Turning The Tide

Companion Teaching Guide

to Louisiana's Coastal Restoration Problems and Solutions

restore

written by
A Louisiana Education Development Team

graphic design & layout by
Marian Brister Martinez

COASTAL WETLANDS PLANNING, PROTECTION, AND RESTORATION ACT

LPB

The Documentary

In 2011, Louisiana Public Broadcasting premiered its internationally acclaimed documentary, ***"Turning the Tide,"*** as an in-depth examination of proposed solutions, proven strategies and bold engineering that can "turn the tide" on the national crisis unfolding at the mouth of America's largest and most productive river delta. This award-winning documentary provides a sobering reality check on what the state of Louisiana could look like if scientific and public consensus isn't soon reached. According to scientists, 10,000 to 13,000 square kilometers of land could be lost by the year 2100.

Nearly 40% of all coastal wetlands in the United States are concentrated along Louisiana's coast, yet they experience 90% of the nation's wetland loss and place critical resources in jeopardy. What is happening at the mouth of the Mississippi River and in Louisiana's coastal wetlands, affects us all and constitutes a national emergency that will require immediate attention and tough decisions about what can be protected and what cannot. Having an educated populace is key to making the difficult choices necessary to protect the region.

This purpose of this study guide is to encourage students to ask questions and to explore how choices being made today will affect their future. ***"Turning the Tide"*** and this companion educational guide encourage students to think about what is at stake in terms of crucial wetland ecosystems, Gulf seafood populations, North American migratory bird and waterfowl populations, the nation's energy infrastructure and national security, interior navigation and water transport for American produce and goods, and a totally unique American culture.

We hope this guide encourages students to gain a new understanding of the problems faced in America's largest delta and explore possible solutions by learning about the plans, the controversies and new discoveries that are turning much of the way we understand this problem on its head. Explore the more systemic issues like comprehensive river and sediment management and water quality throughout the entire Mississippi River watershed. Gain a better understanding of the competing economic and political interests in play in the region and how they affect decision making.

LPB wants to sincerely thank everyone who developed the materials contained in this guide, particularly project team leader and CWPPRA Outreach Coordinator, Susan Testroet-Bergeron and Graphic Designer and Artist, Marian Brister Martinez. We also wish to thank all of the partner agencies who allowed us to incorporate their exceptional materials in this resource.

This project was funded by a grant from the McKnight Foundation and by The Foundation for Excellence in Louisiana Public Broadcasting.

THE McKNIGHT FOUNDATION

LPB

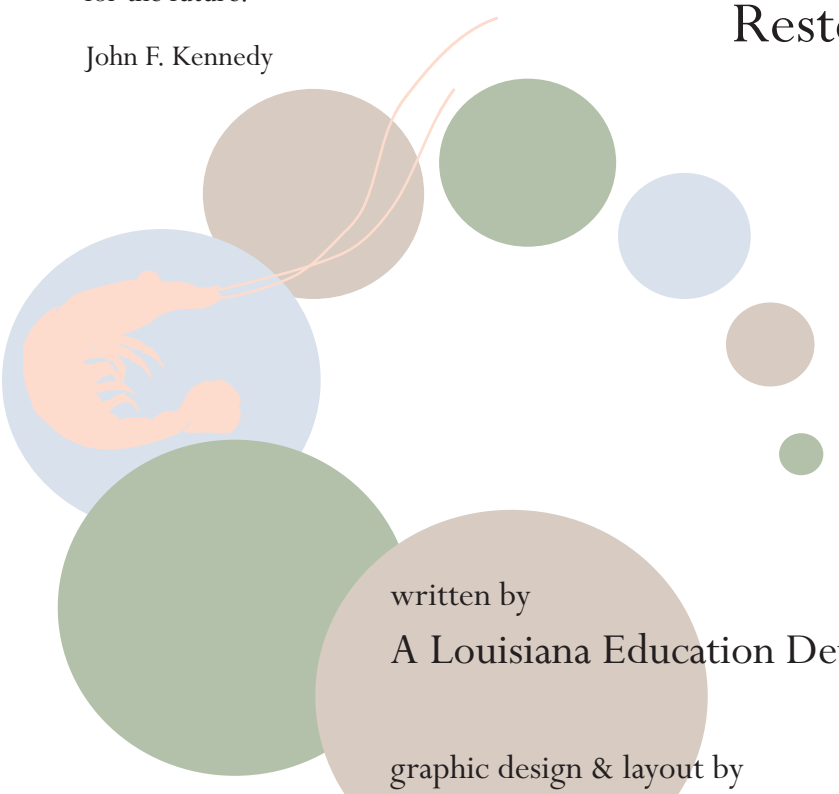
To order a DVD of ***Turning the Tide*** call 1-800-973-7246
OR
FREE online at www.lpb.org or www.lacoast.gov/new/Ed/Curriculum.aspx

Turning The Tide

"Children are the world's most valuable resource and its best hope for the future."
John F. Kennedy

A Teaching Guide

to Louisiana's Coastal Restoration Problems and Solutions



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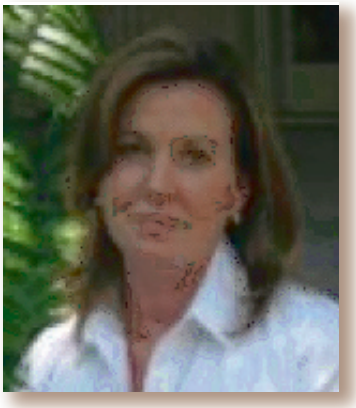
Biography



Christina Melton—Special Projects Producer and Media Preservation and Archive Coordinator at Louisiana Public Broadcasting / Louisiana Educational TV Authority

Christina Melton, Director, Writer and Senior Producer for Louisiana Public Broadcasting's documentary ***Turning the Tide***, was honored by the Louisiana Wildlife Federation and the National Wildlife Federation with the prestigious "2011 Governor's Award—Louisiana Conservationist of the Year." She is Special Projects Producer for Louisiana Public Broadcasting and has been honored with many of the documentary world's top honors, including the Alfred I. Dupont-Columbia Award for Excellence in Journalism, three International CINE Golden Eagles and regional Emmy, Edward R. Murrow and Telly Awards. Four of her last five documentaries have broadcast nationally on PBS, another distributed nationally through American Public Television. Other recent honors include the 2011 National Educational Telecommunications Association Award for Best News Content and a 2011 International CINE Golden Eagle for her contributions to ***Washing Away: After the Storms***, a follow up to her original PBS documentary in 2005. In 2010, she was nominated for an Emmy Award for Best Documentary for ***Summer of Birds: John James Audubon in Louisiana***. In the summer of 2010 she was a featured guest at the annual National Endowment for the Humanities, "Picturing John James Audubon" Summer Institute at Indiana University.

Marian Brister Martinez —Graphic Design and Artist

Pleiades Illustration Company
http://www.pleiadesfineart.com

Marian Brister Martinez is a Louisiana artist/illustrator with roots in coastal Louisiana. She has designed publications for wetland awareness programs such as ***Spirit of the Estuary: Using Art to Understand Ecology, Claude and Clawdette's Estuary Adventure, Louisiana Estuary Cuisine*** with Chef Brandon LeBlanc, and BTNEP's ***Barrier Island Lessons***. She is also published in ***Louisiana Laurels***, a book of poetry and essays written and illustrated by Louisiana authors and artists. In 2007, as a part of the Spirit of the Estuary team, she was a recipient of the Coastal Stewardship Award for her contribution in graphic design and illustration, an award given by the Coalition to Restore Coastal Louisiana. Her work in fine arts encompasses a variety of mediums and subject matter including figurative and landscape paintings, oil on canvas, watercolor, architectural pen and ink drawings, commentary on the human condition and traditional religious iconography. Her work has been exhibited in galleries and churches spanning from Louisiana to South Texas.

Special Thanks to Our Contributors

The group of lessons compiled in this book were written and edited to help teachers share Louisiana wetlands information with their students. Teachers and students are strongly encouraged to watch ***Turning the Tide*** prior to beginning the lessons in this unit.

The following organizations contributed information to make this teaching guide possible.

CNREP
Center for Natural Resource Economics & Policy

BTNEP
BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM

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Coastal Roots

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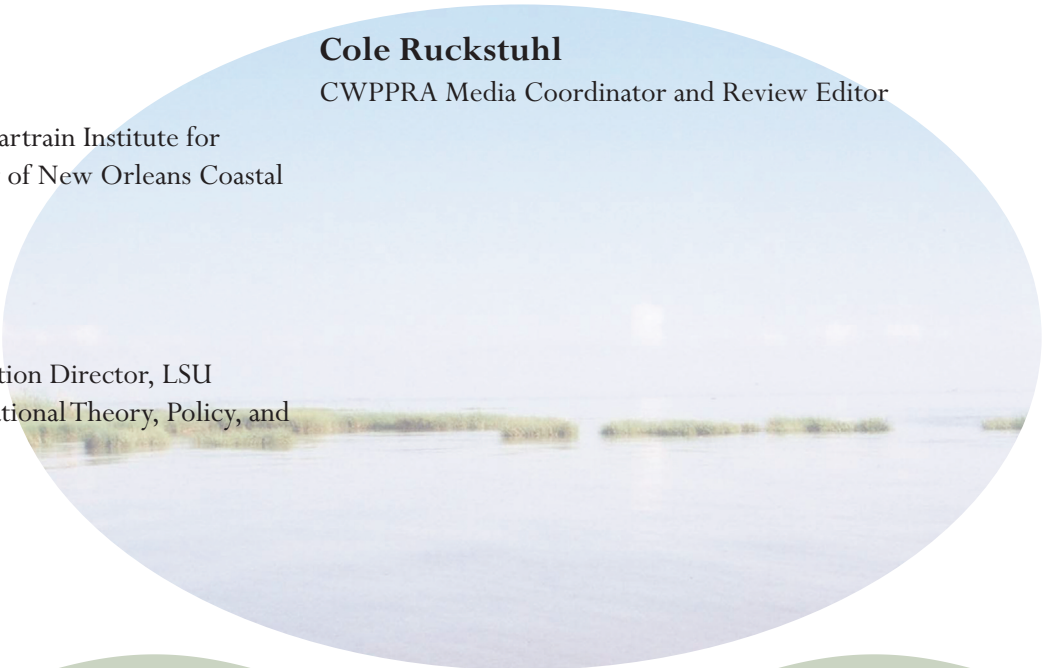


Table of Contents

English

The Hullabaloo of Writing a Journal—WET, WILD, and Provocatively Honest

Objectives

Students will:

- Write a series of journal entries related to wetland topics
- Share journal entries as time permits

Background/Setting the Stage:

Scientists and engineers are required to communicate their ideas, plans and experiments to a variety of audiences. Being able to effectively transfer information is an important job of any researcher. Wetland experts often connect with people through writing and correspondence. Being able to effectively exchange a few words may be one of the scientific investigator's most important jobs. By journaling, scientists gain worthy practice at writing while investing in the future.

It is important to learn how to write a journal for science. Besides serving as a way to organize thoughts, a journal provides a well-documented and detailed approach to understanding a problem or project. Journals also provide a way for people to share information, insight, and ideas. Journals foster learning in a variety of ways; a journal may be used to facilitate critical thinking, create a focused argument, or to assist in a reflection. Science and engineering writers who are actively engaged in a subject have an opportunity to clarify or to expose things they have been thinking about or ideas that may have been presented to them. Journals help scientists generate new ideas in a safe and secure environment. Journals may be used as a place to record procedures and/or observations. Journals can even be used throughout the day, at different times during the same day, or for different purposes. Journals are used to write about a variety of topics and help scientists improve their writing skills. But the most important part about keeping a journal is that any information that is written down may be useful or relevant in the future! A journal should be thought of as a savings account—a place to keep ideas and help them grow.

English

Materials

- ***Turning the Tide* film**—A documentary of the Louisiana Public Broadcasting
http://beta.lpb.org/index.php?/site/programs/turning_the_tide

- Land Area Change in Coastal Louisiana Map from 1932 to 2010
http://pubs.usgs.gov/sim/3164/

- Access to the Internet to view "What is CWPPRA?"
http://lacoast.gov/new/default.aspx

- Student Worksheets

Procedure

1. Prior to assigning the journal topics, watch the Louisiana Public Broadcasting documentary ***"Turning the Tide"*** found online at
http://www.lpb.org/turningthetide

2. Each day, for 4 days, provide the students with about 8 minutes to write their thoughts about the given wetlands journal topics.

3. Share journal entries as time permits on the 5th day.

4. Read the journal entries and make comments as time allows. Comment on students' journal writings but do not grade for grammar. Offer suggestions, remarks or questions while encouraging creative thinking. Remember, a journal should provide the student a safe place to think and write about science and engineering.

activity

Journal Topics

Day 1

What is your immediate reaction to the film ***Turning the Tide?***

Do you think the Louisiana coastline is important to the United States? If so, why? If not, why not?

What harmful things have we done in the past, related to wetlands, that we could do differently now?

When you become a voting citizen, how will environmental issues such as the vanishing Louisiana coast and the urgent need to rebuild it affect your voting record?

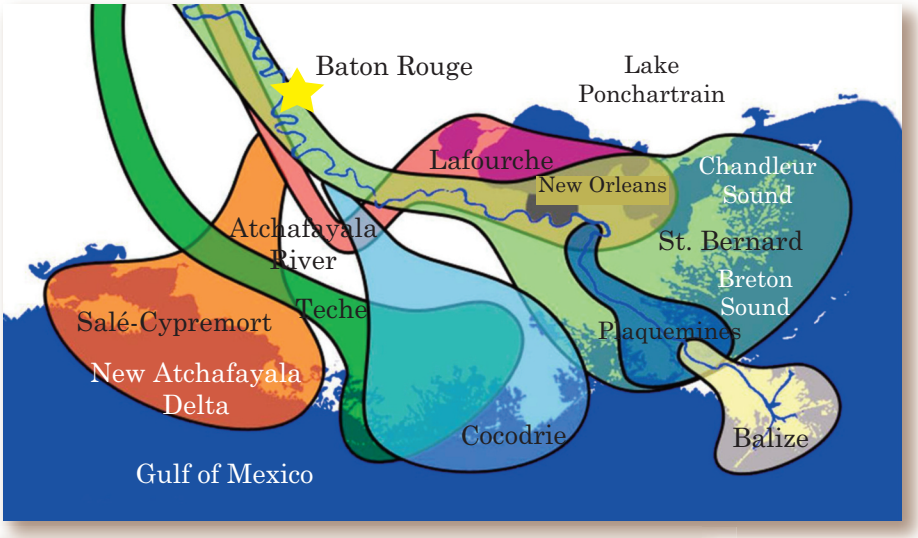
What do you think people don't know about Louisiana's coastal zone that would help them make better decisions?

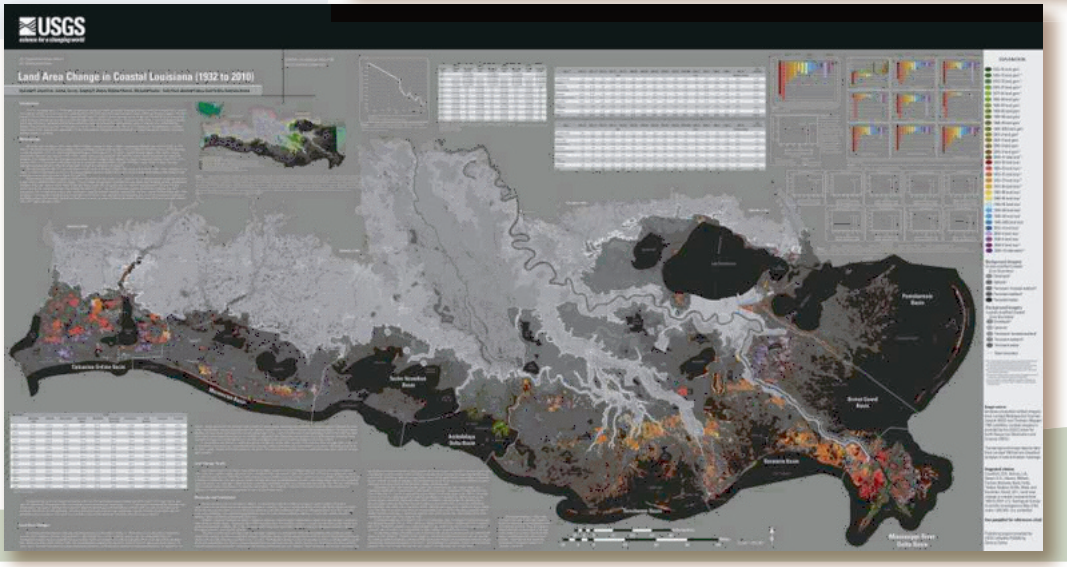
Day 1

Using the maps below, explain how the land along the coast in Louisiana looked in the past.

Using the maps below, explain how the land along the coast in Louisiana looks today?

What do you think were the major causes for change?





activity

Journal Topics

Day 2

Fisherman (Photo Credit: USFWS)

Do humans have any influence on land loss?

How do humans have an affect on the land and water?

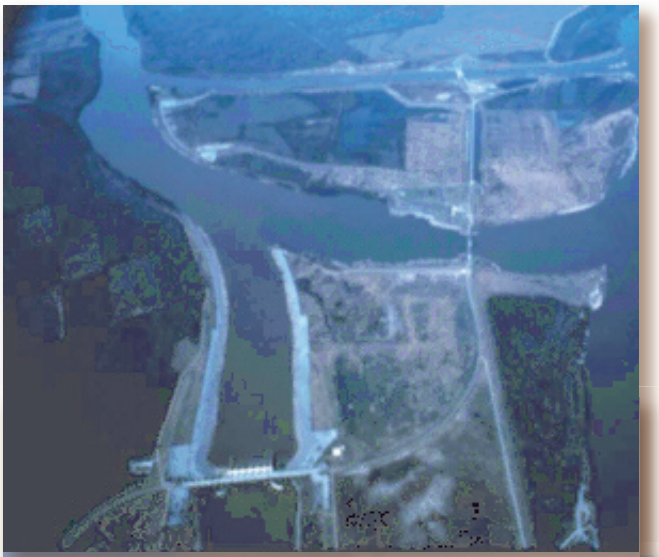
What have we done in the past related to wetlands that we could do differently now?

Day 2

Nature also has an influence on land loss. How does nature affect the estuary and land loss or land gain?

Fragile wetlands are readily damaged, directly and indirectly, by canals dredged for navigation and energy exploration. (Photo credit: USGS)

What can be done in the future to protect and preserve wetlands?



Volunteer helps to plant new marsh grass in the newly created wetlands. (Photo Credit: USFWS)

Levees along the Mississippi River (Photo Credit CWPPRA)

activity

Journal Topics

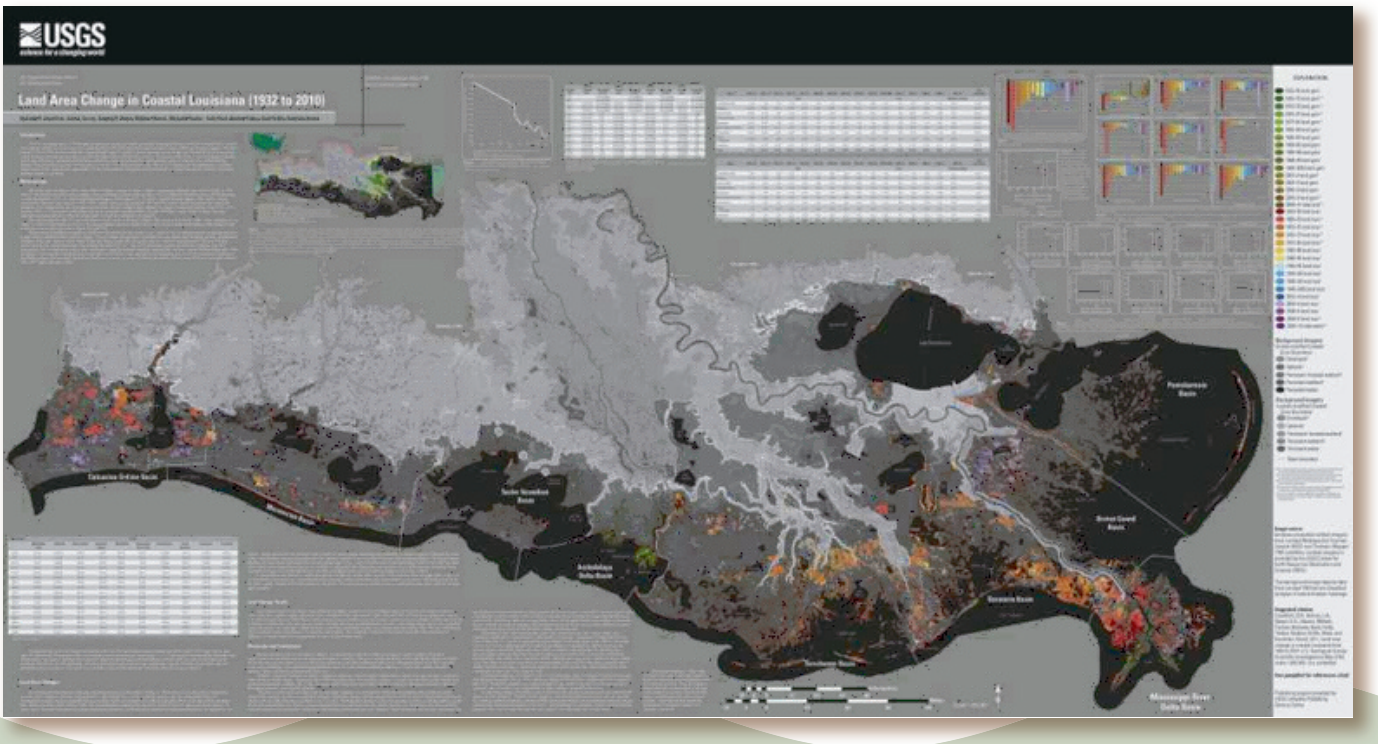
Day 3

Using the map and data below, has coastal land loss happened in YOUR lifetime? What have you observed about land loss from your personal experience?

Using the map below, has coastal land loss happened in your PARENTS' generation? How much? How do you know?

Day 3

Using the map below, has coastal land loss happened in your GRANDPARENTS' generation? How much? How do you know?



Day 3

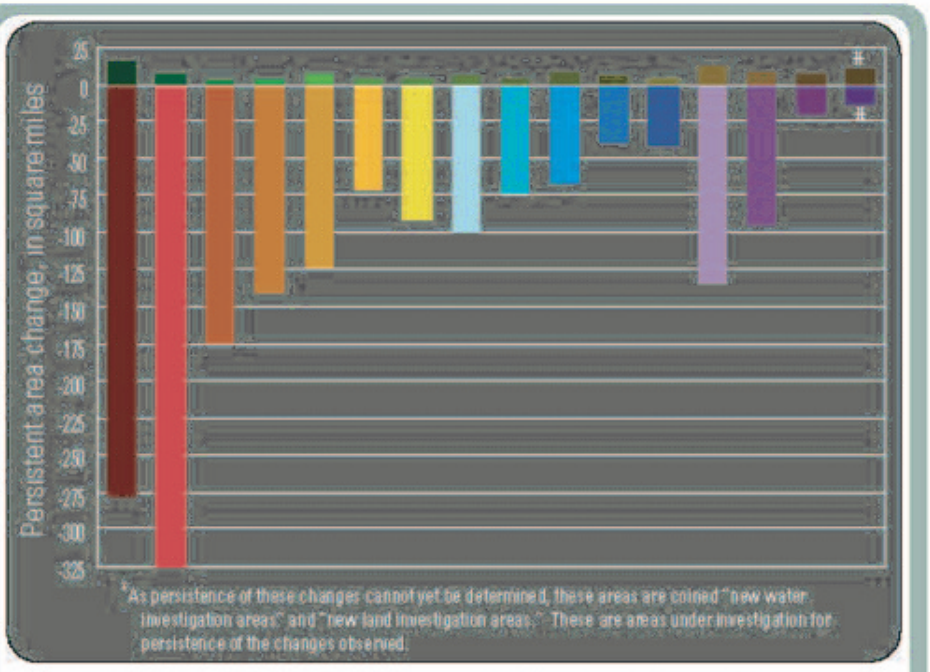


Figure 3. Persistent land loss and land gain across coastal Louisiana by period for 1932–2010.

EXPLANATION

1932–56 land gain[1]	1932–56 land loss[2]
1956–73 land gain[1,4]	1956–73 land loss[2,4]
1973–75 land gain[1,4]	1973–75 land loss[2,4]
1975–77 land gain[1,4]	1975–77 land loss[2,4]
1977–85 land gain[1,4]	1977–85 land loss[2,4]
1985–88 land gain[1]	1985–88 land loss[2]
1988–90 land gain[1]	1988–90 land loss[2]
1990–95 land gain[1]	1990–95 land loss[2]
1995–98 land gain[1]	1995–98 land loss[2]
1998–99 land gain[1]	1998–99 land loss[2]
1999–2002 land gain[1]	1999–2002 land loss[2]
2002–4 land gain[1]	2002–4 land loss[2]
2004–6 land gain[1]	2004–6 land loss[2]
2006–8 land gain[1]	2006–8 land loss[2]
2008–9 land gain[1,3]	2008–9 land loss[2,3]
2009–10 new land[1,3]	2009–10 new water[2,3]

[1]Gain is determined by the last date a particular pixel transitioned from water to land and remained land throughout the period of observation.
[2]Loss is determined by the last date a particular pixel transitioned from land to water and remained water throughout the period of observation.
[3]Because this date range has only one ending dataset, some of these effects may be temporary phenomena.
[4]This date range contains at least one date in which the land/water data were created from Landsat Multispectral Scanner System (MSS).

activity

Journal Topics

Day 4

What is coastal restoration? (Visit http://lacoast.gov/new/default.aspx and read "What is CWPPRA?")

Why is it needed?

Who participates in coastal restoration?

Day 4

What kinds of projects are in your area?

How much does it cost to do coastal restoration? Is it enough now or do we need more?

What would you like to see done for coastal restoration? How can your ideas for restoration be funded?

Day 4

The CWPPRA Legislation

The Coastal Wetlands Planning, Protection and Restoration Act, (CWPPRA pronounced kwip-ruh), is federal legislation enacted in 1990, that is designed to identify, prepare, and fund construction of coastal wetlands restoration projects. Since its inception, 151 coastal restoration or protection projects have been authorized, benefiting over 110,000 acres in Louisiana. The legislation (Public Law 101-646, Title III CWPPRA) was approved by the U.S. Congress and signed into law by former President George H. W. Bush.

The United States Capitol in Washington D.C.
Public Domain Image from the Architect of the Capitol

The annual budget for CWPPRA-funded restoration has varied through the nearly twenty-year life span of the Act. The budget has ranged between approximately $30 million per year to nearly $80 million per year. The funded Louisiana projects provide for the long-term conservation of wetlands and dependent fish and wildlife populations with cost-effective plans for creating, restoring, protecting, or enhancing coastal wetlands.

Visit LACoast.gov on the Web to learn more about Louisiana's coastal restoration efforts.
http://lacoast.gov/new/default.aspx

Day 4

CWPPRA Restoration Techniques

CWPPRA project managers, scientists, and engineers use a variety of techniques to protect, enhance, or restore wetlands. Each restoration project may use one or more techniques to repair delicate wetlands. These techniques include:

- marsh creation and restoration
- shoreline protection
- hydrologic restoration
- beneficial use of dredged material
- terracing
- sediment trapping
- vegetative planting
- barrier island restoration
- bank stabilization

Below is an example of the restoration technique known as the beneficial use of dredged material:

CWPPRA Project BA-39 Mississippi River Sediment Delivery—Bayou Dupont

Sediment is used from the Mississippi River to rebuild wetlands in a new location. The red boat near the levee is pumping sediment to the fragile wetlands in top left of the image. The sediment is then used to rebuild marsh that had turned to open water, creating new wetlands.

Day 4

CWPPRA Restoration Projects

Since its inception, 148 coastal restoration or protection projects have been authorized, benefiting over 112,000 acres in Louisiana. To view the list of projects and learn more about individual projects visit our project page.

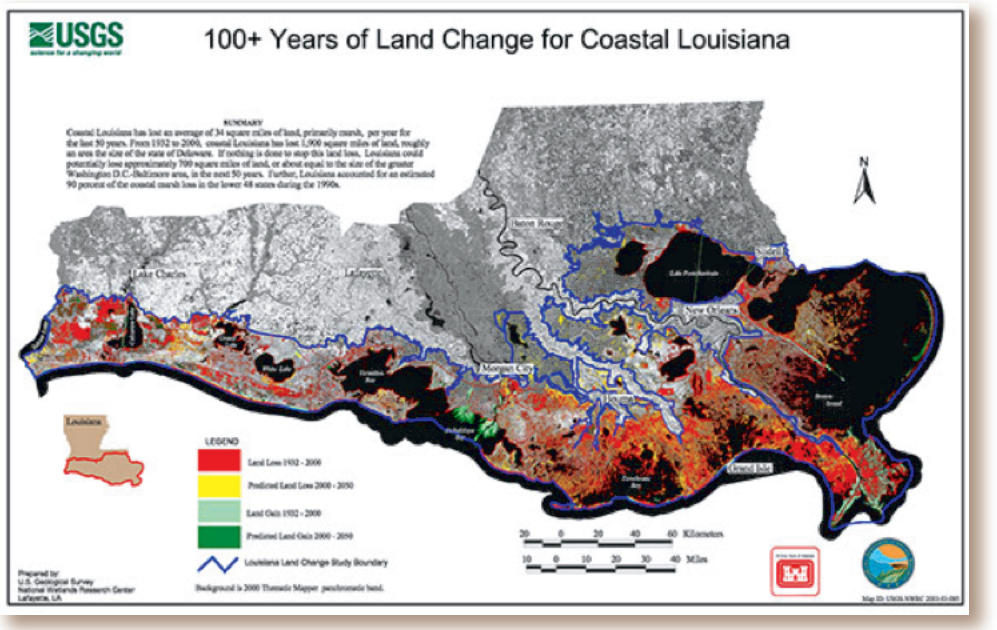
The sediment from the river is delivered from the river to then newly created marshlands.

Day 4

Why Protect Louisiana Wetlands?

Louisiana wetlands are unique and vital ecological assets worth saving. Wetlands act as a storm buffer against hurricanes and storms. They act as flood control devices: holding excess floodwaters during high rainfall (much like a sponge). Wetlands replenish aquifers, and they purify water by filtering out pollutants and absorbing nutrients. CWPPRA funds have been instrumental in helping to restore Louisiana's vanishing wetlands.

Approximately 40 percent of the coastal wetlands of the lower forty-eight states are located in Louisiana. Unfortunately, this fragile environment is disappearing at an alarming rate. Louisiana has lost up to 40 square miles of marsh per year for several decades—that's 80 percent of the nation's annual coastal wetland loss. To date, Louisiana has already lost coastal land area equal to the size of the state of Delaware. This loss is at an average rate of an acre every 38 minutes. If the current rate of loss is not slowed by the year 2040, an additional 800,000 acres of wetlands will disappear, and the Louisiana shoreline will advance inland as much as 33 miles in some areas.



Wetlands also provide habitat for a variety of wildlife. Coastal Louisiana lands are the breeding grounds and nurseries for thousands of species of aquatic life, land animals, and birds of all kinds—including our national symbol, the bald eagle. This ecosystem also provides a migratory habitat for over five million waterfowl each year.

Day 4

People also benefit from Louisiana's coastal lands. Louisiana is responsible for a major part of our nation's oil and gas production, shipping commerce, fisheries industry, fur harvesting, and oyster production, accounting for over 55,000 jobs and billions of dollars in revenues. Additionally, wetlands are wonderful recreational resources and are part of Louisiana's growing ecotourism business. To learn more about the economic value of our wetlands, read *"The Cost of Doing Nothing"* in WaterMarks (Summer 1999).

Example of a shrimp harvest (Photo courtesy of BTNEP)

Although current funding levels do not support all of the necessary restoration required for a sustainable ecosystem, CWPPRA continues to address immediate restoration needs while establishing a foundation of strong science, public participation, and agency cooperation that will continue to serve as the cornerstone of future programs.

Assessments

Comment on students' journal writings but do not grade for grammar. Offer suggestions, remarks or questions while encouraging creative thinking.

GLE's

Resources and Resource Management
Identify the factors that affect sustainable development (SEH- B6)

Personal Choices and Responsible Actions
Analyze the risk-benefit ratio for selected environmental situations (SE-H-C4)

Environmental Awareness and Protection
Describe how accountability toward the environment affects sustainability (SE-H-D5)

Resources

The Coastal Wetlands Planning, Protection and Restoration Act Web Resources
www.LACoast.gov

The U.S. Geological Survey National Wetlands Research Center
www.nwrc.usgs.gov/

> *Land Area Change in Coastal Louisiana from 1932 to 2010* (June 2011) The analyses of landscape change presented in this report use historical surveys, aerial data, and satellite data to track landscape changes. Summary data are presented for 1932–2010; trend data are presented for 1985–2010.
> http://pubs.usgs.gov/sim/3164/

Lesson Source

CWPPRA Public Outreach Committee

Extension Activity

Use the BTNEP lesson from *Spirit of the Estuary* Section 3
Lesson Six:
Estuary Extra—**PRODUCING YOUR OWN ENVIRONMENTAL NEWSPAPER**

Estuary Extra — PRODUCING YOUR OWN ENVIRONMENTAL NEWSPAPER

English extension

Setting The Stage

One interesting way to educate others about factors affecting the Barataria-Terrebonne Estuary is to produce a student newspaper. This can be a big job, but it can also be a lot of fun for teachers and students alike.

At a newspaper, the work is divided by department, so students will work in teams representing each different division. Students should consider what each of those jobs entails. Have them begin generating ideas for *Estuary Extra*. They can refer to other activities they've done in this unit and write about the people, events, and issues that are important in the Barataria-Terrebonne Estuary.

Here are the major departments in any newspaper. Feel free to add any others that you might need.

NEWSPAPER DEPARTMENT	RESPONSIBILITIES AND DUTIES
PUBLISHER	Head of the newspaper staff; assigns newspaper jobs to various teams and individuals.
NEWS DEPARTMENT	Led by the Editor-in-Chief; writes and illustrates all articles and features; takes photos.
BUSINESS / ADVERTISING DEPARTMENT	Raises money to publish the newspaper; sells newspapers; sells advertising space.
DESIGN DEPARTMENT	Puts stories, art, and photos into proper form for printing; prints the newspaper

english extension

Objectives

Students will:

- brainstorm ideas for newspaper topics and design.
- work in cooperative groups to plan, design, edit and publish a student newspaper

Materials

- Sample newspapers and newsletters
- Magazines with advertising
- Writing Materials
- Computer and publishing software
- Copies of Activity: Writing for a Newspaper (pages 20-25)

Preparation

- Gather print materials.
- Make copies of handout.

Procedure

1. Provide good models for students to review and evaluate. Show them professional newspapers as well as student-produced newsletters.

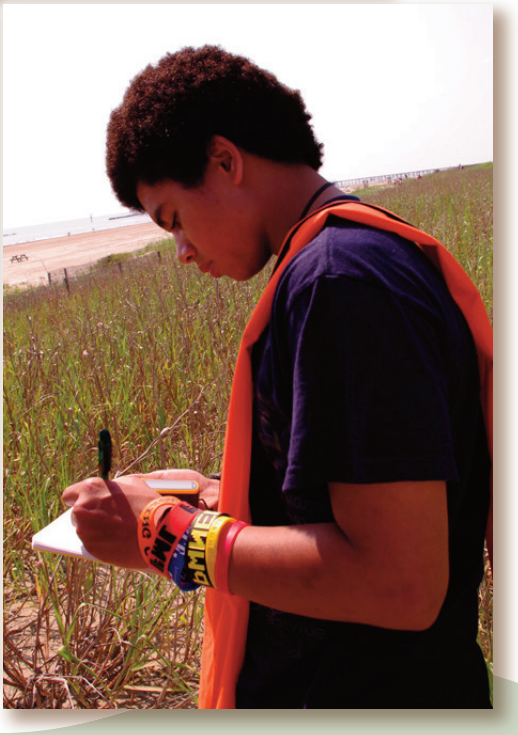
2. Develop a few whole-class activities such as selecting the newspaper logo and masthead for use by all groups. Develop a catchy thematic title, if needed.

3. Create a class "newspaper headquarters" that contains group topic brainstorms, schedule, timeline of progress, assignments, responsibility chart, and "to-do" lists.

4. Have students manage files carefully by giving them a standard way of naming files such as "*estuaryextra1*."

5. Review and discuss the handouts.

6. Review rubrics with the students.



WRITING FOR A NEWSPAPER

english extension

READY?

1. Check the diagram below and start thinking about which part of the newspaper is right for your talents and interests.

PUBLISHER

BUSINESS DEPARTMENT
Ads
Circulation

NEWS DEPARTMENT
News
Editorial
Features
Entertainment
Sports
Art & Photography

DESIGN DEPARTMENT
Layout
Printing

2. Select which newspaper assignment you would like to do, or have your teacher assign you to a department.

3. If you have chosen a writing assignment, use the pointers provided here to help you.

4. Every article should have each of these components:

HEADLINE:	the words printed across the top of an article to catch the reader's interest
DATELINE:	the words at the beginning of an article telling when and where the story was written
BYLINE:	the name of the author of the article, the artist of an illustration, or the photographer of a picture.

english extension

Suggestions for the News Department

NEWS:

News articles are the most structured type of newspaper article. The purpose is to provide information about an event to your readers. Write articles on coastal erosion, habitat loss, endangered/threatened/invasive species, restoration projects, loss of jobs, pollution, education or natural resources in the Barataria-Terrebonne Estuary. Be alert for any news stories on current events occurring in your local community that you can feature in your paper.

Here are some tips to help you write a great article:

Research your story.

- Make a list of questions you want to answer.
- Identify possible sources of information such as the Internet, the library, BTNEP, and reliable subject-matter experts or scientists.
- You can also investigate by visiting a site, observing, taking notes and comparing your conclusions with the other evidence you have gathered.
- As you find answers to your questions, take careful notes, documenting each source.
- Evaluate each source; consider factors such as reliability, objectivity and currency.

Start with a headline that captures the reader's interest.

Use your lead paragraph to hook your reader by highlighting your most fascinating or interesting finding. Summarize the story by including the 5 Ws: WHO, WHAT, WHEN, WHERE, and WHY of the story. The lead should be brief, objective, and limited to essential information. Use Thinking Maps or Graphic Organizers to help you organize your information logically.

- The following paragraphs should explain and develop the 5 Ws by providing details. Put the details in order from most important to least important. If possible, link the story to the life of the reader.
- Write in the third person (he, she, it, and they). Never write news articles in the first person. Personal stories are called "Features."
- Use the active rather than passive voice when reporting.
- Stick to the facts. Do not include your personal opinions. Editorials or Letters to the Editor serve that purpose.
- Use relevant quotes to add local color to your article.
- Wrap up the article. Think about using a strong quote.

Suggestions for the News Department, CONT'D.

FEATURES:

Features are interesting stories about people, places and events, such as the annual BTNEP paddle trip, volunteer tree planting and the *La'Fete de Ecologie Festival.* Some features explore an issue that may be too complex for a hard news item. They are less concerned with facts and more about human interest. Write an article on "The Big One," telling what would happen if a Category 5 hurricane hit Morgan City. Pick one of the "Seven Priority Problems" of the BTE and write a feature story about it. Interview older relatives or friends about coastal land loss problems they have witnessed in the BTE in their lifetime. Possible interviewees include: C. C. Lockwood, the nature and wildlife photographer; Tab Benoit, local musician; Kerry St. Pe', Director of BTNEP; Mark Davis, Director of the Coalition to Restore Coastal Louisiana; Dr. Earl Melancon, oyster expert at Nicholls State University and LUMCON; Windell Curole, South Lafourche Levee District; Archie Chiasson, Manager of the Fresh Water Levee District, or Jerome Zeringue, Terrebonne Parish Levee District. Do a photo essay on plants and animals of the Barataria-Terrebonne Estuary. Report on a local festival, fishing rodeo, or volunteer at a marsh grass planting event. Give recipes for your favorite seafood or game dishes. Write an article on a field trip to your favorite place in the Barataria-Terrebonne Estuary.

Here are tips on writing feature stories:

Be Creative.

You are not bound by the same rules as when writing a news story. Pretend you are telling a story. Use your senses; invite your readers by describing sounds, smells, sights and textures. Paint a picture with your words. Personal thoughts can be part of your feature, but always tell both sides of the story.

If your feature involves an interview, keep the following tips in mind:

- Know your subject. Gather information about the person you are interviewing by reading about his/her work or by talking to friends and associates.
- Make a list of questions to ask, but be open for any spontaneous questions that may arise.
- Develop a positive, polite relationship with the person you are interviewing.
- Explain the ground rules of your interview, if any, and respect your subject's wishes about any off-the-record topics.
- Keep the subject focused. Do not let him/her stray from the topic.
- Tape record or videotape the interview for your records.

Suggestions for the News Department, CONT'D.

EDITORIAL:
This type of article gives you a chance to express your opinion and be persuasive. Write your opinion about the importance of hurricane preparedness, litter reduction or coastal restoration. Draw an editorial cartoon about pollution, wetland loss, problems in the fishing industry or coastal land loss in the Barataria-Terrebonne Estuary. Ask others to write letters to the editor on various topics of interest in the estuary.

Do not forget these tips when writing editorials or letters to the editor:

- Get your facts straight.
- Keep your audience in mind.
- Grab the attention of the reader with your first sentence.
- Present your opinion/arguments logically and persuasively.

SPORTS:
Cover the Grande Isle Tarpon Rodeo. Write an article about wildlife management in the Barataria-Terrebonne Estuary. Write an article about the history of trapping nutria, mink and muskrat. Interview a local fishing guide and report on the latest in fishing lures. Give dates and times for the Hunter Education Workshops and the "Outdoor Women" workshops sponsored by Louisiana Department of Wildlife & Fisheries.

ENTERTAINMENT:
Draw a comic strip or cartoon featuring "Clawdette," the Barataria-Terrebonne Estuary Crab mascot. Design a maze based on a map of the BTE. Develop a crossword puzzle or a word search puzzle with the vocabulary words from a wetland unit. Cover a concert by a local Cajun or zydeco musician or band.

WEATHER:
Design a weather report for the Barataria-Terrebonne Estuary. Include a map, high and low temperatures, rainfall, three-day forecast, ozone index, tidal graph chart, wind speed and direction and any other information your readers might need to know.

PHOTOGRAPHY AND ART:
Take photographs or use computer clip art that will highlight your articles and make them more interesting. Draw clear illustrations, graphs or charts that help your readers understand the subject more easily. Remember to include captions for your pictures or cite the artist you are using!

Suggestions for the Business and Advertising Department

english extension

ADVERTISEMENTS:

RAISING MONEY TO PUBLISH A NEWSPAPER

- Decide on a "price" for each issue of the *Estuary Extra*.
- What is your plan for marketing the newspaper?
- Who is your intended audience?
- Who will sell or distribute the newspapers?
- You can raise money for your newspaper by selling advertising space. Make a decision about the type of ads you want to feature in *Estuary Extra*. Do you want to accept all advertising, or will you accept only advertising from environmentally-friendly products and services?

Here are some ideas for ad opportunities that you can develop:

a store that sells sports accessories
canoeing lessons
Cajun cooking or dancing lessons
shrimp for sale
Cajun Dance Lessons
safe septic systems
hunting dogs for sale
music or computer store
an organic food store and deli
charter fisherman
Red Fish Tournament
litter prevention
Swamp Tours
jackets, tennis shoes, and backpacks made of recycled plastic

guided tours to Bayou Segnette, Jean Lafitte National Historic Park, the LaBranche Wetlands, Des Allemands, Grande Isle State Park, and Bayou Lafourche.

Can you think of others? Look at advertising circulars from a local paper for more ideas.

- Make your ads interesting.
- Use lettering (fonts) of different types and sizes to draw attention but not distract.
- Keep the text simple.
- Use descriptive adjectives and strong verbs.
- Add artwork or photographs to enhance visual interest and to help "sell" the product.

Suggestions for the Design Department

english extension

GETTING THE PAPER READY TO PRINT

After the stories, artwork, and advertising are ready, the Design Department has the job of putting the *Estuary Extra* together. What does that job involve?

For a professional-looking newspaper, use a computer for your work's layout. Experiment with different types and sizes of fonts for variety as well as a look you like.

When articles are ready for publication, it's time to have another group meeting to determine layout. Consider printing articles as single columns to get a feel for length. Show students what 100 words "looks like" in a column so they can adjust content length.

Ask everyone to read the newsletter three times. Read it once for content, once for technical quality, and once backwards (back to front) to catch small errors.

- How large is your newspaper? Will readers have a hard time finding certain features of interest to them? You might want to develop an index on the front page to direct readers to the page number of their favorite section.
- Look at several different newspapers for ideas on layout. This is the arrangement you use for fitting all the pieces of the Estuary Extra on paper. Use a newsletter template from the Document command of your computer word processing program. Empty spaces? What will you do? Use cartoons, pictures or ads as fillers for those spots.
- How will you print the *Estuary Extra*? Will you use recycled paper? Be sure that all your arrangements are in order. You will need access to a copy machine and enough paper to print the necessary number of copies.

FINISHING TOUCHES BY THE EDITORIAL STAFF

PRESS TIME!!

LOOK!

Be sure to proofread each article several times before the *Estuary Extra* goes to press. Double check the spelling of names and places. Be sure dates and times are accurate.

Do a final check on all headlines and photo captions for accuracy.

Check to see that the circulation staff is ready to distribute the paper.

activity

Questions For Journaling

english extension

1. Why is a free press important in a democracy?

2. How important was it for you to research your subject well?

3. Did you interview any people for an article? What appreciation for their work did you gain?

4. Other than factual material, what are some of the important things you learned from writing a newspaper?

5. How did your readership relate to the newspaper?

6. Do you think people are now more informed about wetland issues? Why or why not?

Assessments

Cooperative Learning Group Performance: *Estuary Extra*

Project: _____

Group Members:

	3 OUTSTANDING	2 SATISFACTORY	1 NEEDS IMPROVEMENT
Each member of the group contributed ideas and suggestions for setting goals, assigning roles, and developing a plan of action for the newspaper.			
Each member of the group carried out the duties of his/her role.			
Each member of the group contributed to the development and distribution of the newspaper.			
A positive atmosphere was maintained during group meetings.			
Group goals were achieved.			

OVERALL RATING: Total Possible Points = 15

OVERALL RATING:

Estuary Extra STUDENT NEWSPAPER RUBRIC*

CRITERIA	4	3	2	1
The 5 Ws Who, What, When, Where & Why	All articles adequately address the 5 Ws (who, what, when, where and why).	Most of the articles adequately address the 5 Ws (who, what, when, where and why).	Some of the articles adequately address the 5 Ws (who, what, when, where and why).	Few of the articles adequately address the 5 Ws (who, what, when, where and why).
Layout **Headlines** **Captions**	All articles have headlines that capture the reader's interest and accurately describe the content. All articles have a byline. All graphics have captions that adequately describe people and/or action.	All articles have headlines that accurately describe the content. All articles have a byline. All graphics have captions.	Most articles have headlines that accurately describe the content. All articles have a byline. Most graphics have captions.	Articles are missing bylines OR many articles do not have adequate headlines OR many graphics do not have captions.
Layout **Columns**	Columns are neatly typed in the "justified" type style. There are adequate and even spaces between all columns and articles. The newspaper makes you think "professional."	Columns are neatly typed. There are adequate and even spaces between all columns and articles. The newspaper makes you think "fairly professional."	Columns are typed. There are adequate spaces between most columns and articles. It is easy to read, but does not look professional.	Columns are not neatly typed and/or spaces are not adequate; newspaper is somewhat difficult to read. It looks unprofessional.
Contributions of Group Members	Each person in the group has contributed to the newspaper without prompting from the teacher or peers.	Each person in the group has contributed to the newspaper with few reminders from the teacher or peers.	Each person in the group has contributed to the newspaper with some minimal assistance from the teacher or peers.	One or more students in the group required quite a lot of assistance from the teacher or peers.
Spelling and Editing	No spelling or grammar errors remain after one or more people (in addition to the typist) read and correct the newspaper.	No more than 3 spelling or grammar errors remain after one or more people (in addition to the typist) read and correct the newspaper.	No more than 5 spelling or grammar errors remain after one or more people (in addition to the typist) read and correct the newspaper.	More than 5 spelling or grammar errors remain in the final copy of the newspaper.
Objectives	All of the articles establish a clear purpose in the lead paragraph and demonstrate a clear understanding of the topic.	Most of the article establish a clear purpose in the lead paragraph and demonstrate a clear understanding of the topic.	Some of the articles establish a clear purpose in the lead paragraph and demonstrate a clear understanding of the topic.	Few of the articles establish a clear purpose in the lead paragraph and demonstrate a clear understanding of the topic.
Requirements	All of the required elements are present.	Most of the required elements are present.	Some of the required elements are present.	Few of the required elements are present.

Total Possible Points = 28 **OVERALL RATING:**

* Adapted from C.A. Bennet Newspaper created (n.d.). Retrieved August 27, 2006 from http://coe.west.asu.edu/students/creuss/newspaper_rubric.htm

Resources

Loyola University's Center for Environmental Communications
http://www.loyno.edu/lucec/

Society of Environmental Journalists
http://www.sej.org/index.htm

Knight Center for Environmental Journalism
http://ej.msu.edu/index2.php

School of Communication, Northern Arizona University
http://www.nau.edu/~soc-p/ecrc/

CNN Learning Resources: This site offers news stories, but includes an outline so that students can see how stories are structured. Many stories also contain audio or video, plus vocabulary quizzes, reading comprehension questions, and word searches.
http://literacynet.org/cnnsf/

An interactive language arts and journalism project for middle schools developed by ThinkTVNetwork, Dayton, Ohio. An OET/SchoolNet Project
http://www.writesite.org/

U.S. Environmental Protection Agency: Federal and State Regulations—Louisiana Legal Materials
http://www.law.cornell.edu/states/louisiana.html#codes

Federal and State constitutions, Statutes and codes
http://www.law.cornell.edu/statutes.html

Bureau of the Census
http://www.census.gov/

BTNEP online Self-Guided Tours of the Barataria-Terrebonne Estuary and "When I was your age…"
www.btnep.org

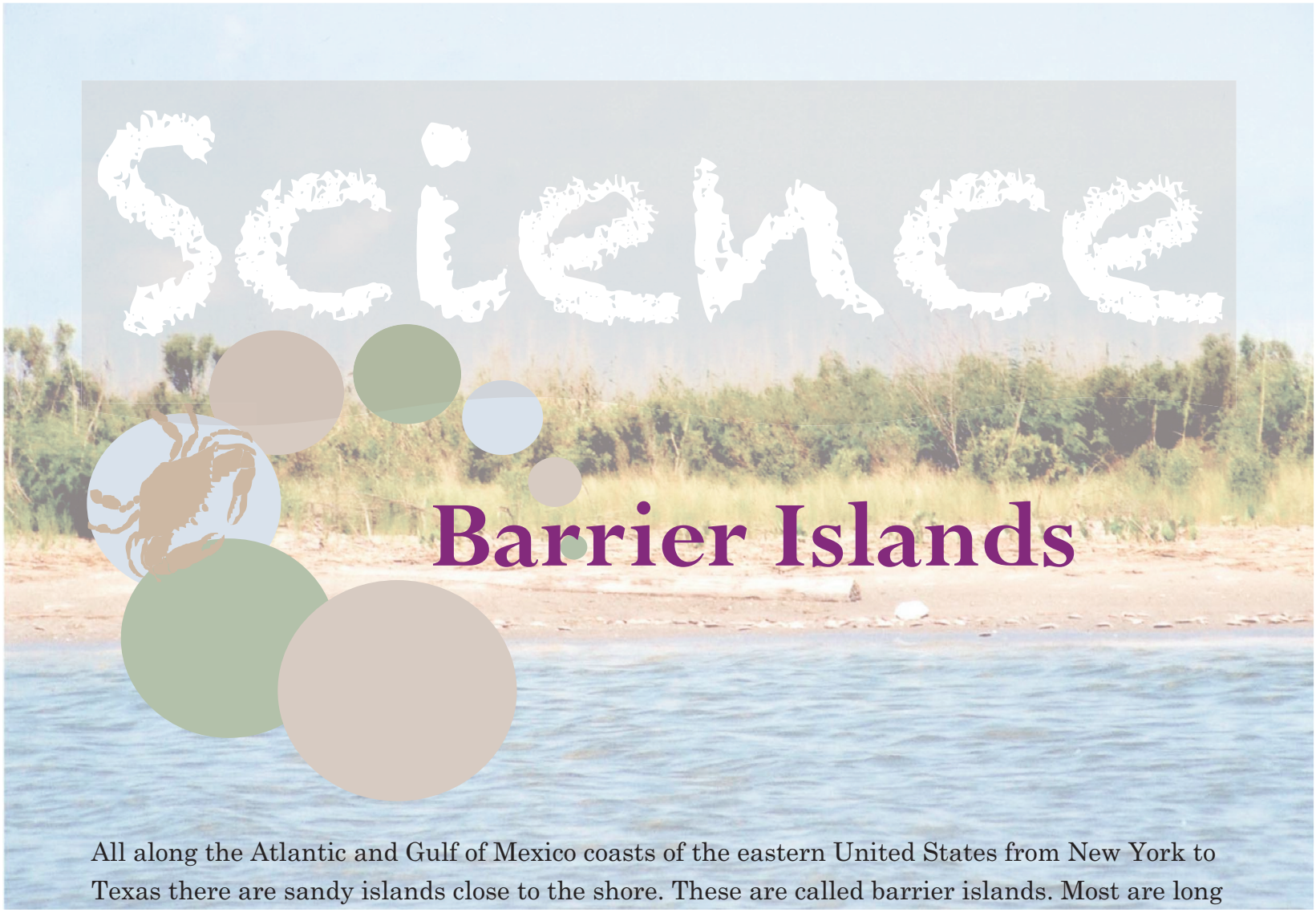
Weather: National Oceanic and Atmospheric Administration
www.noaa.gov/wx.html

The Weather Channel
www.weather.com

Louisiana Universities Marine Consortium website
www.lumcon.edu

Lesson Source

BTNEP
BARATARIA-TERREBONNE
NATIONAL ESTUARY PROGRAM



Barrier Islands

All along the Atlantic and Gulf of Mexico coasts of the eastern United States from New York to Texas there are sandy islands close to the shore. These are called barrier islands. Most are long and thin, oriented parallel to the shoreline. These islands have many things in common but also have many different characteristics. They all consist of a sandy beach facing the ocean or Gulf with several other habitat zones including dunes, swales, maritime forests, marshes and tidal flats. The specific natural environments vary from island to island. The bays, estuaries and lagoons found behind the islands are typically rich in marine life. The islands serve to protect these ecologically valuable places.

These small land masses also protect human communities on the mainland from the destructive energy of tropical storms and hurricanes. Despite their protective function, barrier islands are very dynamic and always on the move. Their formation depends upon the movement of sand by waves, tides and currents, and these forces continue to act on all barrier islands. Many barrier islands are popular vacation sites. Resort towns have been developed on many of these islands. However, attempts to prevent erosional forces from threatening human-built structures are usually ineffective.

Scofield Beach (photo credit: Marian Martinez)

Louisiana Barrier Islands

Scofield Beach arial view (photo credit: Marian Martinez)

The islands of the Louisiana coast were all created as a by-product of the Mississippi River Delta. Most are features associated with an older delta lobe that is no longer growing, and sea level rise is causing a "transgression" or an inland migration of the shoreline. Louisiana barrier islands tend to be low-lying and very vulnerable to inundation during storms. Currently, Grand Isle is the only barrier island on our coast on which there is a permanent settlement. Other settlements have been abandoned in very recent history as erosion has claimed more and more of the island area.

The Importance of Barrier Islands

Protection from Storms

Barrier islands take the brunt of impact from an incoming storm, thereby protecting the habitats and structures behind them. This makes barrier islands important in times of hurricanes and tropical storms. For example, the Timbalier Islands and the Isles Dernieres chain offer protection for communities in Terrebonne and Lafourche parishes.

Wildlife Habitat

Barrier islands contain a variety of habitat zones, all of which are valuable to wildlife. They provide a nesting habitat for birds such as brown pelicans, skimmers, and several species of terns and gulls. They also offer the first landfall for migrant neo-tropical birds arriving on the North American mainland after crossing the Gulf of Mexico in the spring. Here the birds refuel before continuing their journeys north. Monarch butterflies feed on the flowering plants of the barrier islands before and after crossing the Gulf of Mexico in the fall and spring. The shallow protected bays and estuaries behind the barrier islands are one of the richest aquatic environments on the planet, providing food resources for humans such as oysters, crabs, shrimp and fish.

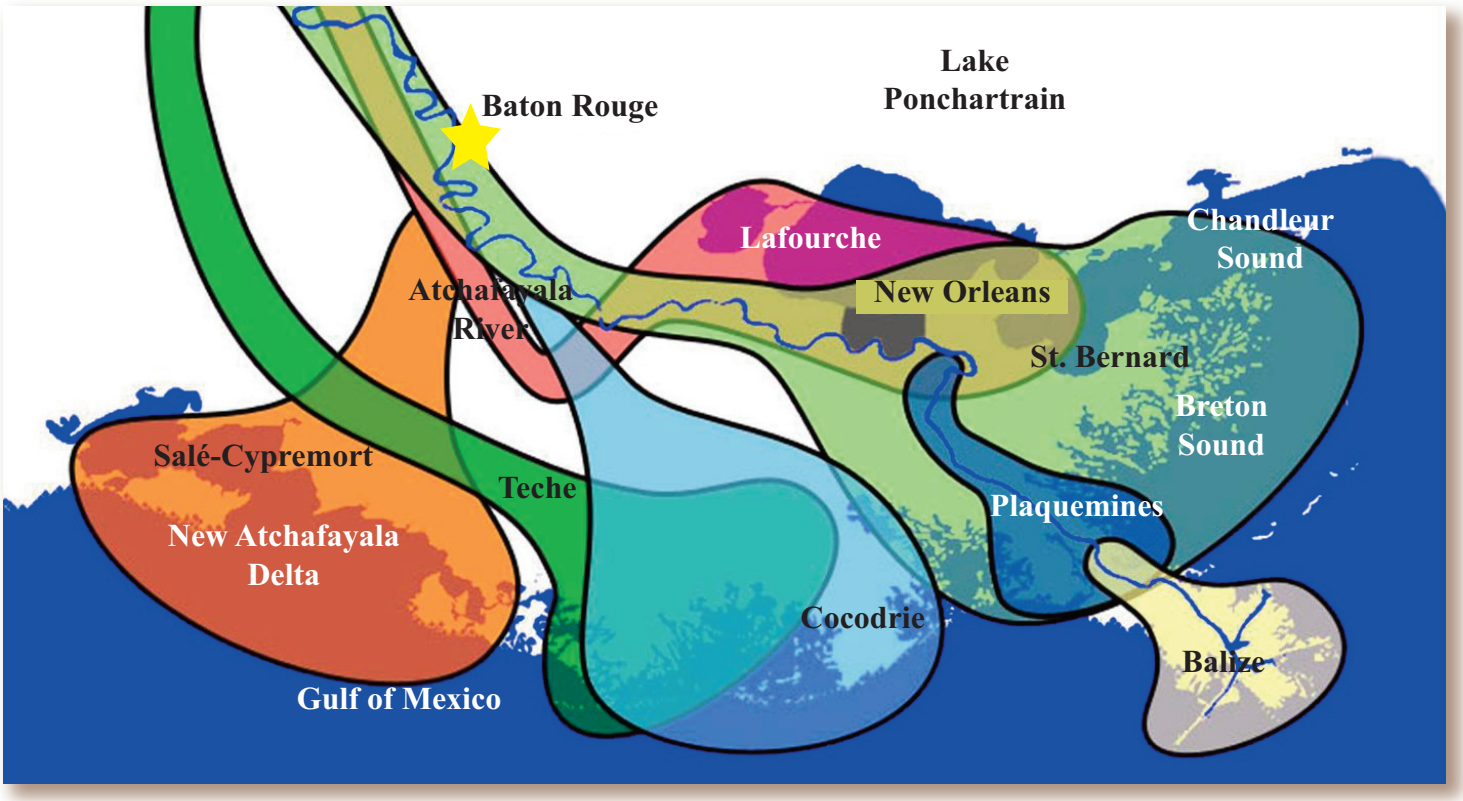
(photo credit: Marian Martinez)

The Formation and Evolution of the Louisiana Barrier Islands

There are several theories for barrier island development. All of the barrier islands on the Louisiana coast are the product of the receding Mississippi River Delta lobes, which formed over a period of about 7,000 years as the river deposited sediment over three million acres, an area known as the delta plain. The delta plain is made up of a number of overlapping delta lobes. Each lobe was deposited over the course of about 1,000 years. Approximately once every millennium the lower part of the Mississippi River changed its path to the Gulf of Mexico, finding a more efficient way. Each new route leads to the development of a new delta lobe. This process is known as delta switching or the delta cycle. This is a natural process that many river deltas go through.

The seven major delta lobes of the Mississippi River

The diagram below shows the seven lobes in order of age from oldest to youngest.

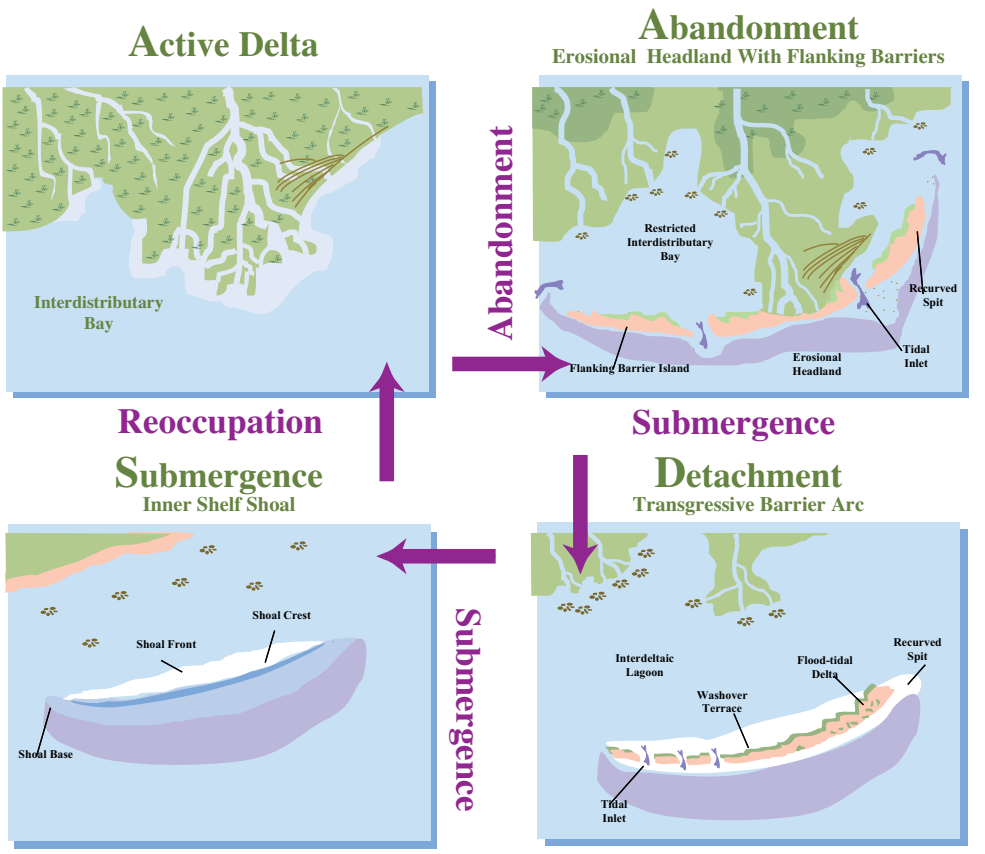


Kolb,van Lopik (1958). Geology of the Mississippi River deltaic plain, southeastern Louisiana. Technical Report 3-483. Vicksburg, MS: U.S. Army Corps of Engineers Waterways Experiment Station
Kulp, M. A., Howell, P., Adiau, S., Penland, S., Kindinger, J., and Williams, S. J., 2002, Latest Quaternery stratigraphic framework of the Mississippi delta region: Gulf Coast Association of Geological Societies Transactions, v. 52, p. 573-582.

Salé-Cypremort	4600 years BP	Lafourche	1000-3000 years BP
Cocodrie	4600-3500 years BP	Plaquemines	750-500 years BP
Teche	3500-2800 years BP	Balize	550 years BP
St. Bernard	2800-1000 years BP		

Barrier island development in Louisiana is tied in to this process of delta building. As the river abandons a delta lobe, it begins a slow decline because it is no longer receiving a supply of new sediment and fresh water. A new delta lobe begins to grow where the river is actively depositing new sediment. The old lobe continues to erode as the forces of waves, winds, and currents rework the sediment. Eventually, subsidence and sea level rise cause the submergence of the land. The reworked sediment forms a headland that continues to evolve with the development of flanking barriers. Eventually, these features become separated from the headland and continue to migrate and change. Finally, erosion and relative sea level changes cause the island to be completely submerged, resulting in a shoal beneath the water.

Barrier Island Evolution



Barrier Island Formation Model - Penland et al.
From *Barrier Island Erosion Study: Atlas of Shoreline Changes in Louisiana from 1853 to 1989, US Geological Survey, Miscellaneous Investigation Series 1-2150-A*

The five steps of barrier island formation:

Active Delta: The delta is actively bulding land, depositing sediment from the channel into the Gulf of Mexico.

Abandonment: The delta is no longer active and erosional forces are at work on the headland, forming sandy spits on either side of the old channel.

Detachment: The combined effects of sealevel rise and subsidence (relative sea level rise) cause the barrier to detach from the mainland and become an island.

Submergence: Relative sea level rise continues to submerge the barrier island. Eventually it becomes a shoal beneath the water.

Reoccupation: Given completely natural conditions (which do not exist today) the Mississippi River's distributaries could eventually reoccupy the area and begin building a new delta lobe and the cycle would continue.

The Status of Louisiana's Barrier Islands Today

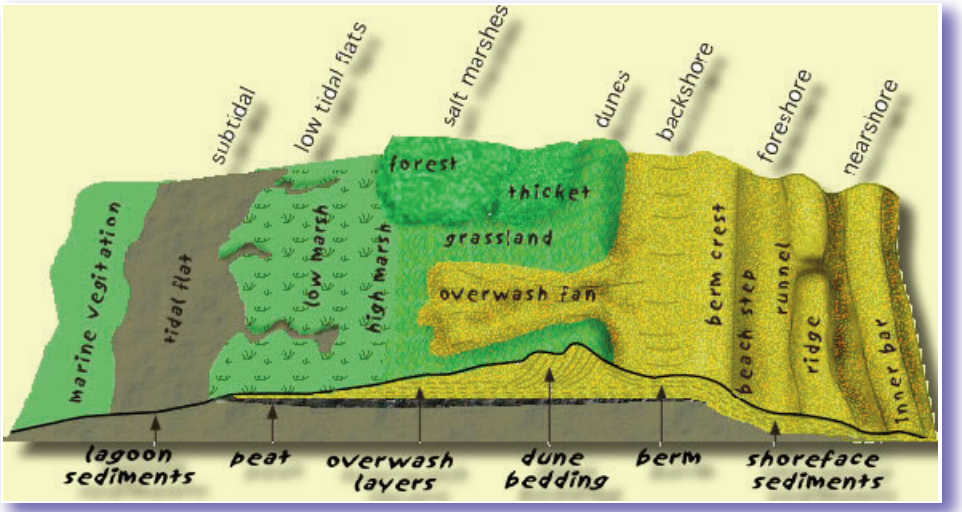
The barrier islands of Louisiana are vital for the protection of Louisiana's coastal communities and its natural resources. They are the first line of defense from summer's hurricanes and winter's storms. However, barrier islands are no longer building naturally. The previously-illustrated cycle has been interrupted by "reoccupation" to the natural processes that drive it. For "reoccupation", stage five of the barrier island termination model, to occur, completely natural conditions that allow the river to rebuild its delta are required. These conditions do not exist because people have altered the course of the Mississippi River in order to control it from flooding and for navigational purposes.

After the great river flood of 1927, the public requested that the U.S. Army Corps of Engineers construct large levees and install control structures in places where the river was likely to change course. One such place is where the Atchafalaya River branches off from the Mississippi River. An example of this is near Simmesport, where the "Old River Control" Structure prevents the flow of water from the Mississippi River into the Atchafalaya River from exceeding 30% of the total volume. If it were not for this structure, the majority of flow of the Mississippi would switch to the course of the Atchafalaya River. A new delta lobe would develop at the mouth of the Atchafalaya south of Morgan City, LA. Currently, with only 30% of the flow entering the Atchafalaya, a small delta lobe is forming in Atchafalaya Bay. As long as the Old River Control Structure holds the Mississippi on its present course, the complete switch cannot take place. The current "Modern" delta lobe would be abandoned and barrier island formation would begin in the location that today is the mouth of the Mississippi River. Because the river is being controlled by humans, the "Modern" delta continues to grow out into the Gulf of Mexico. It is now close to the edge of the continental shelf, the area of shallow water nearest to the coast. The sediment that exits the mouth of the river is deposited in the deep water of the Gulf and is lost from the estuary as a land building material. This material could build new barrier islands or marshes if it could be captured. Instead, the existing barrier islands continue their natural deterioration and no new islands or land can form. The only way to solve the problem without allowing the Mississippi River to change course, is to pump sediment from the floor of the Gulf of Mexico continental shelf onto the existing islands. This method of barrier island restoration has been used successfully in recent years.

The Anatomy of a Louisiana Barrier Island

Below is a cross section of a "typical" barrier island. Barrier islands vary greatly, but a typical island off the coast of Louisiana would have the following features: Beginning at the shoreline of the Gulf of Mexico, the beach rises gently in elevation. The sand is fine-grained and tan in color. Shells and "beach rock" as well as many kinds of natural and man-made debris are scattered through the sand. In some places muddy clay may be exposed and areas of old marsh grass roots embedded in the mud will be visible.

Moving away from the shore, small dunes appear. Vegetation grows on the dunes, holding the sand in place and also trapping new sand and helping the dunes to grow in size. The plants are adapted to this unstable environment, with specialized root systems and coarse leaves that can withstand salt spray and constant wind. Higher on the dunes, small, highly specialized shrubs thrive. Behind the dunes there may be areas of mud flats, which are inundated when a storm surge washes over the dunes. Sand from the dunes may be pushed in "washover fans" onto the mud flats. Here animals such as fiddler crabs may be found burrowing into the mud.

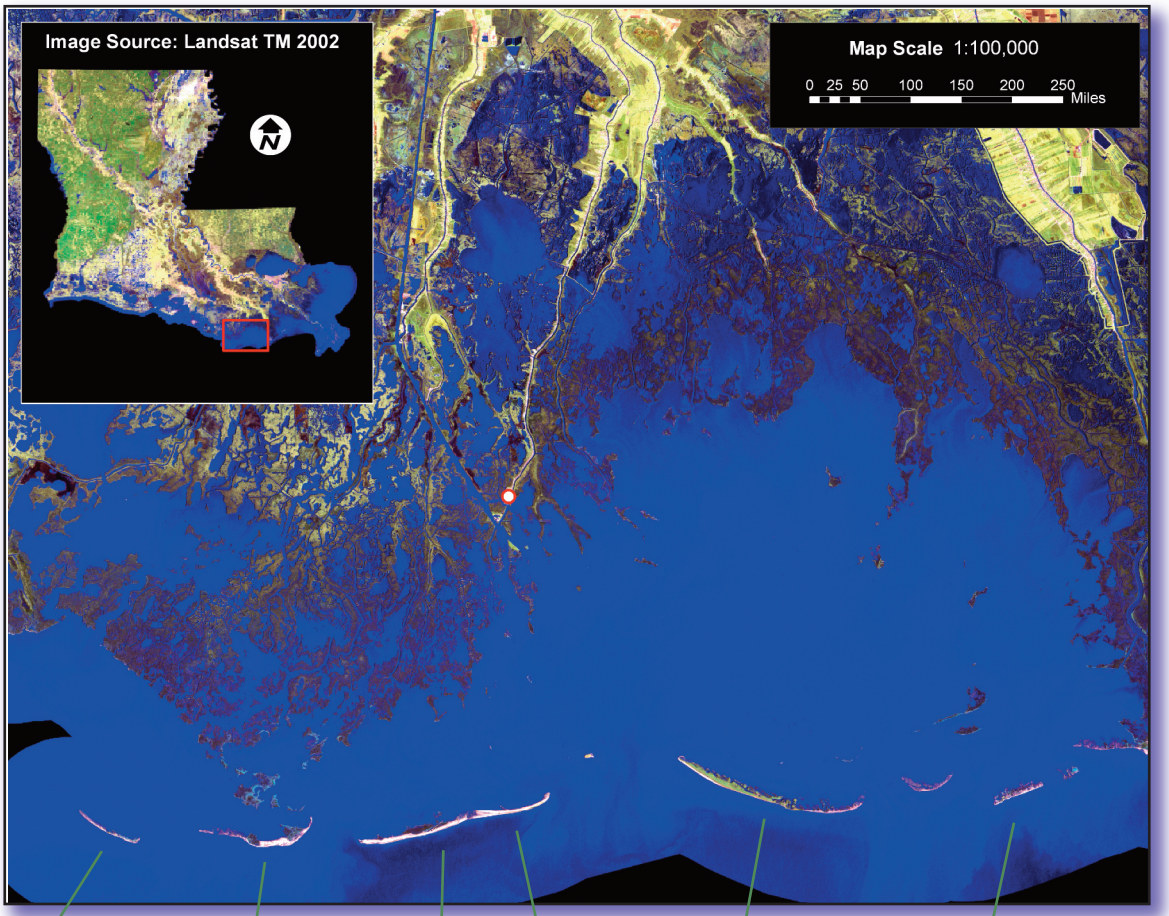


Cross section of a generalized barrier island. Not all features are present on all islands. Louisiana's islands tend to have a much lower profile than those to the east along the Atlantic coast. The dunes are small and trees may not be present on the island. Godfrey, P. J., 1976, Barrier beaches of the east coast: Oceanus, v. 19, n. 5, p. 27-40. http://w3.salemstate.edu/~lhanson/gls214/gls214_barrier_isl.htm

Behind the mud flats are areas of salt marsh. This marsh is important for many species of marine life. The most common grass is **Oyster Grass**. **Black Mangrove** trees may grow on the edge of the marsh. Louisiana barrier islands generally lack trees, but Grand Isle is the exception. Its higher elevation allows maritime oak forests to survive and provide habitat for a variety of organisms. Behind the marsh the shallow water of the bay is often occupied by **submersed aquatic vegetation**. The island protects the bay from the wave energy of the Gulf, and the bay serves as an important nursery for the seafood species for which coastal Louisiana is renowned.

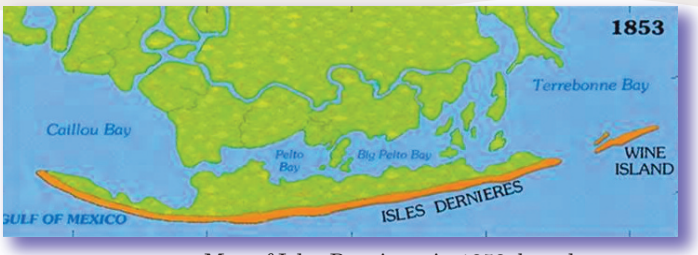
Barrier Islands of Barataria Terrebonne

Two "chains" of small barrier islands are featured on the posters: *The Isles Dernieres (Last Islands)* and the *Timbalier Islands* (The Barrier Island Poster Series is available at BTNEP). At one time, the small islands that make up the two chains were joined to make two larger, continual islands. Erosion has taken its toll, leaving only fragments of the islands that existed in the 1800's. Both island chains are remnants of the Lafourche delta lobe of the Mississippi River delta, but were created by sediment deposited by two different branches or distributary channels of the Mississippi River. The Timbalier Islands were formed after the abandonment of Bayou Lafourche by the Mississippi River. Reworked sediment at the mouth of Bayou Lafourche formed both Grande Isle and the Timbalier Islands. The Isles Dernieres are a result of the sediment at the mouth of Bayou Petit Caillou being reworked by tides and currents.

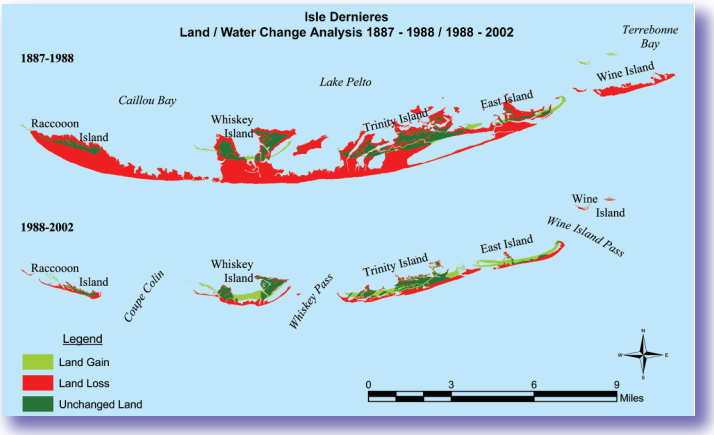


The Isles Dernieres

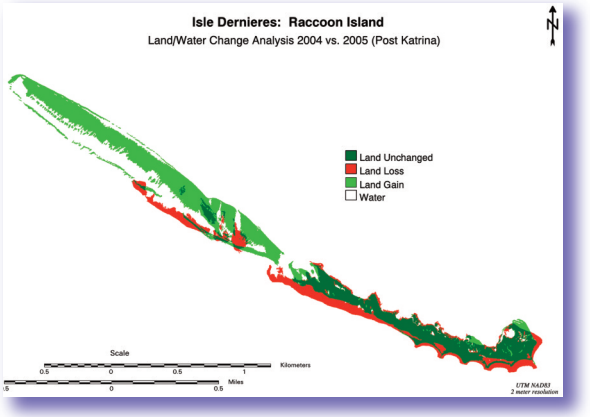
The Isles Dernieres are today made up of either three, four or five islands, depending on your perspective! The complete set of five from west to east are: Raccoon, Whiskey, Trinity, East and Wine Islands. Wine Island was restored with rocks and dredged material after it became a shoal. Today, there is little remaining of the original island. As a result of Hurricanes Katrina and Rita, Trinity and East Islands joined together, after sediment accumulated in the tidal inlet between them. This recent change underscores the dynamic nature of the barrier islands. In the 1850's, Isles Dernieres was a single island barely detached from the mainland. In those days people farmed, grazed cattle and lived and vacationed on the island.There was an overland route used to drive cattle to and from the island. In 1856, a catastrophic hurricane caused a storm surge to wash over the island and to destroy a resort village on what is now Raccoon Island. About 140 people were killed and the village was abandoned. No permanent structures exist on the islands today and a visit to any part of Isles Dernieres requires a seaworthy boat.



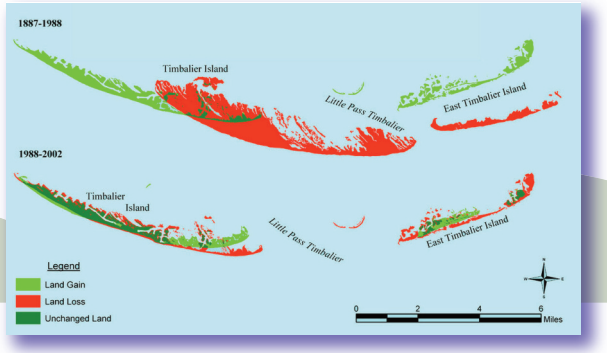
Map of Isles Dernieres in 1853, based on surveys made at that time. Source: *Louisiana Barrier Island Erosion Study: Atlas of Shoreline Changes*



Shoreline change analysis maps of Isles Dernieres. Top: change between 1887 and 1988. Bottom: change between 1988 and 2002. Map Courtesy of UNO Pontchartrain Institute for Environmental Sciences.

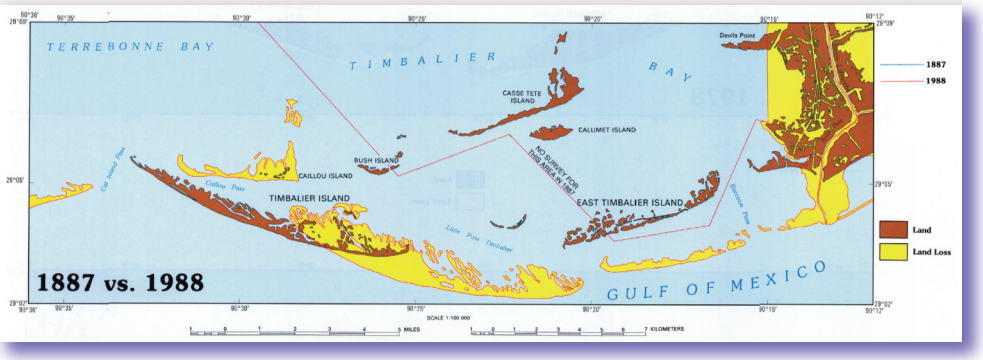


Raccoon Island 2005-2006. Map Courtesy of UNO Pontchartrain Institute for Environmental Sciences.



Shoreline change in the Timbalier Islands 1887—1988. Map Courtesy of UNO Pontchartrain Institute for Environmental Sciences.

Timbalier Islands



Today, the Timbalier Islands are made up of two distinct islands, East Timbalier and West Timbalier (often referred to just as Timbalier Island). Erosion due to subsidence, lack of sediment, sea level rise, waves, and winds from many storms has reduced the land area of the islands dramatically, while the natural migration has moved the islands towards the mainland. In addition, oil and gas exploration and production has been particularly active at East Timbalier Island. Canals and disturbance of the land for drilling have added to the loss that is taking place in this area.

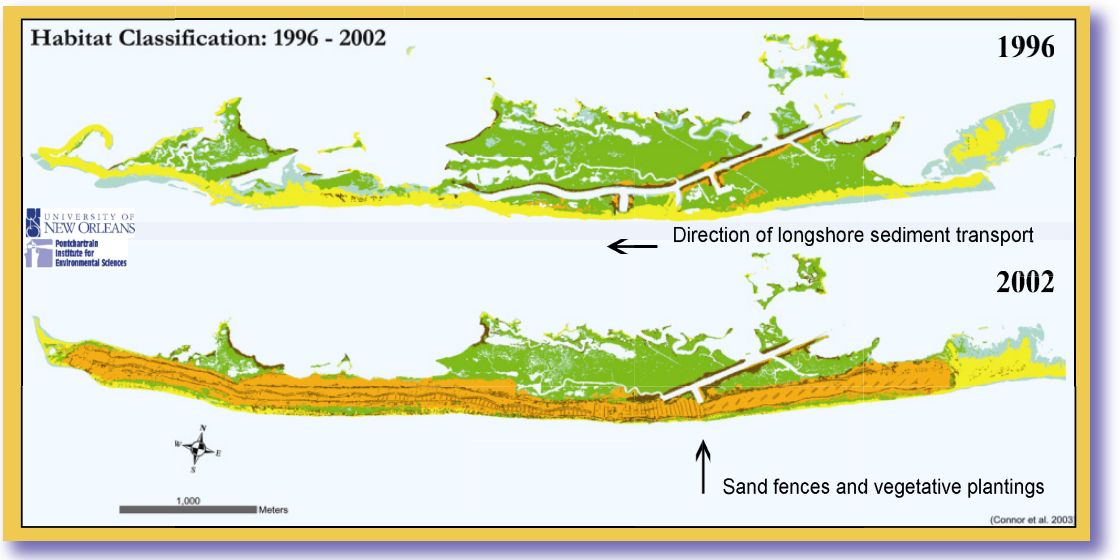
Grand Isle

Grand Isle is Louisiana's only inhabited island. Unlike all the others, it continues to support a viable community—the thriving, though vulnerable Town of Grand Isle. It also supports oil and gas infrastructure, recreational and commercial fisheries, marinas and the Grand Isle State Park. Cultural events such as the annual Grand Isle Tarpon Rodeo and the Grand Isle Bird Festival attract many visitors. Grand Isle is a flanking barrier of the headland created by the eroding Lafourche Delta lobe. Grand Isle is detached from the mainland at Caminada Pass, but Louisiana Highway 1 crosses the pass via a bridge. It is a larger and more geologically stable island than many of the neighboring islands. It supports maritime live oak forests in addition to sandy beaches, dunes, mud flats and salt marshes. A visit to Grand Isle requires no boat and is a great way to learn about barrier island habitats and geology, as well as the varied methods of shoreline erosion control.

Grand Terre Island

Courtesy of the U.S. Geological Survey

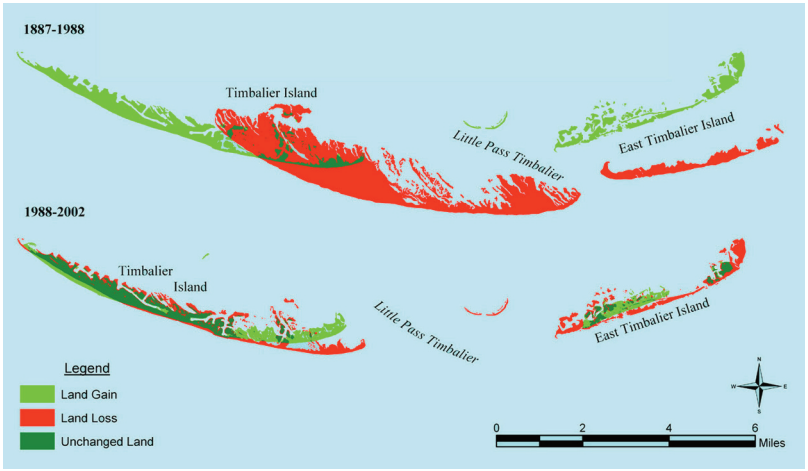
Grand Terre Island is Grand Isle's eastern neighbor. It sits across Barataria Pass from the eastern end of Grand Isle. Geologically, the two islands have different origins and Grand Terre is further along in the "submergence" stage of the "Barrier Island Formation Model." Grand Terre has suffered a great deal of land loss and erosion in recent years. A visit to Grand Terre requires the permission of the Louisiana Department of Wildlife and Fisheries (LDWF), owners of the property. On the western end of Grand Terre the LDWF once operated a Marine Research Lab there for many years. This lab has been relocated on Grand Isle. Fort Livingston, also located on the western end, is part of the Louisiana State Parks system and is protected. At one time, sugar was grown at the Forstall Plantation and processed at a sugar house on the island. Shoreline erosion has claimed all but a few scattered bricks of these structures. The other historical aspect for which Grand Terre is well known is that it was once the headquarters of Privateer Jean Lafitte's operations. Much folklore surrounds this part of history, but no physical remains of the operation have been found on the island.



Sediment restoration on Trinity Island. Map Courtesy of UNO Pontchartrain Institute for Environmental Sciences.

Barrier Island Restoration in The Barataria-Terrebonne Estuary

The barrier islands of the Barataria-Terrebonne Estuary have benefited in recent years from federal funding through the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), or Breaux Act. These funds provide between 20 to 80 million per year to Louisiana, which is matched by the State at a rate of 15%. CWPPRA has funded many projects designed to slow the erosion that has been ravaging the Louisiana coast. The barrier island restoration projects generally use dredged material, which is pumped onto the islands from the floor of the Gulf of Mexico. This builds up the height and width of the islands, creating a more robust profile that can stand up to a storm surge more effectively. Restoration projects on Isles Dernieres and East Timbalier Island were completed in 2002. West Timbalier Island was completed in January 2005. In addition, there is a similar State project on Grand Terre Island.



Sediment restoration on Timbalier Island, showing the completed project and the impact of Hurricanes Katrina and Rita.

Aerial Photos of Trinity Island, before and after the restoration project.
Photos courtesy of Shea Penland

Keeping Our Heads Above Water
—Success of Restoration Projects

Learning Objectives

- Analyze maps and graphed data showing a barrier island before and after restoration and before and after Hurricanes Katrina and Rita.
- Evaluate the success of the restoration project using the data and by collecting online information.
- Predict the future changes in land area in the barrier islands.

Materials List

- Computer with internet access
- Activity Sheets 1, 2, and 3 (one per student or student group)
- Copy of BTNEP resources Posters of *The Barrier Islands of the Barataria-Terrebonne Estuary*

Focus/Overview:

In this lesson, students will use maps and graphed data created by coastal scientists, as well as online information on coastal restoration projects, to analyze changes in land area that have taken place on Louisiana's barrier islands. They will use critical thinking skills to evaluate a restoration project on a barrier island in terms of costs and benefits. They will make predictions about future land area changes on the barrier islands.

Background:

The Isles Dernieres barrier Islands (made up of Raccoon, Whiskey Trinity, and East Islands), have been eroding for many years and in 1989, scientists made the following prediction: "The Isles Dernieres now lie several miles seaward of the retreating mainland, and at current rates, they will be destroyed by 2007" (McBride and others, 1989, in Louisiana Barrier Island Erosion Study: Atlas of Shoreline Changes). Although it may seem that they were mistaken, the islands are above water today because projects were designed and implemented that increased their width and height by pumping sediment onto them. Figure 1 on Activity Sheet 2 illustrates an example of one of these projects. In all, Raccoon, Whiskey, Trinity, and East Islands in the Isles Dernieres chain and Timbalier and West Timbalier Islands have all been restored in this way. These projects have proved successful in helping to maintain the barrier islands in the face of numerous storms. In this activity we will take a close look at these projects and analyze their costs and benefits to decide just how successful they really are.

Preparation

- Make enough copies of Activity Sheets 1, 2 and 3 for the students to work individually or in small groups.

Science

Procedure—Analyze, Assess, Predict Using Figure 1

With Teacher's Guide to Activity Sheets

1. Study Figure 1 on Activity Sheet 2. It is a map of Trinity Island before and after restoration done by CWPPRA, the Coastal Wetlands Planning, Protection and Restoration Act. List three differences you observe between the first and second map.
Answers will vary but may include: canals are filling in, there is more bare land, island is wider on the east.

2. Go to the website http://www.lacoast.gov and click on the "projects" tab at the top of the page. An interactive map will come up. You can mouse over this map to find any project (in this case *TE 24 on Trinity Island off the coast of Terrebonne Parish*.) An active link will appear and you can navigate to the project Fact Sheet. An alternate way to navigate to a project is to use the alphabetic list of all the projects in the state, via the link found below the map. In order to use the list to find the barrier Islands in the Barataria Terrebonne estuary, search for projects in Terrebonne Parish (beginning with "TE") and then scroll down to Isles Dernieres Restoration Trinity Island (TE-24) and click on that project.

Find TE-24 General Project Fact Sheet and open it up. (Or print the fact sheets supplied at the end of this lesson.) Use this source of information to find the answers to the following questions:

a. In what year was the project completed? 1999

b. What was the size of the project area in acres? 776 acres
How many acres of land were created by the project (not the same number)? 500 acres
How many acres are projected to remain after 20 years? 109 acres

c. Why will the area decrease over 20 years? Answers will vary but may include causes for erosion or land loss such as hurricanes, wave action, winter storms, or human degradation.

d. How much did the project cost? $10.7 million How much per acre is this (cost of project divided by the number of acres created)? For 500 acres the cost is $21,400 per acre but for 109 acres the cost is $98,165 per acre. How was this project funded? Through federal and state funds in a project called the Coastal Wetlands Planning Protection and Restoration Act.

e. What is the main benefit of the project? Creation of a new marsh platform that will protect the island and the land behind it.

Procedure—Analyze, Assess, Predict Using Figure 2

3. Use Figure 2 to answer the following questions about the effects of the 2005 hurricanes on Trinity Island

a. What was the main impact of the hurricanes to Trinity and East Islands?
It removed sediment from the island.
Which of the two islands lost more land area? East Island

b. Before August/ September 2005, Trinity and East Islands were separate.
What caused them to join? Hurricanes moved the sediment.

c. Based on the information available, do you think the restoration projects on Trinity and East Islands helped to prevent erosion during hurricanes Katrina and Rita?
Answers will vary.

Procedure—Analyze, Assess, Predict Using Figure 3

4. Use Figure 3 to answer these questions about Trinity Island's change over time.

a. What was the land area of Trinity Island in 1978? 1,300 acres
b. What was the land area after Hurricane Andrew in 1992? 680 acres
c. What was the land area in 2002? 750 acres
d. Calculate the change in area between 1978 and 1992 and between 1992 and 2002.
1978 to 1992 1,300 acres - 680 acres = 620 acres lost
1992 to 2002 620 acres to an increase of 750 acres = 70 acres gained
e. Do these figures indicate that the restoration project helped to increase the land area of the islands? yes
f. Draw a line on the graph to predict the land area change caused by Hurricanes Katrina and Rita (use Figure 2 to help you predict). Slightly down
g. Based on the information in the graph, write a prediction for the land area change for Trinity Island for the time period 2002 – 2020. What known and unknown factors must be taken into account to make such a prediction?
Land will probably be lost due to hurricanes and winter storms.
h. What do you think your children will learn about Louisiana's barrier islands when they are your age? Answers will vary.

5. Based on your answers above and the knowledge you have about the values of barrier islands to Louisiana's coastal residents, complete the cost/ benefit table for TE 24 (Figure 4). Remember that some of the costs and benefits may not be obviously stated on the fact sheet. Write your thoughts about the cost versus the benefits of this project. Do you think it is worth the cost to the taxpayers?
Be prepared to defend your decision.

Figure 3: Graph of land area change over time for Trinity Island

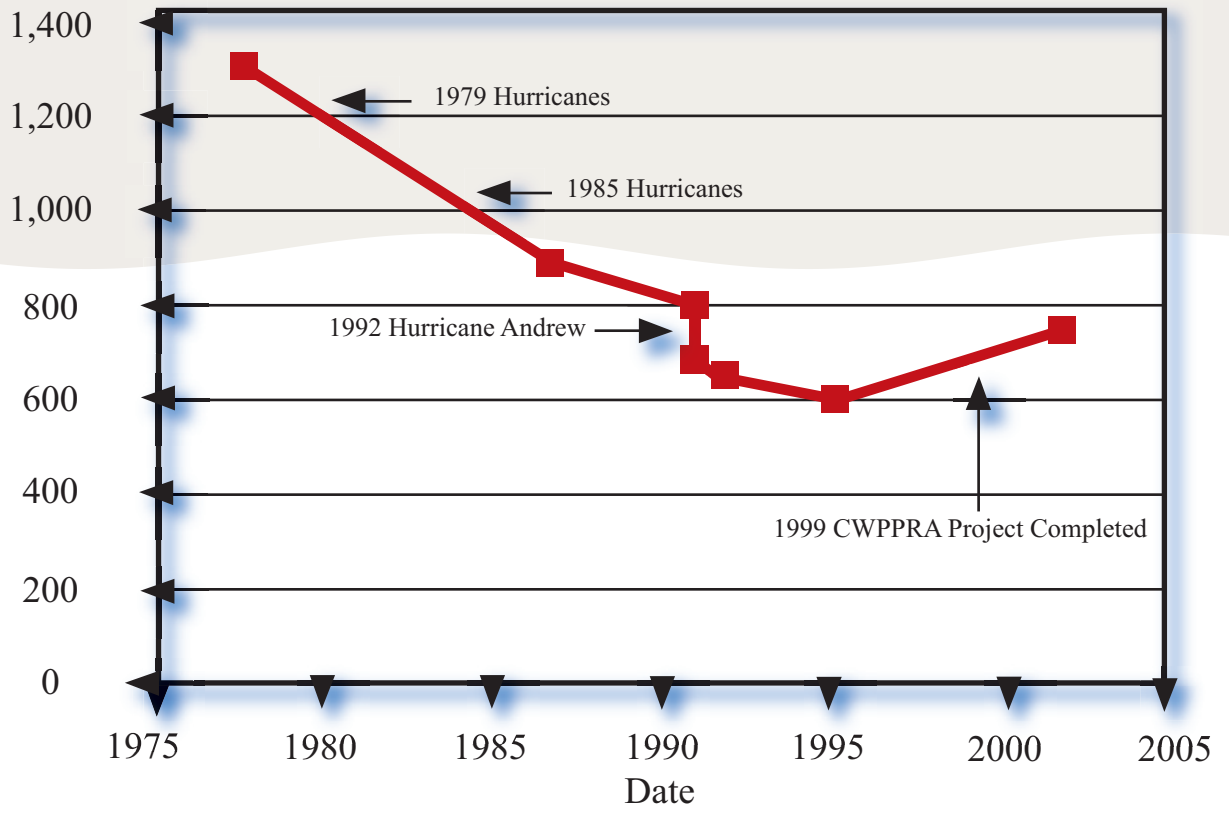


Figure 4: Cost-Benefit Chart

Costs	Benefits
10.7 million dollars	New land was created
Using sand from the shoals—Decreases the sediment budget	New wildlife habitat was created
Cost of plants, sand fences, etc.	New recreational areas were created
Dredging can have harmful effects on the environment	Protection from storms and surges in hurricanes

Conclusions about the project

Answers will vary

Activity Sheet 1

Keeping Our Heads Above Water

Success of Restoration Projects

Student Name: _____

Using figure 1:

1. Study Figure 1 on Activity Sheet 2. It is a map of Trinity Island before and after restoration done by CWPPRA, the Coastal Wetlands Planning, Protection and Restoration Act. List three differences you observe between the first and second map. _____

_____

_____

_____

2. Go to the website http://www.lacoast.gov and click on the "projects" tab at the top of the page. An interactive map will come up. You can mouse over this map to find any project (in this case TE 24 on Trinity Island off the coast of Terrebonne Parish.) An active link will appear and you can navigate to the project Fact Sheet. An alternate way to navigate to a project is to use the alphabetic list of all the projects in the state, via the link found below the map. In order to use the list to find the barrier Islands in the Barataria Terrebonne estuary, search for projects in Terrebonne Parish (beginning with "TE") and then scroll down to Isles Dernieres Restoration Trinity Island (TE-24) and click on that project. Find TE-24 General Project Fact Sheet and open it up. Use this source of information to find the answers to the following questions:

a. In what year was the project completed? _____

b. What was the size of the project area in acres? _____

How many acres of land were created by the project (not the same number)? _____

How many acres are projected to remain after 20 years? _____

c. Why will the area decrease over 20 years? _____

d. How much did the project cost? _____

How much per acre is this (cost of project divided by the number of acres created)? _____

How was this project funded? _____

_____

e. What is the main benefit of the project? _____

_____

Using figure 2:

3. Use Figure 2 to answer the following questions about the effects of the 2005 hurricanes on Trinity Island.

a. What was the main impact of the hurricanes to Trinity and East Islands? _____

_____

Which of the two islands lost more land area? _____

b. Before August/ September 2005, Trinity and East Islands were separate.

What caused them to join? _____

c. Based on the information available, do you think the restoration projects on Trinity and East Island helped to prevent erosion during hurricanes Katrina and Rita? _____

d. Do you think the restoration project was successful in its goal to prevent the disappearance of the islands? _____

Using figure 3:

4. Use Figure 3 to answer these questions about Trinity Island's change over time.

Keeping Our Heads Above Water

Success of Restoration Projects

a. What was the land area of Trinity Island in 1978? _____

b. What was the land area after Hurricane Andrew in 1992? _____

c. What was the land area in 2002? _____

d. Calculate the change in area between 1978 and 1992 and between 1992 and 2002.

1978 to 1992 _____

1992 to 2002 _____

e. Do these figures indicate that the restoration project helped to increase the land area of the islands? _____

f. Draw a line on the graph to predict the land area change caused by Hurricanes Katrina and Rita (use Figure 2 to help you predict). _____

g. Based on the information in the graph, write a prediction for the land area change for Trinity Island for the time period 2002 – 2020. What known and unknown factors must be taken into account to make such a prediction? _____

_____

h. What do you think your children will learn about Louisiana's barrier islands when they are your age? _____

_____

5. Based on your answers above and the knowledge you have about the values of barrier islands to Louisiana's coastal residents, complete the cost/ benefit table for TE 24 (Figure 4). Remember that some of the costs and benefits may not be obviously stated on the fact sheet. Write your thoughts about the cost versus the benefits of this project. Do you think it is worth the cost to the taxpayers? Be prepared to defend your decision.

Activity Sheet 2

Keeping Our Heads Above Water

Change Over Time for Trinity and East Islands

Student Name: _____

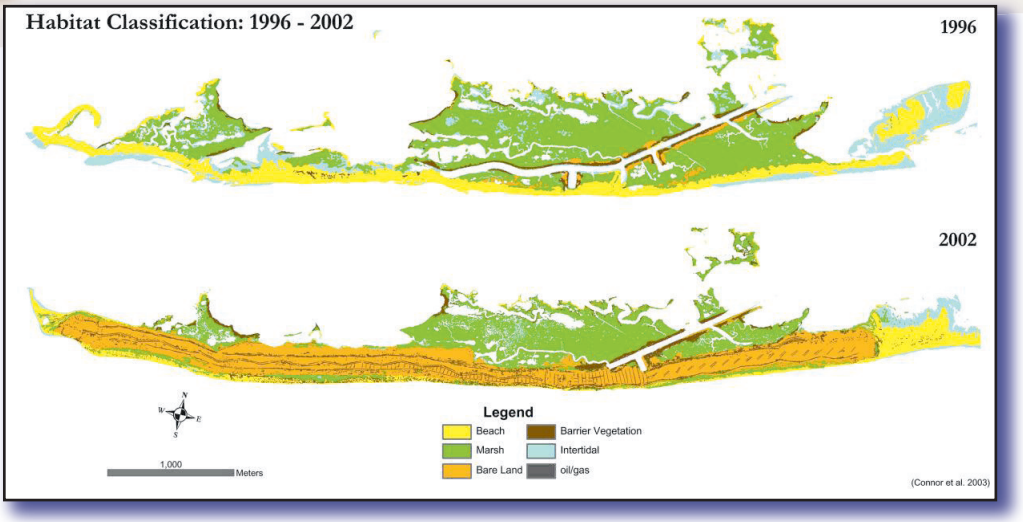


Figure 1: Habitat classification maps showing Trinity Island before and after the restoration project was completed. The "bare land" area on the bottom section of the map is the sediment that was pumped onto the island. done by CWPPRA, the Coastal Wetlands Planing, Protection and Restoration Act.

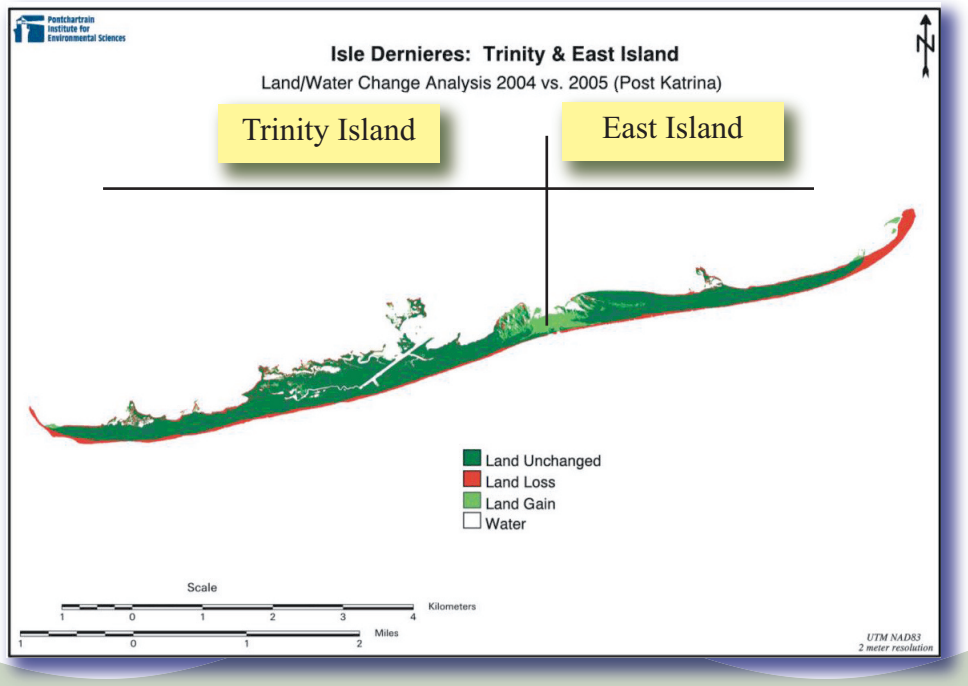
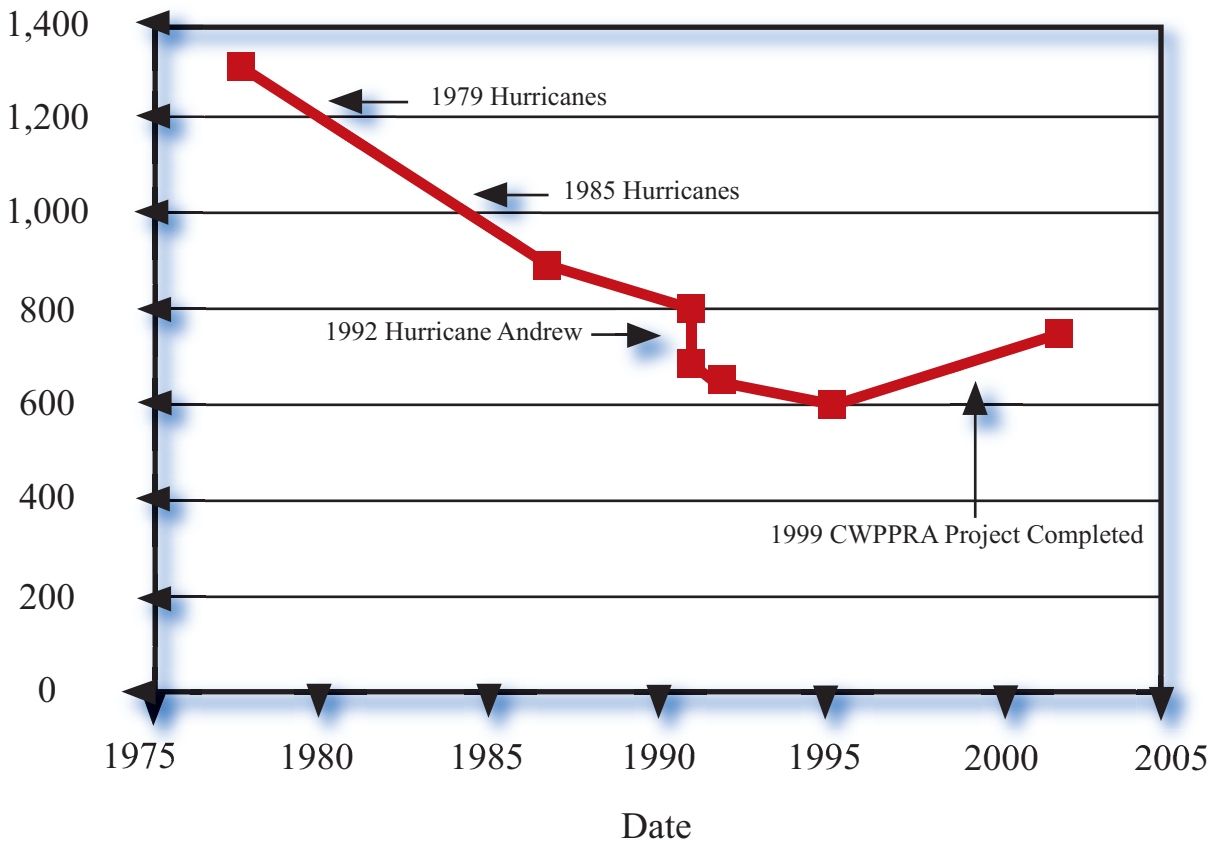


Figure 2: Land loss map showing Trinity and East Islands, now joined together by sediment deposition after hurricanes Katrina and Rita. The red area is the sediment lost due to the storm surges. The lighter green areas represent sediment deposition due to the storms.

Keeping Our Heads Above Water

Change Over Time for Trinity and East Islands

Figure 3: **Graph of land area change over time for Trinity Island**



Keeping Our Heads Above Water

Costs and Benefits of Restoration Projects

Student Name: _____

Figure 4: **Cost-Benefit Chart**

Costs	Benefits

Conclusions about the project

Louisiana Coastal Wetlands Conservation and Restoration Task Force

October 2002
Cost figures as of: January 2012

Isles Dernieres Restoration Trinity Island (TE-24)

This pdf can be found online at http://lacoast.gov/new/Projects/Info.aspx?num=TE-24

Project Status

Approved Date: 1992 **Project Area:** 776 acres
Approved Funds: $10.7 M **Total Est. Cost:** $10.7 M
Net Benefit After 20 Years: 109 acres
Status: Completed June 1999
Project Type: Barrier Island Restoration
PPL #: 2

Location

Trinity Island, which is one of five islands that make up the Isle Dernieres barrier island chain, is located approximately 13 miles south of Cocodrie, Louisiana, in Terrebonne Parish. It is bordered to the north by Lake Pelto and Terrebonne Bay, to the west by Whiskey Pass, to the south by the Gulf of Mexico, and to the east by New Cut and East Island.

Problems

The Isles Dernieres chain of barrier islands in Louisiana is experiencing land loss and fragmentation as a result of both natural processes and human activities. Trinity Island was expected to be lost by the year 2007 if no restoration was completed. The entire Isles Dernieres chain was projected to be lost by the year 2010 without restoration.

Louisiana's barrier islands buffer coastal areas from the storm surges that accompany hurricanes and tropical storms. They also protect interior fringe wetlands along the bay's shoreline from waves coming from the open Gulf of Mexico. Trinity Island serves as a nursery area for waterfowl and migratory species.

Restoration Strategy

The project required restoration of approximately 7.5 miles of both Trinity and East islands. It involved the construction of temporary perimeter containment dikes behind considerable stretches of the islands.

Sediment was suction-dredged from previously defined borrow areas of Lake Pelto and used to hydraulically fill the areas within the retaining dunes and dike structures.

An elevated marsh platform sloping from the dunes to the back bay dikes was created. The dunes and filled marsh were also planted with various species of vegetation.

Trinity Island sand fence and vegetative plantings.

Progress to Date

Construction of this Isles Dernieres project is complete. The dredging and shaping was completed in October 1998 and the vegetative planting was completed in June 1999.

Approximately 500 acres of island were created. The "net benefit after 20 years" figure listed above is the amount projected to remain of the created acreage at the end of the 20-year life of the project. Not included in the benefited acreage figure are benefits to the inland marsh because of reduced wave energy due to barrier island restoration.

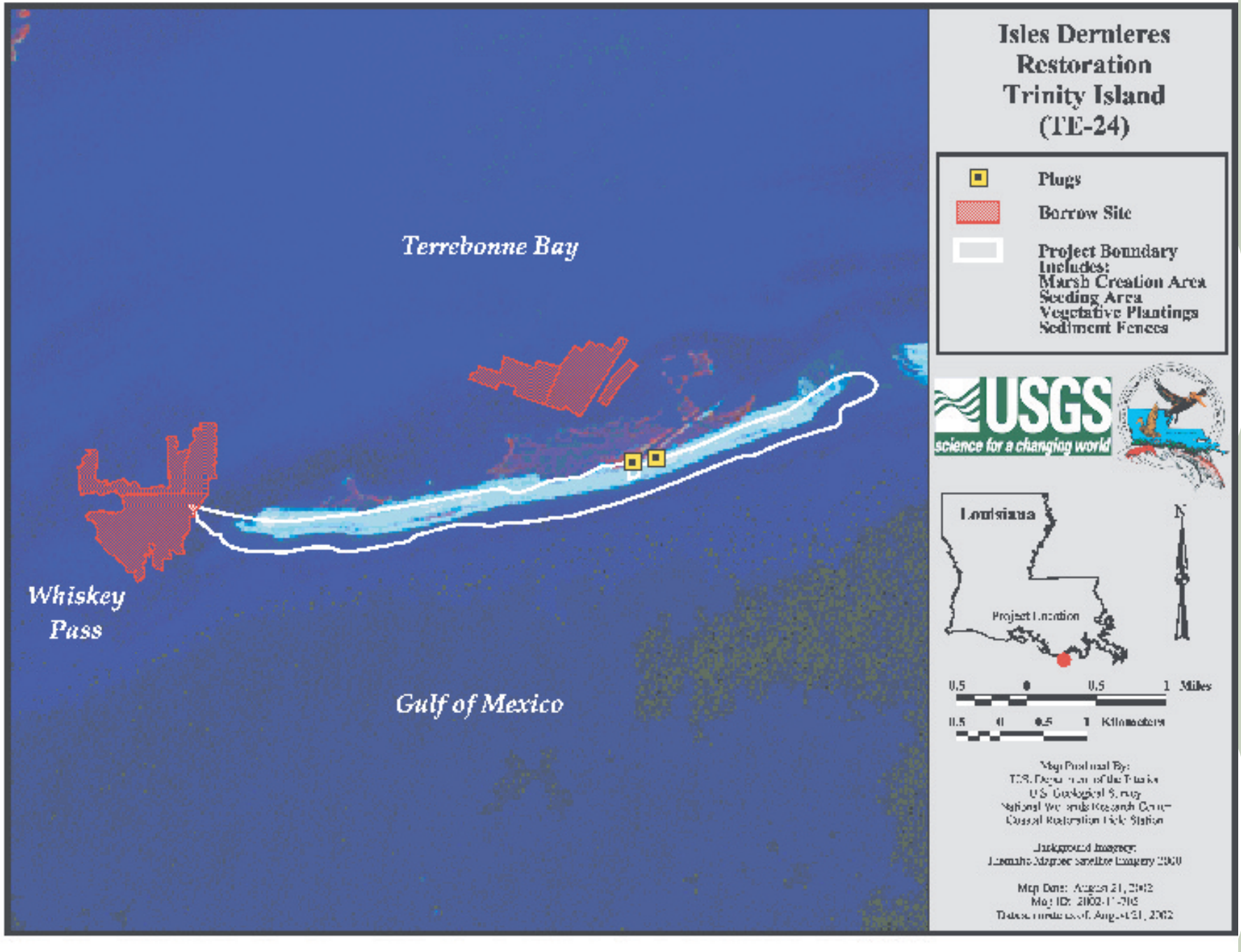
Dune elevation, along with sand fencing and vegetation, is enhancing the barrier island's capabilities to buffer storm surges to fringe marshes and coastal towns. The temporary containment dikes have degraded because of natural processes. Intertidal areas have developed naturally.

This project is on Priority Project List 2.

For more project information, please contact:

Federal Sponsor:
U.S. Environmental Protection Agency
Dallas, TX
(214) 665-7255

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736


Terrebonne Bay
Whiskey Pass
Gulf of Mexico
Isles Dernieres Restoration Trinity Island (TE-24)
Plugs
Borrow Site
Project Boundary Includes:
Marsh Creation Area
Seeding Area
Vegetative Plantings
Sediment Fences
USGS
science for a changing world
Louisiana
Project Location
N
0.5 0 0.5 1 Miles
0.5 0 0.5 1 Kilometers

Extension Activity

1. Visit a barrier Island restoration project that involves pumping sediment onto the island.

2. Invite a speaker from the CWPPRA program to the class to provide in-depth information about the projects.

3. Assign a research project to groups of students that increases the amount of information gathered from the CWPPRA and other websites.

4. Arrange for your students to attend an event such as Ocean Commotion or Louisiana Earth Day's Wetland Tent and assign information gathering tasks involving interviewing experts and gathering a variety of data from exhibits.

Resources

William, S. J., Penland, S., Sallenger, A. H., (Eds). 1992. Louisiana Barrier Island Erosion Study: Atlas of shoreline Changes in Louisiana from 1853 to 1989. USGS.
http://marine.usgs.gov/fact-sheets/Barrier/barrier.html
www.lacoast.gov

The Coastal Wetlands Planning, Protection and Restoration Act Web Resources
www.LACoast.gov (The link to the fact sheet is
http://lacoast.gov/new/Projects/Info.aspx?num=TE-24)

The Barataria-Terrebonne National Estuary Program
www.BTNEP.org

The U.S. Geological Survey National Wetlands Research Center
www.nwrc.usgs.gov/

Land Area Change in Coastal Louisiana from 1932 to 2010 (June 2011) The analyses of landscape change presented in this report use historical surveys, aerial data, and satellite data to track landscape changes. Summary data are presented for 1932–2010; trend data are presented for 1985–2010.
http://pubs.usgs.gov/sim/3164/

follow up

Assessments

Rubric:

Objectives	Criteria				
Points	**1**	**2**	**3**	**4**	**Points**
Students will analyze maps and graphed data showing a barrier island before and after restoration and before and after Hurricanes Katrina and Rita.	Student answered at least 50% of questions accurately for maps and graphed data.	Student answered more than 70% of questions accurately for maps and graphed data and made plausible inferences and predictions	Student answered at least 90% of the questions accurately for maps and graphed data, made plausible inferences and predictions and demonstrated an overall understanding of the meaning of the data for coastal restoration.	Student answered 100% of the questions accurately for maps and graphed data, made insightful inferences and predictions and showed deep understanding of the meaning of the data for coastal restoration.	
Students will evaluate the success of the restoration project using the data and by collecting online information.	The student gathered some data and was able use the information to list at least 1 cost and 1 benefit for the project.	The student gathered adequate information from data presented and on-line sources to list at least 2 costs and 2 benefits for the project.	The student gathered adequate information from data presented and on-line sources to list at least 3 costs and 3 benefits, including "hidden" costs and benefits and wrote thoughtful conclusions about the project's overall value and success.	The student gathered plenty of information from data presented and on-line sources to list at least 4 costs and 4 benefits, including "hidden" costs and benefits and wrote and defended insightful conclusions about the project's overall value and success.	
Students will predict the future changes in land area in the barrier islands.	Student used data presented to write at least one plausible prediction about the future of Louisiana's barrier islands.	The student used data presented and gathered from an on-line source to make more than one plausible prediction about the future of Louisiana's barrier islands.	The student used data presented and on-line source to make and defend at least insightful predictions about the future of Louisiana's barrier islands.	The student used data presented and gathered from an on-line source to make and defend at least 3 insightful predictions about the future of Louisiana's barrier islands.	
Total Points					
Teacher's Comments					

follow up

GLE's

Ecological Systems and Interactions
Describe the abiotic and biotic factors that distinguish Earth's major ecological systems (SE-H-A1)

Resources and Resource Management
Identify the factors that affect sustainable development (SEH- B6)

Personal Choices and Responsible Actions
Analyze the effect of common social, economic, technological, and political considerations on environmental policy (SE-H-C3)

Analyze the risk-benefit ratio for selected environmental situations (SE-H-C4)

Describe the relationship between public support and the enforcement of environmental policies (SE-H-C5)

Environmental Awareness and Protection
Describe how accountability toward the environment affects sustainability (SE-H-D5)

Lesson Source

Pontchartrain Institute for Environmental Sciences
University of New Orleans

BTNEP
BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM

COASTAL WETLANDS PLANNING, PROTECTION, AND RESTORATION ACT

The Great Marsh Dilemma

Objectives

Students will:

- take roles of members of the community who have an interest in the future of a large tract of marsh land and meet to make their recommendations.
- take roles of parish police jurors charged with the task of developing a management plan for the land.
- Solve the problem of a lawsuit brought against the police jury by a party dissatisfied with the management plan.

Overview

This role play helps students understand the many sides to the problem of wetland loss in Louisiana.

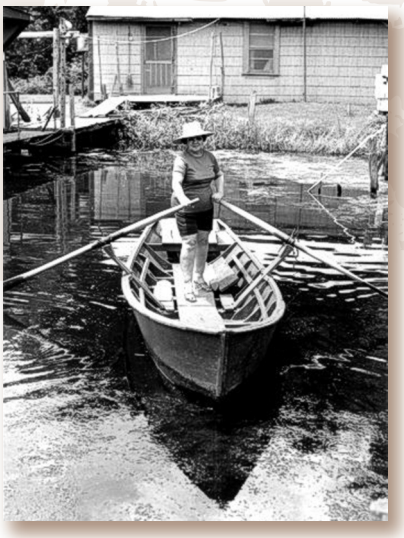
Materials

- Role play cards (laminated, if possible)
- Props for police jury debate—students can choose a simple prop to represent their profession or occupation
- Props for courtroom scene
- Flip chart, easel, markers or chalkboard

Background:

This activity has three parts. In the first part each student receives a role card describing the position of a community member who will make a position statement at a public meeting. After preparing their statements, the students role play a town meeting at which they take turns to make statements. Each speaker's recommendations are recorded on a flip chart, and allowed and prohibited uses are listed as the meeting progresses.

In the next phase of the activity, the students assume the roles of police jury members (they are no longer playing the special interest roles of the first part of the activity). A mock police jury



Preparation

- Run off and laminate the role play cards.
- Collect props for police jury debate and courtroom scene.
- Familiarize yourself with *Robert's Rules of Order* for the police jury meeting.
- Contact a person to serve a subpoena (police officer, judge, principal, etc.)

meeting is held with the teacher or leader as chairperson. At this meeting, the police jury members' charge is to develop a management plan for the marsh area using the citizens' recommendations and the list of allowed and prohibited uses developed during the first meeting. The main uses are discussed and a plan written. This plan is displayed in the classroom. At this point, the teacher discusses why certain uses were allowed or prohibited and the potential biases that were evident. The idea that, in some cases, compromise is necessary can be discussed, too. The ideas of sustainability and mitigation are central to this discussion.

In the last phase of the activity, a surprise visitor serves the entire police jury with subpoenas to appear in the court to defend their decisions in a suit filed by a party whose special interests were not met in the management plan. Finally, a court scene is acted out. Students are called upon to testify in their original roles of citizens with special interests in the future of the land. To conclude the court scene, the judge, played by the teacher or leader, must decide who has the most convincing arguments: those in favor of plaintiff's suit or those against.

This activity plays out differently with each group of students. The important lesson is that resolving a dilemma such as this one within a community is very complex. During the police jury meeting, individual biases will play a large part; this will be recognized. The students should see how a balance or compromise is often the final outcome, with consideration being given to retaining the functions and values of the wetland while allowing some uses that will economically benefit the parish

The Great Marsh Dilemma

Procedure

1. *Read the introductory paragraphs (below) to the students. Embellish the story and explain the situation in any way you wish to help your students grasp the central dilemma.*

We are members of a coastal community that has recently lost a well-respected friend, Mrs. LaTerre. The LaTerre family has lived in this parish since 1780, when it obtained a Spanish land grant. Although the family was once prominent, Mrs. LaTerre was the last remaining survivor. She loved the parish and the land.

Mrs. LaTerre has bequeathed an 80,000-acre tract of marsh land to a Louisiana coastal parish upon her death. Members of the community are now at odds about how the land should be used. The police jury of the parish has been given the task of deciding the future of this valuable piece of property. Mrs. LaTerre made no stipulations in her will about the land, other than the land should be used to "benefit the residents of the parish." The interpretation of this phrase is what has created the dilemma. Some members of the community and police jury consider the word "benefit" in economic terms only; others disagree with that interpretation, contending that the aesthetic quality of the land must be preserved. Some advocate a complete "hands off" approach in which the land should be made into a wildlife refuge with limited access by residents. A nonprofit organization has shown an interest in purchasing the land from the parish to set it aside for conservation and education purposes only.

The land itself is made up of mostly pristine intermediate marsh habitat, with some freshwater marsh and swamp on the inland side, and some brackish and salt marsh closer to the Gulf of Mexico. It is home to incredible populations of wildlife and acts as a nursery for many seafood species. This coastal parish depends heavily on commercial fishery landings for its income, as well as the presence of many recreational fishers who visit and spend money in stores and at other local businesses. Members of the community are aware of the relationship between healthy marshes and productive fisheries.

The land has been in the ownership of the same family since the 1700s. The only development has been several hunting and fishing camps and a few small oil wells owned by the family. There is suspected to be a fairly large reserve of oil beneath the property that has not yet been exploited. An oil company, having heard about the ownership change, is interested in exploration with a view toward producing the oil and gas from the property.

The Great Marsh Dilemma—CONT'D.

Discuss the concepts involved so the students understand the big picture concerning the land. Consider posting a USGS topographic map of a suitable marsh area on which you have marked out an 80,000-acre area. This will assist students in understanding the size and location of the land.

2. Our job is to work together to decide what should be done with the land. We have many options. Remember, however, that the land is mostly coastal marsh and unsuitable for urban development. As you think about the dilemma, bear in mind all the things you have learned about the functions and values of wetlands and the problems of coastal land loss and pollution we have discussed.

3. First we will hold a public meeting at which people with special interests in the area may make statements about how they think the land should be developed. Next, we will hold a police jury meeting. All of you will represent members of the parish police jury. We will discuss proposals of the people who spoke at the town meeting. Our job will be to rank the potential uses of the land and develop a management plan for the land.

Here are 10 role cards. *(Role Play cards)* If you want to play a role of a special interest group representative, listen to the names as I read them. Raise your hand to volunteer to play that role. *Students can play more than one role, as is the case in real life. You can also create additional roles if desired.*

- Sierra Club, represented by Ms. Scarlet Tanager.
- Shrimp fisherman's union, represented by Ted Trawl.
- Oil and Gas Industry Consortium, represented by Mr. R. Evenue, a member of the parish police jury.
- University researchers, represented by Professor O. Tolith, a marine scientist at Louisiana State University Marine Science Lab.
- Local concerned citizens, represented by Ms. Lindy Lovetree.
- Ducks Unlimited, represented by Mr. Merve Ganzer, a local hunting enthusiast.
- Recreational fishermen, represented by Mr. Red Drum.
- Parish Economic Development Council, represented by public affairs professional with expertise in ecotourism, Ms. Misty Waters.
- Archeologist, represented by Ms. Betsy Diggs, who is particularly concerned about the cultural history of the area.
- Businessman and land developer, Mr. Q. Buck.

The Great Marsh Dilemma—CONT'D.

Allow students time to familiarize themselves with their roles as explained on the role cards.

4. *Conduct a town meeting, with yourself as chairperson, at which the students assume their roles and state their opinions on the appropriate use of the land. Record the citizens' recommendations about use of the land on a flip chart or chalk board. After the positions have been stated, have the students create a list of allowed and prohibited uses and record them on the flip chart.*

5. Now we will hold a police jury meeting to discuss the proposals made at the previous meeting and to develop a management plan for the land. *Hold a parish police jury meeting to develop the management plan for the land. Follow Robert's Rules of Order throughout the meeting.*

Presiding over the police jury meeting is Poll E. Ticker (me). I call this meeting of the Parish Police Jury to order. We will follow *Robert's Rules of Order* throughout the meeting. Each of you is a member of the parish police jury and you have the right to state your opinion—provided you address the chairperson (me) correctly first.

We will begin with the list of allowed and prohibited uses from our previous meeting. First we will rank the listed uses by taking a vote on each one. Your vote for the proposed land use will indicate that you support the proposed use of the land. The number of votes determines the rank of the proposed land use. We will use this ranked list to write our management plan for the LaTerre land.

6. *After the management plan has been developed, have someone (a local policeperson, judge, the principal, etc.) enter the classroom to serve the police jury members with subpoenas stating that they are being sued by whichever special interest group feels it did not get due consideration during the final police jury vote. [Inform your visitor about particulars of the disgruntled group. You can even prepare simulated subpoenas for the person to hand out to the class.]*

7. *Hold a mock court case with roles of judge, plaintiff's lawyer, defense lawyer and witnesses from the council meeting, including all those who wish to speak. After all the testimony is heard, the judge can make a ruling or the class can serve as a jury to vote on a decision. Again, the teacher or leader may wish to play the role of judge to ensure the role-playing stays on track.*

activity

The Great Marsh Dilemma

Role Play Cards

Ms. Scarlet Tanager

Sierra Club

We feel truly pristine natural areas are becoming dangerously scarce, jeopardizing the biodiversity of the nation as well as our beautiful state. This has implications for many user groups—the fishermen, hunters, wildlife enthusiasts, scientists, as well as the general public who benefit from sharing their world with nature. This area is one of the last undisturbed wilderness areas of our state. It is home to hundreds of species of birds: migratory water fowl, wading birds, pelicans, egrets and bald eagles. We also believe the parish has a wonderful opportunity in the form of this generous gift of the LaTerre family to contribute to the future of Louisiana. We feel this land should be set aside as a wildlife preserve, managed for the benefit of the wildlife, not for people and financial gain. If we allow oil and gas interests or other commercial developments encroach on this land we will lose an opportunity to save an ecosystem that cannot be replaced.

Dr. O. Tolith

Louisiana State University Marine Lab

At our research and teaching facility we have discussed the need for access to pristine wetland environments. There are few truly undisturbed sites that can be used as control sites for our research on the effects of pollution on the wetlands. We would like to find a site where students could learn about wetland ecology and do field work. The LaTerre land would solve our problem if we could have access to it. Ideally we would like to acquire a small portion to build a field laboratory and dormitories. This would cause limited disturbance to the wetlands. As for large-scale commercial or industrial development on this land, we feel it would do irreparable harm to this unique ecosystem. Therefore, we urge the council not to accept the offers of the oil and gas industry in spite of the economic temptation.

Mr. Ted Trawl

Shrimpers United

My family has been in the shrimping business here for generations. We have seen many changes over the years. When a marsh is affected by erosion or development, the shrimp lose their habitat for the juveniles to grow and mature. If we lose more marsh in this parish, my shrimping business will not survive. Think about the economic impact of all the shrimping in this parish. If we were to lose the shrimp, we would lose a lot. If you like shrimp, you should be for preserving the marsh.

Ms. Lindy Lovetree

School teacher, concerned citizen

I have lived here all of my life and, being a teacher and a mother, my concern is for the next generation. Although I agree that children need opportunities and the community would benefit from economic improvements, let's keep all this in perspective. I cannot see destroying this unique and beautiful place in the name of progress alone. I share Dr. Tolith's views about the educational value of these wetlands, but I feel we must also preserve them because of the ways in which they affect the quality of all of our lives here. To develop the LaTerre land would take away the natural beauty that is so easy to take for granted. I believe we should keep the land in its present state and allow the citizens of our parish and visitors to enjoy the waterways for fishing and bird watching. And let's not forget the values provided the wetlands in terms of flood protection and as a buffer against hurricane damage and as a filter for the pollutants our everyday lives produce.

activity

The Great Marsh Dilemma

Role Play Cards

Mr. R. Evenue

Louisiana Oil and Gas Consortium

Our recent seismic survey showed large reserves of oil and gas beneath the land that this parish now owns. The economic benefits to be gained by the parish from extracting these mineral resources are incredible. The parish is suffering from economic depression and could certainly use these revenues. Visualize new schools for the children of the parish with computers in every classroom and modern teaching equipment, new businesses providing many new jobs for the people of this parish, helping to keep families together. We all use energy—and lots of it. We use it in our cars, boats and in our homes. We need the energy here and throughout the United States. The only wise choice is to develop the potential oil and gas reserves on the LaTerre land. To choose otherwise would be robbing your children of their future in the parish. Today oil and gas extraction can be done with minimal environmental impact. When properly done, we can have the energy and the jobs and protect the environment, too.

Mr. Merve Ganzer

Ducks Unlimited

I represent Ducks Unlimited. We are a national organization concerned with maintaining adequate habitat for water fowl of all kinds. If we fail to protect wildfowl habitats, we will see a decline in duck populations nationwide. The LaTerre land is prime habitat for the ducks and geese that migrate to Louisiana from the north each winter to feed. If this marsh is developed, we will destroy the duck habitat and will have lost an opportunity to develop the potential of this land for duck hunting. Duck hunters can contribute huge amounts to the economy of this parish if you provide access for them during hunting season. I advocate the acquisition of at least 75% of the LaTerre land by Ducks Unlimited for waterfowl protection and hunting. We discourage any development that would alter the hydrology of the land as well as development for oil and gas extraction. We also discourage drainage of marsh waters for construction of any kind.

Mr. Red Drum

Recreational fisherman

Fishing is a big industry here in Louisiana. The recreational fisherman contributes millions of dollars annually to the economy of the state. The LaTerre wetlands, which the parish now owns, are literally a gold mine in terms of fish and the potential for economic gain from encouraging recreational fishing in the area. I see a marina with accommodations for visitors and docks for their boats. I picture big events bringing thousands of visitors here—like the fishing rodeos on Grand Isle. Hotels, restaurants, campgrounds—all of these will benefit if you draw recreational fishermen here. At the same time, you will not need to spoil the beauty of the wetlands themselves. In fact, the more they are left as they are, the better the fishing will be.

Mr. Q. Buck

Businessman

I own a construction business. Buck's Construction is located in this parish and to stay in business and make money, we need to be building things. We can build anything, but the contract has to be there. I can hire the young men of this parish in well-paying jobs once we get the contracts. Real economic development is not in little "warm and fuzzy" projects. We need BIG projects—multi-million dollar projects! We need to extract the minerals that lie beneath the LaTerre marsh or we are cheating ourselves out of a livelihood and schools, stores, shopping malls, big houses, new cars—you name it—we can have it if we are smart. We need to allow the oil industry in to do business in our parish or we will be poor forever.

activity

The Great Marsh Dilemma

Role Play Cards

Ms. Misty Waters

Parish Economic Development Office

We must be realistic. Our parish does not have a sound economic base. We need to proceed carefully and develop the potential of this parish for attracting visitors from far and wide. We have alligators and mysterious swamps. We cook the most delicious food in the nation! We just need to provide good opportunities for tourists and they will come—ready to spend money in our parish! For the LaTerre land, I see a crucial role in strengthening our standing in the tourism industry. We just need to attract investors who are willing to build quality accommodations. Local people will find work as swamp tour guides. We can market the romance of our swamps! Although oil and gas development would bring revenues and business to our parish, do we really want to see ugly oil field equipment trucks rumbling through our town and barges on our waterways? Or do we want to see people enjoying the beauty of our unspoiled wilderness and coming from far and wide to observe the migration of neotropical birds?

Ms. Betsy Diggs

Archeologist

I am just horrified by some of the things I have heard today. I guess none of you have heard of Section 404 of the Clean Water Act. Not one person has mentioned that wetlands can not be developed in any way we please. Before any project involving alteration of a wetland can begin, a permit process must be followed. If the people of the parish have any concern at all for the LaTerre land and the wonderful family who left it to the parish, they will make certain that a full environmental impact statement is conducted before any permits are issued. My job involves documenting past human activities in places that may be altered. I know that this land has Native American burial mounds and shell middens where villages once stood. We should learn about the people who once lived on the land we now claim as ours. We must show respect to them in deciding the fate of the LaTerre land. I urge this council to be cautious in their decisions and not let promises of big shiny cars and beautiful shopping malls blind you.

follow up

Assessments

Write a short summary of how the public must work together to solve wetland issues.

Resources

BTNEP Resource:

Portrait of an Estuary, publication by LSU AG and BTNEP

Websites:

Rules Online website, no date, **Robert's Rules of Order Revised, by General Henry M. Robert, 1915 4th Ed., Public Domain**, accessed July 8, 2005 at http://www.rulesonline.com/

Online reference for Robert's Rules of Order.

Holmstrom, Laurel, Sonoma State University, May 13, 2003, **Robert's Rules of Order Made Simple**, accessed July 8, 2005 at http://www.sonoma.edu/Senate/Roberts_Simple.html

Summary of Robert's Rules of Order.

References:

Sylvester, Nancy. 2004. **The Complete Idiot's Guide to Robert's Rules.** Penguin Group (USA), 352 pp. ISBN: 1592571638.

A book on Robert's Rules that is loaded with understandable and easy to read information.

Jennings, C. Alan. 2004. **Robert's Rules for Dummies** (Dummies Series). Wiley, John & Sons, Inc., 338 pp. ISBN: 0764575740

A book on Robert's Rules that walks readers through assembling a quorum, the order of agenda, the steps for making a motion, nominating and electing officers, and becoming involved in committees.

follow up

GLE's

Environmental Science-Personal Choices and Responsible Actions
Analyze the effect of common social, economic, technological and political considerations on environmental policy (SE-H-C3)

Analyze the risk-benefit ratio for selected environmental situations (SE-H-C4)

Describe the relationship between public support and the enforcement of environmental policies (SE-H-C5)

Environmental Awareness and Protection
Describe how accountability toward the environment afftcts sustainability (SE-H-D5)

Lesson Source

BTNEP
BARATARIA-TERREBONNE
NATIONAL ESTUARY PROGRAM

Dialogue—Disappearing Wetlands

Objectives

Students will:

- analyze David Bates' painting, *Grassy Lake*, generating and interpreting a list of what they observe in the painting.
- improvise a dialogue between two people in a canoe in a swamp.
- write a dialogue about the disappearing wetlands in Louisiana, using the writing process, i.e., prewriting, drafting, reviewing, and editing.
- research the wetlands of the BTE for the purpose of creating a script that will be shared with an audience.
- critique, edit and revise each others' work.
- learn techniques needed to create a tape of their dialogues.
- use the Internet to find an appropriate audience with whom to share their taped dialogues.
- make a fact page or brochure to provide additional wetlands information to their audience.
- record daily reflections in their journals about the process.

David Bates, *"Grassy Lake,"*
oil on canvas, 1982, New Orleans Museum of Art: Museum purchase P. Roussel Norman Purchase Fund and Gift of Mr. And Mrs. Claude C. Albritton, III, 83.27

Overview

This role play helps students understand the many sides to the problem of wetland loss in Louisiana.

Dialogue—Disappearing Wetlands

Preparation

- Acquire a print of *Grassy Lake*
- Make copies of opening lines (Refer to "Process," Step 7)
- Gather materials
- Make copies of Checklists
- Download information on David Bates (Refer to "Resources.")

Materials

- print of *Grassy Lake* (p.76)
- two caps (optional)
- copy of opening lines
- access to computers and Internet
- audiotapes
- paper/pens
- canoe paddles, real or cardboard (optional)
- journals
- resource books
- Handout: *Checklists* (pp.72-73)
- tape player

My work in the last few years has been a process of allowing myself to paint subjects that I really cared about—finding my own place that is special to me. My Grassy Lake pictures are more than a series of paintings for me. They represent the ongoing life of an ancient lake swamp in which I am privileged to participate.
~ David Bates

North Texas Institute for Educators on the Visual Arts (n.d.) retrieved December 21, 2004 from http://www.art.unt.edu/ntieva/artcurr/alsp/ bates.htm

David Bates, born in Texas in 1952, loved and appreciated the unique beauty of the wetlands in Texas, Louisiana, and Arkansas. In particular he was enthralled by the wildlife, water, and light of Grassy Lake in southwestern Arkansas, and in 1982 he painted Grassy Lake, currently on display at the New Orleans Museum of Art.

A dominant theme in Bates's work is the relationship of humans to nature. Grassy Lake serves as a catalyst for inspiring students to research and create dialogues that will educate people about the Louisiana wetlands. Students will record their dialogues on audiotape and find appropriate local and national venues.

Procedure

Dialogue—Disappearing Wetlands

1. Ask students to observe quietly the print, *Grassy Lake*, for approximately three to five minutes.

2. Partner students to record everything they observe in the print.

3. Briefly share observations with the whole class.

4. Discuss what inferences can be made from what was observed, using the following questions:
   - Where are they?
   - Who are they?
   - What is their relationship to each other?
   - Why are they there?
   - How are they feeling about being there?

5. Ask the following questions when discussing the artistic attributes of *Grassy Lake*:
   - What is the focal point, the portion of the painting that draws your attention? (the men's faces)
   - In what direction do your eyes go when looking at the painting? (The slanted oars pull the viewer's eyes diagonally, across the painting.)
   - How does Bates use shapes? (The objects are composed of geometric shapes—rectangles, circles, triangles, and ovals—to illustrate men's legs and arms, the canoe, lily pads and flowers.)
   - Does this painting look realistic? (No)
   - How does it portray the details and the beauty of the swamp? (Answers will vary.)
   - From what point of view is it painted? Why? (The point of view is between bird's eye view and a straight-on view; allowing us to see both men's faces)
   - How does Bates' style of painting portray a connection between the two men? (the foreshortening [a technique that gives the illusion of depth to a person/object so that it appears to push forward or go back into space] shows the closeness both physically and figuratively, between the two men)
   - How else does Bates' style of painting portray a connection between the two men? (Answers will vary.)

6. Have students write words and phrases in their journals describing feelings they have about the painting.

7. Role Play: Initiate dialogue in the canoe by printing the following "One Liners,"

cutting them out and giving one question/comment to each pair in the canoe.

- What was that sound?
- I don't know if this was such a good idea.
- This reminds me of the last trip we had together.
- How will we get help?
- Are you sure that you know where we are?
- Why did we come here?
- Did we take a wrong turn?
- I have never done anything like this before.
- Did you see that?
- It's getting late, shouldn't we turn back?
- Was that lightning?
- How will we turn around since the vegetation is so thick?
- What was that?
- Did you hear thunder?
- There is nothing like this were I come from.
- That is amazing; what is it?
- This wouldn't have happened yesterday.
- Will it always be like this?
- Are you going to miss this?

Dialogue—Disappearing Wetlands

8. Give students five minutes to improvise a dialogue using their opening lines.

9. Allow the partners to wear the caps and hold the oars as they share their dialogues with the whole group.

10. Critique the performances, e.g., authenticity, voice, facial expression, movements, etc.

11. Share background information about David Bates and Grassy Lake, Arkansas. (Refer to "Resources.")

12. Have the students research the wetlands of Louisiana. A good place to start is the URL http:://www.marshmission.com, a chronicle of the artistic journey of naturalist-photographer C. C. Lockwood and landscape artist Rhea Gary into Louisiana's wetlands.

13. Pass out copies of the handout Checklists. Review the criteria for "Dialogue Writing."

Dialogue—Disappearing Wetlands

14. Use the dialogue *If We Don't Protect the Wetlands—Our Name is Mud* (pp.74-75) as a practice activity, illustrating how to write a script as well as how to make an audiotape.

15. Place students in cooperative groups of three.

16. Give them time to write a three-to-five minute dialogue about the disappearing wetlands of the Barataria-Terrebonne Estuary.

17. Practice performing the dialogues.

18. Review and edit the script, if necessary.

19. Review the criteria for "Making an Audiotape" on the handout Checklists.

20. Make an audiotape of the dialogues.

21. Critique and edit the audiotapes, if necessary.

22. Discuss possible local/state/national/international audiences to receive the tapes.

23. Use the Internet to find an audience to receive the tapes.(Check out ePALS in the "Resources.")

24. Ask students to research and create an information flier about Louisiana's disappearing wetlands that will accompany the tape.

25. Review the criteria for "Designing an Information Flyer" on the handout Checklists.

26. Critique and edit the information flyers, if necessary.

27. Send tapes and fliers to an authentic audience.

Dialogue—Disappearing Wetlands

Checklists

WRITING DIALOGUE

Your script should include:

- ☐ a sense of place—in the wetlands, in a canoe
- ☐ a narrator
- ☐ an introduction using vivid descriptive words that capture the essence of the wetlands
- ☐ dialogue between two people—one is the guide who has lived in the area all his life, and the other is a traveler on his first trip to the wetlands
- ☐ crisp dialogue that bring the characters to life
- ☐ clear description of a problem, concern, issue, or feeling
- ☐ dialogue that "rings true"
- ☐ dialogue that creates an emotional impact—there is a connection between information and feeling
- ☐ dialogue that educates the audience about the wetlands' environment
- ☐ evidence of knowledge about the wetlands, its plants, and animals
- ☐ sufficient dialogue for a performance that lasts between three and five minutes
- ☐ citation of resources

MAKING AN AUDIOTAPE

Your completed tape should:

- ☐ be easily understood
- ☐ contain subtle swamp sounds
- ☐ last between three and five minutes
- ☐ have an emotional impact on the audience

When you are recording your dialogue:

- ☐ vary the rate of speech—slower to convey suspense, faster to evoke action
- ☐ articulate clearly, using adequate volume
- ☐ shift characters smoothly
- ☐ it should be easy for the listener to identify who is speaking

Dialogue—Disappearing Wetlands

Checklists—CONT'D.

DESIGNING AN INFORMATION FLYER

Your information flyer should:

- ☐ inform the audience of the importance of the wetlands
- ☐ inform the audience of the future of the wetlands if nothing is done, and how this will impact Louisiana and the United States
- ☐ consist of short, concise bullets
- ☐ include an eye-catching graphic that is related to the message

Review and make sure that:

- ☐ all facts are accurate
- ☐ capitalization, punctuation, grammar, and spelling are correct
- ☐ vocabulary is appropriate for the audience; words are defined, if necessary
- ☐ information is organized
- ☐ formatting is attractive and attention getting, i.e., type and size of font, bold text, use of color
- ☐ layout and design look professional, e.g. neat and attractive

"Blue Marsh"
Marian Brister Martinez, artist.
Printed with permission.

If We Don't Protect the Wetlands—— Our Name is "Mud"

Bobby is an old Cajun who lives on the banks of Lac des Allemands. Elton is an up-and-coming cosmetics consultant from New York City trying to determine if his company can use mud from Lac des Allemands for their new Mud Mask.

Bobby: I grew up here, you know. Spent my childhood on these banks and waters.

Elton: Did you now? Tell me more about this lovely mud.

Bobby: Look at those cypress trees! Have you ever seen anything more beautiful?

Elton: Well, actually (under his breath) .....yeah, sure.....

Bobby: Do you realize that a few years ago that this very spot would still be on dry land? This part of the lake has eroded away.

Elton: So....there's plenty of mud here. About the mud.....

Bobby: The mud is at the bottom of the lake.

Elton: No, really....

Bobby: We lose an average of a football-field size chuck of wetlands every thirty minutes. Every thirty minutes, Glen! Think about that!

Elton: My name is Elton.

Bobby: Saltwater intrusion is destroying these trees. They are disintegrating... along with my childhood.

Elton: We want to market this mud as a facial treatment. Can you tell me a little bit more about it?

Bobby: (sharply) Hold your paddle right, will you?

Elton: Don't talk to me like that! Who do you think you are?

Bobby: I'm trying to get you to listen to my story. These swamps are a habitat for muskrats. I had a pet muskrat. His name was Spot.

Elton: I really don't care about muskrats. Do you know of any way to retrieve the mud from the bottom of the lake?.

If We Don't Protect the Wetlands—— Our Name is "Mud"

CONT'D.

Bobby: Spot died a few years ago, but his kin still live in these wetlands. These disappearing marshes and swamps are their home, Glen, and mine, too. They are dying!

Elton: That's a shame. But perhaps the mud could brighten up their lives....and complexions..

Bobby: ENOUGH WITH THE MUD, MAN! That is not the priority here. These swamps are like my youth! They are disappearing!

Elton: Old dude, you're disappearing.

Bobby: You've got that right, because our culture will disappear along with these wetlands. My grandfather owned this land. Doesn't that mean anything to you? Don't you care about anything other than yourself ?

Elton: Quite frankly, no. But the mud means a lot.

Bobby: Did you see that Great Blue Heron just fly by?

Elton: It was the same color as our most popular eyeshadow, Grecian Slate.

Bobby: Don't you see? These wetlands are filled with potential. They are filled with inspiration for your makeup products. And they are dying because people don't care enough to fix the problems they're facing.

Elton: The colors of this swamp do remind me of the colorful shades of makeup back home in New York. Have you ever been to New York? It's quite different from here.

Bobby: This is my home, the only place I want to live. I'm trying to save my beautiful wetlands, while you are miles away putting makeup on beautiful faces.

Elton: (Thoughtfully) I know it must sound like I don't care, but I didn't know how valuable these wetlands are. But I see the error of my ways! The swamp is beautiful, and it needs to be saved.

Bobby: I can't believe you actually said that! But it is true. The swamp is a dying beauty, and it deserves our undying attention.

(Inspirational music)

David Bates, “Grassy Lake,” oil on canvas, 1982, New Orleans Museum of Art:
Museum purchase P. Roussel Norman Purchase Fund and Gift of
Mr. And Mrs. Claude C. Albritton, III, 83.27

follow up

Assessments

Use Rubistar to create rubrics for the presentation, tape, and flyer. The URL for Rubistar is http://rubistar.4teachers.org/index.php

GLE's

Biology—Interdependence of Organisms
Analyze positive and negative effects of human actions on ecosystems
(LS-H-D4) (SE-H-A7)

Environmental Science
Analyze the effects of common social, economic, technological, and political considerations on environmental policy (SE-H-C3)

follow up

Resources

About the Artist: David Bates
http://www.art.unt.edu/ntieva/artcurr/alsp/bates.htm

Art Education, Collaboration and the Internet
This is a how-to Web site on integrating the Internet and new technologies into the art curriculum. http://www.artjunction.org/articles/collab2.html

ePALS
ePALS is the world's leading provider of school-safe email and collaborative technology for the educational market. EPALS connects over 4.6 million students and educators in 191 countries for classroom-to-classroom projects and cross-cultural learning in the world's largest online classroom community.
http://www.epals.com/

Vanishing Wetlands: Two Views
http:://www.marshmission.com

Lesson Source

BTNEP
BARATARIA-TERREBONNE
NATIONAL ESTUARY PROGRAM

How Far Are You From The Sea? The Vertical and Horizontal Truth

Objectives

Students will be able to

- Identify and explain the causes of land loss in Louisiana
- Identify their school location from the sea both in vertical distance and horizontal distance
- Evaluate the risks of flooding in a certain area based on various indicators

photograph provided by BTNEP

Materials

- Access to the internet
- Computer that can access online videos
- Information pages on causes of land loss:
    - Sea level Rise
    - Subsidence
    - Hydrologic Change
    - Storms
    - Saltwater Intrusion
- Student Record Sheet
- Benchmark (Note: Markers in 2012 cost about $14 each with the printing http://www.berntsen.com/Go-Shopping/Surveying/Concrete-Survey-Markers/Aluminum-Concrete-Survey-Markers)

Background:

As Louisiana's coastal marshland continues to erode away from natural forces and human activities, the Gulf of Mexico will keep getting closer to our homes and communities; closer in terms of both distance and elevation.

The causes of coastal erosion include:

- **subsidence** (the sinking of marshland),
- **hydrologic changes** such as channelization (canals like the Gulf Intracoastal Waterway or GIWW),
- **saltwater intrusion**, and of course,
- **storms** washing away the shoreline.

The Gulf is also getting closer in terms of elevation due to **sea level rise**. Over the last 50 years, sea level along Louisiana's coast has risen about 1.5 feet. If these trends continue, storm surges will appear stronger and reach further inland.

So, just how far away is the Gulf of Mexico? If you live along the coast of Louisiana, you may be very familiar with the idea that we don't live very far from the sea. For example, in Vermilion Parish alone, if you traveled horizontally you might find these distances to the portion of the sea called the Gulf of Mexico:

- **Abbeville: 26 miles (14 miles to Vermilion Bay)**
- **Erath: 26 miles (12 miles to Vermilion Bay)**
- **Maurice: 36 miles**
- **Indian Bayou: 37 miles (20 miles to White Lake)**
- **Kaplan: 30 miles (17 miles to White lake**
- **Gueydan: 31 miles (15 miles to White Lake)**

But have you considered how far away you are from the sea based on total feet above sea level? Let's look at those numbers in Vermilion Parish again.

- **Abbeville: 8 to 15 feet above sea level**
- **Erath: 5 to 7 feet**
- **Maurice: 18 to 20 feet**
- **Indian Bayou: 15 to 19 feet**
- **Kaplan: 10 to 14 feet**
- **Gueydan: 6 to 7 feet**

Images from
http://en.wikipedia.org/wiki/Vermilion_Parish,_Louisiana

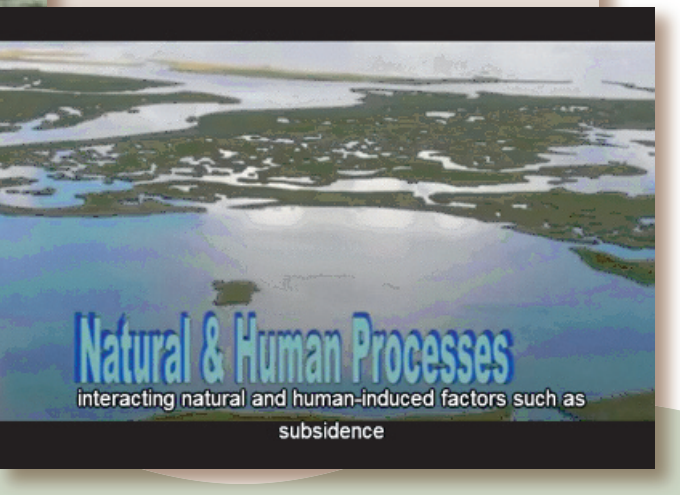
Procedure

Watch *"Sea-level Rise, Subsidence, and Wetland Loss"*
http://gallery.usgs.gov/videos/347
Sea-level Rise, Subsidence, and Wetland Loss

This video describes causes of wetland loss in the Mississippi River Delta. Rapid land subsidence due to sediment compaction and dewatering increases the rate of submergence in this deltaic system.

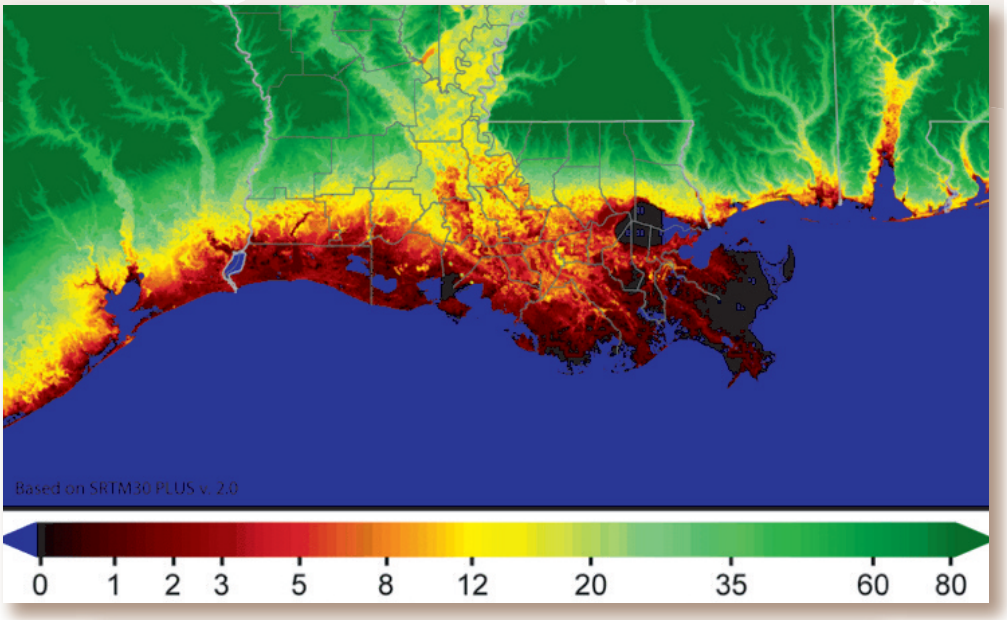
The construction of levees along the lower Mississippi River has also reduced delivery of sediments to coastal wetlands, which have been deteriorating as soil surfaces sink and wetland plants are subjected to excessive flooding. Other factors that have contributed to land loss include construction of canals and periodic hurricanes. Sea-level rise can lead to movement of saltwater inland, but coastal plants tolerate salinity through several morphological and physiological mechanisms.

The causes of wetland loss are complex and not the result of any single factor. Natural and anthropogenic factors have combined with global processes such as sea level rise to cause wetland loss in the Mississippi River Delta.



Sea Level Risks—Louisiana

Sea Level Rise



This map shows the risks associated with sea level rise.
http://ete.cet.edu/gcc/?/resourcecenter/viewResource/6

Let's start with sea level rise because it will affect all of the people on Earth who live in coastal zones.

Sea level rise is an increase in the mean level of the ocean. The National Oceanographic and Atmospheric Administration (NOAA) has been measuring mean sea level for over 150 years, with **tide stations** operating on all U.S. coasts. Sea level is the base level for measuring elevation and depth on Earth.

Because the ocean is one continuous body of water, its surface tends to seek the same level throughout the world. However, winds, currents, river discharges, and variations in gravity and temperature prevent the sea surface from being truly level.

So that the surface of the ocean can be used as a base for measuring elevations, the concept of "local mean sea level" has been developed. In the United States and its territories, local mean sea level is determined by taking hourly measurements of sea levels over a period of 19 years at various locations, and then averaging all of the measurements.

Global warming, the current period of climate change on Earth, is causing glaciers and ice sheets to melt. Melting ice sheets cause an elevation in sea level. This phenomenon is called sea level rise.

Geography

Sea Level Rise

Sea level rise threatens low-lying areas around the world. Island nations, such as Maldives and Comoros, are particularly at risk. Coastal cities, such as those along coastal Louisiana, New York City, New York, and Mumbai, India, must also prepare for higher sea levels.

photo credit: Marian Martinez

1. The earth's climates have changed in the past, are currently changing, and are expected to change in the future, primarily due to changes in the amount of light reaching places on the earth and the composition of the atmosphere. The burning of fossil fuels in the last century has increased the amount of greenhouse gases in the atmosphere, which has contributed to Earth's warming (4B/H6).

2. Human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and intensive farming, have changed the earth's land, oceans, and atmosphere.

Global sea level rose about 17 centimeters in the last century. Over the past decade, sea levels have risen at twice the rate of the preceding century. Currently, the rate of rise is a little more than 3 millimeters a year. There are two main factors responsible for sea level rise, and both are related to our warming climate: the melting of land-based glaciers and ice sheets, and the thermal expansion of the upper ocean caused by warming surface waters.

http://ete.cet.edu/gcc/?/resourcecenter/slideshow/6/81

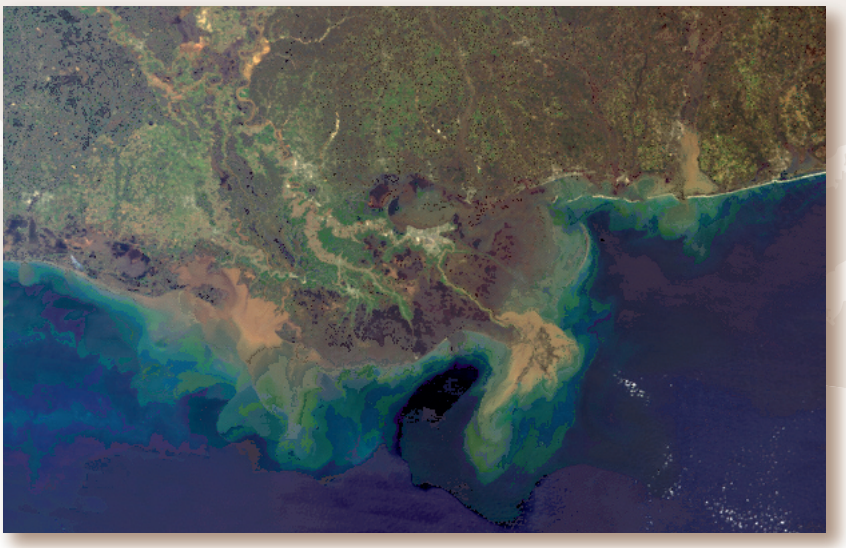
Geography

Subsidence

http://celebrating200years.noaa.gov/foundations/leveling/image8.html
This elevation benchmark shows the effect of subsidence.

The second reason Louisiana citizens need to be concerned about their "distance" to the sea is subsidence or the gradual sinking of land. Subsidence or the compaction of the sediments is influenced by a number of factors. Heavy sediment loads brought down by the Mississippi river are now being compacted. Additionally, organic material in the sediment oxidizes causing soils to eventually be compacted. Louisiana also has faults underground that can cause the land to slump. Geologically, the crustal adjustment in Louisiana may even be caused by the removal of earlier ice sheets far to north of this region. Fluid withdrawal due to hydrocarbon extraction may cause soil compaction or fault reactivation.

Hydrologic Changes

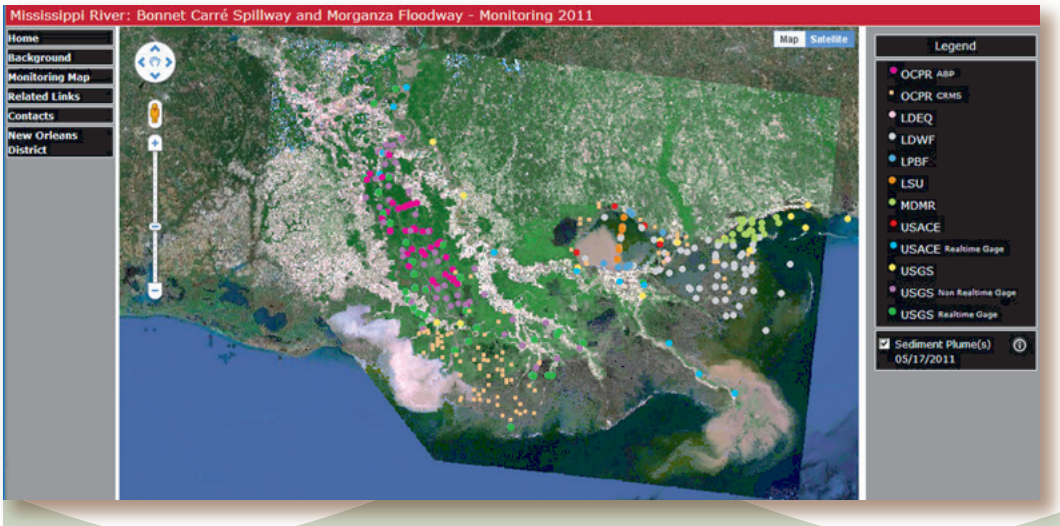


evNASA http://earthobservatory.nasa.gov/IOTD/view.php?id=1257
The Mississippi River carries roughly 550 million metric tonnes (500 million tons) of sediment into the Gulf of Mexico each year. This true-color image, acquired from the Moderate Resolution Imaging Spectroradiometer (MODIS) aboard NASA's Terra satellite via direct broadcast on March 5, 2001 at 10:55 AM local time, shows the murky brown water of the Mississippi mixing with the dark blue water of the Gulf two days after a rainstorm.

Hydrologic changes are defined as water flow variations that redistribute water with abrupt modifications or changes that occur faster than human or natural systems can adapt. In Louisiana, these hydrologic changes come from a variety of sources.

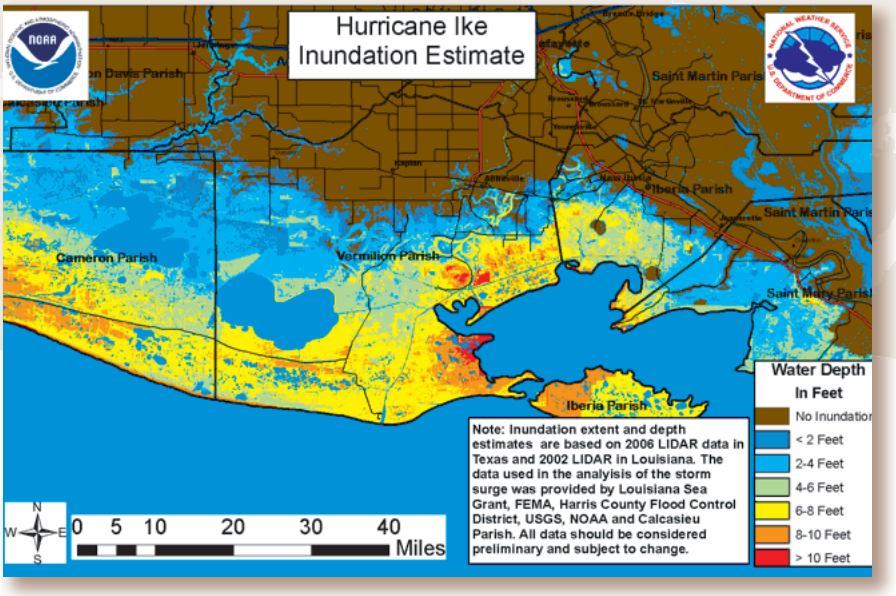
The leveeing of the Mississippi River protected citizens from flooding but now the river acts as a funnel, preventing sediment from flowing over wetland areas. The building of the Gulf Intracoastal Waterway (GIWW) provided intrastate transportation via a water canal between Texas and Florida, however over time, wake erosion has progressively widened the channel, and the spoil banks have breached allowing saltwater intrusion into previously fresh areas. Other navigation channels and oil field drilling canals also change the natural flow of water in Louisiana's coastal ecosystem.

Before human induced hydrologic alterations for flood protection, navigation channels, and drilling in the early 1900s, the natural drainage of the rivers in Louisiana provided a sheet flow across the wetlands delivering sediment. As tributaries were cleared, deepened, and somewhat straightened vital sediment and nutrients were funneled out into the Gulf of Mexico.



This map has been developed to serve as a data portal to the various monitoring activities related to the opening of the Bonnet Carré Spillway and the Morganza Floodway in 2011. Collaborating organizations that have provided their monitoring information are reflected on the map with links to their data, where available. This map only provides known monitoring information related to the 2011 opening of the Bonnet Carré Spillway and the Morganza Floodway and does not provide an exhaustive list of existing gages and other data collection points.
http://deltas.usgs.gov/spillway/BonnetCarre2011.aspx

Storms



From: Land Area Changes in Coastal Louisiana After Hurricanes Katrina and Rita by John Barras
pubs.usgs.gov/circ/1306/pdf/c1306_ch5_b.pdf

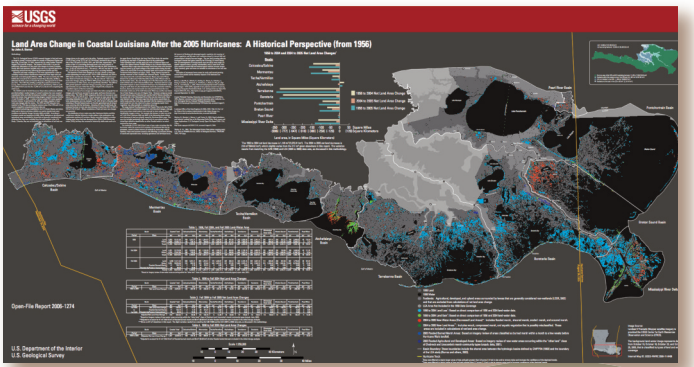
Storms such as tropical cyclones like hurricanes bring strong winds combined with low pressure, excessive rain, and storm surge that drive water onshore. Hurricanes often remind us that we live in a vulnerable location. Even severe winter storms can bring in changes in water.

"The U.S. Geological Survey's (USGS) National Wetlands Research Center analyzed land loss or change to water immediately after Hurricanes Katrina and Rita. Analysis was based on USGS Earth Resources Observation and Science (EROS) Data Center's multiple Landsat TM satellite images of coastal Louisiana acquired immediately before and after the landfalls of Katrina and Rita. A series of seven Landsat TM scenes acquired between October 16 and October 25, 2005, provided a snapshot of land-water area changes after the storms. Total water area increased by 217 mi2 (562 km2) after the hurricanes according to a comparison of the 2004 and 2005 classified imagery.

View in detail the "Land Area Change in Coastal Louisiana After the 2005 Hurricanes: A Historical Perspective" at http://pubs.usgs.gov/of/2006/1274/

The 217 mi² (562 km²) of new water area occurring after the hurricanes contains losses caused by direct removal of wetlands as well as transitory water area changes caused by remnant flooding, removal of aquatic vegetation, scouring of marsh vegetation, and water-level variation caused by normal tidal and meteorological variation between images.

Estimation of permanent losses cannot be made until several growing seasons have passed and the transitory impacts of the hurricanes are minimized."



Saltwater Intrusion

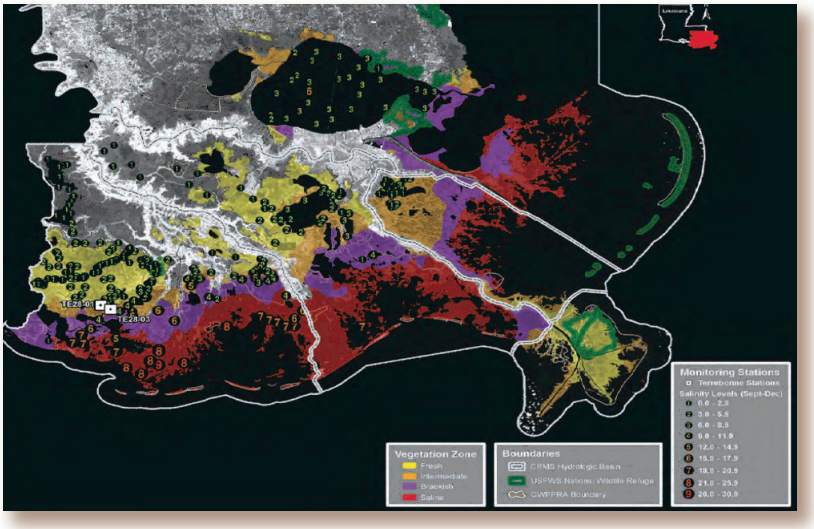
Above is an image of plants suffering from saltwater intrusion. Photo credit USGS

Plant communities along the coastline are dependent on salinity and hydrology. Often after a hurricane event or winter storm salinities in marsh areas can increase. Plant species living in these exposed areas express changes as increased salinity act as an environmental stressor. Symptoms of salt injury to plants look similar to drought conditions. Plants can wilt and growth may be stunted. Long term consequences of exposure to high salinities may include plant dieback, shifts in plants from species those less salt tolerant to those more tolerant of salt and a reduction in seed germination.

Table 1.
Typical salinity ranges found within various vegetation types in coastal Louisiana (Chabreck, 1970), and maximum discrete salinity measurements of surface waters recorded between September and December 2005.

[All salinities are reported in parts per thousand (ppt). Note that the salinity of ocean water is approximately 35 ppt]

Vegetation type	Typical salinity range	Maximum salinity measured after 2005 hurricanes
Swamp	0–0.5	8
Fresh marsh	0–3	26
Intermediate marsh	2–8	26
Brackish marsh	4–10	34
Saline marsh	8–29	30



Eastern coastal Louisiana discrete surface salinity measurements (September–December 2005) with proximity to vegetation zones (Chabreck and Linscombe, 2001) and U.S. Fish and Wildlife Service (USFWS) national wildlife refuges. Regarding boundaries, CRMS refers to Coastwide Reference Monitoring System, and CWPPRA refers to the Coastal Wetlands Planning, Protection and Restoration Act. *(pubs.usgs.gov/circ/1306/pdf/c1306_ch6_c.pdf)*

Procedure

1. Review the information sheets on SEA LEVEL RISE, SUBSIDENCE, HYDROLOIC CHANGES, STORMS AND SALINITY CHANGES with your students as a whole class or in small groups.

2. Watch "Sea-level Rise, Subsidence, and Wetland Loss" online at http://gallery.usgs.gov/videos/347. This video describes causes of wetland loss in the Mississippi River Delta area.

3. Ask students to list and describe four causes for land loss in Louisiana on the student record sheet

4. Using Google maps, have students calculate their horizontal distance to the Gulf of Mexico.

    a. Go to www.maps.google.com
    b. Click on "Get Directions"
    c. In the first box type in the address of your home or school.
    d. In the second box type in the name a town nearest to the Gulf of Mexico.
    e. And click "Get Directions"
    f. The map will show your current location, a line, and your final location.
    g. This will give you a rough estimate of your horizontal distance to the Gulf.
    h. Record that distance on your student record sheet.

5. Using LSU AgCenter data, have students calculate their vertical distance from average sea level.
    a. Click on http://www.lsuagcenter.com/en/family_home/home/design_construction/Laws+Licenses+Permits/Getting+a+Permit/Your+Flood+Zone/flood_maps/

    b. Click on the parish you live in. It will be highlighted in red.
    c. Click GO.
    d. Type in your address in the box that says "Enter your address here." Be sure to use your house or school number, street, city, and state.

e. Click the "Locate" button.
f. On the left hand side of the map a list of information will appear. It will include your latitude, longitude, Flood Zone, and actual ground elevation number. If the number has a negative sign in front of it you are BELOW sea level.
g. Record your distance on the student record sheet.

6. Ask students to record which issues they think will most likely be a cause for flooding in their region.

7. Help students "plant" a metal marker or benchmark in the front of the school. That marker will be stamped with the current elevation of that school. Students will also be taught how to locate the elevation of other points of interest including their homes.

NOTE: The survey markers in 2012 cost about $14 each with the printing. http://www.berntsen.com/Go-Shopping/Surveying/Concrete-Survey-Markers/Aluminum-Concrete-Survey-Markers

8. Using the method above, locate the elevation of other points of interest such as:
   a. students' homes
   b. library or park or
   c. a nearby levee

Students decide where to place benchmark.

activity

Student Record Sheet

1. List and describe four causes of land loss in Louisiana.

   1.

   2.

   3.

   4.

2. Using Google maps, calculate your horizontal distance to the Gulf of Mexico.

   a. Go to www.maps.google.com
   b. Click on "Get Directions"
   c. In the first box type in the address of your home or school.
   d. In the second box type in the name a town nearest to the Gulf of Mexico.
   e. And click "Get Directions"
   f. The map will show your current location, a line, and your final location.
   g. This will give you a rough estimate of your horizontal distance to the Gulf.
   h. Record your horizontal distance to the Gulf of Mexico; _____

3. Using LSU AgCenter data calculate your vertical distance from average sea level.

   a. Click on http://www.lsuagcenter.com/en/family_home/home/design_construction/Laws+Licenses+Permits/Getting+a+Permit/Your+Flood+Zone/flood_maps/

   b. Click on the parish you live in. It will be highlighted in red.
   c. Click GO.
   d. Type in your address in the box that says "Enter your address here." Be sure to use your house or school number, street, city, and state.
   e. Click the "Locate" button.

activity

Student Record Sheet—CONT'D.

f. On the left hand side of the map, a list of information will appear. It will include your latitude, longitude, Flood Zone, and actual ground elevation number. If the number has a negative sign in front of it, you are BELOW sea level.

g. Record your elevation. _____

4. Which of the issues related to coastal land loss are most important to the area you live in and why?

5. Your class may choose to "plant" a metal marker or benchmark in the front of your school to identify the land's elevation. That marker will be stamped with the current elevation of that school.

6. Using the method above locate the elevation of other points of interest such as:

a. your homes

b. your library

c. a nearby levee

Find out about

FLOOD and WIND Hazards

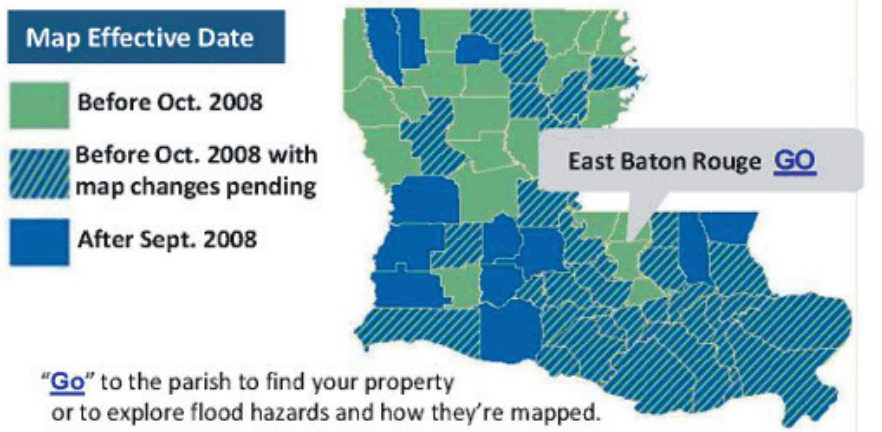
at your Louisiana location!

LSU AgCenter Research & Extension

When you're planning, building or insuring a home, it's important to know your exposure to natural hazards such as floods and high winds.

Throughout Louisiana, building to minimize flood and wind damage is a building code requirement .

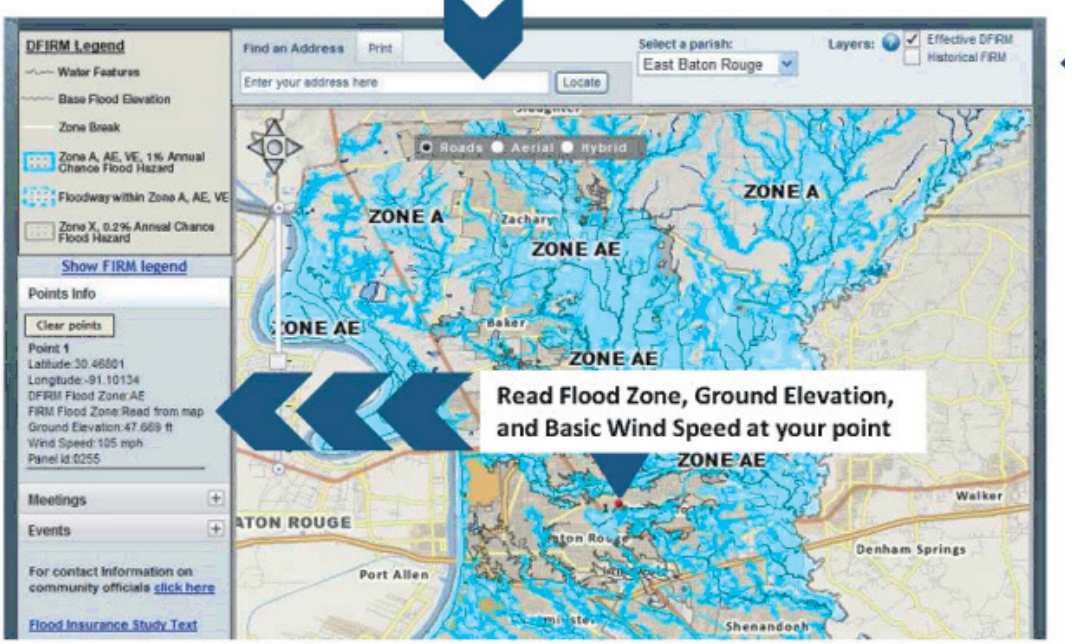
Use this online tool to study conditions at your site or to explore how flood maps are changing in your parish.



"Go" to the parish to find your property or to explore flood hazards and how they're mapped.

LSUAgCenter.com/floodmaps

Enter an address or click and zoom to find your point of interest



Read Flood Zone, Ground Elevation, and Basic Wind Speed at your point

Turn on map layers you want to view and compare.

Choose the "Hybrid" view to find your house on an aerial photograph.

Visit *LSUAgCenter.com/floodmaps* to learn why October 2008 is significant and how knowing the ground elevation helps you understand your vulnerability to floods.

Made available by the Disaster Recovery and Mitigation Unit, LSU AgCenter, with funding assistance from the Louisiana Department of Transportation and Development, Floodplain Management Office.
Contact Pat Skinner, pskinner@agcenter.lsu.edu for information and help with the site.

April, 2011

LSU AgCenter Interactive Maps

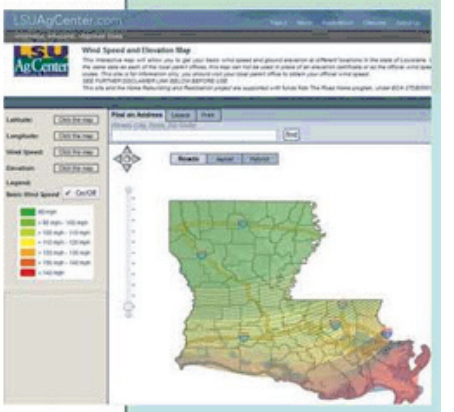
Tools help Louisiana citizens assess risk of flooding

September 2011

As the 2011 hurricane season continues, many Louisianans want to compare their area's elevation to a predicted flood crest nearby.

The LSU AgCenter has two mapping services/sites that ANYONE can use to find ground elevation at ANY spot in Louisiana. Both sites were built as part of the LSU AgCenter code enforcement and hazard resistant building education programs to aid with recovery from hurricanes Katrina and Rita.

- Both sites allow you to find a point by pan-and-click on the map or by entering a street address.
- Both sites allow you to turn on a background aerial image to locate a specific building or property.
- You can zoom in and out on either map, as well as pan the map in any direction.
- Click with the mouse on either map to place a pin and see ground elevation value (along with other information about the point).
- These sites provide images with a resolution and precision that is more accurate than the flood modeling or forecasts shown on them. The location of flood boundaries is approximate and should be used ***for estimating purposes only.***

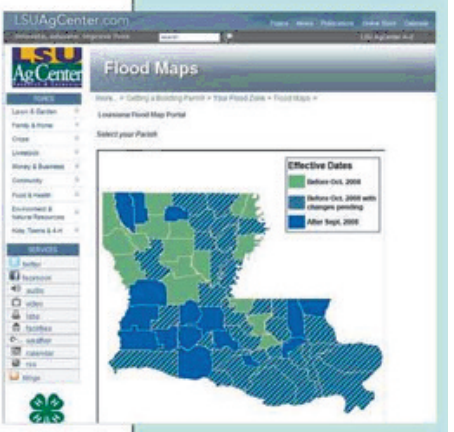


This mapping site gives Basic Wind Speed for building code purposes and shows ground elevations provided by the USGS.

Wind Speed Map System: *maps.lsuagcenter.com/windspeed_elevation*

The LSU AgCenter's wind speed and elevation interactive map does not require you to select a parish before locating the property of interest.

- Turn off the "Basic Wind Speed" layer. (The on-off toggle is just to the left, above the legend.)
- Enter an address and click on "find."
- Turn on the "Hybrid" base map to activate the aerial imagery and identify individual structures.



This mapping site presents Flood Insurance Rate Maps (FIRMs) and related products. It also shows ground elevations provided by the USGS.

Flood Map System: *www.LSUAgCenter.com/floodmaps*

The LSU AgCenter's flood maps portal displays flood insurance rate maps, which are used in the National Flood Insurance Program.

- Click on the parish of your choice and choose "Go."
- When the parish map opens, turn off the flood layers. (Uncheck the boxes in the upper right corner.)
- Enter an address and click on "Locate."
- Turn on the "Hybrid" map to activate the aerial imagery and identify individual structures. (Check "Hybrid" option that appears on map.)

LSUAgCenter.com/2011Hurricanes
Your guide to the LSU AgCenter 2011 hurricane preparation, prevention, recovery and rebuilding resources

Using the Flood Maps portal during flood threats

For any point on the map, you can see whether the area has been identified as a special flood hazard area. A special flood hazard area has a 1 percent chance per year of being inundated. Areas protected from rivers by levees are NOT in the special flood hazard area unless they flood from some other source, such as poor drainage or other rivers and streams running through the parish. For example, New Orleans is protected from the Mississippi River and Lake Pontchartrain by levees, but many areas flood due to rain that exceeds the capacity of drainage canals and pump systems. Similarly, Baton Rouge is protected from the Mississippi River by a levee but has extensive flood hazard areas associated with the Amite and Comite rivers, which run through and east of the parish.

For any point on the map, you can see the approximate ground elevation. Ground elevation is provided by the U.S. Geological Survey. If you have been told that a flood will reach a certain level AT YOUR LOCATION, and you know the ground elevation, you can estimate the flood depth. For example, if the flood will reach 55 feet mean sea level and your ground elevation (from this website) is 52 feet mean sea level, you would anticipate that the flood would be about 3 feet deep at your point—unless there is high ground between you and the river that would prevent the flood from reaching your property.
The flood level at your location is seldom the same as the reading on the nearest river gauge. Some river gauges use a different vertical reference than the USGS uses when providing ground elevations. A correction factor must be applied.

Online mapping systems have limitations. Use with caution

- The websites should not be relied upon to determine levee elevations. Narrow features such as the crown of levees are difficult to represent accurately and are only approximations. Local Office of Emergency Preparedness should have information about current local levee elevations.

- The flood elevation in the river, at the gauge, is not necessarily the elevation the water will be 100 yards or a few miles away from the gauge. The river elevations are of the water level in a very constrained environment. Local authorities will attempt to provide water surface elevation in specific locations.

- Some stream gauges need to be adjusted when comparing their readings to ground elevation. Most river gauges in southern Louisiana use the same ***vertical reference*** system that is used to provide ground elevations in our websites. Northern gauges, including those at Natchez and Vicksburg, require a conversion factor. Gauge locations and readings can be accessed at: http://www.srh.noaa.gov/lmrfc/ . For Natchez, add 17.3 feet to the gauge reading. For Vicksburg, add 46.2 feet.

Authors: Maurice Wolcott, Paco Capello and Pat Skinner

What you need to know about the flood maps on the LSU AgCenter Flood Maps portal

- These maps do NOT show historic floods. They do NOT show imminent flood threats or forecasts.
- Where an area is protected by a levee, the map shows only areas that flood WHEN THE LEVEES HOLD (do not leak, break or get overtopped).
- Most areas along the main rivers in Louisiana are protected by levees. This includes the major rivers and streams that feed them
- Lands near these rivers may be more likely to flood when the rivers inside the levees are very high, even if the levees hold. There may be seepage, leakage, a higher underground water table or sand-boils (where water finds a channel of sandy soil, travels under the levee and rises on the protected side).
- Lands near rivers and streams that drain into these major rivers may be more likely to flood for several reasons. Water will back up from the major rivers into the feeder streams. High water levels in the receiving rivers will retard the normal flow of streams into them. When rivers and streams are full, heavy rains that normally would run off quickly may accumulate, producing a flood.
- Lands shown on the maps as flood hazard areas usually are the lowest lands and the most difficult to drain. These would be the areas most likely to flood, most likely to flood first – in a slow levee failure -- and most likely to have the deepest floodwater, if the levees were fully overtopped.
- Flood maps that show hazard areas in shades of blue are NEWER and have more reliable flood risk assessments than flood maps that show flood hazard areas only in shades of gray.

Extension Activity

1. Using FloodSmart.gov view the current flood map of your area.

   a. Click on http://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/map_update_schedule.jsp

   b. In the box, enter your zip code.

2. To check real time flood conditions visit http://water.weather.gov/ahps/

3. Encourage students to learn more about flood risks. Print the *"Flood and Wind Hazards"* and LSU AgCenter Interactive Map pages"

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ww.noaa.gov/features/climate/sealevelchanges.html

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http://plant-materials.nrcs.usda.gov/technical/gulf_restoration.html
http://pubs.usgs.gov/circ/c1075/wetland.html
http://plant-materials.nrcs.usda.gov/technical/gulf_restoration.html

follow up

Assessments

Assess the students' understanding of land change and sea level rise from their answers on the student assessment sheet.

Resources

LSU AgCenter FloodSmart.com
http://www.lsuagcenter.com//en/family_home/home/design_construction/Laws+Licenses+Permits/Getting+a+Permit/Your+Flood+Zone/flood_maps/

USGS National Wetlands Research Center
http://www.nwrc.usgs.gov/

GLE's

Environmental Science
Personal Choices and Responsible Actions

21. Analyze the effect of common social, economic, technological, and political considerations on environmental policy (SE-H-C3)

22. Analyze the risk-benefit ratio for selected environmental situations (SE-H-C4)

23. Describe the relationship between public support and the enforcement of environmental policies (SE-H-C5)

Lesson Source

Economics: The Dollars & Sense of Coastal Restoration

Objectives

Students will be able to

- Research the definition of economics
- Research the use of economics in coastal restoration decisions
- Take roles of members of the CWPPRA Task Force, CWPPRA agencies, local governments, public citizens, and the media to help to learn how coastal restoration projects are chosen
- Solve the problem of how to choose which project will be selected based on criteria.
- Evaluate how the choices were made
- Analyze if the choices were made on sound economics

Overview

This two-part lesson provides students with a background in economics which leads to a role play activity helping students understand the economics of Louisiana's coastal restoration initiatives.

Materials

- Student Coastal Restoration Economics Backgrounder sheets
  —Make one set and use from year to year
- Role play cards (laminated, if possible)
  —Make one set and use from year to year
- Props for roles—students can choose a simple prop to represent their profession or occupation
- Props for CWPPRA Task Force meeting
- Flip chart, easel, markers or chalkboard

Economics

Preparation

- Run off student *"Coastal Restoration Economic Backgrounder"* and student answer sheet.
- Laminate the role play cards
- Collect props for CWPPRA Task Force meeting scene or ask students to create props.
- Familiarize yourself with *Robert's Rules of Order* for the meeting.

Procedure

This activity has two parts.

Part 1: Coastal Restoration Economics Backgrounder
Reading, Writing and Summary—This will take one class period.

Have the students read in small groups the *Coastal Restoration Economics Backgrounder*. Students will work in groups to answer the related questions on the student answer sheets as a team. Students will reconvene as a whole group and review the answers. Teacher answer key has the correct answers to share with the students.

Once the reading, writing, and summary of the economics backgrounder is complete, students will conduct the role playing activity.

Coastal Restoration Economics Is Similar to Personal Economics

What is Economics?

Do you spend money? Where does the money come from? Do you want it now or later? Can you spend it on needs or wants? How do you decide how to spend it?

These questions deal with economics or the science and math of the production of goods, services, and the welfare of humankind.

What exactly is economics? Numerous definitions exist, but simply put:

> **Economics is the study of how *limited or scarce resources* are *allocated* amongst *competing needs.***

The **"allocation"** part of this definition is based on the concept of efficiency, or the idea that limited resources should be used in an optimal manner and not wasted.

You are an economist!
Given this simple definition, anyone who has ever tried to get the most out of something —their money, time, labor, or any other "resource" at their disposal—is acting as an "economist."

What is the Role of Economics in Restoration?

How should limited funding be allocated to restore coastal Louisiana? What are the challenges in measuring ecosystem restoration benefits and prioritizing projects? Who gets to decide what projects should be funded? How can location, risk, sustainability, time, and discounting influence project selection?

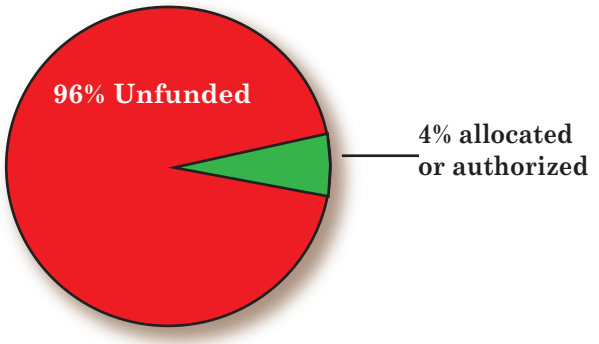
activity

Coastal Restoration Economics Backgrounder—CONT'D.

How does economics apply to coastal restoration?

When it comes to coastal restoration, project funding is perhaps our most "limited" resource. The current 2012 State of Louisiana Coastal "Master Plan" estimates a need of $100 BILLION.

Use the graph below to determine how much of the $100 billion do we have?



Currently, allocated and authorized restoration funding is only ~ 4% of what would be needed to hold on to our remaining coastal land. At an estimated cost of **$10 billion**, 96% of the needed funds for coastal restoration have yet to be secured. This scarcity of available funding creates a tremendous economics challenge—ensuring we get the most out of our limited restoration dollars.

As Future Voters You Need To Be Aware of "Decision-Making 101"

So, if our Louisiana restoration needs greatly exceed our current budget, how do we select projects (allocate limited dollars) in the most optimal way?

At a minimum, we should try to allocate funding towards projects whose benefits are greater than their costs. Mathematically speaking, we refer to this as a ***"benefit-to-cost ratio"***, which ideally should be greater than or equal to one.

$$\text{B:C Ratio} = \frac{\text{Project Benefits (\$)}}{\text{Project Costs (\$)}} \geq 1.0$$

This ratio approach sounds simple, but it's a difficult challenge when it comes to ecosystem restoration because it requires standardizing the way costs and benefits are measured across of a wide range of projects. It also requires some level of consensus on the relative importance of individual performance measures.

activity

Coastal Restoration Economics Backgrounder—CONT'D.

How do we measure costs and benefits?

Projects Costs are usually easier to calculate than benefits, and are almost always expressed using a standard unit of measurement: dollars.

What Does A Coastal Restoration Project Cost?

Coastal restoration projects can be very expensive, with some requiring several hundred million dollars to implement depending on size and location. **Regardless of scale, costs for most projects are usually divided into three parts.** Roughly 10% of project costs go towards planning and design, 85% towards construction, and about 10% is budgeted for monitoring and maintenance over the project life time—usually a 20-year or 50-year horizon.

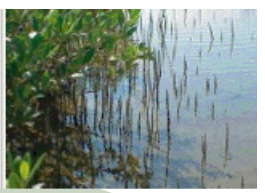
Project Benefits are more difficult to standardize because most of the benefits we seek from coastal restoration are not traded in financial markets.

Habitat units—The first major restoration program in Louisiana was the Coastal Wetland Planning, Protection, and Restoration Act (CWPPRA). The CWPPRA program developed a sophisticated method for standardizing these ecosystem services into common "habitat units."

> For this program, "cost-efficacy" analysis is the way in which economic efficiency is pursued. Under this non-monetary approach to benefit estimation, various types of restoration projects can be compared by the costs incurred with delivery of a common habitat unit.

$$\text{Cost-efficacy} = \frac{\text{Costs (\$)}}{\text{Habitat Units (\$)}}$$





What is a brown pelican worth?

What is the storm protection value of a barrier island?

How much would you pay for a unit of fish habitat?

activity

Coastal Restoration Economics Backgrounder—CONT'D.

Ecosystem Valuation—More recently, restoration managers have looked to environmental economists to develop actual dollar values for ecosystem services. Through the use of stated and revealed preference methods, economists can develop "non-market" estimates of the annual service values derived from coastal wetland ecosystems. Non-market services may include the fact that wetlands clean water or act as water purifiers. Wetlands also support rich biodiversity of plants and animals. The habitats help in flood water storage or flood abatements. They help in carbon sequestration and act as sediment traps. All of these services at this point still have non-market values.

Regardless of the method, all benefit standardization and valuation estimates should be context-specific and based on objective, science-based methodology.

Whose Benefits Are We Really After?

An additional difficulty of standardizing project benefits involves reconciling the competing needs and interests of different stakeholders. Because preferences for ecosystem services vary, coastal policy is highly dependent on who is at the table when priorities are set.

To be effective, restoration programs should involve a diverse, balanced range of stakeholders. To the extent possible, the prioritization process should be open and transparent to the public. This democratic process is especially important for when programs attempt to identify and weight benefit metrics and indices as a substitute for financial estimates of project benefits.

activity

Coastal Restoration Economics Backgrounder—CONT'D.

Comparing Alternatives

What are the different types of coastal restoration projects?

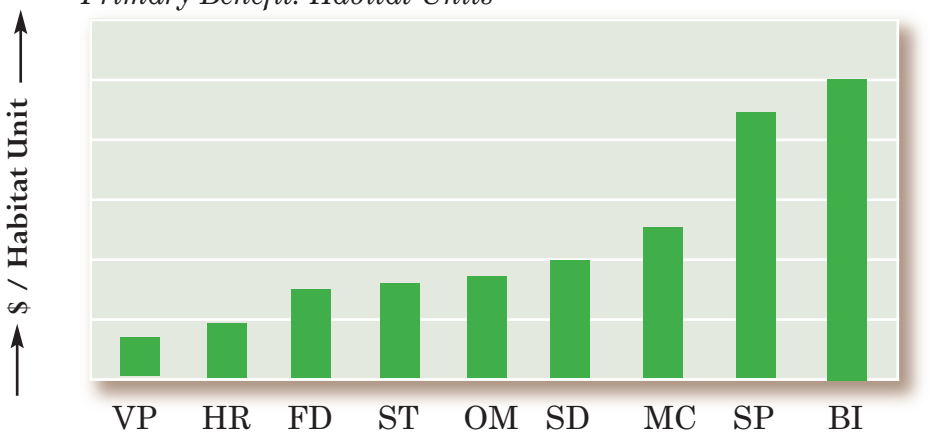
(VP) Vegetative Planting	(HR) Hydrologic Restoration	(SP) Shoreline Protection
(MC) Marsh Creation	(FD) Freshwater Diversion	(SD) Sediment Diversion
(OM) Outfall Management	(ST) Sediment Trapping	(BI) Barrier Island

So how do the costs of these different project types compare to each other, and which project type is the most efficient?

To allocate restoration dollars efficiently, we must first identify what benefits are being targeted. Below are two conceptual examples of how the efficiency rankings of the 9 project types listed above can vary depending on how benefits are defined.

Restoring Wildlife Habitat

Primary Benefit: Habitat Units



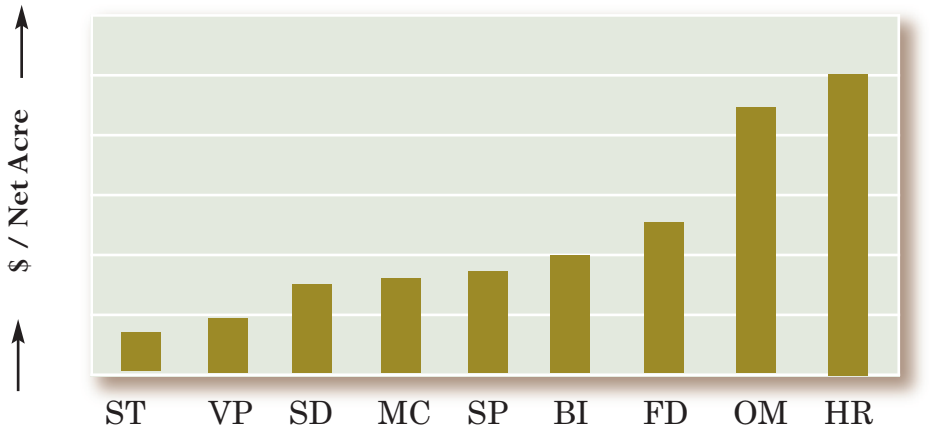
In the figure above, the 9 coastal restoration project types are ranked from lowest to highest costs based on their cost-efficiency in delivering a standard unit of habitat for each restoration dollar spent. In this example, vegetative planting (VP) is the most efficient (lowest cost per unit) and barrier islands (BI) are the least efficient (highest cost per unit).

activity

Coastal Restoration Economics Backgrounder—CONT'D.

Restoring Coastal Land

Primary Benefit: Net Acres



Project Type

In the figure above, the project types are ranked from lowest to highest costs based on their cost-efficiency in delivering net acres for each restoration dollar spent. In this example, sediment trapping (ST) is the most efficient (lowest cost per unit) and hydrologic restoration (HR) is the least efficient (highest cost per unit).

Additional Restoration Considerations

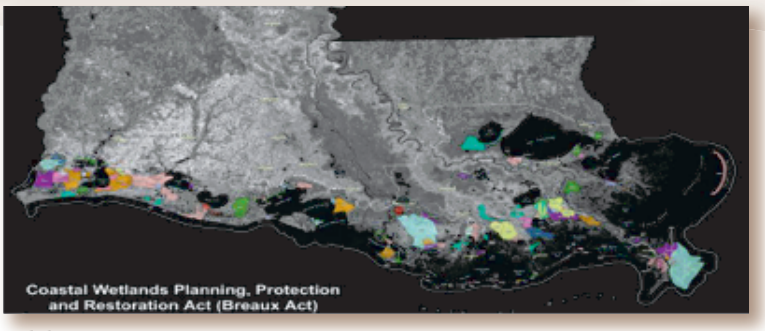
Okay… so once we decide on a way to standardize benefits (based on sound science and balanced public input) we then simply allocate available funds to the projects that are the most cost-efficient, right?

Once again, it's not that simple. There are ***at least 4 additional factors that come into play when prioritizing funding for coastal restoration projects:***

Location is always a principle consideration of any type of project. If you look at a map of wetland restoration projects in coastal Louisiana, you will see many different types of methods. The reason for this variation is that our coastal zone contains numerous sub-regions, each with its own diverse geographic characteristics. Some of these regions can only be restored using specific types of coastal restoration.

activity

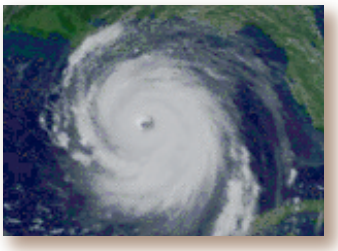
Coastal Restoration Economics Backgrounder—CONT'D..



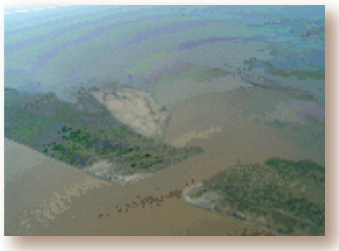
For example, sediment trapping (ST) is a relatively low cost method of building small amounts of coastal land, but it is only well-suited for the southwestern region of the coast. Only in this sub-region are the underlying mineral sediments strong enough to support the heavy weight of ST terraces constructed in coastal lakes and bays.

Barrier island (BI) restoration, though very expensive from both a habitat and land-building perspective, is also by definition very location-specific. Given their unique geology, BI projects require a combination of sand mining and vegetative planting for the purposes of beach nourishment and dune stabilization.

Risk is another vital consideration, and one highly related to project location.



Environmental Risk



Economic Risk

Social Risk

Environmental risk to coastal restoration projects includes threats related to ongoing coastal erosion, subsidence, sea level rise, tropical storms and hurricanes. The vulnerability of coastal restoration to these factors is dependent on a project's type, location, scale, and degree of completion.

Economic risks to coastal restoration primarily pertain to continuation of support funding. Over time, program dollars can diminish or be eliminated altogether. Moreover, individual projects could become too expensive to maintain once constructed. For example, the West Bay Sediment Diversion was recently de-authorized due to unexpectedly high dredging costs associated with channel shoaling linked to the project.

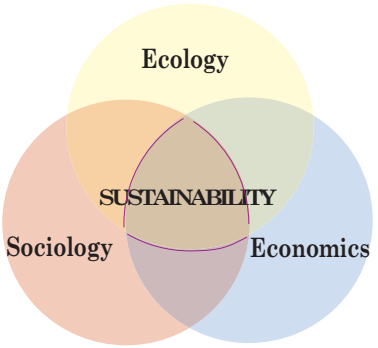
activity

Coastal Restoration Economics Backgrounder—CONT'D.

Social opposition can pose an even greater risk to coastal restoration than environmental and economic risk combined. Social risk pertains to the potential for stakeholders or communities to block a project's construction or to severely limit its use. Such opposition is typically due to perceived or actual threats to private commercial interests that might result from project implementation.

Sustainability is factor increasingly cited by coastal managers as a criterion of major importance for project selection. Unfortunately, application of the term is often limited to simply a description of a project's resiliency to environmental risk. Given this narrow interpretation, projects with self-renewing features like sediment accretion are automatically and incorrectly described as having relatively higher levels of "sustainability."

In reality, sustainability is a three-tiered concept that involves not only environmental factors, but economic and social considerations as well.



For example, a large-scale sediment diversion might offer the potential for long-term land building through alluvial processes. However, the project may prove unsustainable due to socioeconomic constraints. Examples of such constraints might include concerns from coastal communities over project-based flooding or opposition from fishermen concerned about salinity-based displacement of traditional harvest areas. Thus, application of "sustainability" as a project selection criterion requires simultaneous consideration of ecological integrity, economic prosperity, and social viability.

Time is perhaps the most important economic criteria of all—and one that is often overlooked when it comes to project comparisons.

activity

Coastal Restoration Economics Backgrounder—CONT'D.

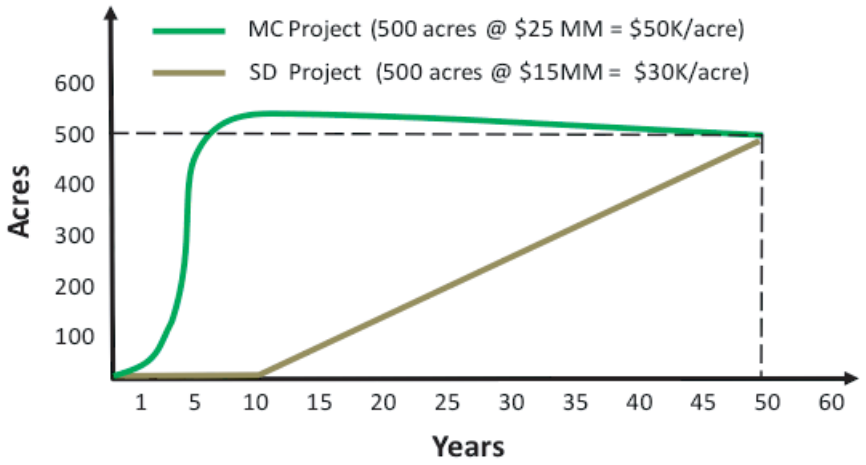
Would you rather I give you a dollar today? ...Or would you prefer that I give you that same dollar 50 years from now?

This simple question is often used by economists to demonstrate the fact that most individuals prefer benefits sooner, rather than later. In short, time matters. Given the prospects of economic, environmental, and social risk, the certainty of a unit of restoration in the present day is usually preferred over the uncertainty of that same unit of promised in the future.

What does the *"restoration trajectory"* look like?

The way that ecosystem benefits accrue over time can be referred to as the restoration trajectory. The shape of this *benefits time-line* can be used to compare the ecosystem service provisions (e.g. surge protection, habitat provision, etc.) provided by different project alternatives at a given location.

Comparing Acreage Endpoints

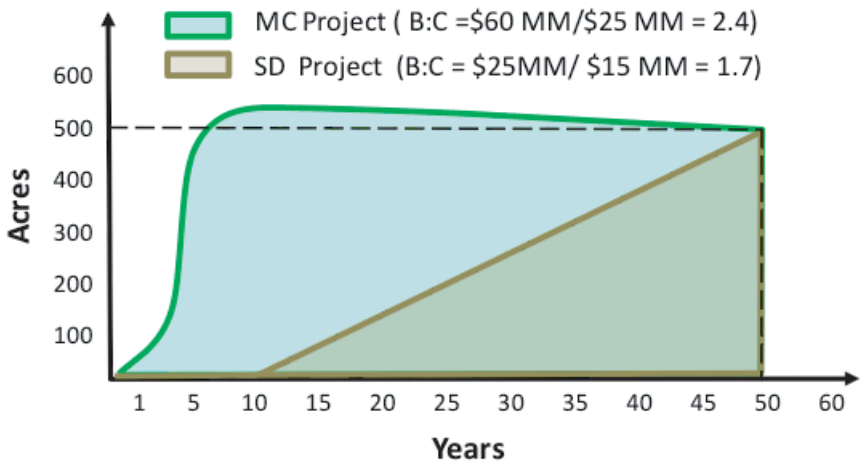


Consider the sample restoration trajectories for marsh creation (MC) and sediment diversion (SD) in the graphic above. Each of these projects converges on a common level of 500 net acres of coastal land in 50 years. If we consider final costs and acreages only, the SD project is the apparent better deal, with a cost of $30K/acre compared to $50K/acre for the MC project.

activity

Coastal Restoration Economics Backgrounder—CONT'D.

Comparing Ecosystem Service Flows



A different conclusion emerges; however, when we consider the flow of ecosystem services over time. In the graphic above, the shaded area under each trajectory represents the aggregate ecosystem services (non-market values) accruing from restored wetlands for the two alternative project types.

Due to a more rapid rate of restoration, the total ecosystem benefits accrued by the MC project ($60 MM) are more than twice the ecosystem benefits accrued by the SD project ($25 MM). From the perspective of ecosystem services provisioning over the 50 year project life time, the MC project outperforms the SD project (B:C=2.4 vs. B:C= 1.7).

activity

Coastal Restoration Economics Backgrounder—CONT'D.

Discounting is a method by which the future value of ecosystem benefits and costs can be expressed in current day terms. As applied in the example above, the aggregate flow of ecosystem services over 50 years is expressed in terms of present day dollars for both the MC and SD projects. The net sum of these benefits and costs over time is incorporated into the B:C ratio as:

$$\text{B:C Ratio} = \frac{\text{Project Benefits (\$)}}{\text{Project Costs (\$)}} = \frac{\sum_{t=1}^{T} \frac{B_t}{(1+R)^t}}{\sum_{t=1}^{T} \frac{C_t}{(1+R)^t}} \geq 1.0$$

Here *Bt* is the ecosystem benefits accruing in year *t* during the time period *T*, and *Ct* is the ecosystem restoration costs accruing in year *t* during the time period *T*. Finally, *R* is a risk-adjusted discount rate that ranges from 0-15% according to the environmental, economic, and social uncertainties of a given project.

Generally speaking, zero or low discount rates tend to favor the feasibility of slower-performing projects like sediment diversions. Higher discount rates tend to favor the feasibility of more aggressive restoration, such as that seen with pipeline-based marsh creation.

As a result, the appropriate use of environmental benefit-cost analysis (and the choice of discount rates in particular) is the subject of considerable debate both within and outside the ecosystem restoration community.

activity

Coastal Restoration Economics Backgrounder—CONT'D.

Bringing It All Together

So how does it all fit together and how can economics be used to improve coastal restoration spending in Louisiana?

In the past 25 years, coastal restoration in Louisiana has evolved from a state and federal program (CWPPRA) spending $30-$50 million annually to a 2012 state master plan calling for more than $50 billion worth of restoration projects to protect and sustain our rapidly eroding coast.

Economics in early restoration programs was predicated on a cost-efficacy approach. Recent advances in "non-market" valuation allow for the use of financially based benefit-cost models for the purpose of project comparison.

Though some scientists and advocates shun the use of economic criteria for examining coastal restoration, there is no escaping the reality that restoration needs far outweigh available funding. Thus, there will always be a need to compare benefits to costs—whether formally or informally—to maximize the return on limited restoration funding.

activity

Student Summary and Review of Coastal Restoration Backgrounder

1. Define economics:

2. Explain how you are an economist in your everyday life. Give 2 examples.

3. Mathematically explain the "benefit-to-cost" as a ratio or an equation.

4. What are the three basic parts of the cost of a restoration project?

activity

Student Summary and Review of Coastal Restoration Backgrounder—CONT'D.

5. How are project benefits calculated under the CWPPRA program?

6. Name things that are hard to quantify when you are discussing benefits of restoration.

7. What are ecosystem services that currently don't have a "market" value?

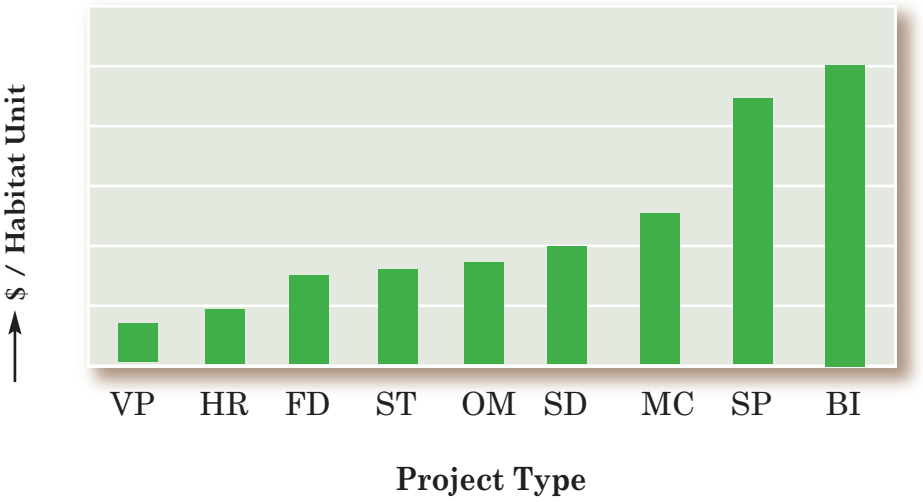
activity

Student Summary and Review of Coastal Restoration Backgrounder—CONT'D.

Using the graphs below, answer the following questions.

VP—Vegetative Planting	HR—Hydrologic Restoration	FD—Freshwater Diversion
ST—Sediment Trapping	OM—Outfall Management	SD—Sediment/Water Diversion
MC—Marsh Creation	SP—Shoreline Protection	BI—Barrier Island Restoration

Graph of Cost Efficiency Using Standard Habitat Units



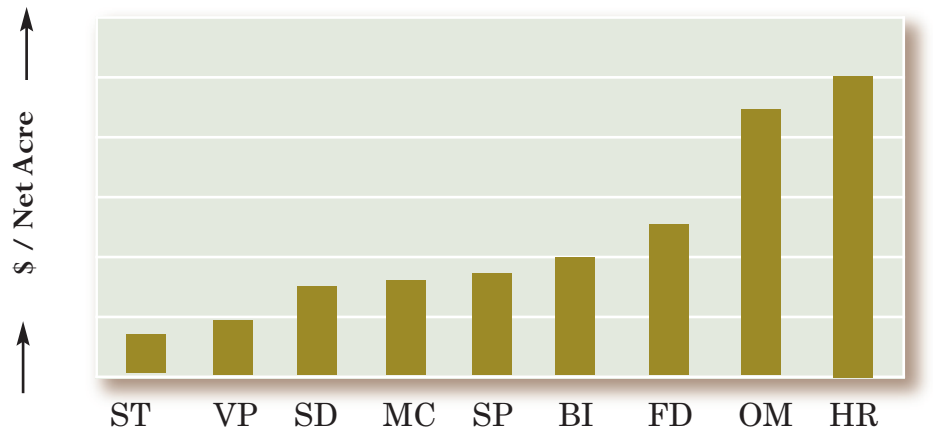
8. Which project costs the most to build per habitat unit?

   Which project costs the least?

activity

Student Summary and Review of Coastal Restoration Backgrounder—CONT'D.

Graph of Cost Efficiency Based on Cost per Net Acre Created



Project Type

9. Which project cost the most to build per net acre?

   Which projects costs the least per net acre?

10. Name 4 additional factors that come into play when deciding the efficiency of a coastal restoration project.

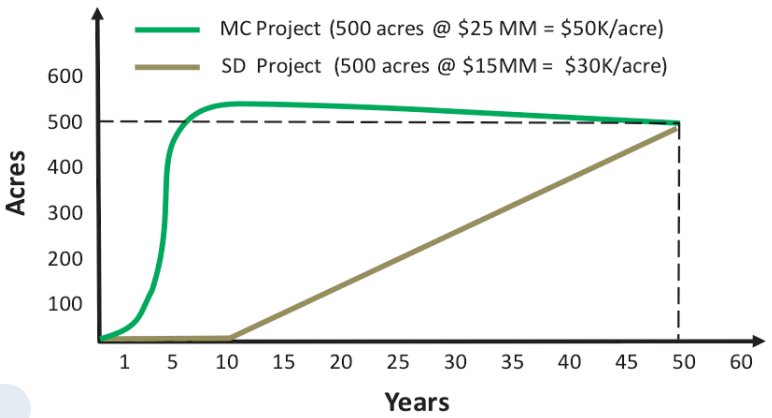
11. What is a "restoration trajectory?"

activity

Student Summary and Review of Coastal Restoration Backgrounder—CONT'D.

Graph Comparing Marsh Creation and Sediment Diversion Projects Over Time

MC—Marsh Creation
SD—Sediment/Water Diversion



12. How many acres of land are created in 5 years using Marsh Creation?

13. How many acres of land are created in 5 years using Sediment/Water Diversion?

14. How many acres of land are created in 10 years using Marsh Creation?

15. How many acres of land are created in 10 years using Sediment/Water Diversion?

16. How many acres of land are created in 30 years using Marsh Creation?

17. How many acres of land are created in 30 years using Sediment/Water Diversion?

18. How many acres of land are created in 50 years using Marsh Creation?

19. How many acres of land are created in 50 years using Sediment/Water Diversion?

20. Using the graph above, explain the cost of each type of project.

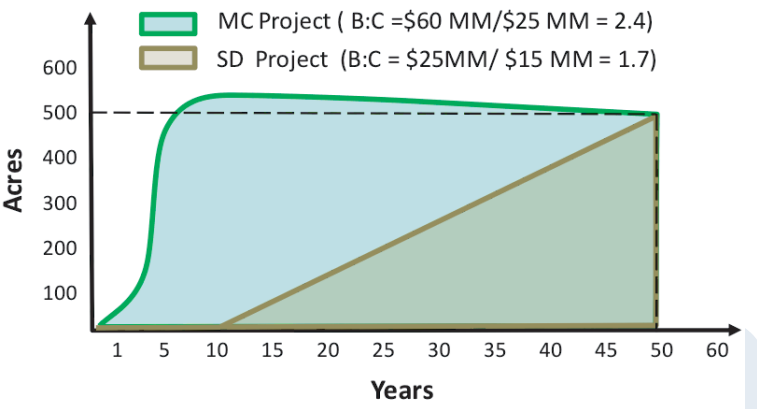
activity

Student Summary and Review of Coastal Restoration Backgrounder—CONT'D.

21. Name 4 events or activities that could cause the project to be derailed between 0 & 50 years?

Comparing Ecosystem Service Flow

MC—Marsh Creation
SD—Sediment/Water Diversion



22. How do the ecosystem service benefits compare when looking at marsh creation projects verses sediment/water diversions?

23. What is discounting?

24. Evaluate how sound economics can be used to improve coastal restoration spending in Louisiana?

Economics

Teacher Answer Key

1. Define economics:

Economics is the study of how limited or scarce resources are allocated amongst competing needs.

2. Explain how you are an economist in your everyday life. Give 2 examples.

Student answers will vary. Examples may include purchasing jeans that cost less but last longer than other brands; purchasing food items that are on sale due to being "in season" or going to a student car wash instead of an expensive chain car wash.

3. Mathematically explain the "benefit-to-cost" as a ratio or an equation.

$$\text{B:C Ratio} = \frac{\text{Project Benefits (\$)}}{\text{Project Costs (\$)}} \geq 1.0$$

4. What are the three basic parts of the cost of a restoration project?

Roughly 10% of project costs go towards planning and design, 85% towards construction, and about 10% is budgeted for monitoring and maintenance over the project life time—usually a 20-year or 50-year horizon.

Teacher Answer Key—CONT'D.

5. How are project benefits calculated under the CWPPRA program?

For this program, "cost-efficacy" analysis is the way in which economic efficiency is pursued. Under this non-monetary approach to benefit estimation, various types of restoration projects can be compared by the costs incurred with delivery of a common habitat unit.

$$\text{Cost-efficacy} = \frac{\text{Costs (\$)}}{\text{Habitat Units (\$)}}$$

6. Name things that are hard to quantify when you are discussing benefits of restoration. Student answers may vary. Below is a list of possible answers.

What is a brown pelican worth?
What is the storm protection value of a barrier island?
How much would you pay for a unit of fish habitat?

7. What are ecosystem services that currently don't have a "market" value?

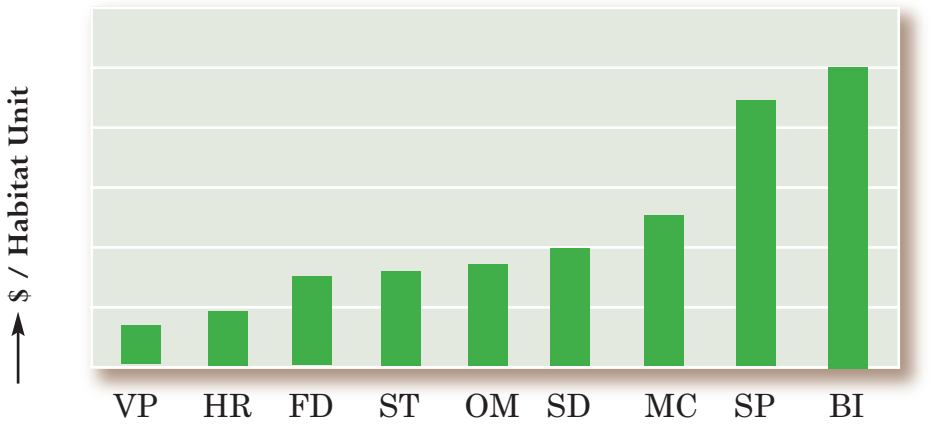
Non-market services may include the fact that wetlands clean water or act as water purifiers. Wetlands also support rich biodiversity of plants and animals. The habitats help in flood water storage or flood abatements and reduce storm surge. They help in carbon sequestration and act as sediment traps. All of these services at this point still have non-market values.

Teacher Answer Key—CONT'D.

Using the graphs below, answer the following questions.

VP—Vegetative Planting
ST—Sediment Trapping
MC—Marsh Creation
HR—Hydrologic Restoration
OM—Outfall Management
SP—Shoreline Protection
FD—Freshwater Diversion
SD—Sediment/Water Diversion
BI—Barrier Island Restoration

Graph of Cost Efficiency Using Standard Habitat Units



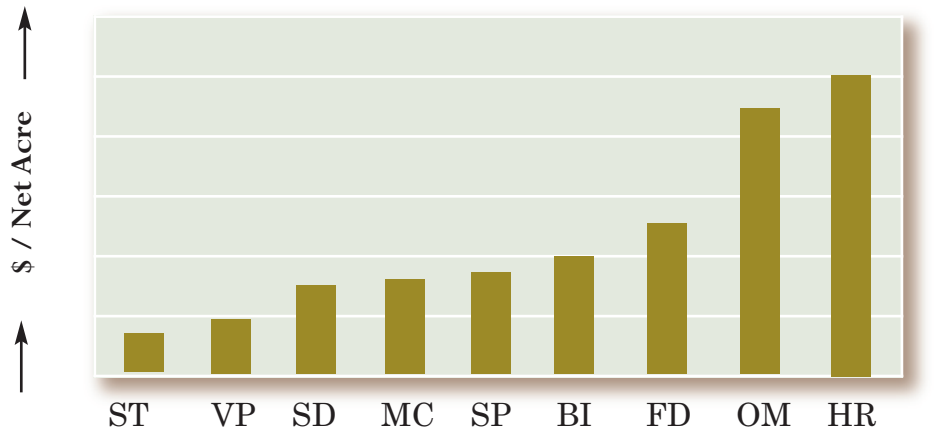
Project Type

8. Which project costs the most to build per habitat unit? Barrier Island Restoration

Which project costs the least? Vegetative Planting

Teacher Answer Key—CONT'D.

Graph of Cost Efficiency Based on Cost per Net Acre Created



9. Which project cost the most to build per net acre? Hydrologic Restoration

   Which projects costs the least per net acre? Sediment Trapping

10. Name 4 additional factors that come into play when deciding the efficiency of a coastal restoration project.

    Location, risk, sustainability, and time are four additional factors.

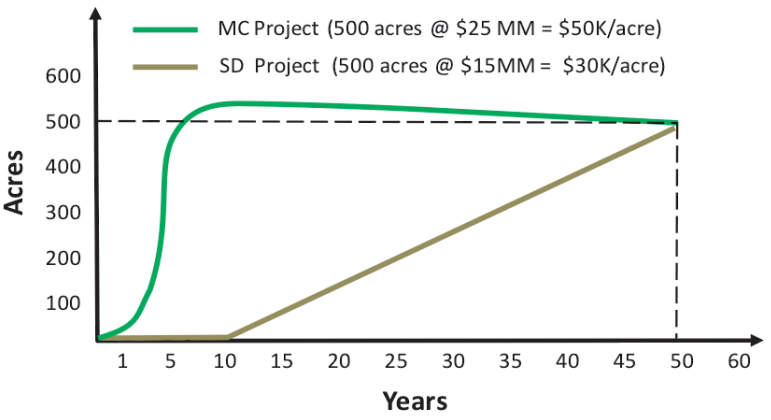
11. What is a "restoration trajectory?"

    The way that that ecosystem benefits accrue over time can be referred to as the restoration trajectory. The shape of this benefits time-line can be used to compare the ecosystem service provisions (e.g. surge protection, habitat provision, etc.) provided by different project alternatives at a given location.

Teacher Answer Key—CONT'D.

Graph Comparing Marsh Creation and Sediment Diversion Projects Over Time

MC—Marsh Creation
SD—Sediment/Water Diversion



12. How many acres of land are created in 5 years using Marsh Creation? about 400 acres

13. How many acres of land are created in 5 years using Sediment/Water Diversion? 0 acres

14. How many acres of land are created in 10 years using Marsh Creation? about 525 acres

15. How many acres of land are created in 10 years using Sediment/Water Diversion? 0 acres

16. How many acres of land are created in 30 years using Marsh Creation? about 510 acres

17. How many acres of land are created in 30 years using Sediment/Water Diversion? about 250 acres

18. How many acres of land are created in 50 years using Marsh Creation? about 500 acres

19. How many acres of land are created in 50 years using Sediment/Water Diversion? about 500 acres

20. Using the graph above, explain the cost of each type of project.

Each of these projects converges on a common level of 500 net acres of coastal land in 50 years. If we consider final costs and acreages only, the SD project is the apparent better deal, with a cost of $30K/acre compared to $50K/acre for the MC project. However, ecosystem services over time should also be taken into account. Due to a more rapid rate of restoration, the total ecosystem benefits accrued by the MC project ($60 MM) are more than twice the ecosystem benefits accrued by the SD project ($25 MM). From the perspective ecosystem services provisioning over the 50 year project life time, the MC project outperforms the SD project (B:C=2.4 vs. B:C= 1.7

Teacher Answer Key—CONT'D.

21. Name 4 events or activities that could cause the project to be derailed between 0 & 50 years?

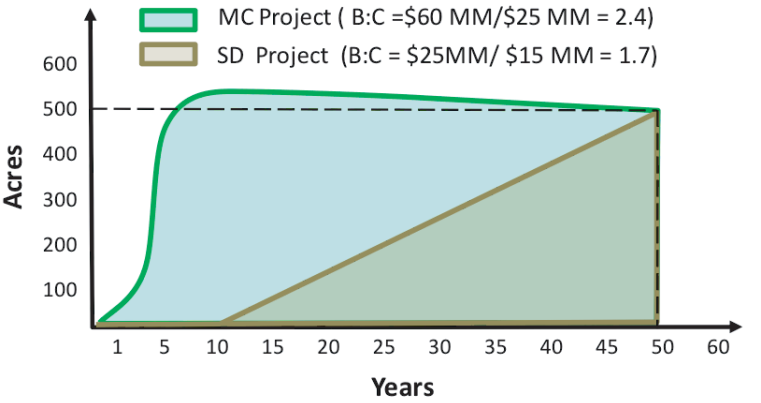
Student answers will vary. Consider these ideas:

Public use of wetlands may change
Funding changes
Public perception of the value of wetlands may change
Political changes

Hurricanes may change the landscape dramatically as in the storms of 2005. Hurricanes are one of the most common natural drivers of coastal disturbance and widespread morphological change.

Comparing Ecosystem Service Flow

MC—Marsh Creation
SD—Sediment/Water Diversion



22. How do the ecosystem service benefits compare when looking at marsh creation projects verses sediment/water diversions?

Due to a more rapid rate of restoration, the total ecosystem benefits accrued by the MC project ($60 MM) are more than twice the ecosystem benefits accrued by the SD project ($25 MM). From the perspective ecosystem services provisioning over the 50 year project life time, the MC project outperforms the SD project (B:C=2.4 vs. B:C= 1.7)

23. What is discounting?

Discounting is a method by which the future value of ecosystem benefits and costs can be expressed in current day terms

24. Evaluate how sound economics can be used to improve coastal restoration spending in Louisiana?

Student answers will vary.

Economics

Part 2: The CWPPRA Task Force Meeting—Coastal Restoration Economics Decisions

Role Play—This will take two 50 minute class periods

In the first part each student receives a role card describing the position of a community member who will participate in a Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA pronounced quip'-ruh) public meeting. After preparing their statements, the students will prepare props to role play a public meeting at which they try to get their coastal restoration project picked for funding and eventual construction.

Economics

Role Play—CONT'D.

In the next phase of the activity, the students assume the roles. The meeting will unfold as follows:

- The CWPPRA Task Force meeting is called to order by the CWPPRA Chairman.
- Each of the CWPPRA Task Force members introduces themselves.
- The Chairman explains that the agenda for today will identify various coastal restoration projects that will be brought before the Task Force and then voted on for funding. The Chairman notes that after each agenda item the public will be allowed to comment.
- The agenda is followed. Members of the local governments and concerned citizens are allowed to speak. At the end of the meeting projects totaling no more than $79 million dollars are chosen.

In the last phase of the activity, a group from the "media" writes local articles for the paper, TV and radio.

At the completion of the activity students will be asked to write an essay about how projects were chosen, how the public had an effect on the choices and if the choices were made with sound economics in mind.

This activity plays out differently with each group of students. The important lesson is that students understand that the economics of restoration are an important factor in choosing restoration.

Procedure for Task Force Role Play

The Task Force Meeting

1. Read the introductory paragraphs (below) to the students. Embellish the story and explain the situation in any way you wish to help your students grasp the central dilemma.

> "Students, you are about to enter the world of coastal restoration by taking on alternate personalities. You are each going to be a member of the community that has a vested interest in coastal restoration.
>
> The real problem is, of course, economics. Louisiana restoration needs greatly exceed our current budget. The goal today is encourage the CWPPRA Task Force to select the best projects with limited funds. What stands before you will be a list of projects totaling $162.7 million dollars. The CWPPRA program only has $79 million to spend. At the end of this mock meeting, the CWPPRA Task Force must choose the best projects.
>
> As you take on different roles you will be trying to persuade the Task Force to chose your project. ALL of these projects are good restoration ideas. You must help the Task Force understand "your alternate personality's" reason for supporting a project. The goal is to provide the taxpayers (the real you) with the most efficient use of public funds."

2. Your job is to work to decide what coastal restoration projects should be funded based on sound economics. You will be given many options. Remember, however, that the cost of restoring coastal habitats is very variable based on a host of factors. As you think about the dilemma, bear in mind all the things you have learned about the functions and values of wetlands and the problems of coastal land loss and the urgent need for restoration we have discussed.

3. Here are 30 role cards. (**Activity 1—See Role Play cards, pages 133-141.**) You must play a role in the restoration community. Listen to the names and descriptions as I read them. Raise your hand to volunteer to play that role. *Students can play more than one role, as is*

The Task Force Meeting—CONT'D.

the case in real life. You can also create additional roles if desired. You should be sure that at least all of the bulleted roles are given to the students.

Allow students time to familiarize themselves with their roles and the proposed projects as explained on the role cards and project fact sheets.

4. Conduct a meeting, with the CWPPRA TASK FORCE and other members of the meeting, at which the students assume their roles and state their positions as described in the CWPPRA meeting agenda. Students who are not on the agenda can speak during the time that the Chairman asks for remarks from the public

5. At the end of the meeting the CWPPRA Task Force will have to recommend no more than $79M worth of projects for construction. Allow the students to "mingle" for 5 minutes as the "public" after the meeting. During the meeting the media folks should be "creating" their story.

The Media Report

6. A report is prepared and provided to the daily news.

The Evaluation and Analysis Report

7. After projects have been chosen and eliminated ask the students to evaluate:
    a. why do they think certain projects were chosen and others were eliminated,
    b. if the projects were chosen based on sound economics,
    c. how do they think it felt not to be chosen.

The Task Force Meeting—CONT'D.

List of Characters

CWPPRA TASK FORCE

Chairman representing the US Army Corps of Engineers (USACE)	•Col. John D. Diplomatie
Member representing the State of Louisiana Coastal Protection & Restoration Authority-CPRA	•Mr. Robert Bargainette
Member representing the Environmental Protection Agency (EPA)	•Mr. James Millieu
Member representing the US Fish and Wildlife Service (USFWS)	•Ms. Elizabeth Brown
Member representing NOAA National Marine Fisheries Service	•Ms. Linda Angler
Member representing the USDA National Resources Conservation Service	•Mr. Michael Agrarian

CWPPRA FINANCIAL OFFICER

CWPPRA Financial Officer	•Ms. Grace Sharpe'

LOCAL GOVERNMENT REPRESENTATIVES

Terrebonne Parish Coastal Zone Manager	Mr. Marcus Belanger
Plaquemines Parish Coastal Zone Manager	Mr. Terry Dean
Jefferson Parish Coastal Zone Manager	Ms. Wendy Lafitte
Cameron Parish Coastal Zone Manager	Ms. Carolyn Audrey
St. Charles Parish Coastal Zone Manager	Mr. Lee Schexnayder

FEDERAL GOVERNMENT SCIENTIFIC AND TECHNICAL STAFF

•Gabrielle Arceneaux	Government Scientist Representing USFWS
•Glenn Authement	Government Scientist Representing EPA
•Mary Babin	Government Scientist Representing USACE
•Wilton Blanchard	Government Scientist Representing NOAA NMFS
•Louis Boudreaux	Government Scientist Representing USDA NRCS

The Task Force Meeting—CONT'D.

List of Characters—CONT'D.

BUSINESS INTERESTS

Bill Mouton	Floating Highway Construction Company
Adrienne Nunez	Seaside Designers Corporation
Sherri Pitre	Coastal Ecosystem Engineers, Inc.
Margaret Wilton	Industialist
Philip Steerman	Navigation
Michael Scour	Dredger

ENVIRONMENTAL GROUP MEMBERS

Jacques Thibodaux	National Habitat Protection (Not For Profit)
Andre Verret	Louisiana Department of Wildlife and Fisheries

ADDITIONAL STAKEHOLDERS

•Jane Broussard	Private Landowner
•Martin Chauvin	Oil and Gas Landowner
•Rachel Chaisson	Concerned Citizen
•Paul Fontenot	Concerned Citizen
•Mary Guidry	Educator
•Adele Landry	Historian
•Bill Plume	Birder

MEDIA / REPORTERS

Madeline Stringer	Newspaper Reporter
Zachary Pacquette	TV Reporter

The Task Force Meeting—CONT'D.

Project List

	Project Number	Project Name	Parish	Cost	Agency
1	BA - 27c	Barataria Basin Landbridge Shoreline Protection (3)	Jefferson	$46.2 M	NRCS
2	PO - 17	Bayou LaBranche Wetland Creation	St. Charles	$3.8 M	USACE
3	TV - 21	East Marsh Island Marsh Creation	Iberia	$23.0 M	EPA and NRCS
4	ME - 16	Freshwater Introduction South of Hwy. 82	Cameron	$6.3 M	USFWS
5	PO - 33	Goose Point / Point Platte Marsh Creation	St. Tammany	$15.9 M	USFWS
6	TE - 40	Timbalier Island Dune and Marsh Creation	Terrebonne	$17.5 M	EPA
7	MR - 03	West Bay Sediment Diversion	Plaquemines	$50.0 M	USACE
			TOTAL	**162.7M**	

At maximum only 48% of the projects can be built. Which projects will the students choose?

CWPPRA

Coastal Wetlands Planning, Protection and Restoration Act Task Force Meeting Agenda

DATE: **9:30AM**

LOCATION:
Estuarine Fisheries and Habitat Center
Conference Room 119
646 Cajundome Blvd.
Lafayette, Louisiana

Documentation of Task Force meetings may be found at:
http://www.mvn.usace.army.mil/pd/cwppra_mission.htm

1. Meeting Initiation —*Colonel J.D. Diplomatie and Task Force Members*

Introduction of each of the Task Force Members to include opening remarks of Task Force Members.

2. Report: Status of CWPPRA Program Funds and Projects —*Grace Sharpe', CWPPRA Financial Officer and staff member of the USACE*

Ms.Sharpe' will provide an overview of the status of CWPPRA accounts and available funding in the program for the upcoming year.

3. Report: Discussion of Candidate Projects to Evaluate for Priority Project List (PPL) 22

Each member of the federal government scientific and technical staff will report on the projects listed below in the order that they projects appear on the sheet below

Fact Sheets have been provided for each of the **government scientists** and **scientific and technical staff.** Remember, not all the projects can be funded; so, this is the time the staff is to let the Task Force know how important each project is. After each project

is proposed by the scientific and technical staff, the **public, local government representatives, business interests, environmental groups, and stakeholders** will have a turn to comment on each of the projects as the are proposed.

PPL 22 candidates for analysis as listed below:

	Project Number	Project Name	Parish	Cost	Agency
1	BA - 27c	Barataria Basin Landbridge Shoreline Protection (3)	Jefferson	$46.2 M	NRCS
2	PO - 17	Bayou LaBranche Wetland Creation	St. Charles	$3.8 M	USACE
3	TV - 21	East Marsh Island Marsh Creation	Iberia	$23.0 M	EPA and NRCS
4	ME - 16	Freshwater Introduction South of Hwy. 82	Cameron	$6.3 M	USFWS
5	PO - 33	Goose Point / Point Platte Marsh Creation	St. Tammany	$15.9 M	USFWS
6	TE - 40	Timbalier Island Dune and Marsh Creation	Terrebonne	$17.5 M	EPA
7	MR - 03	West Bay Sediment Diversion	Plaquemines	$50.0 M	USACE

CWPPRA

Coastal Wetlands Planning, Protection and Restoration Act Task Force Meeting Agenda—CONT'D.

4. Additional Public Comments — ***Colonel Diplomatie*** requests that any member of the public who has not had a chance to speak be allowed to share their ideas.

5. Vote and Decision: Using the economic criteria given, the CWPPRA Task Force must now choose the PPL 22 projects.

The Task Force will have 5 minutes to rank their top 4 projects on a flip chart or chalkboard. With 1 being the best project and 2, 3, and 4, the next important projects. Remember, only 4 of the 7 projects can be picked by each Task Force member. The scientific and techical staff will then tally the votes and report to the public which projects will be funded.

6. Request for Additional and Final Public Comments —*Col. Edward Fleming, USACE*

7. Announcement: Media Members will announce when to expect their reports to be published.

8. Decision: Adjourn

CWPPRA Task Force Meeting Role Play Cards

Col. John D. Diplomatie

Chairman
US Army Corps of Engineers (USACE)

Ladies and Gentlemen, welcome to the CWPPRA Task Force meeting. I am the Chairman of the CWPPRA Task Force representing the USACE. I'd like to call the meeting to order and invite each of the CWPPRA Task Force members to introduce themselves, and then we will be following the agenda before us. Remember, we are here today to decide which coastal restoration projects we will be able to fund. This year we have $79 million dollars. After each agenda item, the public will have a chance to make comments on each of the agenda items.
NOTE: *As Chairman, you must keep the meeting going forward to the end. You are in favor of PO-17 and MR-03 during the meeting and must rank these two projects highest during voting.*

Mr. Robert Bargainette

Task Force Member
State of Louisiana—Coastal Protection & Restoration Authority—CPRA

I am here representing the State of Louisiana. I am pleased to see the federal government investing in our state. For each project you approve, the State will match the project funds for 15%. We have a master plan for restoration and want to be sure that all the projects are a part of our master plan. I understand that I won't be able to vote on the projects but I will want to make comments about each of the projects the State supports.

NOTE: *As the State representative, during the meeting you have to pick the projects you really like and then encourage the Task Force to vote in favor of your preferences.*

Mr. James Millieu

Task Force Member
Environmental Protection Agency (EPA)

I am here representing the EPA. I am encouraged to know the CWPPRA program is working to save important wetland habitats that protect our drinking water. As you all know, protecting the environment is everyone's responsibility. At EPA, we implement regulations that are written into law by Congress. By building new wetlands and protecting healthy wetland habitats we are also protecting water supplies because wetlands act as water purifiers.

NOTE: *As the EPA representative, during the meeting you will be in support of two projects, TV-21 and TE-40. You must rank these two projects highest during the voting part of the meeting.*

Ms. Elizabeth Brown

Task Force Member
US Fish and Wildlife Service (USFWS)

I am here representing the USFWS. I am happy to say that the projects that CWPPRA builds helps to protect, conserve, and enhance fish, wildlife, and plants and their habitats for the continued benefit of the American people. We have worked with local communities to help design projects that improve fish and wildlife resources and may even be used to improve ecotourism. Habitat conservation and restoration are fundamental to achieving our agency's goals. As a reminder, the Endangered Species Act with relation to terrestrial and freshwater organism is administered through USFWS.
NOTE: *As the USFWS representative, during the meeting you will be in support of two projects, ME-16 and PO-33. You must rank these two projects highest during the voting part of the meeting.*

CWPPRA Task Force Meeting Role Play Cards—CONT'D.

Ms. Linda Angler

Task Force Member
NOAA National Marine Fisheries Service

I am here representing NOAA NMFS. NOAA Fisheries is responsible for the management, conservation, and protection of living marine resources within the US economic zone. It is our expressed goal to be stewards of living marine resources for the benefit of the nation through science-based conservation and management. We also administer the Endangered Species Act for the protection of marine organisms. Because many marine organisms spend part of their life cycles in wetland habitats we are happy to be a part of the CWPPRA program.
NOTE: *As the NOAA representative, during the voting part of the meeting you should support projects that you think improve fisheries.*

Mr. Michael Agrarian

Task Force Member
USDA National Resources Conservation Service

For CWPPRA, I am here representing the USDA NRCS. NRCS's mission is to provide leadership in the conservation of soil, water, and related natural resources. The NRCS has a reputation of providing balanced technical assistance in land conservation and wetlands restoration and enhancement. Wetlands are a home to many species of migratory and resident birds, reptiles and amphibians, fish, insects, and plants. They also benefit society by storing floodwaters, filtering pollutants, serving as a carbon sink, and providing recreation sites for boating and fishing.
NOTE: *As the NRCS representative, during the voting part of the meeting you should support the TV-21 project and rank it first.*

Ms. Grace Sharpe'

CWPPRA Financial Officer

For this year, the CWPPRA program will have $79 million dollars to spend on restoration. What will be brought to you today by federal government scientific staff are 7 projects for a total value of $162.7 million dollars. Task Force, you can ONLY allocate a total of $79 million dollars, so you will have to evaluate the projects during this meeting, and at the close of the meeting select through voting. Any remaining funds that you have will be used in next year's budget.

NOTE: *Ms. Sharpe' is always polite and will keep a tally of all funds that are to be spent on restoration.*

Gabrielle Arceneaux

Government Scientist
US Fish and Wildlife Service (USFWS)

We have two projects to present to the Task Force today. The projects are:
ME-16 Freshwater Introduction South of Hwy 82 in Cameron Parish on the southwest side of the state and PO-33 Goose Point/Point Platte Marsh Creation in St. Tammany Parish just north of Lake Pontchartrain.
I have prepared fact sheets so you can learn about each of the projects but I would like to highlight these interesting aspects of each project.

NOTE: *YOU MUST READ BOTH Project FACT SHEETS and EXPLAIN THE PROJECTS in under 3 minutes.*

CWPPRA Task Force Meeting Role Play Cards—CONT'D.

Glen Authement

Government Scientist
Environmental Protection Agency (EPA)

We have two projects to present to the Task Force today. The projects are:
TE-40 Timbalier Island Dune and Marsh Creation in Terrebonne Parish on the southeast side of the state and TV-21 East Marsh Island Marsh Creation in Iberia Parish in the central part of the state.
I have prepared fact sheets so you can learn about each of the projects, but I would like to highlight these interesting aspects of each project.

NOTE: *YOU MUST READ BOTH Project FACT SHEETS and EXPLAIN THE PROJECTS in under 3 minutes.*

Mary Babin

Government Scientist
US Army Corps of Engineers (USACE)

We have one project to present to the Task Force today. The projects is:
MR-03 West Bay Sediment Diversion in Plaquemines Parish down river of New Orleans.

I have prepared a fact sheet so you can learn about the projects but I would like to highlight these interesting aspects of each project.

NOTE: *YOU MUST READ THE Project FACT SHEETS and EXPLAIN THE PROJECT in under 3 minutes.*

Wilton Blanchard

Government Scientist
NOAA National Marine Fisheries Service

Today, we don't have any of our own projects to bring before the Task Force, but we would like to comment on projects that we think would be most beneficial for fisheries. The projects we are in support of today are:

PICK 3 Projects

Because:
Give the reasons why you support these projects.

Louis Boudreaux

Government Scientist
USDA National Resources Conservation Service

We have two projects to present to the Task Force today. The projects are:
BA-27c Barataria Basin Landbridge Shoreline Proetection (3)- in Jefferson Parish just south and east of New Orleans and
TV-21 East Marsh Island Marsh Creation in Iberia Parish.
We are partnering with EPA on the second project so we will let them share that one with you.
I have prepared a fact sheet on BA-27a so you can learn the projects but I would like to highlight these interesting aspects of each project.

NOTE: *YOU MUST READ the Project FACT SHEETS and EXPLAIN THE PROJECT in under 3 minutes.*

CWPPRA Task Force Meeting Role Play Cards—CONT'D.

Mr. Marcus Belanger

Representative
Terrebonne Parish Coastal Zone Manager

I would like to speak in support of TE-40 Timbalier Island Dune and Marsh Creation. I think the project is very important because:

List three things based on the fact sheet.

1.
2.
3.

Mr. Terry Dean

Representative
Plaquemines Parish Coastal Zone Manager

I would like to speak in support of MR-03, the West Bay Sediment Diversion project. I think the project is very important because:

List three things based on the fact sheet

1.
2.
3.

Ms. Wendy Lafitte

Representative
Jefferson Parish Coastal Zone Manager

I would like to speak in support of BA-27c, the Barataria Basin Landbridge Shoreline Protection Phase 3 project. I think the project is very important because:

List three things based on the fact sheet

1.
2.
3.

Ms. Carolyn Audrey

Representative
Cameron Parish Coastal Zone Manager

I would like to speak in support of MR-03 the West Bay Sediment Diversion project. I think the project is very important because:

List three things based on the fact sheet

1.
2.
3.

CWPPRA Task Force Meeting Role Play Cards—CONT'D.

Mr. Lee Schexnayder

Representative
St. Charles Parish President

I would like to speak in support of PO-17 Bayou LaBranche Wetland Creation project. We are excited about this project not only for its environmental benefits, but it will also help with ecotourism. Environmentally, I think the project is very important because:

List three things based on the fact sheet

1.
2.
3.

Bill Mouton

Business Representative
Floating Highway Construction Co.

I think the Bayou LaBranche Wetland Creation project is important to New Orleans residents as the project is bounded by U.S. Interstate 10 to the south and Lake Pontchartrain to the north. This project would protect the road that is a major hurricane evacuation route out of New Orleans. When you are thinking about coastal restoration, you need to keep in mind that there are people living here, too. And people need to be taken care of as well as the birds and bunnies.

Adrienne Nunez

Business Representative
Seaside Designers Corporation

We are in support of the MR-03 West Bay Sediment Diversion. I know it may seem like the only reason we are interested in this project is because it the largest project on the list today and we are the largest wetlands contractors in the State. But honestly, we want to see the sediment of the Mississippi River used wisely. We believe that the material that is dredged during the building of the channel for this large scale diversion as well as the water that will be coming into the area will create a healthy wetland in an area that was once open water.

Sherri Pitre

Business Representative
Coastal Ecosystem Engineers, Inc.

Our business is a small women-owned business in Lake Charles and we are excited to see that there is a project in Cameron Parish. One third of all businesses in the US are women-owned and we are excited to have an opportunity to work with people right here in our local community. We strongly support ME-16 Freshwater Introduction South of Hwy 82 in Cameron parish. Not only will the project protect fragile marsh. It has the potential to also generate jobs for our local community.

CWPPRA Task Force Meeting Role Play Cards—CONT'D.

Margaret Wilton

Business Representative
Industrialist

I am here to complain about the P0-33 project. It is titled the Goose Point/Point Platte Marsh Creation project. For years my business has been trying to purchase the land inside the St. Tammany Wildlife Management Area from the State of Louisiana to create a new neighborhood. Since Hurricane Katrina, people continue to move to the north shore of Lake Pontchartrain. We need land to build new neighborhoods. There are plenty of wetlands on the north shore for people to use. We don't need any additional "protected" areas.

Philip Steerman

Business Representative
Navigation

I am here to comment on the West Bay Sediment Diversion—MR-03. The problem with this project is that you must maintain an anchorage area at Pilottown in the Mississippi River. You must meet with the Mississippi River Commission and the River Boat Pilot Association prior to moving this project forward. We want to be involved. I strongly suggest that you take this project off of this year's list and move it to next year. I feel that we have been left out of the planning for this project and no one knows the river better than the river boat pilots.

Michael Scour

Business Representative
Dredger

I am here representing the dredging industry. We want to assure you that no matter what your needs are we are always willing and able to help with coastal restoration. We have 37 different dredging companies in Louisiana and we have a fleet of dredges, backhoes, and pumps that get the job done no matter how big or small. As Louisiana residents, we are so thankful for the 1990 landmark legislation the Coastal Wetlands Planning, Protection and Restoration Act. Many states are fighting to save these precious wetland resources. I just want you to know the dredging industry stands ready to play a leading role in many of these environmental restoration projects.

Jacques Thibodaux

Environmental Representative
National Habitat Protection
(Not For Profit)

We are in strong support of the West Bay Diversion, MR -03. We know that the river built the wetlands of Louisiana. The longer we starve our wetlands from the nutrients of the river the more coastal land loss we will experience. We can't wait one more day for this project. Our Board of Directors has asked me to attend this meeting so that I could convey to you the urgent need for this project. I hope that you will consider putting MR-03 at the top of your list when we get to the voting part of the meeting today.

CWPPRA Task Force Meeting Role Play Cards—CONT'D.

Andre Verret

Environmental Representative
LA Department of Wildlife & Fisheries

We strongly support the Goose Point/Point Platte Marsh Creation project TE-40 and the East Marsh Island Marsh Creation project because they are both on public property. Allowing citizens to access as much of the land that we restore is very important. New wetlands provide home to a wide variety of plants, birds, alligator, and deer. Creating these new lands on public property is a great way to also reconnect people with nature.
We also support the restoration of Timbalier Island TE-40 as it is of vital importance to the fisheries along coastal Louisiana.

Jane Broussard

Stakeholder
Private Landowner

I am here to support the BA-27a Barataria Basin Land Bridge Shoreline Protection Project BA-27c. This land bridge protects those of us who are land owners just north of the project. As hurricanes come into the area, the land bridge acts as a buffer to storm surge breaking down the tall waves and absorbing wind and water energy. While I understand that the project is expensive, the rocks and structures that will be built will provide protection for us.

Martin Chauvin

Stakeholder
Natural Gas Company Landowner

I am from Erath, Louisiana. Henry Hub is a distribution hub of the natural gas pipeline system in Erath, Louisiana. Due to its importance, this small Louisiana town lends its name to the pricing point for natural gas futures contracts traded on the New York Mercantile Exchange. It interconnects with nine interstate and four intrastate pipelines. Based on the economic need, I think we need to build as many projects as close to Erath as possible. Therefore, I support the East Marsh Island Marsh Creation Project and the Freshwater Introduction South of Hwy 82.

Rachel Chaisson

Stakeholder
Concerned Citizen

I am from St. Charles Parish. Because we are not right on the very edge of our coast, we seldom get picked for CWPPRA projects. But what you must remember is that it is much less expensive to save and repair wetlands that are not completely lost. Currently we have only 4 of the 148 CWPPRA projects in our parish. Notice how for just $3.8 million dollars you can build 487 acres of land with the Bayou LaBranche Wetland Creation project P-17. The project also protects important infrastructure. As you saw from the earlier description, Interstate 10 would be protected as an evacuation route if we build this modest project.

CWPPRA Task Force Meeting Role Play Cards—CONT'D.

Paul Fontenot

Stakeholder
Concerned Citizen

I am a fisherman, hunter, and general outdoorsman. I am here in support of the East Marsh Island project. The Marsh Island Wildlife Refuge, owned and operated by the state of Louisiana, is located between Vermilion Bay and the Gulf of Mexico. Marsh Island is very important as wintering grounds for blue and snow geese. Recently, 30,000 geese and 50,000 ducks have been documented using the refuge. Besides waterfowl, Marsh Island's major commercially important inhabitants are alligators, fisheries, and furbearers. Commercial harvests of shrimp in Vermilion Bay and the gulf, as well as recreational harvests on the refuge, are due to shrimp utilization of Marsh Island as a nursery ground. The economics of this project is not just about the cost per acre. You must consider the importance of this habitat.

Mary Guidry

Stakeholder
Educator

As a high school economics teacher I want to remind you all the monies you spend here today are public funds and must be spent as wisely as possible. Do not forget that the money we have for restoration is limited and must be divided among competing needs. Our Louisiana needs greatly exceed our current budget. When you select projects today be careful to think about which benefits you are trying to achieve. You cannot please everyone. Don't forget about risk, sustainability, and ecosystem services. Though scientists and advocates shun the use of economics for examining coastal restoration, there is no escaping the reality that Louisiana's restoration needs far outweigh available funding. I urge you to choose carefully!

Adele Landry

Stakeholder
Historian

I am a member of the Louisiana Historical Society. I strongly encourage you to save the barrier islands. You can do so by supporting the Timbalier Island Dune and Marsh Creation project TE-40. At one time, many islands of Terrebonne Parish were connected as one piece of land called Isle Derniere or Last Island. This island was a resort for the rich and powerful many years ago in the 1800s. By saving this island you would be helping to protect and preserve history. Who can put a price on that?

Bill Plume

Stakeholder
Birder

I am a member of the Louisiana Audubon Society. It is not an easy decision to let you know how we feel about restoring coastal habitats. Louisiana is home to many migratory and resident bird populations. We were unable to chose just one project to support but our top four projects include: West Bay Sediment Diversion, East Marsh Island Marsh Creation, Timbalier Island Dune and Marsh Creation and Goose Point/Point Platte Marsh Creation. We know this decision will be difficult but we certainly hope you will agree with us on those four as the top projects.

CWPPRA Task Force Meeting Role Play Cards—CONT'D.

Zachary Pacquette

Stakeholder
TV Reporter

Your job is to listen to the entire meeting, interview any of the people you like and then create a 4-minute story that will air on tonight's local TV news station.

Be sure to get all the sides of the story.

Did the Task Force make an economically wise decision in its choice of projects?

Madeline Stringer

Stakeholder
Newspaper Reporter

Your job is to listen to the entire meeting, interview any of the people you like and then create a 300-word story that will run in the local morning newspaper.

Be sure to get all the sides of the story.

Did the Task Force make an economically wise decision in its choice of projects?

follow up

Assessments

- Write a short summary of how the public must work together to solve wetland issues.

- Write an evaluation of how restoration projects are chosen. Evaluate how economics plays a role in coastal restoration.

Resources

Websites:

www.LaCoast.gov Provides a review of all CWPPRA coastal restoration projects and links to CWPPRA Task Force meeting agendas and binders.

http://www.cnrep.lsu.edu/ **The Center for Natural Resource Economics and Planning** is helping Louisiana to meet the challenge of resource management involving reconciling the duel needs for economic viability and environmental integrity by improving the efficiency and equity of the state's natural capital management and allocation.

Rules Online website, no date, **Robert's Rules of Order Revised, by General Henry M. Robert, 1915 4th Ed., Public Domain**, accessed July 8, 2005 at http://www.rulesonline.com/
Online reference for Robert's Rules of Order.

Holmstrom, Laurel, Sonoma State University, May 13, 2003, **Robert's Rules of Order Made Simple**, accessed July 8, 2005 at http://www.sonoma.edu/Senate/Roberts_Simple.html
Summary of Robert's Rules of Order.

follow up

References:

Sylvester, Nancy. 2004. **The Complete Idiot's Guide to Robert's Rules**. Penguin Group (USA), 352 pp. ISBN: 1592571638.

*A book on **Robert's Rules** that is loaded with understandable and easy to read information.*

Jennings, C. Alan. 2004. **Robert's Rules for Dummies** (Dummies Series). Wiley, John & Sons, Inc., 338 pp. ISBN: 0764575740

*A book on **Robert's Rules** that walks readers through assembling a quorum, the order of agenda, the steps for making a motion, nominating and electing officers, and becoming involved in committees.*

GLE's

Science
7: GLE-38 Analyze the consequences of human activities on ecosystems (SE-M-A4)

Biology
HS Biol-27 Analyze the positive and negative effects of human actions on ecosystems (SE-H-D4) (SE-H-A7)

Environmental Science
HS Env. Sci-22 Analyze the risk-benefit ratio for selected enviornmental situations (SE-H-C4)

Lesson Source

CNREP
Center for
Natural Resource Economics
& Policy

Sea Grant
LOUISIANA

COASTAL WETLANDS PLANNING, PROTECTION, AND RESTORATION ACT

rev. September 2010
Cost figures as of: July 2012

East Marsh Island Marsh Creation (TV-21)

Project Status

Approved Date: 2005 **Project Area:** 362 acres
Approved Funds: $22.6 M **Total Est. Cost:** $23.0 M
Net Benefit After 20 Years: 169 acres
Status: Construction
Project Type: Marsh Creation
PPL #: 14

Location

The project is located in the Teche/Vermilion Basin at the east end of Marsh Island Wildlife Refuge southeast of Lake Sand in Iberia Parish, Louisiana.

Problems

Substantial areas of interior emergent marsh on Marsh Island have been converted to open water, primarily because of Hurricane Lili (2002). Areas targeted under this project are those with the greatest historical land loss and within close proximity to East Cote Blanche Bay.

Restoration Strategy

This project is designed to re-create brackish marsh habitat in the open water areas of the interior marsh primarily caused by hurricane damage. Based on 2007 aerial photography analysis, approximately 197 acres of marsh will be nourished and 165 acres of open water will be restored to interior emergent marsh habitat. The loss rates for the interior ponded areas are estimated to be reduced by 50 percent. This project provides a synergistic effect with CWPPRA's Marsh Island Hydrologic Restoration (TV-14), a project constructed in December 2001.

Aerial view of the east end of Marsh Island after commencement of construction activity.

Aerial view of the east end of Marsh Island where material dredged from East Cote Blanche Bay will be deposited to fill in open ponds and nourish marsh.

Progress to Date

The Louisiana Coastal Wetlands Conservation and Restoration Task Force approved funding for engineering and design at their February 2005 meeting. The U.S. Environmental Protection Agency and the Natural Resources Conservation Service, working through the Louisiana Department of Natural Resources, completed the engineering and design of the project and construction began in March 2010.

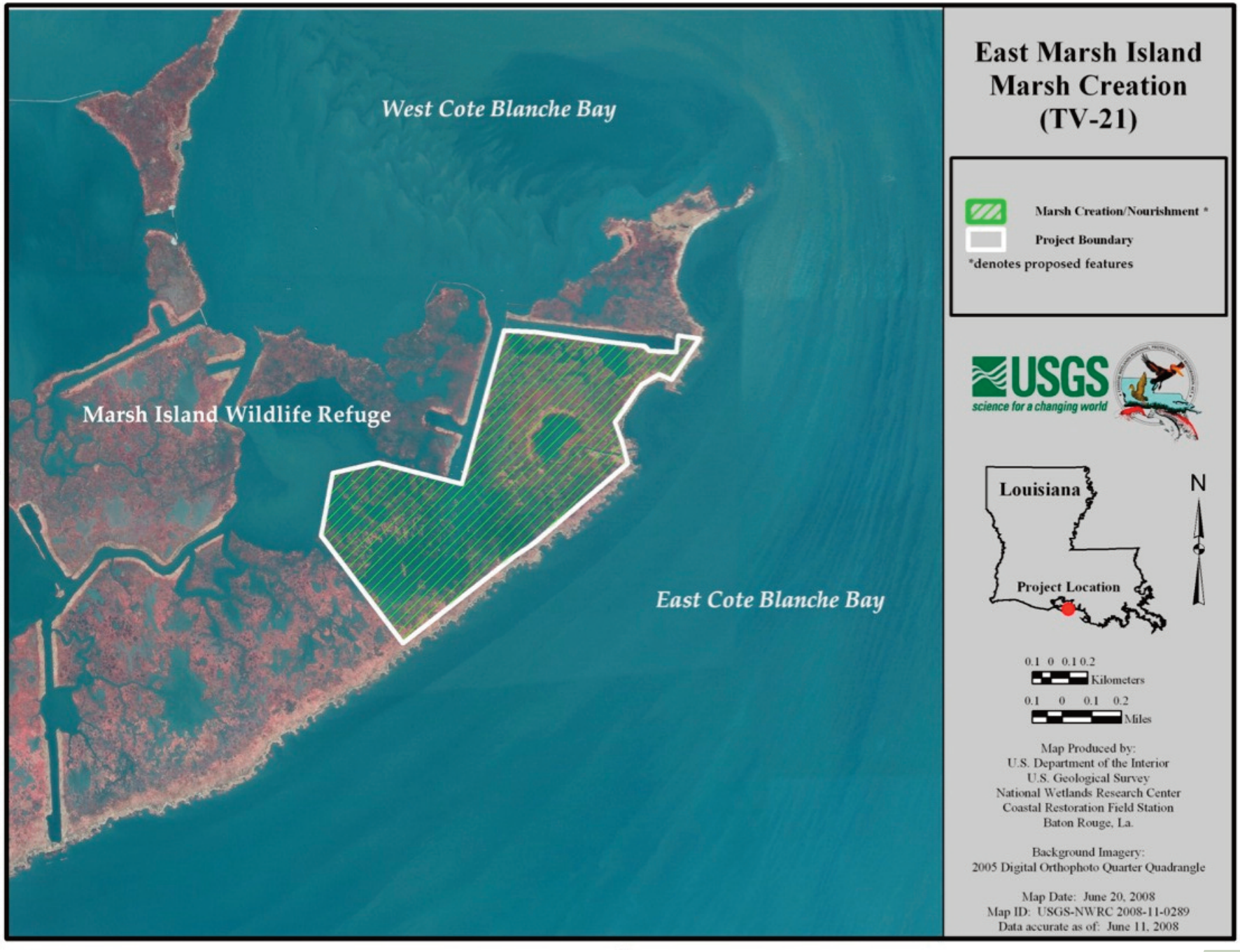
This project is on Priority Project List 14.

For more project information, please contact:

Federal Sponsors:
U.S. Environmental Protection Agency
Dallas, TX
(214) 665-7459

Natural Resources Conservation Service
Alexandria, LA
(318) 473-7756

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736


West Cote Blanche Bay
Marsh Island Wildlife Refuge
East Cote Blanche Bay
East Marsh Island
Marsh Creation
(TV-21)
Marsh Creation/Nourishment *
Project Boundary
*denotes proposed features
USGS
science for a changing world
Louisiana
Project Location
N
0.1 0 0.1 0.2
Kilometers
0.1 0 0.1 0.2
Miles
Map Produced by:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Baton Rouge, La.
Background Imagery:
2005 Digital Orthophoto Quarter Quadrangle
Map Date: June 20, 2008
Map ID: USGS-NWRC 2008-11-0289
Data accurate as of: June 11, 2008

March 2010 (rev)
Cost figures as of: July 2012

Barataria Basin Landbridge Shoreline Protection, Phase 3 (BA-27c)

Project Status

Approved Date: 2000 **Project Area:** 2,380 acres
Approved Funds: $37.2 M **Total Est. Cost:** $46.2 M
Net Benefit After 20 Years: 264 acres
Status: Engineering and Design
Project Type: Shoreline Protection
PPL #: 9

Location

The project is located along the west bank of Bayou Perot and the north shoreline of Little Lake in Lafourche Parish and along the east bank of Bayou Perot and the east and west banks of Harvey Cutoff in Jefferson Parish, Louisiana.

Problems

The Barataria Landbridge is a critical land form that retards marine tidal forces which, among other things, threaten the upper Barataria basin. The highly organic soils in the project area are particularly susceptible to shoreline erosion. With increased tidal action, erosion rates in the project area range up to about 75 feet/year. With continued erosion, the landbridge function will be lost in the near future.

Restoration Strategy

This project encompasses about 41,000 feet of shoreline protection. About 20,000 feet of protection will be along the west bank of Bayou Perot and the north shore of Little Lake in Lafourche Parish. In Jefferson Parish, about 15,000 feet of the protection will be along the east bank of Bayou Perot and about 3,000 feet along each bank of the Harvey Cutoff.

Progress to Date

Approximately 11,000 feet of shoreline protection was completed in 2004 and another 10,000 feet of shoreline protection was completed in 2009. Approximately 20,000 feet of shoreline protection has recently been funded for construction.

This project is on Priority Project List 9.

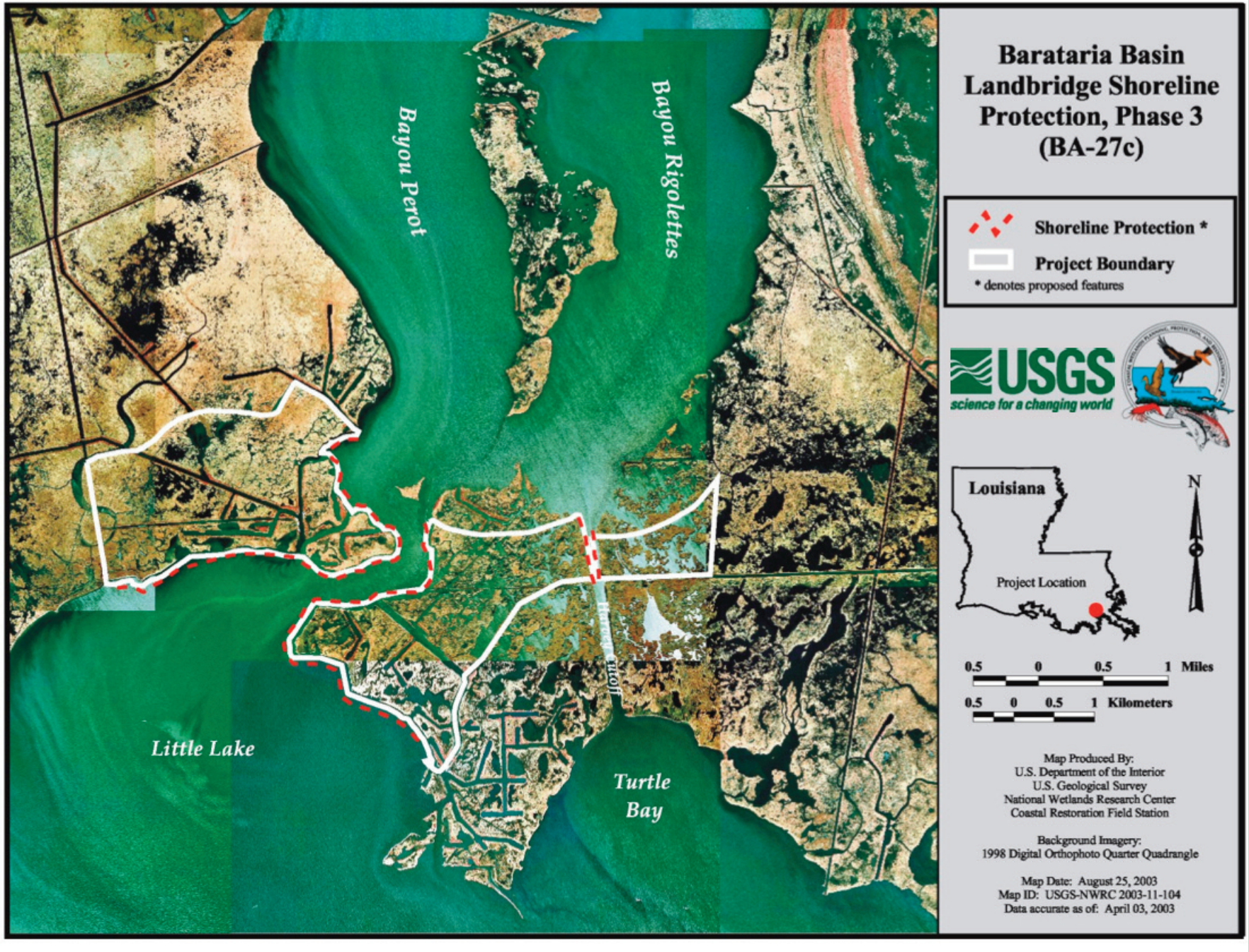
Protection will be provided to a total of 41,000 feet of shoreline in order to preserve the effectiveness of these areas in preventing marsh loss.

For more project information, please contact:

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7756

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, La.
(225) 342-4736

www.LaCoast.gov


Barataria Basin
Landbridge Shoreline
Protection, Phase 3
(BA-27c)
Shoreline Protection *
Project Boundary
* denotes proposed features
USGS
science for a changing world
Louisiana
Project Location
N
0.5 0 0.5 1 Miles
0.5 0 0.5 1 Kilometers
Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle
Map Date: August 25, 2003
Map ID: USGS-NWRC 2003-11-104
Data accurate as of: April 03, 2003
Bayou Perot
Bayou Rigolettes
Little Lake
Turtle
Bay

September 2010 (rev)
Cost figures as of: July 2012

Freshwater Introduction South of Highway 82 (ME-16)

Project Status

Approved Date: 2000 **Project Area:** 19,988 acres
Approved Funds: $5.15 M **Total Est. Cost:** $6.34 M
Net Benefit After 20 Years: 296 acres
Status: Completed 2006
Project Type: Hydrologic Restoration
PPL #: 9

Location

The project is located in the north central and eastern portions of Rockefeller State Wildlife Refuge and Game Preserve and Miami Corporation property in Cameron and Vermilion parishes, Louisiana, 9 miles southwest of Pecan Island, LA.

Problems

The Chenier Subbasin of the Mermentau Basin, located south of Highway 82, has been experiencing saltwater intrusion due to lack of freshwater and nutrient input from the Lakes Subbasin. Excess freshwater in the Lakes Subbasin, located north of Highway 82, is available to reduce salinities further south in the Chenier Subbasin.

Restoration Strategy

The project components included: installation of four freshwater introduction water control structures; plug removal; modification of the Little Constance structure; and canal enlargement north and south of Louisiana Highway 82 to allow water flow under the highway from the Lakes Subbasin south into the Chenier Subbasin. A small "spray dredge" was used to enlarge the freshwater introduction channels that spread the dredged sediment in a thin layer over the existing marsh eliminating spoil banks and impacts to adjacent marsh. Higher water levels in the Lakes Subbasin afford the opportunity to divert water into the Chenier Subbasin. 26,000 linear feet of "duck-wing" earthen terraces were also constructed west of Rockefeller's Unit 14 impoundment.

Progress to Date

The project was approved for engineering and design in January 2000 and for construction in October 2004. Hydrologic modeling and final designs were completed in September 2003 and December 2004 respectively. Construction began in June 2005 and was completed in October 2006.

Monitoring Results

The various project features, with the exception of rock revetment, are in excellent condition and the structures are functioning as designed. Salinity levels were reduced in the target brackish marshes in southeastern Rockefeller Refuge. Operation of the structures to improve drainage allowed the area to recover in the fall of 2006 after Hurricane Rita. The vegetative recovery was greater in the project area after Hurricane Rita compared to that recorded in adjacent reference sites. Preliminary information in the 2008 monitoring report indicated that the project-area brackish marsh site showed a gain in elevation compared to other sites.

Early stages of the construction of a water control structure to move freshwater to brackish marshes to the south.

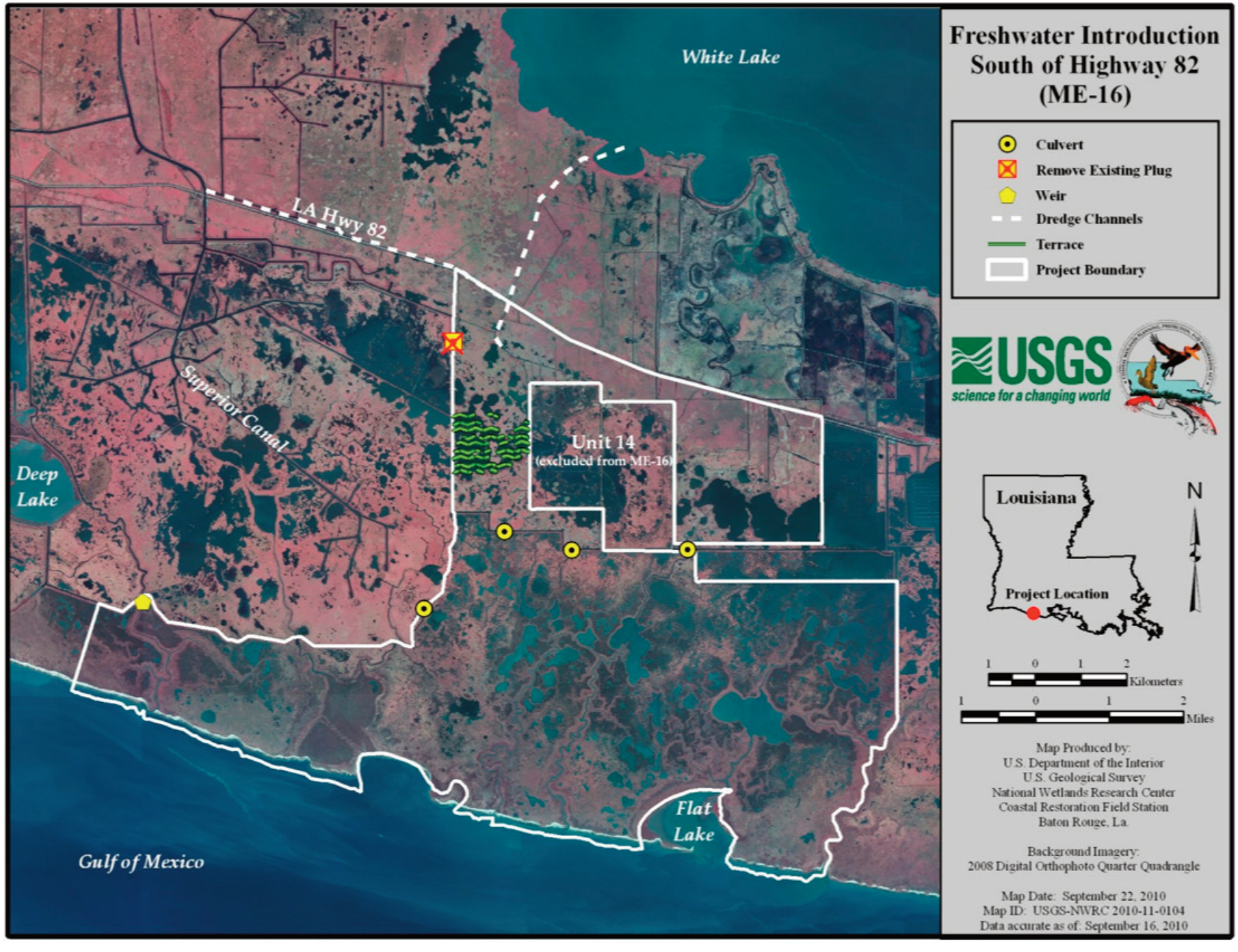
Small spray dredge enlarging the Grand Volle Ditch and spraying the spoil over existing marsh.

For more project information, please contact:

Federal Sponsor:
U.S. Fish and Wildlife Service
Lafayette, LA
(337) 291-3100

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

www.LaCoast.gov


White Lake
LA Hwy 82
Superior Canal
Unit 14
(excluded from ME-16)
Deep Lake
Flat Lake
Gulf of Mexico
Freshwater Introduction South of Highway 82 (ME-16)
Culvert
Remove Existing Plug
Weir
Dredge Channels
Terrace
Project Boundary
USGS
science for a changing world
Louisiana
Project Location
N
1 0 1 2
Kilometers
1 0 1 2
Miles
Map Produced by:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Baton Rouge, La.
Background Imagery:
2008 Digital Orthophoto Quarter Quadrangle
Map Date: September 22, 2010
Map ID: USGS-NWRC 2010-11-0104
Data accurate as of: September 16, 2010

June 2004 (rev.)
Cost figures as of: July 2012

West Bay Sediment Diversion (MR-03)

Project Status

Approved Date: 1992 **Project Area:** 12,910 acres
Approved Funds: $33.3 M **Total Est. Cost:** $50.8 M
Net Benefit After 20 Years: 9,831 acres
Status: Completed Nov. 2003
Project Type: Water Diversion
PPL #: 1

Location

The diversion site is located on the west bank of the Mississippi River, in Plaquemines Parish, Louisiana, 4.7 miles above Head of Passes. The project diverts Mississippi River water and sediments into West Bay.

Problems

Marshes along the lower Mississippi River are subsiding and converting to open water because of a lack of riverine sediment inputs and fresh water.

Restoration Strategy

The objective of the project is to restore vegetated wetlands in an area that is currently shallow open water. The project diverts sediments to create, nourish, and maintain approximately 9,831 acres of fresh to intermediate marsh in the West Bay area over the 20-year project life.

The project consists of a conveyance channel for the large-scale diversion of sediments from the river. The conveyance channel is being constructed in two phases: (1) construction of an initial channel with an average discharge of 20,000 cubic feet per second (cfs); (2) after a period of intensive monitoring, enlargement of the channel to a 50,000 cfs discharge. Material from the construction of the initial channel was used to create wetlands in the diversion outfall area.

The diversion may induce shoaling in the main navigation channel of the Mississippi River and the adjacent Pilottown anchorage area. Dredging of the main channel is accomplished under the U.S. Army Corps of Engineers' ongoing Operations and Maintenance Program for the river, but additional dredging of the anchorage area would be an added feature and cost of the project. The material dredged from the anchorage area will be used to create wetlands in the West Bay diversion outfall area.

The conveyance channel allows fresh water and sediment to flow from the Mississippi River (bottom of picture) to restore vegetated wetlands in an area that is currently shallow open water.

Progress to Date

An Environmental Impact Statement was completed in March 2002. Final project plans and specifications were approved in September 2002. Project construction began in September 2003 and was completed in November 2003. Monitoring of the channel and receiving area is currently underway.

The Louisiana Coastal Wetlands Conservation and Restoration Task Force approved proceeding with the project at the current price of $22 million at their January 2001 meeting. Most of the increase in the project cost is for dredging of the anchorage area and the relocation of a 10-inch oil pipeline.

This project is on Priority Project List 1.

For more project information, please contact:

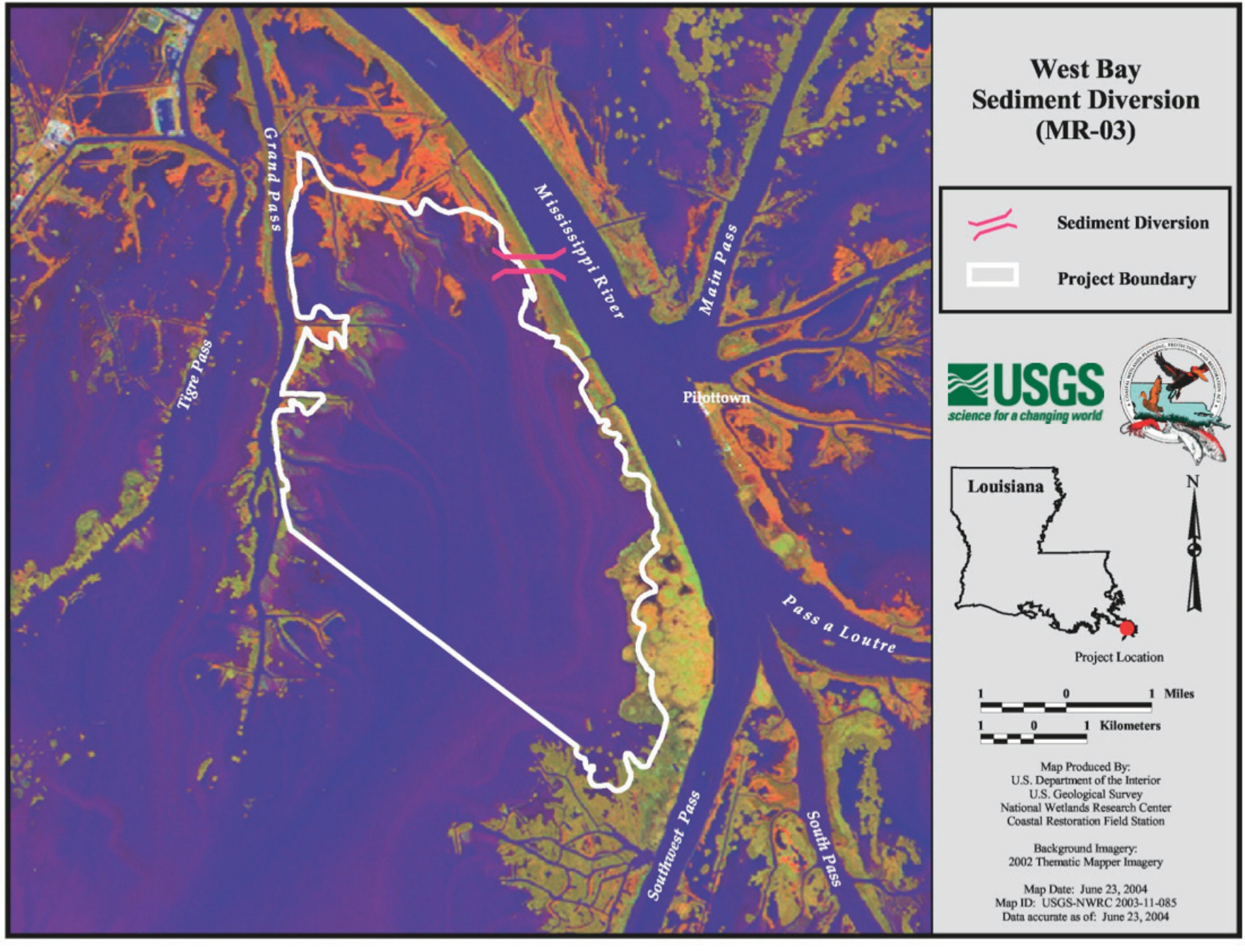
US Army Corps of Engineers
New Orleans District

Federal Sponsor:
U.S. Army Corps of Engineers
New Orleans, LA
(504) 862-1597

CPRA

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

www.LaCoast.gov


West Bay
Sediment Diversion
(MR-03)
Sediment Diversion
Project Boundary
Grand Pass
Mississippi River
Main Pass
Tigre Pass
Pilottown
Pass a Loutre
Southwest Pass
South Pass
USGS
science for a changing world
Louisiana
N
Project Location
1 0 1 Miles
1 0 1 Kilometers
Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Background Imagery:
2002 Thematic Mapper Imagery
Map Date: June 23, 2004
Map ID: USGS-NWRC 2003-11-085
Data accurate as of: June 23, 2004

rev. June 2006
Cost figures as of: July 2012

Timbalier Island Dune and Marsh Restoration (TE-40)

Project Status

Approved Date: 2000 **Project Area:** 663 acres
Approved Funds: $16.6 M **Total Est. Cost:** $17.4 M
Net Benefit After 20 Years: 273 acres
Status: Construction
Project Type: Barrier Island Restoration
PPL #: 9

Location

Timbalier Island is located south of Terrebonne Bay and west of East Timbalier Island in Terrebonne Parish, Louisiana.

Problems

Timbalier Island is migrating rapidly to the west/northwest, which is a clear indication of the dominant influence of longshore sediment transport processes (the movement of beach material by waves and currents) along the island. Thus, the western end of Timbalier Island is undergoing lateral migration by spit-building processes, at the expense of erosion along the eastern end, while the island overall is shortening and narrowing. This loss can be attributed to an inadequate sediment supply, relative sea-level rise, and the passage of storms. Without mitigating efforts, Timbalier Island was projected to disappear by the year 2050.

Restoration Strategy

The objective of this project is to restore the eastern end of Timbalier Island through the direct creation of dune and marsh habitat. The project boundary is divided into Areas A and B. Area A was restored through direct creation of dune and marsh on the east end of Timbalier Island. Area B will be enhanced through addition of sediment into the nearshore system, maintaining the west/northwest migration of the island and attenuation of wave energy.

Specifically, the project introduced sediment from the Gulf of Mexico to restore 2.2 miles of the beach rim and dune system and create a marsh platform on the bay side of the island. The marsh platform was built around existing marsh with minimal impact. Approximately 4.6 million cubic yards of material was dredged from the Little Pass borrow area about 14,000 feet away from the project and 22,750 linear feet of sand fencing was placed. Over 110,000 container grown plants consisting of eight species were initially planted. This is the most diverse plantings to date for a CWPPRA barrier island project. The sand fencing and vegetative plants help capture and retain wind-blown sand.

The plants and sand fencing shown above will help to maintain the integrity of Timbalier Island by capturing and retaining wind-blown sand.

Progress to Date

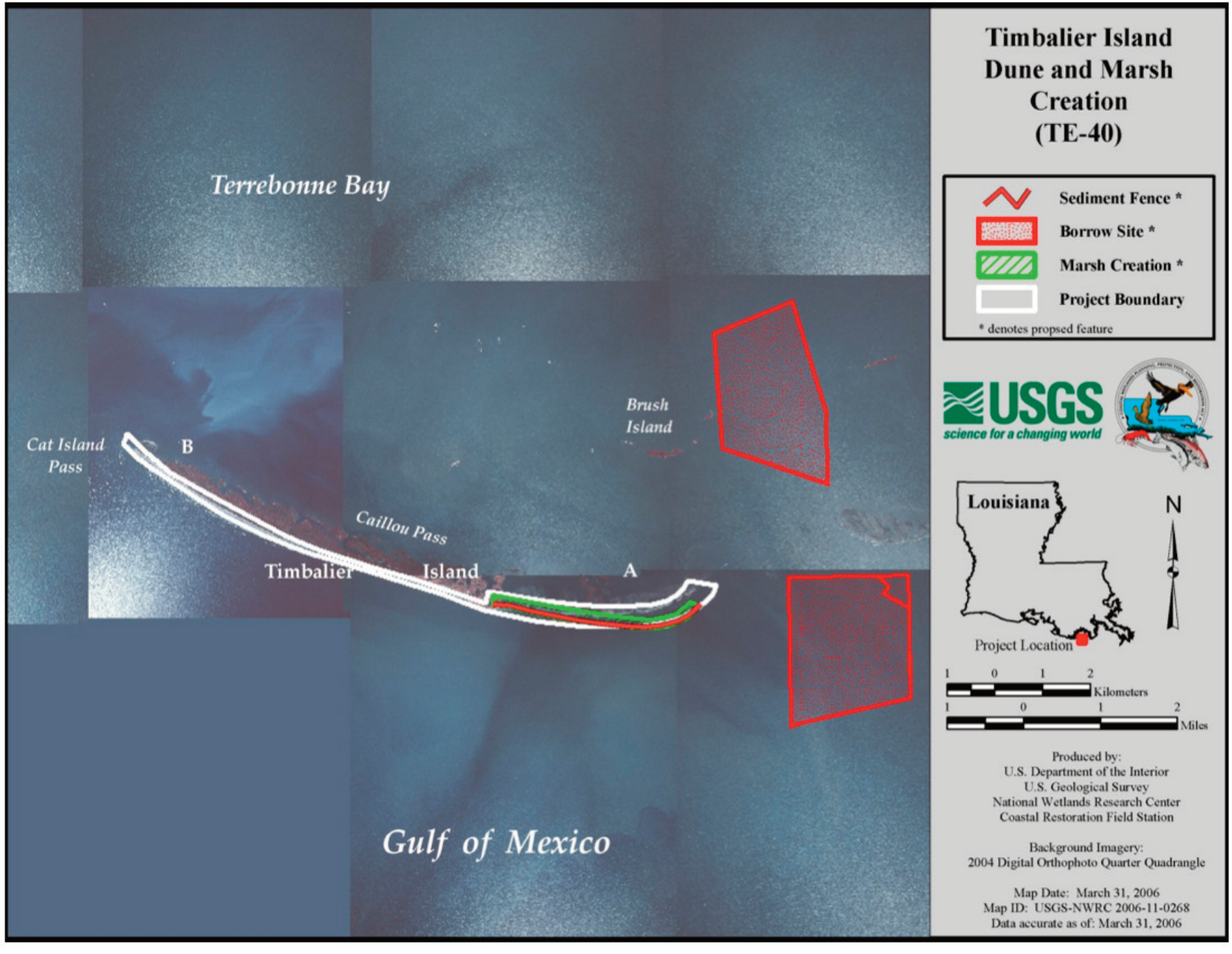
Construction funding was approved by the Louisiana Coastal Wetlands Conservation and Restoration Task Force in January 2003. Construction began June 2004 and dredging from the borrow site was completed in December 2004. This portion of the project was accepted in January 2005. The initial vegetative planting component began March 2005 and was completed in June 2005. The total cost of construction was $13,761,336. An additional row of sand fencing will be installed in spring 2006 along with an additional 40,000 plugs of smooth cord grass and 2,000 bitter panicum container plants.

This project is on Priority Project List 9.

For more project information, please contact:

Federal Sponsor:
U.S. Environmental Protection Agency
Dallas, TX
(214) 665-7255

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736


Terrebonne Bay
Brush Island
Cat Island Pass
B
Caillou Pass
Timbalier Island
A
Gulf of Mexico
Timbalier Island Dune and Marsh Creation (TE-40)
Sediment Fence *
Borrow Site *
Marsh Creation *
Project Boundary
* denotes propsed feature
USGS
science for a changing world
Louisiana
N
Project Location
1 0 1 2
Kilometers
1 0 1 2
Miles
Produced by:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Background Imagery:
2004 Digital Orthophoto Quarter Quadrangle
Map Date: March 31, 2006
Map ID: USGS-NWRC 2006-11-0268
Data accurate as of: March 31, 2006

rev. March 2010
Cost figures as of: July 2012

Bayou LaBranche Wetland Creation (PO-17)

Project Status

Approved Date: 1991 **Project Area:** 487 acres
Approved Funds: $3.81 M **Total Est. Cost:** $3.81 M
Net Benefit After 20 Years: 203 acres
Status: Completed October 2000
Project Type: Marsh Creation
PPL #: 1

Location

The project is bounded by U.S. Interstate 10 to the south and Lake Pontchartrain to the north. It is approximately 3 miles northeast of Norco, Louisiana, in St. Charles Parish.

Problems

Construction of Interstate 10 (with its associated construction access canals), the Illinois Central Railroad, and an abandoned agricultural development resulted in altered hydrology and increased salinity.

The primary cause of wetland loss in the area was the failure of agricultural impoundments and subsequent flooding.

An unnamed hurricane in 1915 and Hurricane Betsy (1965) caused salt water to overflow the banks of Lake Pontchartrain and flow unchecked through canals. This overflow resulted in excessive salt water in the project area marsh and a subsequent loss of intermediate marsh vegetation.

Restoration Strategy

The project's goal was to create an area of 70% land and 30% water within 5 years of construction. Depositing 2.7 million cubic yards of sediments dredged from Lake Pontchartrain within an earthen containment berm created new, emergent marsh in what had formerly been an open water area.

Project effectiveness was evaluated by monitoring emerging wetland vegetation growth, water quality, and both the elevation and compaction rates of the deposited sediment.

Aerial view looking north depicting the marsh created within the Bayou LaBranche project area. Lake Pontchartrain is in the foreground, U.S. Interstate 10 can be seen running east to west near the top, and the emergent marsh (open water prior to 1994) is the large, vegetated area in the center.

Progress to Date

Land and water analysis in 1997 showed 300 acres of open water had been converted to land 3 years after construction was completed in 1994. The project had created 80% land and 20% percent water in 3 years, which was well within the target schedule. As of January 1999, sediment elevation was within target range at all monitoring stations.

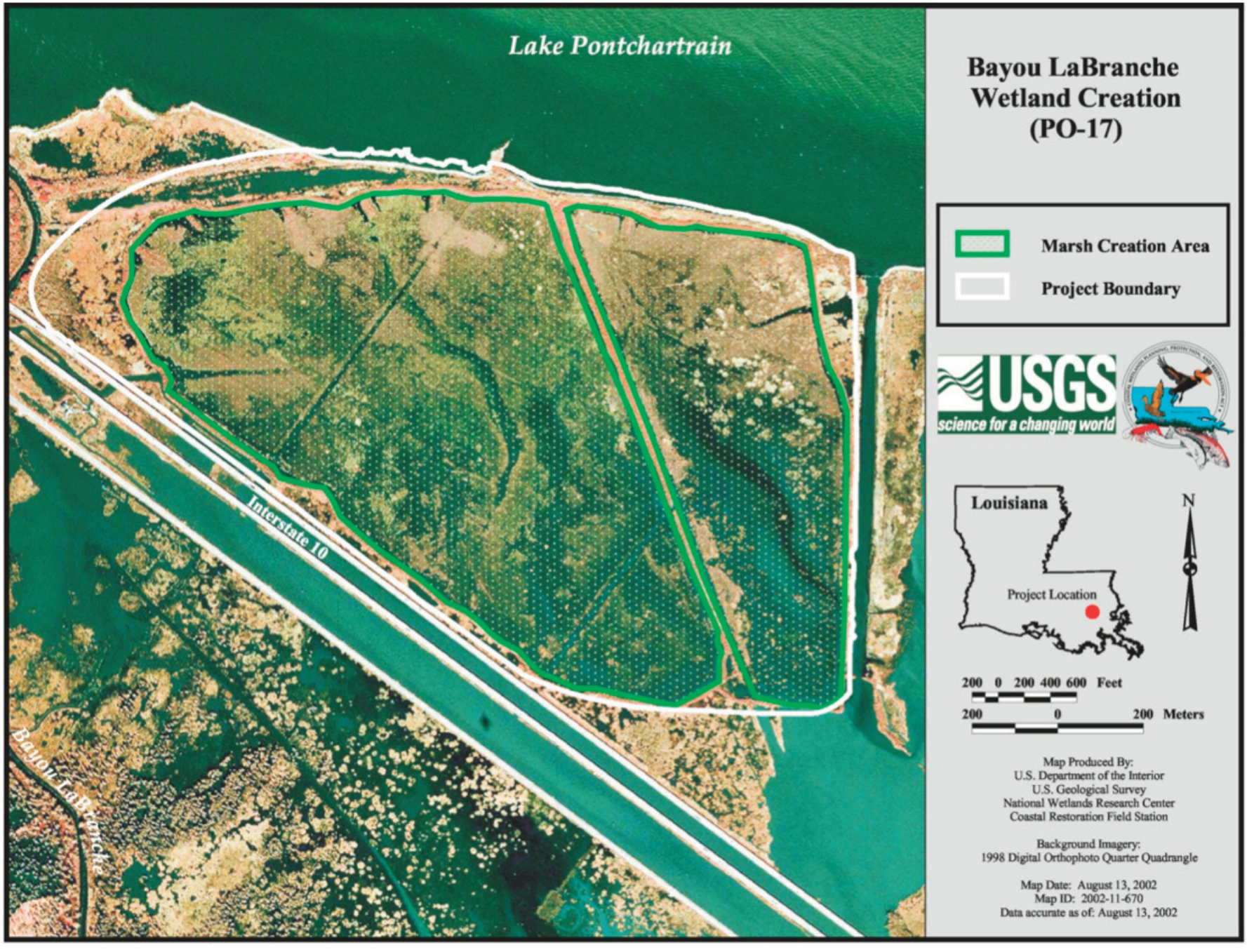
The goal of creating a shallow water habitat conducive to the natural establishment of wetland vegetation seems to have been partially met. As sediment continues to consolidate and water is maintained in the area, upland vegetation is expected to be supplanted by more oblilgate wetland species. The project goal of creating a minimum of 70% marsh and 30% open water in the project area may still be attained as sediment elevation continues to decline. The project will be monitored for 20 years.

This project is on Priority Project List 1.

For more project information, please contact:

Federal Sponsor:
U.S. Army Corps of Engineers
New Orleans, LA
(504) 862-1597

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736


Lake Pontchartrain
Interstate 10
Bayou LaBranche
Bayou LaBranche Wetland Creation (PO-17)
Marsh Creation Area
Project Boundary
USGS
science for a changing world
Louisiana
Project Location
N
200 0 200 400 600 Feet
200 0 200 Meters
Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle
Map Date: August 13, 2002
Map ID: 2002-11-670
Data accurate as of: August 13, 2002

(rev) March 2009
Cost figures as of: July 2012

Goose Point/Point Platte Marsh Creation (PO-33)

Project Status

Approved Date: 2004 **Project Area:** 1,384 acres
Approved Funds: $15.7 M **Total Est. Cost:** $15.9 M
Net Benefit After 20 Years: 436 acres
Status: Construction Completed
Project Type: Marsh Creation
PPL #: 13

Location

The project is located on the north shore of Lake Pontchartrain between Fountainebleu State Park and Louisiana Highway 11 and within the Big Branch Marsh National Wildlife Refuge in St. Tammany Parish, Louisiana. The project area at Goose Point also includes a portion of the St. Tammany State Wildlife Refuge.

Problems

Interior ponding and, to a lesser extent, shoreline erosion are the major causes of wetland loss in the project area. Loss rates were highest during the period from 1956 to 1978. Those high loss rates were associated with hydrologic alterations which allowed salt water to penetrate the fresher marshes. During the transition to a more brackish plant community, large ponds were formed. A narrow strip of land separates those ponds from Lake Pontchartrain. Although the shoreline erosion rates are relatively low, the shoreline is already breached in several areas, and marsh loss in the interior ponds is expected to increase if the shoreline fails.

Restoration Strategy

The goal of this project is to re-create marsh habitat in the open water behind the shoreline. This new marsh will maintain the lake-rim function along this section of the north shore of Lake Pontchartrain by preventing the formation of breaches into interior ponds.

Sediment will be dredged from Lake Pontchartrain and contained in cells within the interior ponds to create approximately 417 acres of marsh. In addition, 149 acres of degraded marsh will be nourished with dredged material. Marsh will be created to widen the shoreline so that the ponds will not be breached during the course of normal shoreline retreat.

View looking south toward Lake Pontchartrain showing the narrow strip of shoreline between the lake and the interior marsh pond near Point Platte.

Progress to Date

On February 12, 2009, a final inspection of the project site was conducted. All construction activities are complete.

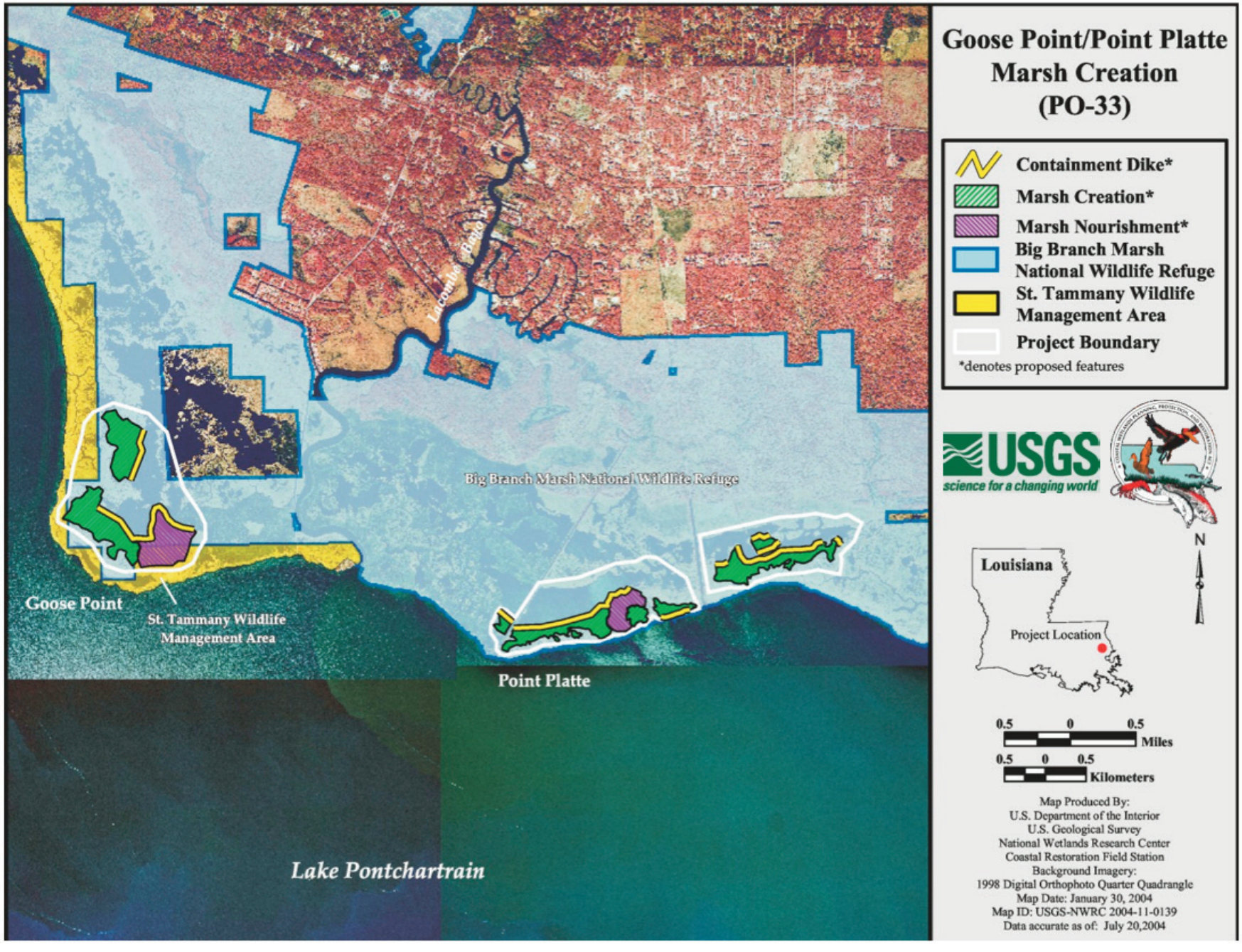
This project is on Priority Project List 13.

For more project information, please contact:

Federal Sponsor:
U.S. Fish and Wildlife Service
Lafayette, LA
(337) 291-3100

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

www.LaCoast.gov


Goose Point/Point Platte
Marsh Creation
(PO-33)
Containment Dike*
Marsh Creation*
Marsh Nourishment*
Big Branch Marsh
National Wildlife Refuge
St. Tammany Wildlife
Management Area
Project Boundary
*denotes proposed features
USGS
science for a changing world
Big Branch Marsh National Wildlife Refuge
Goose Point
St. Tammany Wildlife
Management Area
Point Platte
Lake Pontchartrain
Louisiana
Project Location
N
0.5 0 0.5
Miles
0.5 0 0.5
Kilometers
Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle
Map Date: January 30, 2004
Map ID: USGS-NWRC 2004-11-0139
Data accurate as of: July 20,2004

acknowledgements

LPB and the Louisiana wetlands education development team would like to take this time to thank the following agencies and organizations for their continued efforts to share quality content information with educators.

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Special thanks to the University of New Orleans Pontchartrain Institute for Environmental Science (UNO PIES) for their contributions to the Science section.

Special thanks to LSU AgCenter for their contributions to the Geography section.

Special thanks to the Center for Natural Resource Economics and Policy for their contributions to the Economics section.

If you would like to find additional materials from these organizations visit the Web at:

www.LACoast.gov
www.BTNEP.org
www.pies.uno.edu
www.lsuagcenter.com
www.cnrep.lsu.edu/