarge
Ethan Jordan
Sara Loquist
Jennifer Price
Reagan Rispone
Travis Dickerson
Cameron Spencer

Coastal Roots Planting, Shelby Doyle

students participated in the coastal roots program lead by Dr. Pamela Blanchard, to aid in restoring the coastal ecology.

Morgan City Excursion, Shelby Doyle


CITY

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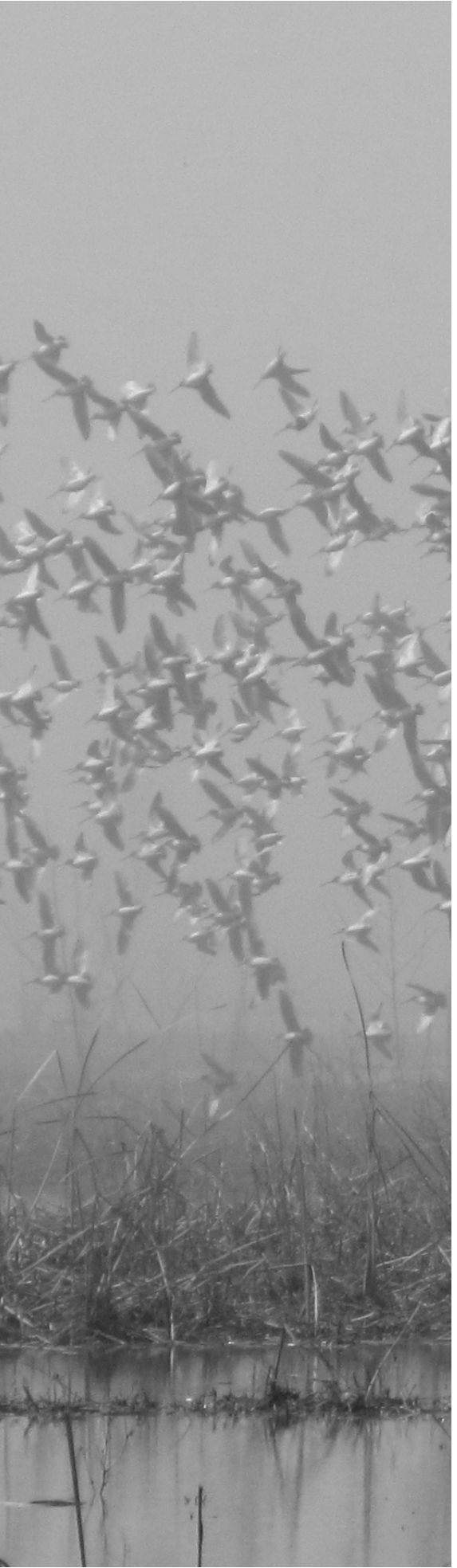


WAX LAKE DELTA

The Hurricane Katrina disaster of August 2005 highlighted a problem recognized for decades: the Mississippi River Delta (MRD) is sinking, resulting in extensive loss of wetlands and increasing the exposure of urban and industrial infrastructure to coastal storms [Fischetti 2001; NRC 2005]. By far the largest contributing factor to wetlands loss has been the construction of flood control levees along the lower Mississippi River, that has cutting off the river from its surrounding delta plain, thus converting the river into a pipeline that shunts water and sediment to the Gulf of Mexico and starves the wetlands of sediment [Day et al. 2005]. The land-loss problem will be exacerbated further with eustatic sea level rise [Blum & Roberts 2009], which is a problem facing deltas and depositional coastlines the world over [Syvitski et al. 2009; Vörösmarty et al. 2009]. The urgent need for large- scale wetland restoration through the diversion of Mississippi River water and sediments has been recognized throughout the restoration community [Day et al. 2003; Mitsch & Day 2006; Mitsch et al. 2005, CPRA 2007]. This management strategy uses diversion control structures from the Mississippi River to deliver freshwater and sediments to declining wetland areas (e.g., Barataria Bay and Breton Sound) [[Delaune et al. 2008; Day et al. 2005, 2007; Keddy et al. 2007; Lane et al. 2006]. These early diversions were not designed to capture sediment from the river and cannot be expected to build significant land, but they do restore seasonal freshwater pulses to the estuary. Large-scale river diversions that can deliver coarse sediment are needed to build wetlands. This concept has been modeled and projects 1,000 km2 of new wetlands can be built with the Mississippi River within a century [Kim et al. 2009].

One of the major challenges facing large-scale delta restoration is confidence that the trajectory of delta growth and decay of these new subdeltas will build land and promote wetland ecology as predicted in mathematical and physical models. The Wax Lake Delta (WLD) is living proof that land building in the face of sea level rise and subsidence is possible, as long as a substantial sediment supply is available in a shallow depositional region. Thus, the WLD is both an inspiring analog for engineered diversions of the Mississippi River, and an ideal natural laboratory to understand the ecogeomorphic evolution of growing delta lobes. Delta restoration requires calibrated predictive models for design and scenario analysis that are grounded in comprehensive field-based data sets. There is no facility anywhere in the world that can provide such data sets. The DELTA LAB research observatory at WLD provides critical data to the worldwide research community focusing on evolution and restoration of prograding delta environments. The delta is developing in shallow bayhead with lease agreement by the Louisiana Department of Wildlife and Fisheries.

Far left, Wax Lake Delta, Shelby Doyle

Marsh Condition within the current deltaic environment

Left, Migratory birds take flight, Shelby Doyle

Above, Wax Lake Delta, Shelby Doyle Marsh Condition along a deltaic lobe.

near the headlands of oldest lobe of the Mississippi River, the Maringouin-Teche. Currently the WLD receives approximately 30-40% of the total water and sediment discharge of the Atchafalaya River, which is equivalent to 10-12% of Mississippi River discharge [McManus 2002; Roberts et al. 2003]. Long-term subaerial land growth of the WLD is 1.0 - 2.0 km2 yr-1 [Roberts et al. 1997], and the delta front expands at a rate of +/- 0.3 km yr-1 [Parker & Sequierios 2006]. Sediment transport in the WLD is influenced by seasonal water exchange from river flooding, tidal exchange, cold fronts, and tropical storms. Winter-spring cold fronts control the inshore to offshore exchange of water and sediments as river discharge is increasing [Mossa & Roberts 1990]. As river discharge decreases and winds relax during summer, micro-tides transport sediment-laden river water to vegetated wetlands. The lowest water discharge occurs during the fall, when tropical storms periodically move water inshore [Walker 2001]. Interacting with these geophysical forces is the seasonal growth and mortality of wetland plants that affect sediment retention in the wetlands [Holm & Sasser 2001]. The delta islands are colonized by woody, shrub/scrub and herbaceous fresh marsh species that exhibit zonation along the natural elevation gradient (Visser 1998) these same patterns have also been documented in the Atchafalaya Delta (Johnson et al 1985, Schaffer et al. 1992).The delta is under state ownership managed as a Wildlife Management Area

The accuracy of land building models is completely dependent upon the breadth and accuracy of the field data available development and verification. While more detailed numerical models are currently being developed to investigate the physical controls over fine scale channel structure [Edmonds & Slingerland 2010] the data sets need to validate them are not currently available. The ecological, nutrient biogeochemical, and storm surge reduction attributes of delta models are also still being developed and are limited by a lack of large spatial and temporal data sets. These types of models are critical to predicting the benefits that large-scale coastal and ecological restoration projects can provide society and when developed will be an integral part of the restoration management practice in Louisiana as well as other deltas around the world. Deltas exemplify the strong coupling across disciplinary boundaries that we recognize as characteristic of Earth-surface dynamics [Committee on Challenges and Opportunities in Earth Surface Processes 2010]. We stress also that engineering is, in effect, folded into the entire effort as the basic-science research increasingly strives to produce engineering-style predictions of the outcomes of specific designs and actions. Finally, the problem of predicting delta evolution and dynamics is as scientifically rich as it is socially important. Given that hundreds of millions of people worldwide live or depend on low-lying depositional coasts, human impacts dominate coastal dynamics (e.g. by modifying channel patterns, building levees, and manipulating water flow); social factors and social sciences need to be included in the entire framework for delta management and restoration [Syvitski et al. 2009].

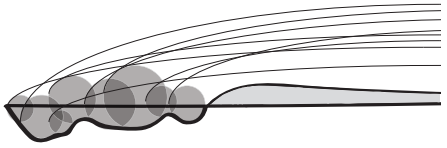
The missing centerpiece in the grand scientific challenge of delta prediction and restoration is a densely instrumented delta observatory to provide the comprehensive data sets needed to stimulate the whole enterprise. The challenge is to develop a research environment that captures key pulsed events (e.g. fronts, floods, tropical storms) that drive the physical, ecological, and geochemical patterns that determine delta evolution. Our main goal is to develop the instrumentation necessary to capture such pulsed events in the Wax Lake DELTA LAB observatory. The instruments we developed at WLD is not a single device but the instrumented delta itself: a dense, self-activating instrument network designed to capture the full range of relevant physical-geochemical-ecological linkages associated with such events. The DELTA LAB described in this proposal represents a critical investment in the development of a field-based research environment in the emerging discipline of 'coastal and ecological engineering'.

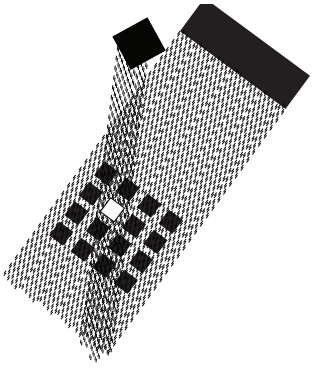
Dr. Robert Twilley
Professor, Department of Oceanography and Coastal Science
Executive Director, Louisiana Sea Grant College Program

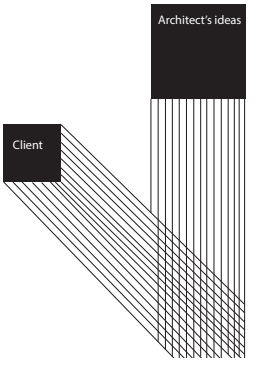
Dr. Chris Paola
National Center for Earth Surface Dynamics, University of Minnesota

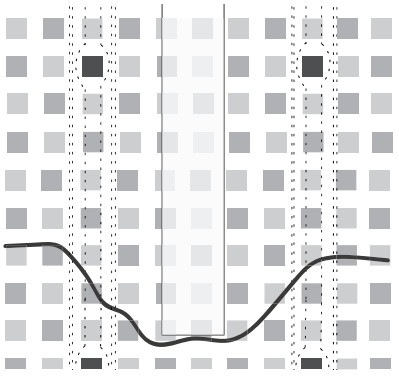
Diagrams

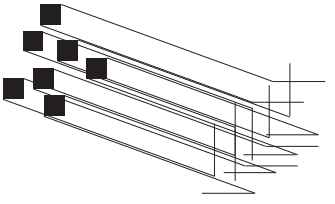
These diagrams explored ideas of energy, flood protection and the delta. The following are a sample of those produced by all the students in the course.

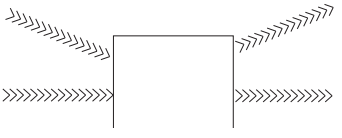


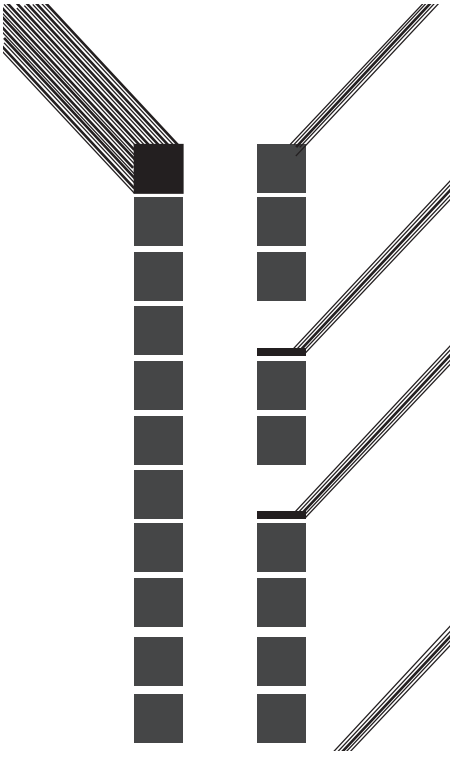


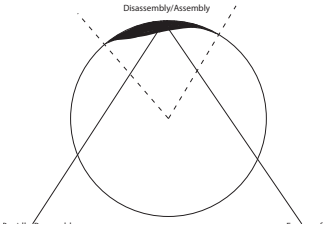


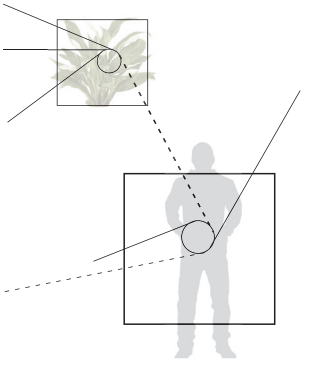


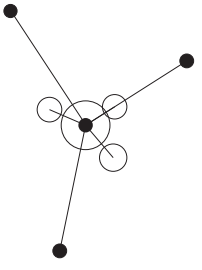


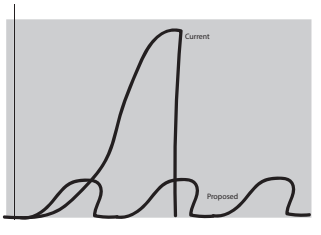


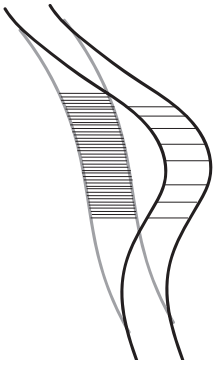


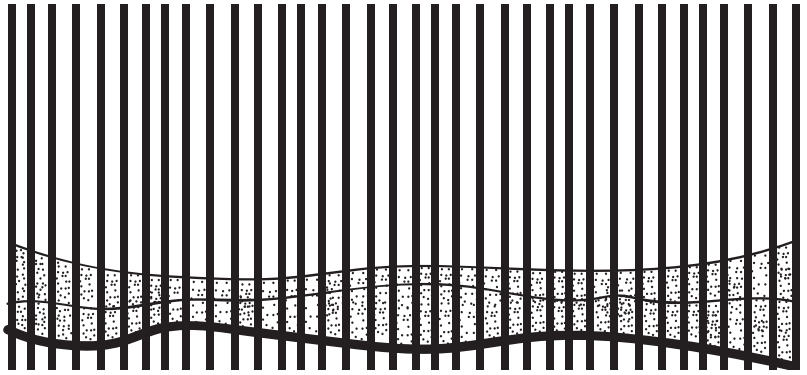


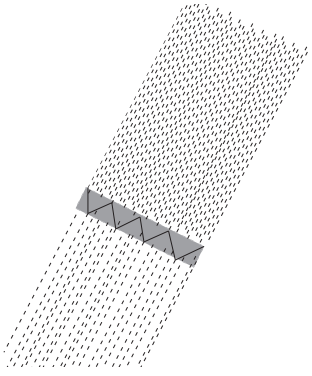


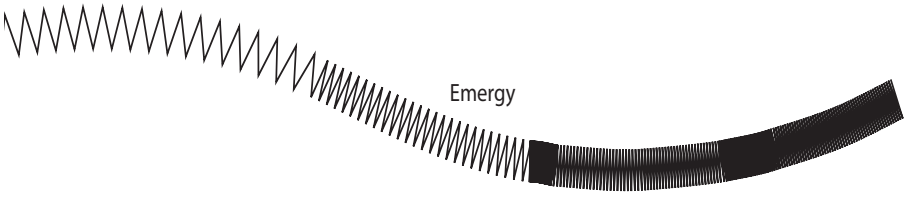








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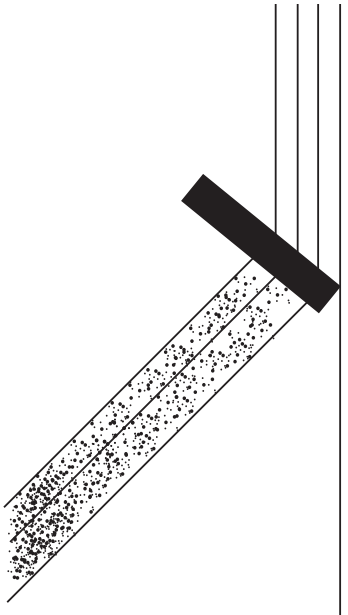
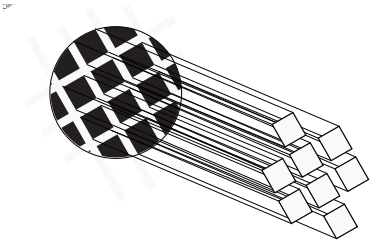
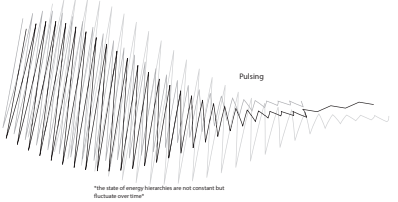





Pulsing
the state of emergy hierarchies are not constant but fluctuate over time

NERRS Facilities

Grand Bay Coastal Resource Center

Location: Jackson County, MI.
Acres: 18,049
Website: www. nerrs.noaa.gov/reserves/grand-bay.html

The vision of work at the Grand Bay NERR over the next five years is to contribute to the broader effort that: "Coastal ecosystems of the Gulf of Mexico will be conserved and valued."

The mission of the Grand Bay NERR is: "To practice and promote informed stewardship of Grand Bay NERR and Mississippi coastal resources through innovative research, education and training."

The mission of promoting informed stewardship of Mississippi coastal resources reflects the vision of valuing and conserving the broader Gulf of Mexico and being part of a regional effort to focus increased attention to the economic and environmental value of "America's Sea".
Reserve goals and objectives will be addressed through an integrated approach which will include collaborations and actions between staff and partners. The Reserve manager will support the actions of staff to complete the proposed goals and objectives.

Goal 1: Enhance Grand Bay NERR's role as a distinguished center for estuarine research, sound conservation and resource management.
Goal 2: Scientific understanding and knowledge informs the management of coastal resources and ecosystems.
Goal 3: Local communities appreciate and value the significance of coastal ecosystems.
Goal 4: Local communities will make improved science-based decisions regarding management of coastal resources and watersheds.

Our current focus areas are: (1) Ecological Effects of Sea Level Rise, (2) Ecology of Tidal Marsh Vertebrates, (3) Ecology of Unique Habitats, (4) Monitoring Ecosystem Effects of Mercury, (5) Coastal Plant Ecology and Mapping, and (6) Long-term Monitoring of Environmental Conditions.

VISITOR PARKING

SIDE DORM ENTRANCE

GRAND BAY NERR

The new Grand Bay Coastal Resources Center Interpretative Area is open to the public weekly. Hiking, boating, paddling, photography, fishing and hunting

opportunities are available seasonally.

ELEVATED COURTYARD

CISTERN

GRAND BAY NERR FACILITY SITE PLAN
SCALE:1/64"=1'-0"

0' 20' 40' 60'

NERRS Facilities

Grand Bay Coastal Resource Center

PROGRAM
20 Staff Parking Spaces
25 Visitor Parking Spaces
AFV Parking Spot
Car Pool Parking Spot
Bus Drop off
(2) 9' Wide Cisterns & Retention Ponds
1 Main Entering Road
Loading Dock
Mechanical Yard
Bus/RV/Boat Pullout

EDUCATION K-16 PROGRAMS
On site:
Middle and High School programs
Carnivorous Plants of Mississippi and Alabama Grade 6-9 Marine Habitats Grades 6 and up
Environmental Competitions Grades 9 and up Stewardship Grades 9 and up
Off site:
Elementary and Middle School Programs Pitcher Plants Grades 1-3
Clean Coastal Waters Grades 4-5
Stash Your Trash Grades 6-8
Career Days Middle and High School
Regional Science Fair Presentation all ages

EDUCATION COMMUNITY OUTREACH
Periodic community events
Adventure Quencher (nature photography, black lighting for bugs, catenating, kayaking, boat tours, field trips)
My Coast Presentations
Celebrate the Gulf Family Fair
Speaker Presentations
Self-Guided - Explore on your own
Interpretive Center M-F from 9 AM till 3 PM.
Recreational Opportunities
Adventure Quencher program

PROGRAM
chemical analysis lab: 743 sq ft
biological research lab: 746 sq ft
equipment storage: 192 sq ft
microbiology lab: 132 sq ft
specimen storage: 203 sq ft
storage: 128 sq ft
typ office: 100 sq ft
lockers: 52 sq ft
tlt rm: 70 sq ft
laundry: 13 sq ft
mechanical room: 809 sq ft
mudroom: 396 sq ft
janitor closet: 12 sq ft
outdoor auditorium: 1716 sq ft
8 person bunk room: 246 sq ft
bath for 8 person rm: 146 sq ft
laundry: 32 sq ft
commons: 221 sq ft
kitchen: 109 sq ft
2 person dorm room: 58 sq ft
2 person bath: 59 sq ft
lobby: 765 sq ft
interpretive area: 1055 sq ft
computer classroom: 656 sq ft
access storage: 208 sq ft
conference storage: 118 sq ft
screened porch: 507 sq ft
mechanical room: 339 sq ft
manager office: 330 sq ft
resource room: 158 sq ft
data room: 56 sq ft
kitchen/break room: 212 sq ft
meeting room: 342 sq ft
GIS office: 260 sq ft
tech work area: 333 sq ft
work room: 374 sq ft
file storage: 79 sq ft
USFW open office: 799 sq ft
USFW law enforcement: 224 sq ft
storage: 79 sq ft

NERRS Facilities

Grand Bay Coastal Resource Center

LIGHTING
"Nearly 90% of our occupied spaces are lit using natural daylight" (http://grandbaynerr.org/green/). This decreases the need for artificial lighting. Natural light, in tandem with exterior views, have been proven to make workers more healthy and productive.

EXTERIOR SKIN STRENGTHS
The exterior siding is made of 95% recycled plastics, fibers and rubber. The material was chosen because of its resistance to water, mold and insects and has a lifespan of 50 years.

EXTERIOR SKIN WEAKNESSES
Awnings and exposed joists in roof overhangs provide many areas for bugs nests to form. Aluminum Mullions conduct cold and heat into facility.

CLASSROOM STRENGTHS
Flexible spaces with durable materials.
Multiple work surfaces for displays, presentations, etc.

CLASSROOM WEAKNESSES
Overlit, hard to project presentation.
High ceilings and hard materials create harsh acoustical properties

LAB STRENGTHS
Well lite enjoyable spaces to work in
Spacious lab and counter spaces
Visibility into labs from hallways without interrupting researchers

LAB WEAKNESSES
Never enough storage

ADMINISTRATION STRENGTHS
Well sized offices for full time employees
Travel distance good to labs
Space in halls to post research projects

ADMINISTRATION WEAKNESSES
Hallways became long

CIRCULATION STRENGTHS
Simple circulation patterns
Ends at destinations
Creates viewports along hallways

CIRCULATION WEAKNESSES
No security between public exhibit and private offices and labs.

STORM ANALYSIS PAST HURRICANE DAMAGES

Tropical storm erosion plays a vital role in the recession of soft marshy mainland shoreline, specifically that of the Grand Bay area. Sixteen tropical storms (maximum wind speed < 74 mph) and hurricanes (> 74 mph in center) impacted parts of south Mississippi between 1870 and 1895 and twelve between 1896 and 1921. Fifteen storms and hurricanes, most prominently Frederic in 1979, a high-Category 3 hurricane (111 - 130 mph) may have had at least a marginal impact in the Grand Bay area between 1921 - 1998. The land area that surrounds the Grand Bay - Pt. aux Chenes Bay complex and extends landward was inundated by storm tide for a distance of 5 km during Hurricane Frederic (U.S. Army, Corps of Engineers 1981, Plate 13).

The 1998 Hurricane Georges, considered a long-track "Cape Verde" type category 1 (74 - 94 mph) to low Category 2 (96 - 110 mph), created significant aggradation from sand eroded in other intertidal beach, backfill and dune areas in certain Harrison and Jackson County beach sectors (Otvos 2004). Grand Bay's funneling effect created a record 4.2 m high storm run-up in the NW corner, east of the Chevron Oil Refinery (Blackwell and Calhoun 1999). Being in the NE quadrant from the hurricane's eye, this value was higher than measured at the Ocean Springs landfall location (Otvos 2004, 2005).

STORM ANALYSIS STRUCTURAL PROTECTIONS

Building is elevated 19.5 feet above sea level on a framework of a galvanized steel trusses that sit atop pilings. The facility also features the use of fire wise landscaping, which minimized the impact of wildfire in areas where dwellings abut forest. St. Augustine grass provides a 100 wide buffer along with a gravel pat that allows rainfall to soak into the ground instead of running off. The facility also employs the use of operable windows with interior screens (so that hurricanes cannot blow them off) for passive ventilation so that the building is habitable even when there is no power for extended periods of time. Also featured are windows that are rated to withstand winds of 150 mph.

NERRS Facilities

LUMCON

Location: Cocodrie, LA.
Acres: 4,200,000
Website: www.lumcon.edu

Vision Statement:
The Louisiana Universities Marine Consortium (LUMCON) will maintain a national and international reputation as a leading marine research and education institution, and stimulate and coordinate and facilitate scientific research among the marine science and education programs within Louisiana.

LUMCON's primary goals remain to support Louisiana through essential research, education of all levels of society, and support for other institutions or individuals who seek similar goals. Goal 1 is "To increase public and private research and development activity in the marine sciences and related fields." LUMCON scientists generate about $3 million annually in support of research programs. Goal 2 is "To be a learning enterprise in which all Louisiana businesses, institutions and citizens are actively engaged in the pursuit of knowledge." Goal 3 is "To provide a unique research and education structure, in terms of people, resources and philosophy, that enhances the success of staff, collaborators, visitors and the public in a better understanding of Louisiana's important and valuable resources." The location of the LUMCON Marine Center on the upper end of Terrebonne Bay and its proximity to the Mississippi River delta and Atchafalaya River delta estuary, large estuaries, and expansive coastal wetlands, makes it an ideal venue for the study of coastal Louisiana.

Mission:
LUMCON will conduct research and education programs directly relevant to Louisiana's needs in marine and coastal science, develop products that educate local, national, and international audiences, and serve as a facility for all Louisiana schools with interests in marine research and education in order to make all levels of society increasingly aware of the environmental, economic, and cultural value of Louisiana's coastal and marine environments.

ROOF

BOARDWALK

LUMCON

A one-hour in-depth tour of the DeFelice Marine Center.
-Learn about LUMCON's history, administration, architecture, services and on-going research and educational programs.
-Visit the collections room, tower, research labs, library, etc.

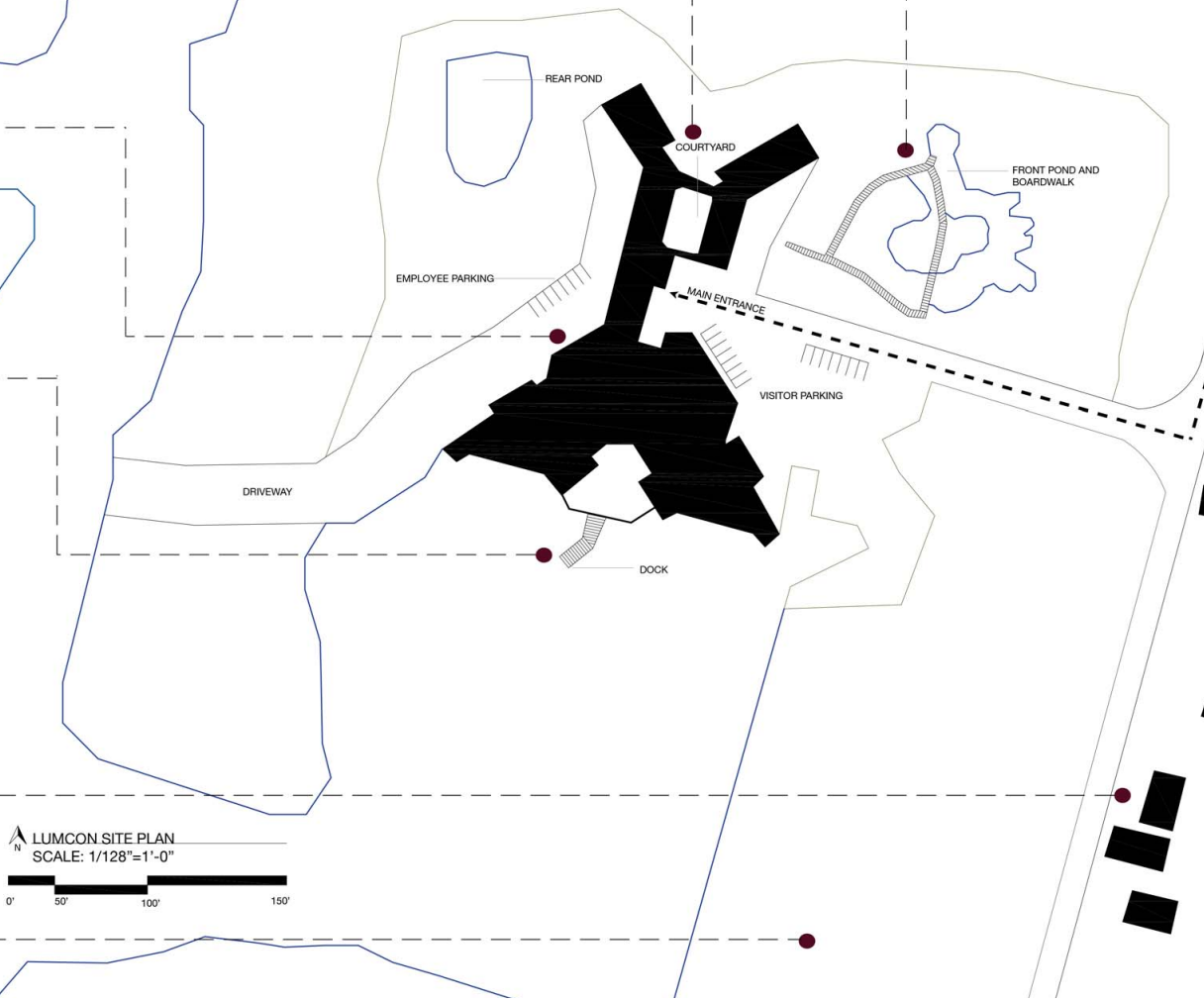
DOCK

A small boat trip to the barrier islands south of Cocodrie to study barrier island biology and geology. Beach, salt marsh, tidal inlet, and bay (Timbalier and Terrebonne Bays, Bay Cocodrie, Bay Sainte Elaine, and Lake Pelto) habitats are available. Hydrographic, benthic grab, and 16 foot trawl sampling are also possible from

HOMES

WETLAND

Canoe/kayak trip into the salt marsh surrounding the Marine Center to learn about salt marsh ecology and processes, wetland loss and restoration practices.



NERRS Facilities

LUMCON

LAB STRENGTHS
Separate wings for wet labs and dry labs, Accessibility hallway,
Close to offices, Located on interior to protect equipment from storm damages

LAB WEAKNESSES
Not adaptable to changing technologies

SITE STRENGTHS
Location near to research subject [Marsh, Bay, Gulf]
Directly on water for easy boat launch

SITE WEAKNESSES
Brought in sediment, Remote location, Exposure to weather, Difficult for educational purposes

ADMINISTRATION STRENGTHS
Close to lab facilities, Views from windows of surrounding areas, Private location away from visitor spaces

ADMINISTRATION WEAKNESSES
Reception desk is not functional due to acoustics and poor entrance label, Need more storage, The classroom at LUMCON was highlighted as a favorite space in the building. The key to this success was in scalability.

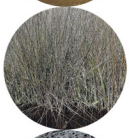
CLASSROOM STRENGTHS
adaptable, flexible, facilitates conversation, no windows to eliminate daydreaming, durability

CLASSROOM WEAKNESSES
white board spaces, storage, floating classroom/houseboat to bring children out onto the water to learn

The circulation of LUMCON is defined by flooring, designating public vs. private places. The circulation as a whole tends to be confusing.

CIRCULATION STRENGTHS
Identified spaces, Doors are different colors depending on interior vs. exterior doors, Simple shape connecting living and working by eating

Smooth Cordgrass
Spartina alterniflora

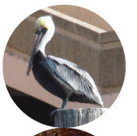


Black Needlerush
Juncus roemarianus

Salt Wort
Batis maritima

[flora]

Salt Grass
Distichlis spicata
Wire Grass
Spartina patens
Sturdy Bulrush
Schoenoplectus robustus
Saltmarsh False Foxglove
Agalinis maritima
Crimson-Eyed Rosemallow
Hibiscus moscheutos
Pickleweed
Salicornia depressa
Seaside Goldenrod
Solidago sempervirens
Eastern Baccharis
Baccharis halimifolia
Bushy Seaside Tansy
Borrichia frutescens



Brown Pelican
Pelecanus occidentalis

Pallid Sturgeon
Scaphirhynchus albus

Eastern Oyster
Crassostrea virginica

[fauna]

Whooping Crane
Grus americana
Tricolored Heron
Egretta tricolor
Boat-Tailed Grackle
Quiscalus major
Gull-Billed Tern
Gelochelidon nilotica
Sheepshead
Archosargus probatocephalu
Red Drum
Sciaenops ocellatus
Diamondback Terrapin
Malaclemys terrapin
Salt Marsh Snake
Nerodia clarkii
Atlantic Bottlenose Dolphin
Tursiops truncatus

NERRS Facilities

Ace Basin National Estuarine Research Reserve

Location: Charleston, SC
Acres: 25,724
Website: www.dnr.sc.gov/marine/NERR

The Education Program seeks to deliver programs that lead South Carolina's citizens to understand, appreciate, and value our coastal ecosystems while advancing the goals of the broader education system. The ACE Basin NERR has developed a strategic plan that integrates this work with that of the various sectors. It is noteworthy that staff from the stewardship sector plays a significant role in outreach to groups beyond the traditional scope of education programs such as fishers, recreational boaters, and homeowners. As a result, the strategies that the Education sector employs are presented within the context of the over arching goals and objectives of the Reserve. ACE Basin NERR educational goals and objectives will be accomplished using a variety of informational, interpretive and educational programs and media (Reserve goal #2).

Specific programs may include, but are not limited to:

- Research /management-oriented interpretive tours of ACE Basin NERR(by land and water) for the public and special groups;
- Estuarine ecology workshops for educators and students; workshop topics will be directly related to the Reserve and coastal management;
- The Coastal Carolina Discovery program, which provides lessons focusing on estuarine ecology for middle school students;
- Interpretive programs offered in cooperation with SCRIPT staff at the Environmental Learning Center;
- The Coastal Exploration Series provides lectures and hands-on experiences for the general public; it highlights the value of land 51 conservation and expertise of local and regional resource managers,especially Reserve staff;
- Audio-visual presentations, research demonstrations, and facility tours will be made available to interested groups upon request

NERRS Facilities

Elkhorn Slough National Estuarine Research Reserve

Location: Moss Landing, California
Acres: 1,439
Website: www.elkhornslough.org/esnerr

The Elkhorn Slough National Estuarine Research Reserve winds inland nearly seven miles from Monterey Bay to Watsonville, located 23 miles north of Monterey, Calif.. Its broad salt marsh is second in size in California only to San Francisco Bay. The Reserve's 1,439 acres represent the central California sub-region and include threatened habitats such as maritime chapparal, coastal prairie, coastal sage scrub, live oak woodlands, and grasslands. Elkhorn Slough is noted for its diversity: more than 550 species of invertebrates, 100 species of fish, and 135 species of birds have been identified, including six that are listed as threatened or endangered. Located on the Pacific Flyway, the Elkhorn Slough Reserve and the surrounding area is also renowned for outstanding birding opportunities.

NERRS Facilities

Guana Tolomato Matanzas National Estuarine Research Reserve

Location: Ponte Vedra, FL
Acres: 73,352
Website: www.dep.state.fl.us/coastal/sites/gtm/

Guana Tolomato Matanzas National Estuarine Research Reserve (GTM Research Reserve) is dedicated to the conservation of natural biodiversity and cultural resources through research and monitoring to guide science-based stewardship and education strategies.

Site selection for a Florida east coast National Estuarine Research Reserve (NERR) began in September 1991. Estuaries in the Carolinian and West Indian biogeographic regions were identified and assessed. The Guana Tolomato Matanzas ecosystem was identified as the preferred site by a committee of scientists, environmental educators and coastal managers for its potential for scientific research, environmental education opportunities and its relative pristine condition.

73, 352 acres of salt marsh, mangrove tidal wetlands, oyster bars, estuarine lagoons, upland habitat and offshore seas in the Northeast Florida. . The GTM Reserve is located in the East Florida subregion, south of Jacksonville and sandwiching St. Augustine.

Research
A major goal of the GTM Research Reserve is to promote research and monitoring that contributes to a fundamental understanding of estuarine systems and supports the adaptive management of same.

Education
The Guana Tolomato Matanzas Reserve offers a variety of education programs to suit a range of audiences. The primary goals of the reserve education program are:
Engage and excite people about estuaries and the animals and plants that inhabit them
Promote awareness of the reserve and its management goals and objectives
Translate scientific findings from reserve projects so the public has current information to help them make informed decisions
Increase knowledge about living sustainably within the watershed of the reserve

NERRS Facilities

Narragansett Bay National Estuarine Research Reserve

Location: Prudence Island, R.I.
Acres: 1,730
Website: www.nbnerr.org/

The 2,388 acres of habitat located on 3 islands: Prudence, Patience and Hope Islands, and 1,730 acres of estuarine water to depth of 18' Reserve headquarters on Prudence island (small year round community) which provides 5,000 sq. ft. of lab and office space with a conference room, visitors center and workshop. Also here is a small renovated cottage that acts as a dormitory for 12 visiting scientists or students. There is a 3-bay garage house for maintenance equipment which also serves as a workshop. There are floating docks for small vessel access to the reserve. The component's land is very irregular in shape, the north end has two coves on the west side and one on the east side. The terrain has a low profile, with slopes of 13-15 percent and a maximum elevation of 70 feet. Isolated hummocks and a long north-south ridge of unconsolidated glacial material are among the area's notable upland features. The coves on the western shore combine to form 92 acres of salt marsh. Several large salt marsh areas are found in the "creek" connecting North Prudence to the central section of the island. The central area contains forested uplands with the highest elevation at 180 feet. South Prudence has rock cliffs along the waterfront, grading into cobble beaches. An extensive eelgrass meadow runs along the east shore.

Research
To conduct and provide opportunities for original research in coastal and estuarine systems; to track changes in the Reserve and within the Narragansett Bay estuary to help forecast environmental quality and trends; to protect Narragansett Bay by encouraging and assisting partners in research, monitoring, and science-based ecosystem management; and to provide managers, scientists, and educators with scientific and technical information that fosters research, education, stewardship, and informed decision making.

Education
To increase public awareness of Narragansett Bay's environmental, economic, and cultural importance as an estuary
To work with our partners to improve public understanding of current estuarine research and natural resource stewardship projects
To make estuary data, education programs, activities, and curricula available to Rhode Island schools, colleges, and universities
Examples: year-round tours, on and off site k-12 educational programs and workshops, professional development workshops, on-site community events, presentations, service learning and coastal clean-ups

Priority Issues
Water Quality
Changes in Biological Communities
Habitat Alteration

NERRS Facilities

North Inlet-Winyah Bay National Estuarine Research Reserve

Location: Georgetown County, S.C.
Acres: 18,916
Website: www.northinlet.sc.edu

North Inlet-Winyah Bay National Estuarine Research Reserve protects more than 18,916 acres of habitats ranging from tidal and transitional marshes to oyster reefs, beaches, and inter-tidal flats and from coastal island forests to open waterways. With more than 90 percent of North Inlet estuary's watershed in its natural forested state, its relatively pristine salt marshes and ocean-dominated tidal creeks have higher water and habitat quality than those in adjacent Winyah Bay. As the estuary with the third largest watershed on the east coast, Winyah Bay's brackish waters and marshes have been greatly influenced by agriculture, industry and other human activities. The reserve is home to many threatened and endangered species, including sea turtles, sturgeons, least terns and wood storks.

A primary focus of the NIWB NERR Research and Monitoring Program is participation in the National Estuarine Research Reserve's System-Wide Monitoring Program (SWMP). SWMP is a national initiative among all NERRs, developed and initiated in 1995, that is designed to develop quantitative measurements of short-term variability and long-term changes in the water quality, biotic diversity, and land-use/land -cover characteristics of estuaries and estuarine ecosystems for the purposes of contributing to effective coastal zone management.

NERRS Facilities

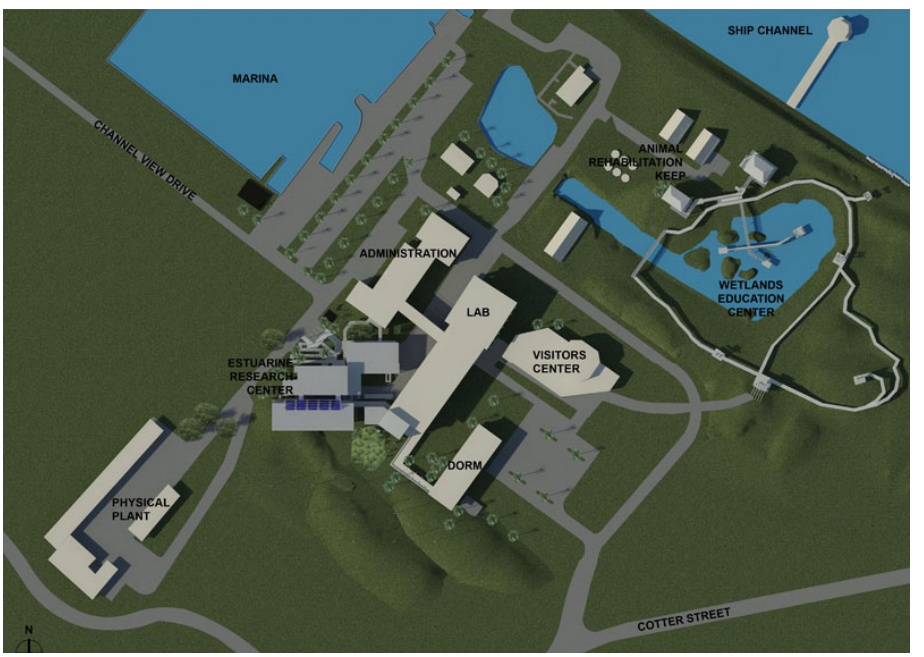
Mission- Arasas National Estuarine Research Reserve

Location: Port Aransas, TX
Acres: 185,708
Website: www.missionaransas.org

The Mission-Aransas Reserve is a 185, 708-acre contiguous complex of wetland, terrestrial, and marine environments. The land is primarily coastal prairie with unique oak motte habitats. The wetlands include riparian habitat, and freshwater and salt water marshes. Within the water areas, the bays are large, open, and include extensive wind tidal flats, seagrass meadows, mangroves, and oyster reefs. These unique and diverse estuarine habitats in the western Gulf of Mexico support a host of endangered and threatened species including the endangered whooping crane.

Aransas National Wildlife Refuge Facilities
Facilities at the Aransas National Wildlife Refuge include a wildlife interpretive center that offers refuge information, exhibits, environmental education, wildlife programs, and a nature bookstore. A 16-mile, paved auto tour loops through brushlands, grasslands, oak mottes, and brackish and freshwater marshes; complete with trailhead signs and exhibit panels. The 40-foot observation tower offers a panoramic view of San Antonio Bay and Mustang Lake. A boardwalk made of environmental friendly recycled "plastic lumber" meanders through a salt marsh to the shore. The refuge also offers several miles of walking trails that include observation platforms, telescopes, and a photo blind. Two picnic grounds with restrooms are also available. The refuge also has a headquarters complex, with offices, residences, and service area. A Youth Environmental Training Center (YETA) is used by youth groups and other organizations to promote environmental education. The YETA is composed of n assembly area, picnic shelter, restroom facilities, amphitheater and four primitive campgrounds for up to 250 - 300 people (Figure 24). A layout of the YETA facilities is in Appendix 9.

The refuge also has two boat dock and houses at Mustang Lake (9' dredged channel) and Matagorda Island. In addition there are two cabin cruiser boats, cathedral and "v" hulled, approximately 24 feet long. Each cruiser can hold 9-12 people.



NERRS Facilities

Rookery Bay National Estuarine Research Reserve

Location: Naples, FL.
Acres: 110,000
Website: https://rookerybay.org/

Rookery Bay Reserve headquarters is located on Tower Road adjacent to Henderson Creek, upstream from the Shell Island Road facilities. Large and small conference rooms, as well as offices housing a majority of the 25 personnel employed at the reserve, are located in the headquarters building.

The Environmental Learning Center is a 16,500 square-foot facility with four research laboratories, classrooms and 140-seat auditorium, and two story visitors center. The visitor center offers a variety of hands-on experiences, including 2,300-gallon aquarium and interactive exhibits addressing research and stewardship efforts ongoing within the Reserve, as well as a nature store, gallery and picnic area. The Environmental Learning Center is located on Tower Road adjacent to the headquarters building. In addition to new staff lab facilities, visitor center and training wing, the new facility provides space for administrative and research offices.
A new pedestrian bridge will lead visitors from the Rookery Bay Environmental Learning Center across Henderson Creek to a proposed interpretive trail, scheduled to open to the public by Thanksgiving 2009. Rookery Bay Reserve has two dormitory facilities for visiting researchers, educators, and resource managers - four beds in a restored gatekeeper's house on Goodland Bay and 12 beds at the lodge on Cannon Island.

NERRS Facilities

San Francisco Bay National Estuarine Research Reserve

Location: Tiburon, CA
Acres: 2,070
Website: http://www.sfbaynerr.org/

Located at China Camp State Park and Rush Ranch
Primary focus of the reserve is to support tidal marsh restoration through research, monitoring and education; Nearly 97% of the historic wetlands have been lost due to development pressures in the region. San Francisco Bay National Estuarine Research Reserve's mission is to improve understanding and stewardship of estuary, with a broader relevance to the ecosystems beyond the Golden Gate.

-Rush Ranch: famous for the tidal brackish marsh; great bird and wildlife watching, scenic hiking trails, and rich human history; 3 hiking trails;China Camp: hiking trails, biking trails, tidal salt marshes

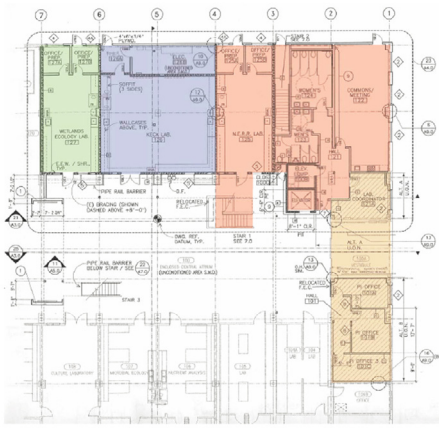


Fig A. Project Funding by Location

- NOAA - San Francisco Bay National Estuarine Research Reserve
- W.M. Keck Foundation
- Clear Genesis Foundation
- Unrestricted donations

San Francisco Bay Reserve's K-12 education programs strive to help teachers improve the quantity and quality of estuarine science taught in K-12 classrooms (both indoor and outdoor). We offer professional development workshops primarily for middle and high school level science teachers. Our workshops bring together scientists and teachers, and offer interactive, hands-on approaches to using scientific research and data in a variety of settings. Our education staff is also committed to helping teachers effectively use the Reserve System's Estuaries 101 lesson plans to teach basic science concepts and data analysis.

NERRS Facilities

Sapelo Island National Estuarine Research Reserve

Location: Townsend, GA.
Acres:2,300
Website: www.sapelonerr.org/

The Sapelo Island research Facility contains the Duplin River Estuary, a pristine barrier island. The Island is two thirds Salt Marsh and 2,300 acres of upland forest (oak, hardwood, and pines).

Facilities
Interpretive Visitor's Center (Mainland outreach center)
Educational Outreach Facility
On-island education classroom and laboratory
Research dorm
Ferry to and from Island (Meridian Ferry Dock)s

Program
Research programs for local, state and federal
assessment of short-term variability and long-term trends related to estuarine health provide scientific information pertinent to state and regional policy needs. The Living Shorelines Project-scientifically quantifying the biological benefits of alternative shoreline sediment control structures, while assessing their costs, longevity, appropriateness, and aesthetics in comparison to conventional control structures such as oyster-shell infused Gabion construction, rip rap, interlocking concrete sheathing, and treated lumber bulkhead. Education Outreach for children as well as tours around the island featuring both cultural and natural history of the place. On-site school programs as well as teacher training enhances the educational outreach program of this site. There is also a GIS lab, Monitoring lab and Habitat Mapping project.

NERRS Facilities

Wells National Estuarine Research Reserve

Location: Wells, ME.
Acres: 2,250
Website: www.wellsreserve.org

"The Alheim Commons is the 20-bed housing facility of the Wells National Estuarine Research Reserve. It was designed and constructed to accommodate coastal scientists, educators, and resource managers who are visiting south coastal Maine and working on projects with the Reserve, or working independently on projects directly related to the Reserve's coastal resource stewardship mission. The building was completed in December 2005 and ready for occupancy January 1, 2006.

In building the Alheim Commons, the Wells Reserve incorporated recycled-content products and used environmentally friendly materials and construction techniques. Other goals for the completed building included energy efficiency, renewable energy, water efficiency, low-maintenance landscaping, and waste reduction. The Alheim Commons was constructed for year-round use; it is very well insulated and heated though the zoned system, allowing the Reserve to close down unused rooms in the off-season. The design has large south-facing windows to allow for solar gain during cold-weather months. Equally as important as the green elements were the project goals of ensuring the new building would have the following: low operating costs (or as low as possible), durability, ease of maintenance, and a pleasant, home-like appearance both on the exterior and interior. The interior of the building safely and comfortably accommodates up to 20 people. The floor plan has seven bedrooms in the barn and two in the house. There are four full baths, and a laundry room. The ell is the building's primary gathering place. The main entrance, located in the back of the building, has a vestibule separating outdoors and indoors. Inside the ell is a large kitchen with refrigerators, stoves, ovens, and cabinets for food and utensils. Adjoining the kitchen in the ell is the dining and common area. In addition to the two bedrooms, there is a study/quiet area in the main house. The interior floorplan was designed for flexibility. For example, the house portion can converted to more private living spaces, if the need arises in the future. The Alheim Commons is a wireless facility, allowing residents to connect to the internet from the comfort of their "home.""

NERRS Facilities

Lake Superior National Estuarine Research Reserve

Location: Lake Superior, WI.
Acres: 16,697
Website: lsnerr.uwex.edu/

The NERRS Facility located on Lake Superior Wisconsin, provides research for St. Louis River Freshwater Estuary and Lake Superior. They Promote public awareness, promote educator and student understanding through educational outreach. They research the socioeconomic aspects of the estuary. They also aim to protect and enhance ecological health through citizen volunteer monitoring. There are several landscape typologies located within the reserve including upland and submerged lands, riparian and riverine habitat, riverine islands, freshwater marshes, interdunal wetlands, scrub swamp, aspen, dry and hardwood forests as well as open sand beach and dunes.

The reserve is located in Douglas County, Wisconsin at the point where St. Louis River flows into Lake Superior near the Minnesota border. The total acreage included is 16,697.

NERRS Facilities

Padilla Bay National Estuarine Research Reserve

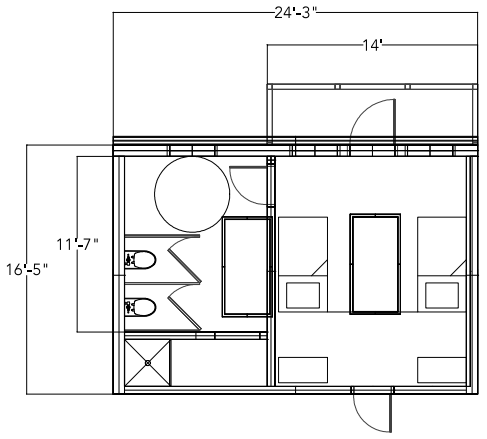
Location: Padilla Bay, WA.
Acres: 11,460
Website: www.padillabay.gov/

The NERRS Facility located on Padilla Bay, Washington, provides research for Skagit County in the northern reached of greater Puget Sound. There are various educational programs including school civic, college, scouts, and adult. Programs include water quality research, tracking change within the landscape, invasive species and biodiversity research and coastal training.

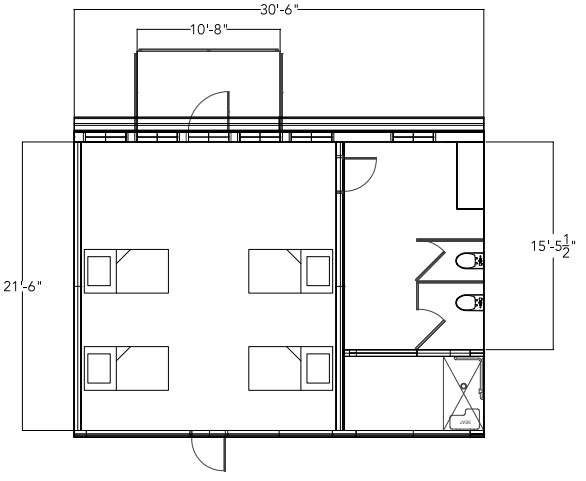
Local landscape typologies include continuous eel grass, intertidal embedment, predominately aquatic habitats and smaller portions of uplands, freshwater sloughs and high salt marsh. The reserve is on the southern fringe of the San Juan Archipelago, and includes 11,460 acres.

Building Component

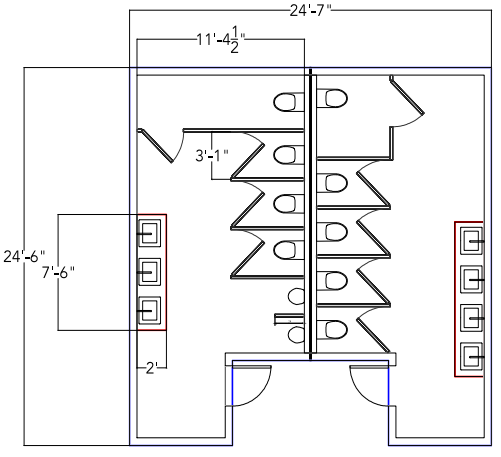
Dorms | Bathrooms



Two person dorm
170 Sq Ft

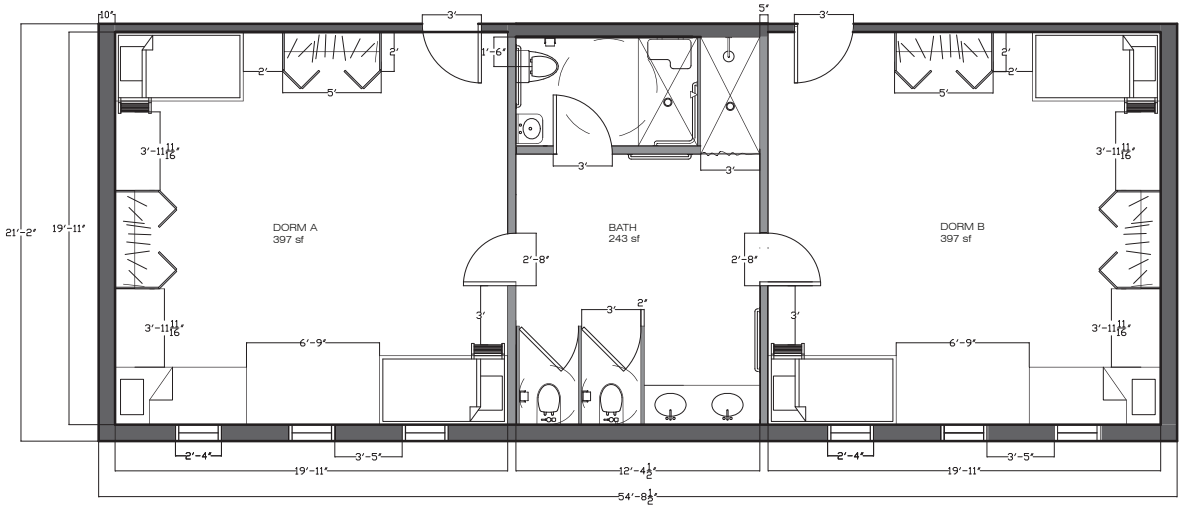


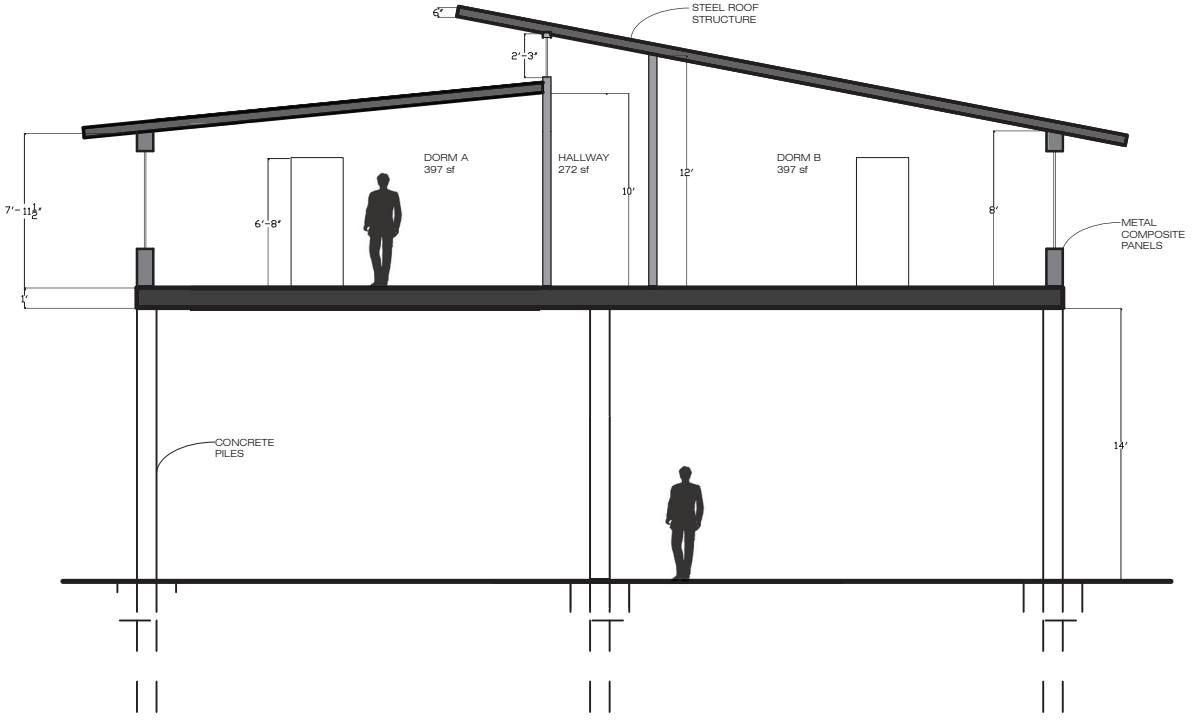
Four person dorm
660 Sq Ft



Dorm Bathroom
490 Sq Ft

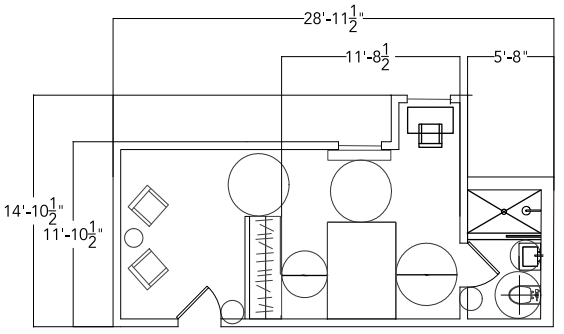
Six person dorm
1162 Sq Ft



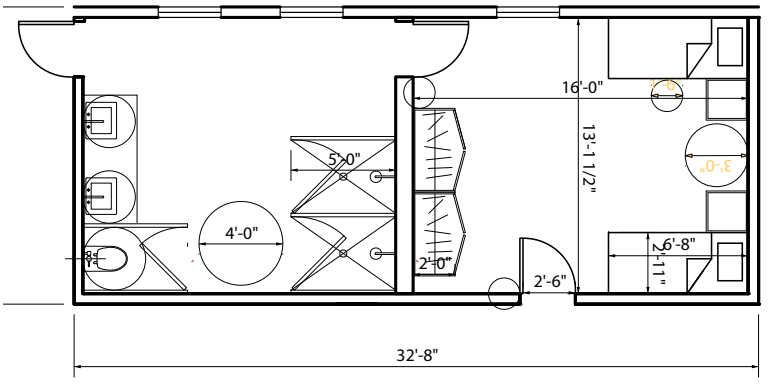


Building Component

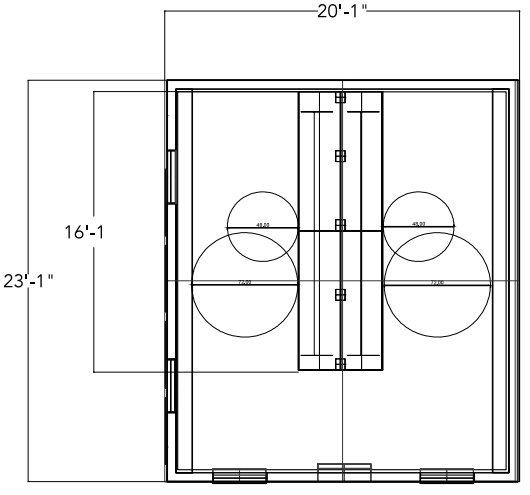
Longterm Dorms | Boat Storage | Kitchen | Kitchenette



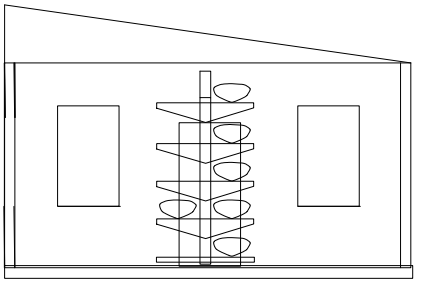
One person Long Term Dorm
250 Sq Ft



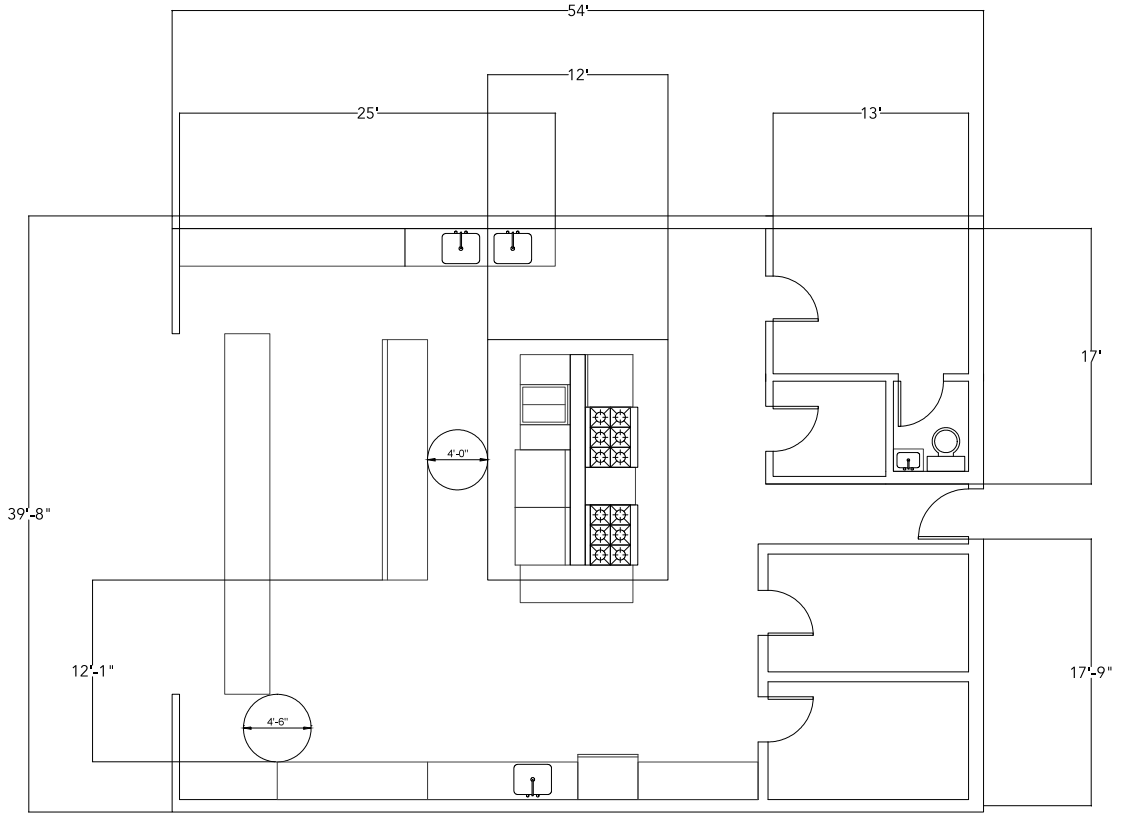
Two Person Long Term Dorm
419 Sq. Ft.

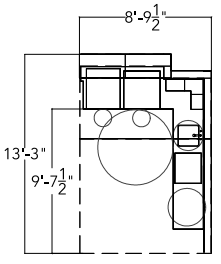


Boat Storage
465 Sq Ft



Commercial Kitchen
2142 Sq Ft

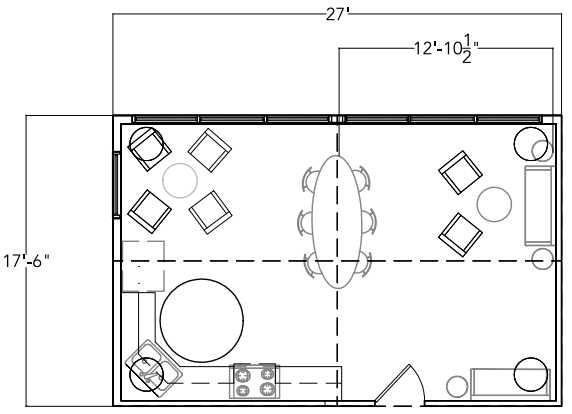




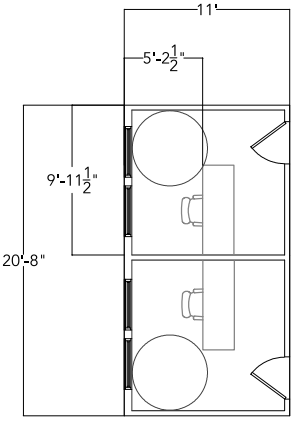
Kitchenette
54 Sq Ft

Building Component

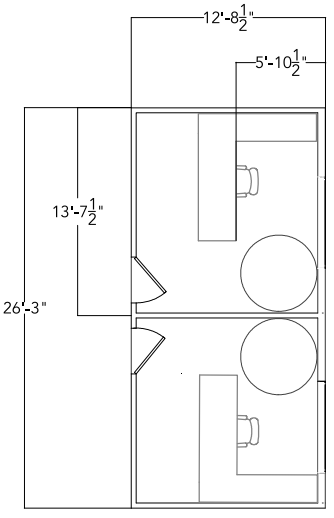
Lounge | Office | Conference Rooms



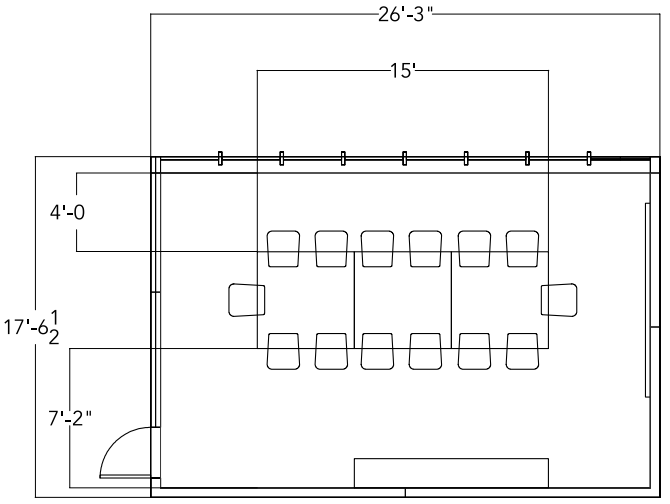
Lounge
468 Sq Ft



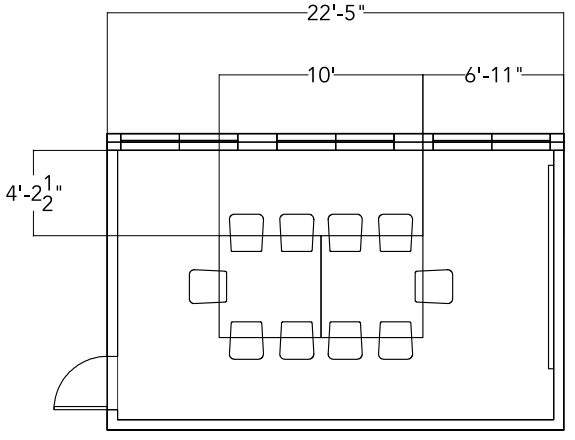
Small Offices
225 Sq Ft



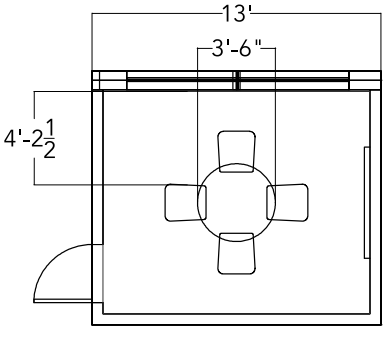
Large Offices
333 Sq Ft



Large Conference Room
460 Sq Ft



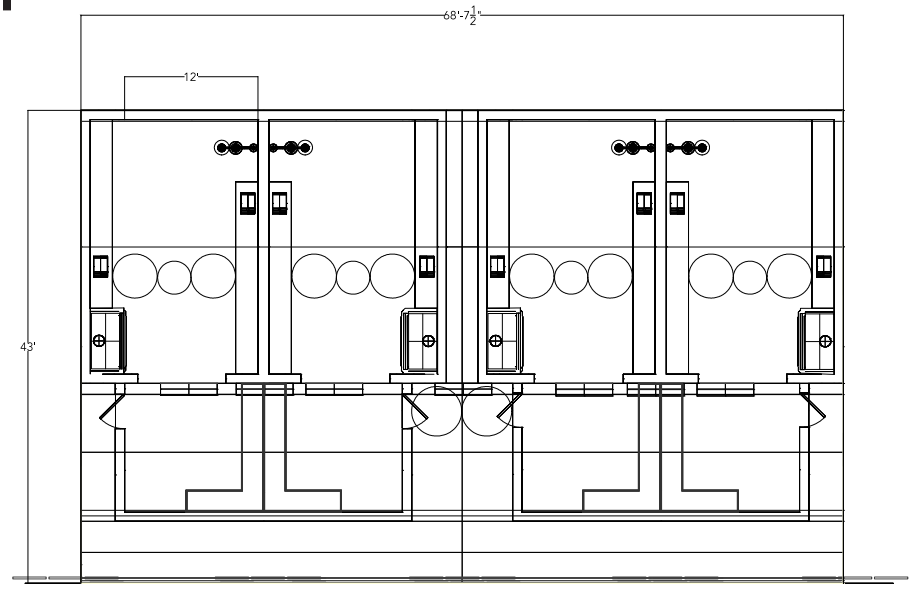
Medium Conference Room
326 Sq Ft



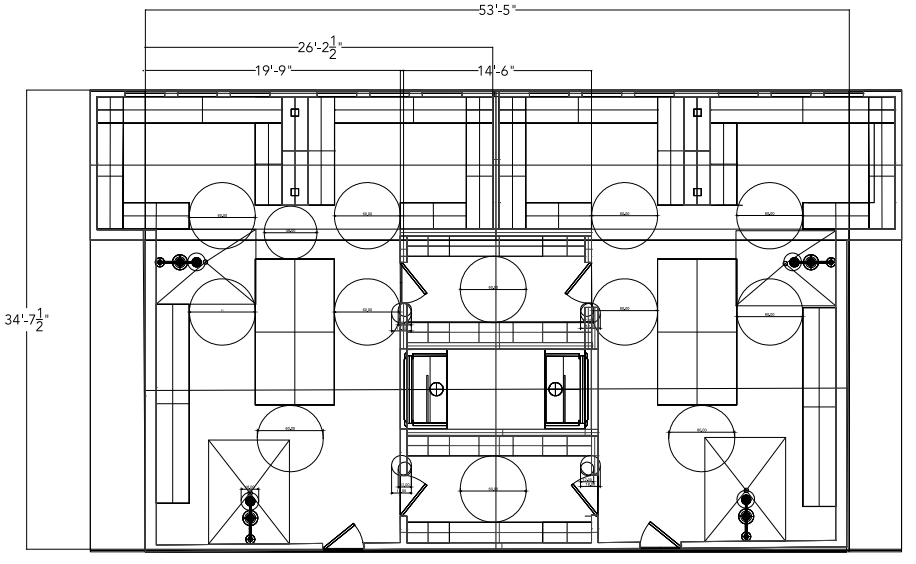
Small Conference Room
150 Sq Ft

Building Component

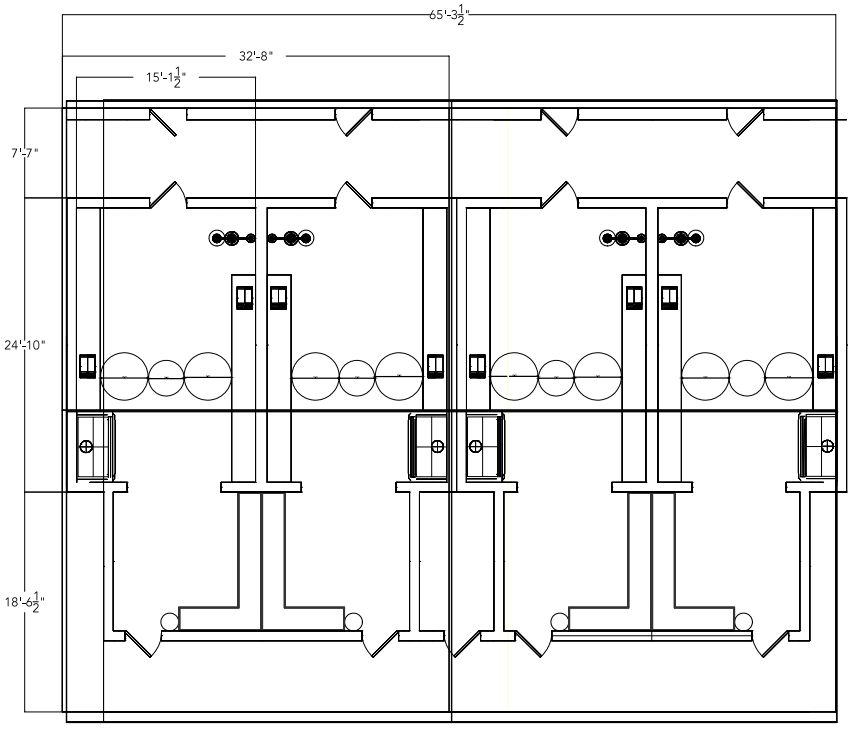
Research Labs [Wet] | Research Labs [Dry]



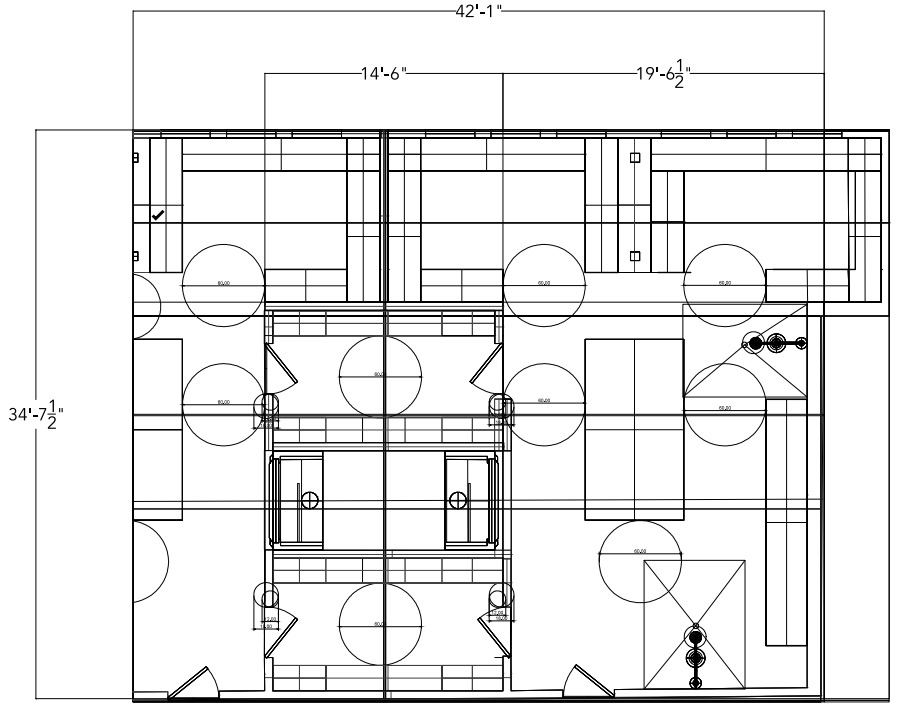
Wet Lab
1293 Sq Ft



Dry Lab
1560 Sq Ft



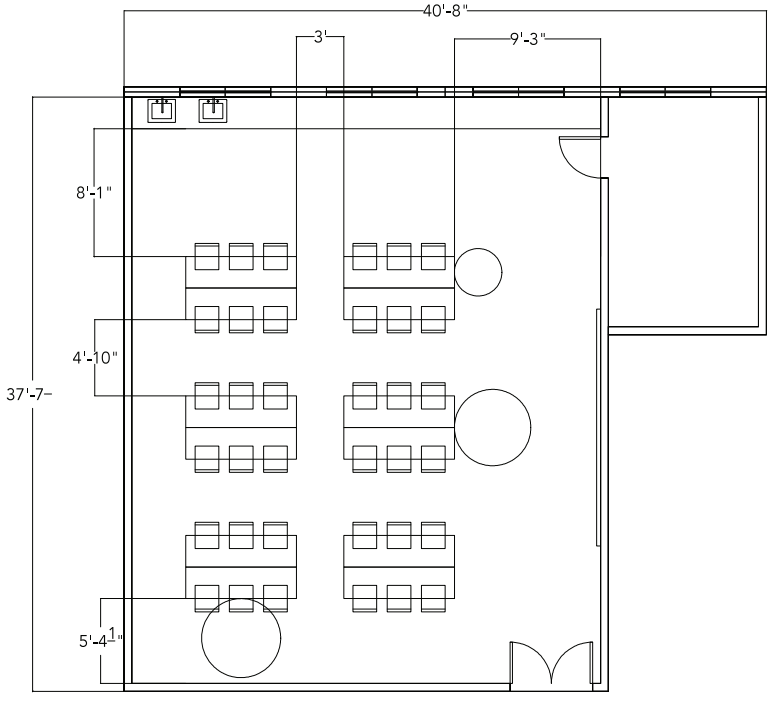
Wet Lab
2401 Sq Ft



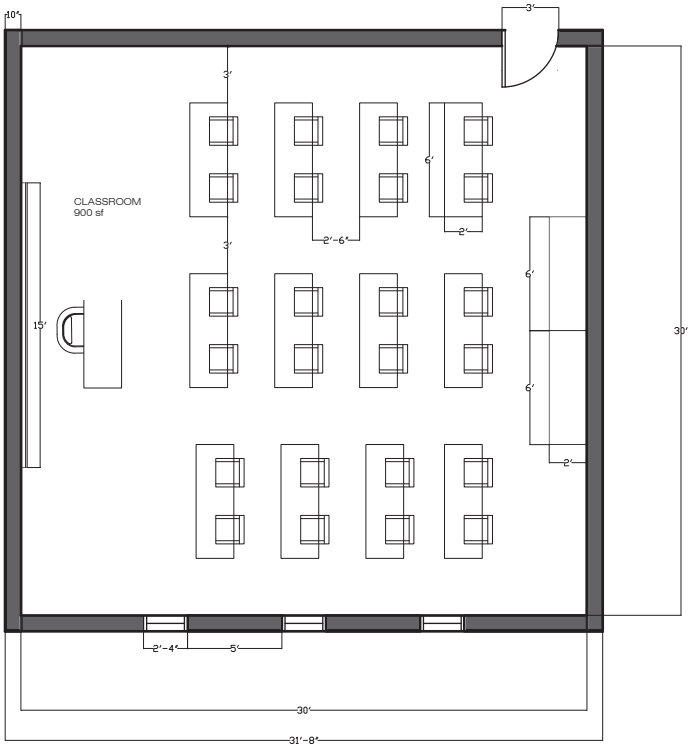
Dry Lab
1525 Sq Ft

Building Component

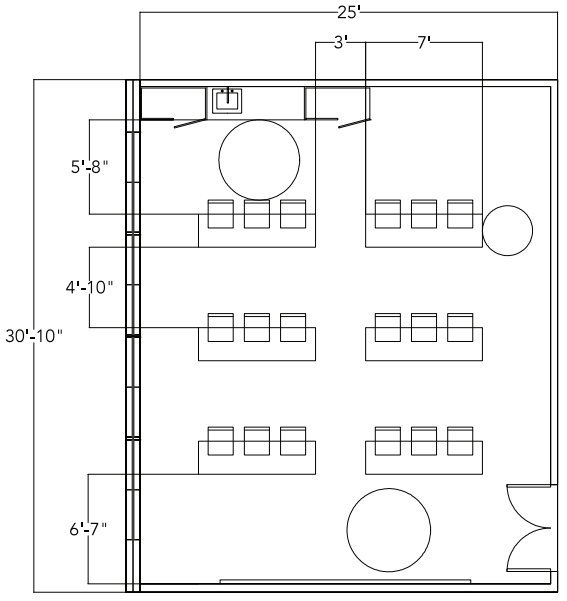
Classrooms | Cafeteria



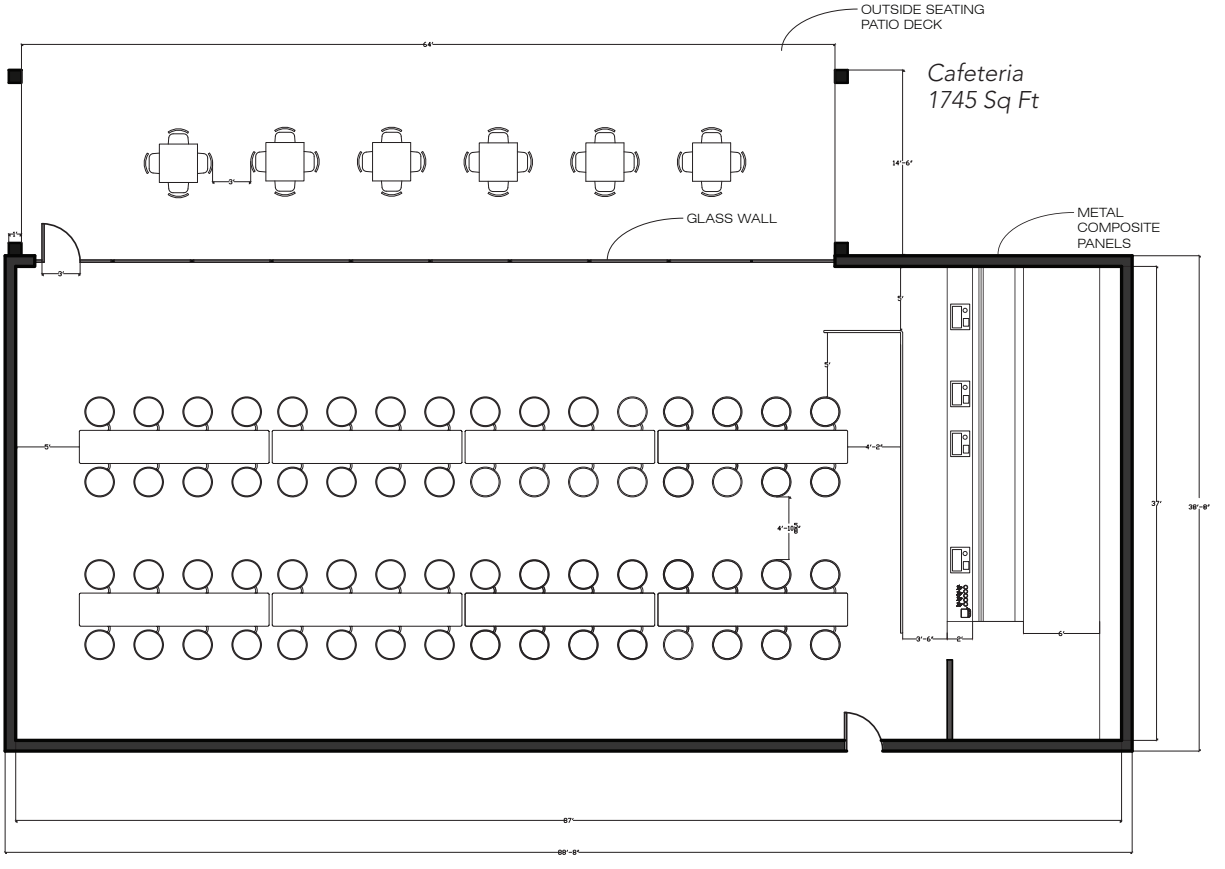
Classroom
1100 Sq Ft



Classroom
900 Sq Ft



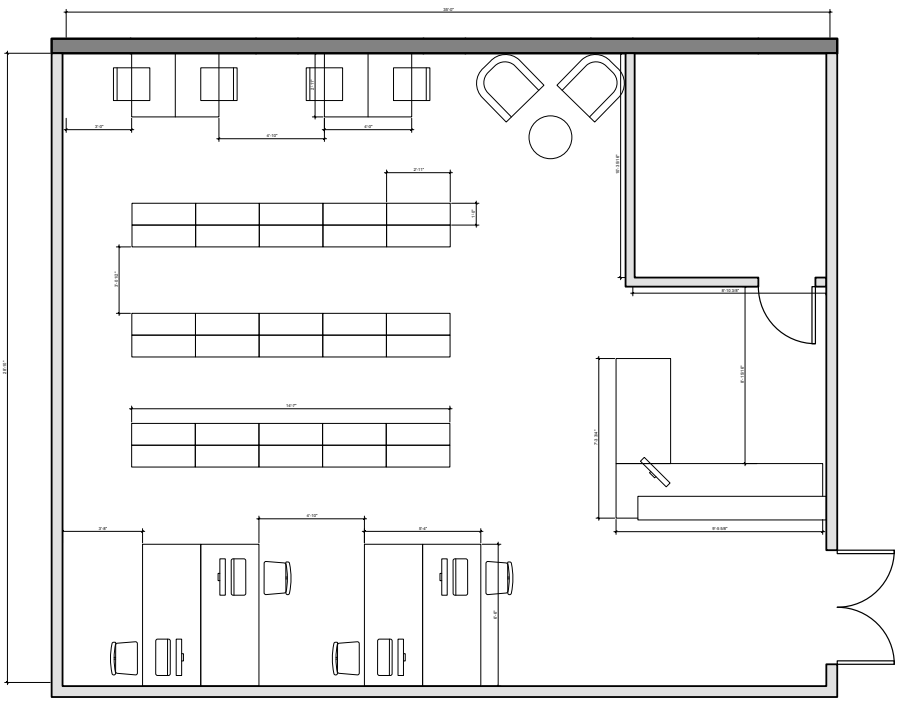
Classroom
732 Sq Ft



Cafeteria
1745 Sq Ft

Building Component

Library



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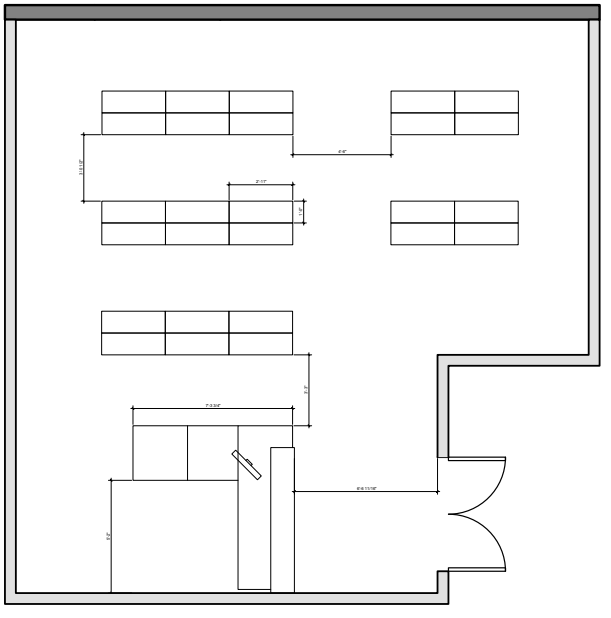
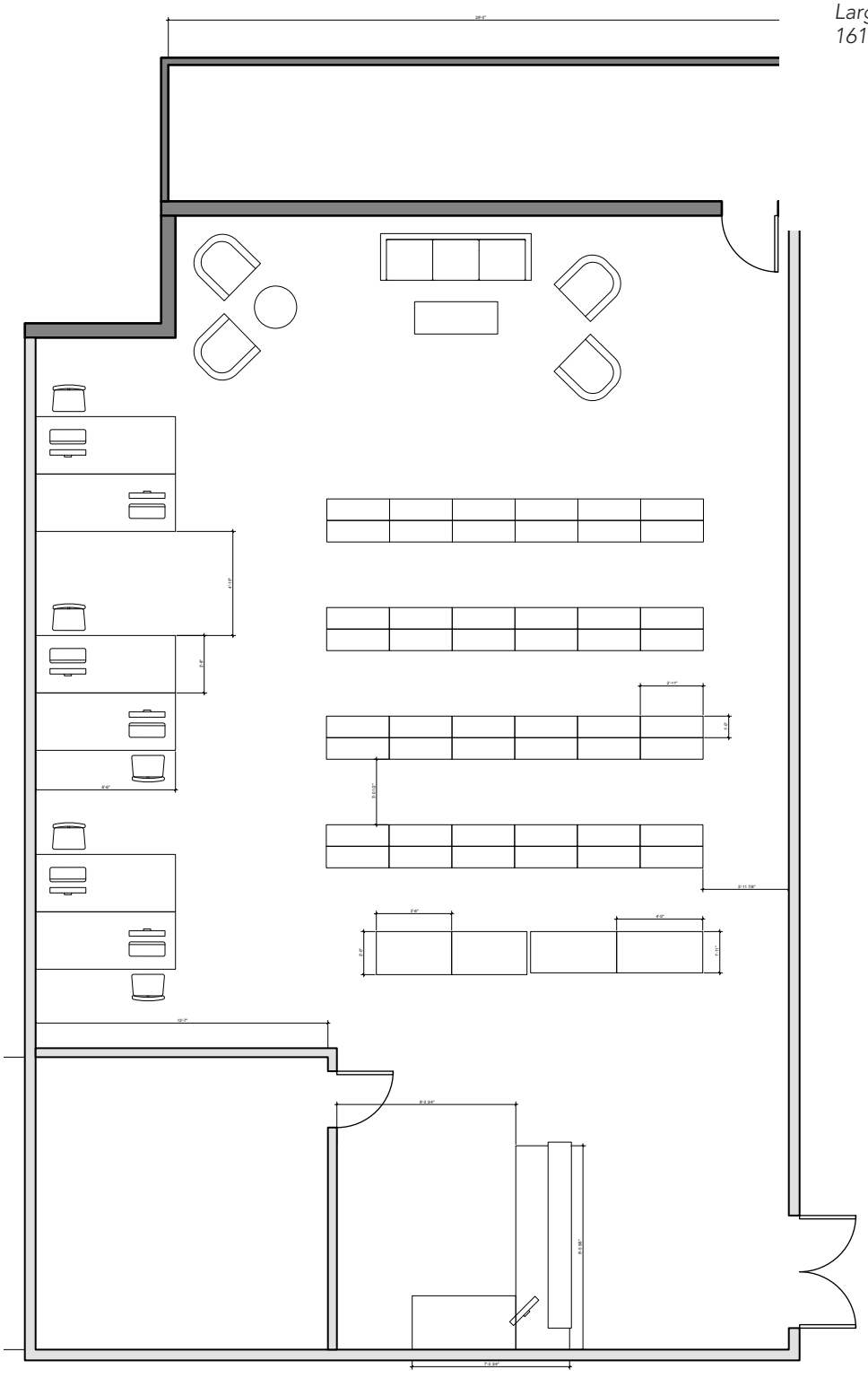
916 Sq. Ft



Small Library
614 Sq. Ft

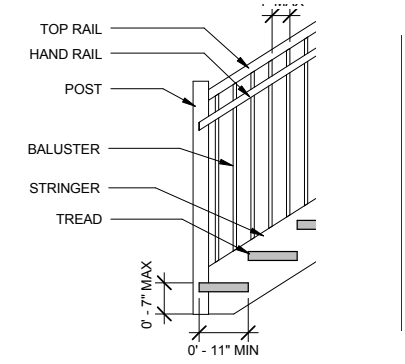
Large Library
1610 Sq. Ft

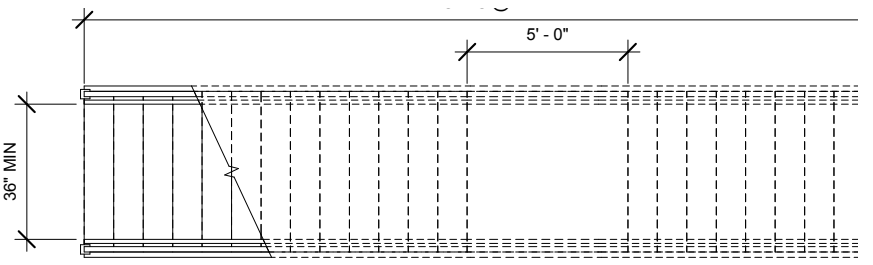
1

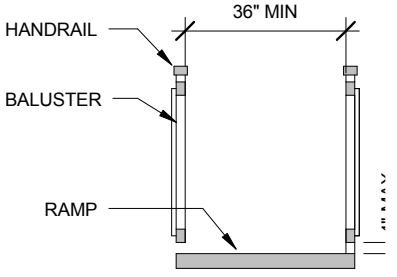


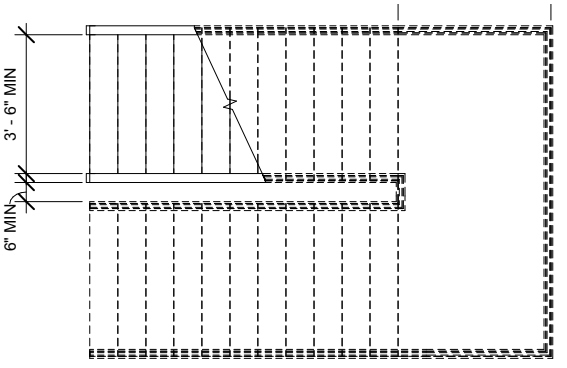
Building Component

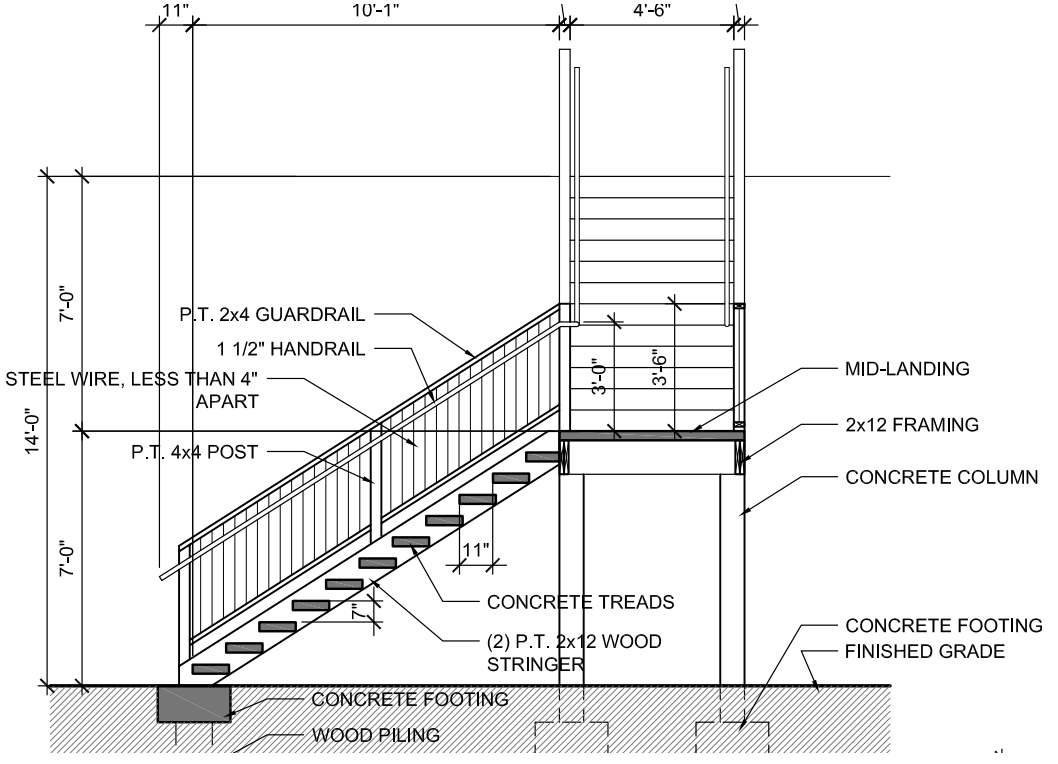
Circulation



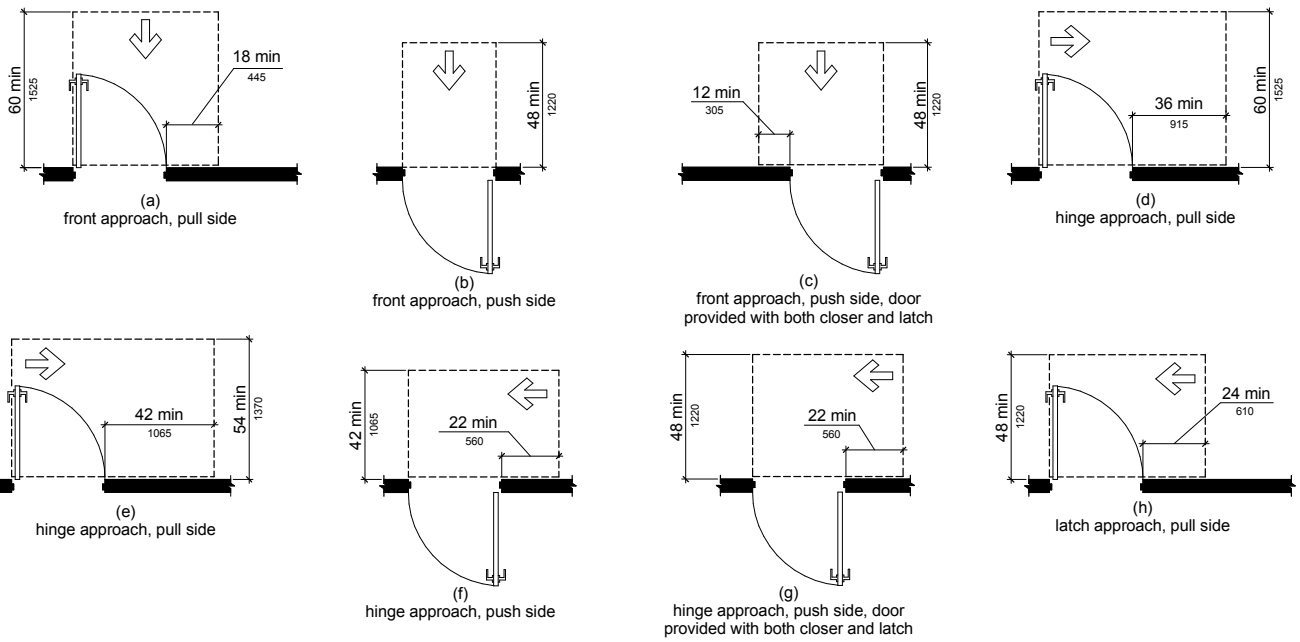




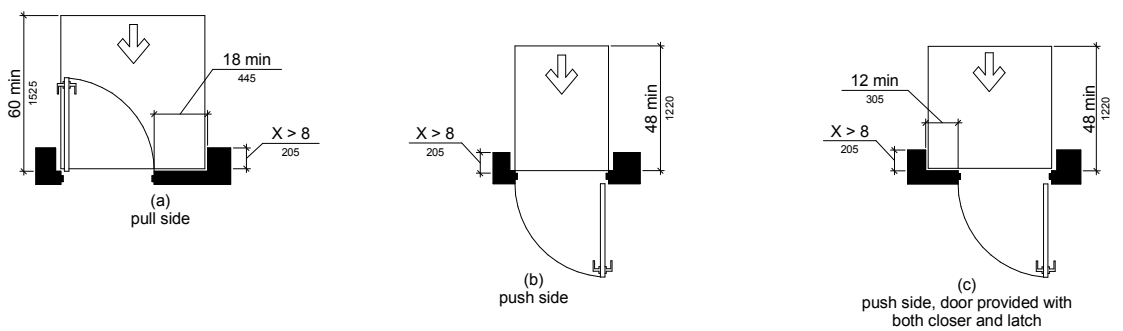




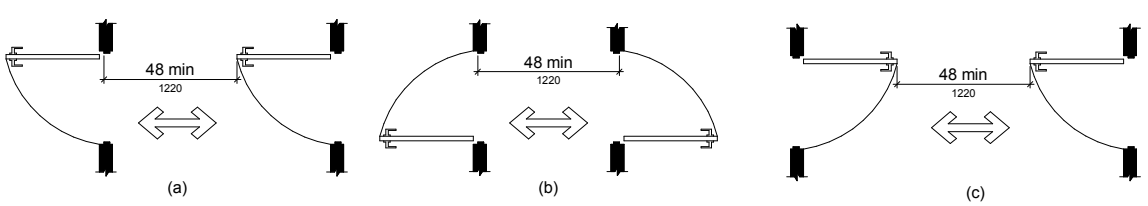
Clearance at Manual Swinging Doors



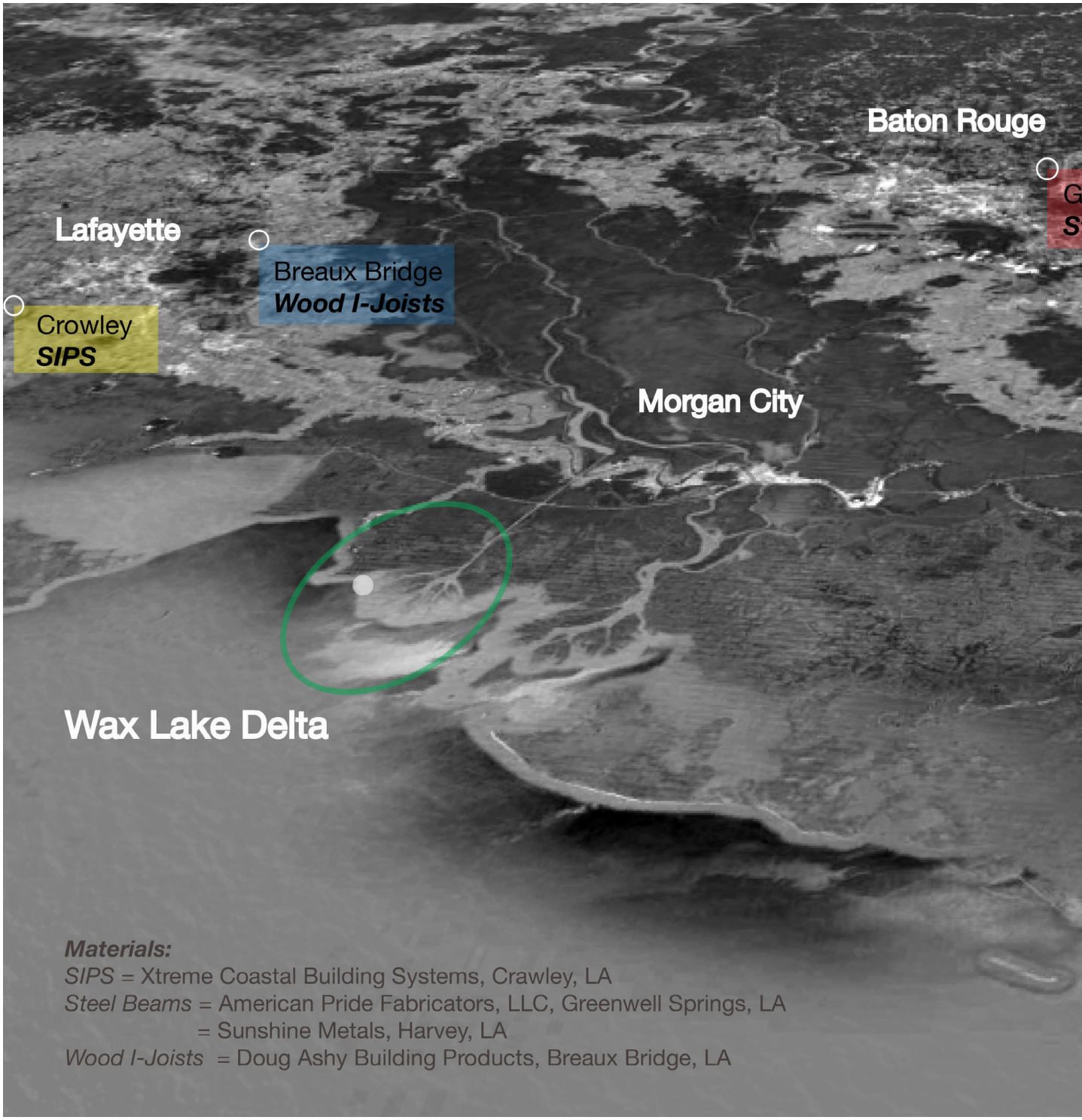
Maneuvering Clearance at Recessed Doors

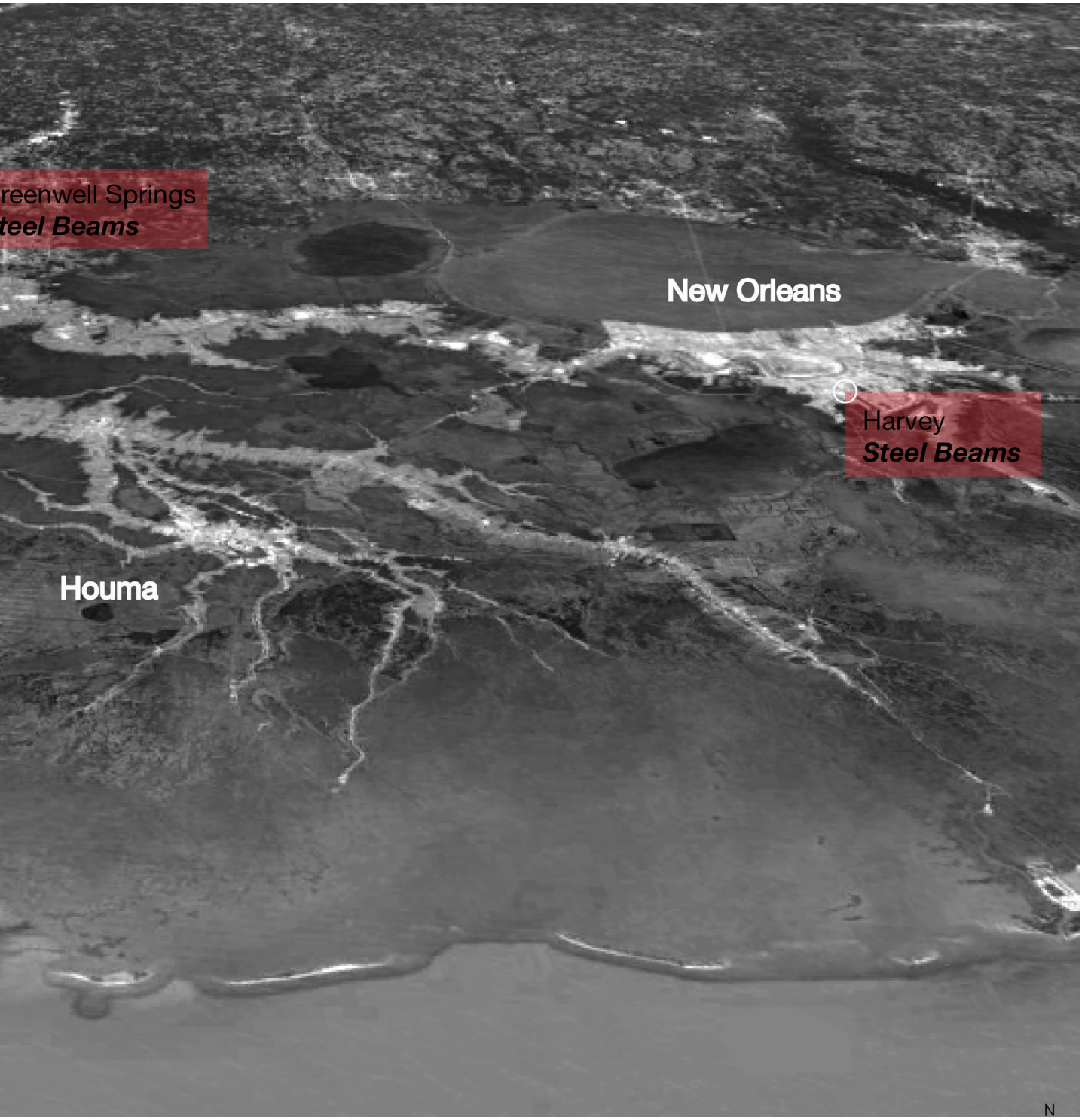


Doors in Series

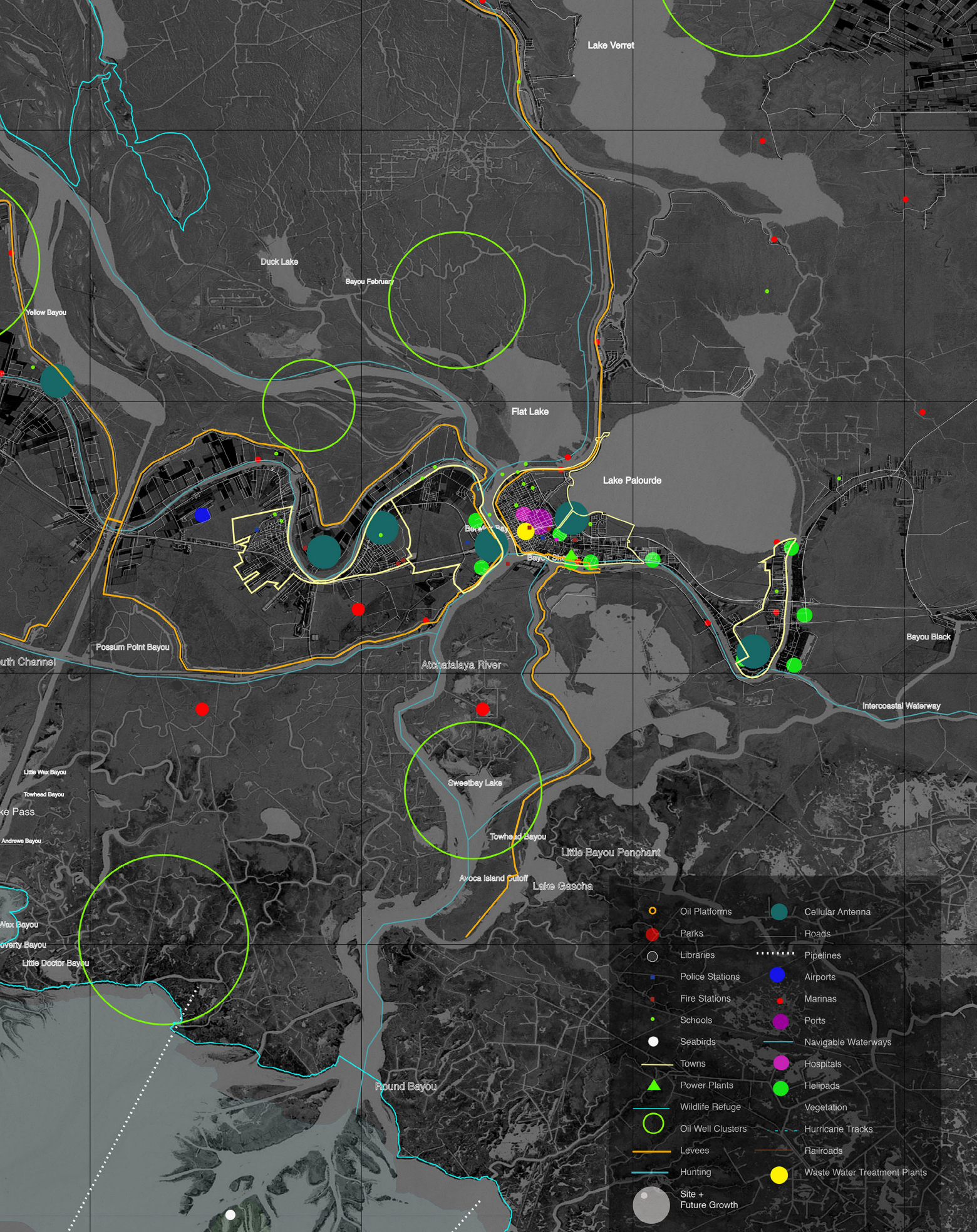


Mapping Wax Lake Delta




reenwell Springs
teel Beams
New Orleans
Harvey
Steel Beams
Houma
N


Stump Bayou
Bayou Gregorie
Bayou Auger
Jaws Bay
Mud Lake
Franklin Canal
Bayou Portage
William Storage Canal
Black Crook Bayou
Vermilion Bay
West Cote Blanche Bay
Leopard Bayou
Hog Bayou
Bear Fork Bayou


Lake Verret
Duck Lake
Bayou February
Yellow Bayou
Flat Lake
Lake Palourde
Possum Point Bayou
Atchafalaya River
Bayou Black
Intercoastal Waterway
Little Wax Bayou
Towhead Bayou
Andrewe Bayou
Sweetbay Lake
Towhead Bayou
Little Bayou Penchant
Avoca Island Cutoff
Lake Gascha
Little Doctor Bayou
Round Bayou
Oil Platforms
Parks
Libraries
Police Stations
Fire Stations
Schools
Seabirds
Towns
Power Plants
Wildlife Refuge
Oil Well Clusters
Levees
Hunting
Site + Future Growth
Cellular Antenna
Roads
Pipelines
Airports
Marinas
Ports
Navigable Waterways
Hospitals
Helipads
Vegetation
Hurricane Tracks
Railroads
Waste Water Treatment Plants

Wax Lake Delta

Day trip to the Wax Lake Delta. Boat and captain contracted from the LSU Coastal Studies Institute School of the Coast and Environment.

http://www.sce.lsu.edu/

Left, Group Photo Kayaking, Shelby Doyle

Far Left, Boating excursion, Shelby Doyle

Coastal Roots

Students from 2nd grade through high school are taking part in this project to learn about and become environmental stewards of their natural resources by establishing native plant nurseries at their schools. Students are growing native plant seedlings and grass plugs that they will plant in a coastal habitat restoration project in south Louisiana and in Chile, South America. There are currently 45 schools across 18 Louisiana parishes currently participating in the LSU Coastal Roots Program, as well as one school in San Pedro de la Paz (Concepcion), Chile.

www.coastalroots.lsu.edu

Left, Group Photo during planting excursion, Shelby Doyle

Far Left, planting shoots prepared for planting, Shelby Doyle

Old River Control

The Old River Control Structure (ORCS) is a floodgate system in a branch of the Mississippi River in central Louisiana. It regulates the flow of water leaving the Mississippi into the Atchafalaya River, thereby preventing the Mississippi river from changing course. Completed in 1963, the complex was built by the U.S. Army Corps of Engineers in a side channel of the Mississippi known as "Old River," between the Mississippi's current channel and the Atchafalaya Basin, a former channel of the Mississippi.

www.mvn.usace.army.mil/Portals/56/docs/PAO/Brochures/OldRiverControlBrochure.pdf

Left, Group Photo at old River control, Shelby Doyle

Far Left, Old River Control Structure, Shelby Doyle

Grand Bay

The Grand Bay National Estuarine Research Reserve (NERR) was established in 1999 and is managed by the Mississippi Department of Marine Resources as part of the National Oceanic and Atmospheric Administration's National Estuarine Research Reserve System. The Grand Bay NERR is comprised of approximately 18,000 acres and contains pine savannas, salt marshes, salt pannes, bays and bayous as well as terrestrial habitats that are unique to the coastal zone.

grandbaynerr.org

Left, Group Photo during marsh Hike, Shelby Doyle

Far Left, Grand Bay NERRs Facility, Shelby Doyle

Morgan City

In 1987, the U.S. Army Corps of Engineers upgraded the levee protecting downtown Morgan City, replacing the exist ing 7-foot high floodwall from the 1940s with a new 17-foot high floodwall stretching the 11,500 feet along both sides of the river. A series of walkways and stairs along the top of the wall, in addition to landscaping and cast in place graphics, helped to alleviate the immense verticality of the concrete floodwall. This design won numerous engineering awards, while also serving as the first of its kind for the Army Corps of Engineers.

Left, Group Photo on Morgan City Flood Wall, Shelby Doyle

Far Left, Flood Gate, Shelby Doyle


GRAND
BAY

Glossary of Terms Used

Abiotic- physical rather than biological; not derived from living organisms.
Abundance- an ample quantity; relative degree of plentifulness
Adiabatic- relating to or denoting a process or condition in which heat does not enter or leave the system concerned.
Affordance- a relation between an object or an environment and an organism, that affords the opportunity for that organism to perform an action.
Aleatoric- depending on an uncertain event or contingency as to both profit and loss
Allogenic-transported to its present position from elsewhere; caused by nonliving factors in the environment
Alluvial- a deposit of clay, silt, sand, and gravel left by flowing streams in a river valley or delta, typically producing fertile soil.
Amortization- to gradually reduce or write off the cost or value of (as an asset)
Anisotropic- having a physical property that has a different value when measured in different directions. A simple example is wood, which is stronger along the grain than across it.
Anthropogenically-(chiefly of environmental pollution and pollutants) originating in human activity
Appurtenant- NFIP defines this as "a structure which is on the same parcel of property as the principal structure to be insured and the use of which is invidental to the use of the principal structure"
Autogenic Succession- Succession driven by the biotic components of the ecosystem
Avulsion- is the rapid abandonment of a river channel and the formation of a new river channel. Avulsions occur as a result of channel slopes that are much less steep than the slope that the river could travel if it took a new course
Berm- the horizontal part of the beach which is formed by sediments deposited by the waves.
Biogeochemistry- scientific discipline that involves the study of the chemical, physical, geological, and biological processes and reactions that govern the composition of the natural environment (including the biosphere, the cryosphere, the hydrosphere, the pedosphere, the atmosphere, and the lithosphere).
Bouma Sequence- describes a classic set of sedimentary structures in turbidite beds deposited by turbidity currents at the bottoms of lakes, oceans and rivers.
Celerity- swiftness of movement
Chronosequence- is a set of forested sites that share similar attributes but are of different ages. Since many processes in forest ecology take a long time (decades or centuries) to develop, chronosequence methods are used to represent and study the time-dependent development of a forest.
Compensational Stacking-the tendency of sediment transport processes to fill-in topographic lows through deposition is a concept widely used in the interpretation of the stratigraphic records.
Community Rating System- a voluntary incentive program that seeks to encourage coastal communities to build above and beyond the requirements.
Denitrification- microbially facilitated process of nitrate reduction (performed by a large group of heterotrophic facultative anaerobic bacteria) that may ultimately produce molecular nitrogen (N2) through a series of intermediate gaseous nitrogen oxide products.
Diffuse- spread out over a large area; not concentrated.
Downcutting- geological process that deepens the channel of a stream by removing material from the stream's bed
Effusivity- the rate at which a material can absorb heat. It is the property that determines the contact temperature of two bodies that touch each other.
Emergy- quantifies the qualities of energy captured in matter
Empower- for systems organized on many scales from small to large territory of influence, a maximum power design develops in which each scale is symbiotically connected by feedback loops with the next
Energy- a measure of a system's capacity to do work on its surrounding environment; a state function whose differential equals the work exchanged with the surroundings during an adiabatic process
Entropy- a thermodynamic quantity representing the unavailability of a system's thermal energy for conversion into mechanical work, often interpreted as the degree of disorder or randomness in the system.
Exergy- the energy that is available to be used

Exigency-an urgent need or demand.
Exuberance-profuse in growth or production; luxuriant;
Feedback- action of a unit or process to enhance production and survival of a contributing unit or process, thereby enhancing itself; a loop of mutually enhancing interactions
Fetch- the distance over water that the wind blows in a single direction
FIRM- Federal Insurance and Mitigation Administration
Flood-pulse events- the movement, distribution and quality of water in river ecosystems and the dynamic interaction in the transition zone between water and land.
Fluvial- the processes associated with rivers and streams and the deposits and landforms created by them
Groins- man-made structures designed to trap sand as it is moved down the beach by the longshore drift
Habitus- general constitution, especially bodily build.
Homeorhesis- a concept encompassing dynamitic systems which return to a trajectory, as opposed to systems which return to a particular state, which is termed homeostasis.
Hygroscopic- (of a substance) tending to absorb moisture from the air; relating to humidity or its measurement.
Holocene- of, relating to, or denoting the present epoch, which is the second epoch in the Quaternary period and followed the Pleistocene.
Hydrogeomorphic-an interdisciplinary science that focuses on the interaction and linkage of hydrologic processes with landforms or earth materials and the interaction of geomorphic processes with surface and subsurface water in temporal and spatial dimensions
Hypoxic- low oxygen conditions
Jalousie- a blind with adjustable horizontal slats for admitting light and air while excluding direct sun and rain
Littoral Drift-Movement of sand by littoral currents in a direction parallel to the beach along the shore.
Lobes- accumulation of sand and silt deposits that were carried by the river and deposited in the delta.
Luddite Reactions- a term describing those opposed to, or slow to adopt or incorporate into their lifestyle i.e. industrialization, automation, computerisation or new technologies in general.
Meritorious- deserving reward or praise.
Mires- high-water table maintained by the generally low lying ground.
Negentropy- refers to the degree of order or organization within a closed system.
Overwash- Occurs when low-lying coastal lands are overtopped and eroded by storm surge and waves such that the eroded sediments are carried landward by floodwaters, burying uplands, roads and at-grade structures.
Panopticon- a building, as a prison, hospital, library, or the like, so arranged that all parts of the interior are visible from a single point.
Physiography- the branch of geography dealing with natural features and processes.
Plenitude- the condition of being full or complete.
Polyvalent- Having many different functions, forms, or facets
Porewater- water contained in pores in soil or rock.
Pulsing- modulate (a wave or beam) so that it becomes a series
Sand Spits-created by deposition. A spit is an extended stretch of beach material that projects out to sea and is joined to the mainland at one end. Spits are formed where the prevailing wind blows at an angle to the coastline, resulting in longshore drift.
Scour- Removal of soil or fill material by the flow of flood waters. Flow moving past a fixed object accelerates, often forming eddies or vortices and scouring loose sediment from the immediate vicinity of the object. The term is frequently used to describe storm-induced, localized conical erosion around pilings and other foundation supports, where the obstuction of flow increases turbulence.
Undermining- Process whereby the vertical component of erosion or scour exceeds the depth of the base of a building foundation or the level below which the bearing strength of the foundation is compromised.
Wave Runup- the height above the still water elevation (tide and surge) reached by the swash

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An Embryonic Major Delta Lobe: A New Generation of Delta Studies in the Atchafalaya-Wax Lake Delta System, *H.H. Roberts, J.M. Coleman, S.J. Bentley, and N. Walker*

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Vegetation Dynamics in the Emerging Atchafalaya Delta, LA, USA
Gary P. Shaffer, Charles E. Sasser, James G. Gosselink and Marcel Rejmanek

Organizations and Individuals

LSU Coastal Sustainability Studio
www.css.lsu.edu/

The LSU Coastal Sustainability Studio (CSS) is a trans-disciplinary program of the College of Art + Design, College of Engineering, and School of the Coast & Environment

LSU Coastal Roots
http://coastalroots.lsu.edu/

To assist students in developing an attitude of stewardship toward our natural resources and to provide an active learning situation in which they can explore strategies for sustaining our coastal ecosystems.

Dr. Pam Blanchard, LSU Department of Educational Theory, Policy, and Practice, College of Education, Director of Coastal Roots Program