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# WATER MARKS

Louisiana Coastal Wetlands Planning, Protection and Restoration News

July 2017 Number 55



Species important to the economy, to recreation, to culture, to beauty  
**CWPPRA Projects Protect and Create Wetland  
Habitat for Louisiana's Fish and Wildlife**

**July 2017**  
Number 55

*WaterMarks* is published two times a year by the Louisiana Coastal Wetlands Conservation and Restoration Task Force to communicate news and issues of interest related to the Coastal Wetlands Planning, Protection and Restoration Act of 1990. This legislation funds wetlands restoration and enhancement projects nationwide, designating nearly \$80 million annually for work in Louisiana. The state contributes 15 percent of total project costs.

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**ABOUT THIS ISSUE'S COVER . . .**

*Ducks take flight above the marsh in one of Louisiana's many National Wildlife Refuges. A terminus of the Mississippi Flyway, Louisiana provides wintering habitat for migratory and resident waterfowl, estimated in numbers topping three and a half million in December, 2016. Nearly one-third of all bird species known to occur in the United States are found at some time during the year in the Gulf Coast region.*

Photo: U.S. Fish and Wildlife Service

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**WHETHER THE RESULT OF NATURE OR RESTORATION, SOME HABITATS FLOURISH, OTHERS DECLINE**

## Louisiana's Fisheries Respond to Changing Conditions in the Wetlands

**A**s Louisiana's wetlands disappear, fish habitat disappears with them. Numerous species of estuarine and marine fish rely on the wetlands during various phases of their life histories, but erosion and changes in marsh salinities over the past century are threatening the fisheries. Scientists warn that if the land loss trend is unchecked, freshwater and emergent marshes will dwindle; shallow, saltier waters will expand; and fish diversity will inevitably decline.

Yet, despite Louisiana experiencing significant land loss for some time, current

fisheries appear to be plentiful. If marsh decline leads to collapse, why is there no discernible effect on fish numbers? Scientists suggest a couple of reasons:

- Strong fish landing numbers over recent years may be unrelated to a fishery's size and health but linked to variables such as the past century's growth in the commercial fishing industry, improved fishing equipment and harvesting technologies, and increased demand for seafood. Fish catch may be masking a fish population's decline.
- Deteriorating wetlands may actually give fish populations a temporary boost:
  - o Disintegrating marshes release enormous amounts of organic material, increasing the base of the ecosystem's food web.
  - o Fragmentation multiplies marsh edges, attracting crustaceans and other small prey and providing nursery and foraging habitat for commercially important fisheries.

However, as fragmented marshes succumb to water, edge habitat does shrink and fisheries will collapse. Some studies indicate this occurs when about 70 percent of a marsh's surface converts to open water.

### Does coastal restoration improve fisheries?

In general, restoration projects that restore, enhance or create wetlands are simultaneously restoring, enhancing or creating fish habitat. But as a project changes conditions in a locale, some fish move in and others move out.

Fish congregate in the marsh type – fresh, intermediate, brackish or salt – that best meets their current physiological and nutritional needs. Whether the result of natural causes or of intentional restoration, changes in conditions such as temperature, salinity, and hydrologic flow benefit some species at the expense of others. For example, when wetlands convert to open water and the saline gradient moves up the estuary, habitat for fish that thrive in shallow pools of salty water expands while habitat for fish dependent on fresher, less saline marshes declines. In reverse direction, a river diversion could

freshen a marsh and push salt tolerant species downstream.

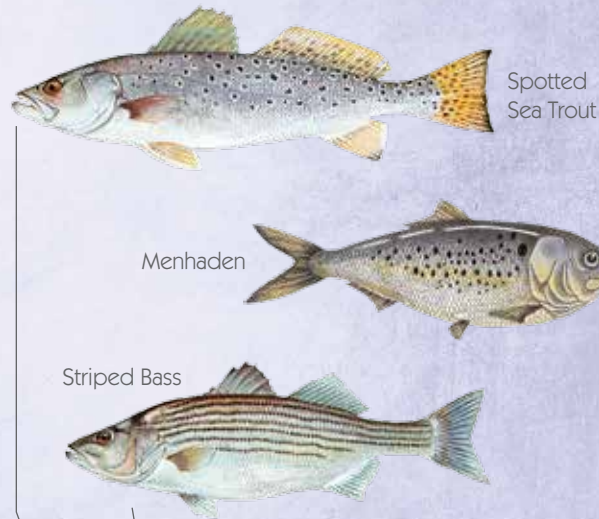
“If we do nothing to halt Louisiana’s coastal land loss,” says Andy Nyman, professor of wetland wildlife ecology at Louisiana State University, “in 100 years our coast will resemble the coasts of Texas and Mississippi. These states, too, have

Many species of fish in the Gulf of Mexico depend on habitat in Louisiana’s wetlands during some point in their life cycle. Whether pursued from a commercial vessel plying the ocean depths or from a lone craft casting a single line into marsh waters, fishing is a cornerstone of Louisiana’s coastal economy and a mainstay of its recreational sports.



## Salt Marsh

Salt marsh is the most rapidly expanding type of marsh in Louisiana, as navigation and oil and gas canals built over the past 100 years couple with natural forces to allow salt water swift access into the wetlands. Although vegetative diversity is quite limited, vigorous plant growth creates habitat and supports a food web for a number of aquatic organisms, including shrimp, crabs, saltmarsh topminnows, redfish, sea trout and menhaden. A number of species spawn in salt marshes or use them as nurseries, among them flounder, bay anchovies and striped bass. An increase in saltmarsh acreage does not, however, directly increase in these species; while using salt marshes for a portion of their life histories, many of these species are transient and move through the entire estuarine landscape during different stages of their growth.



Background Image: U.S. Fish and Wildlife Service. Fish graphics: LA Dept. of Wildlife and Fisheries



## Brackish Marsh

Brackish marsh usually lies between salt and intermediate marshes. Less saline than salt marshes, a brackish marsh hosts a greater diversity of plant life but a similar nekton community, with many transient species moving through it as they grow or as seasonal conditions change. Blue catfish, juvenile red drum, American eels, and some varieties of gobies and killifish are among the species preferring the saline gradient of brackish marsh. Intruding salt water is converting fresher marshes into brackish, so, like salt marsh, the total expanse of brackish marsh in Louisiana is increasing.



Background Image: U.S. Fish and Wildlife Service. Blue Catfish and American Eel: LA Dept. of Wildlife and Fisheries. Killifish: Noel M. Burkhead, U.S. Geological Survey



wetlands, but they are far smaller and far less diverse than are ours.”

### A measure of wetland health

“Fish and wildlife issues motivated wetland restoration long before the focus shifted to storm protection,” says Nyman. “For over 50 years, almost every document

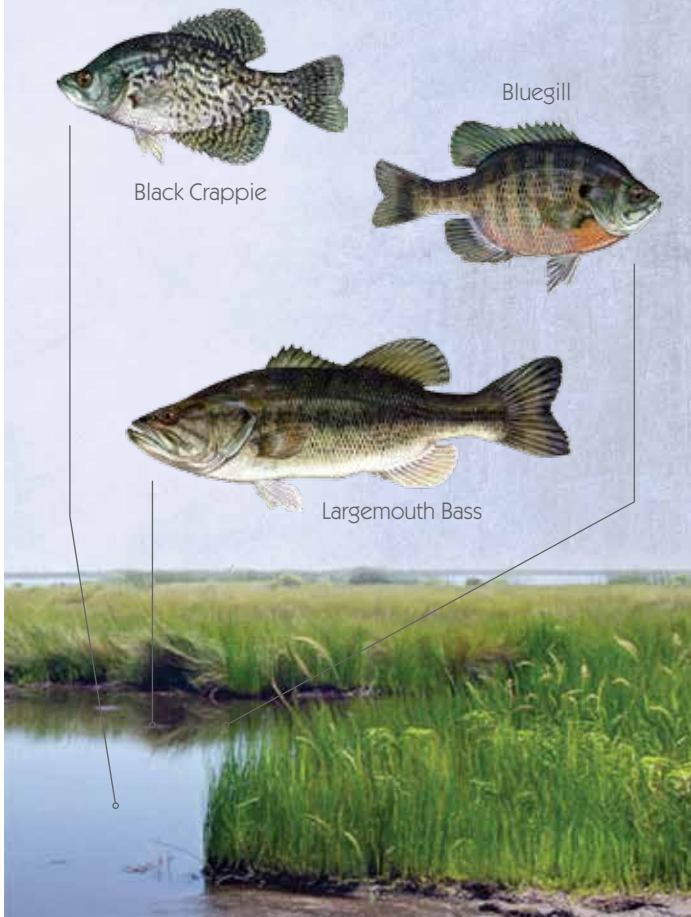
addressing Louisiana’s land loss, including the law creating the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), mentions ‘wetlands and the fish and wildlife dependent thereon.’”

To gauge benefits of proposed restoration projects, CWPPRA uses a Wetland

Value Assessment (WVA) model to determine probable changes in the quality and quantity of fish and wildlife habitat. Other wetland values and services, such as storm-surge protection, floodwater storage, water quality functions and nutrient cycling, are assumed to correlate positively to fish and wildlife habitat. Thus, if

## Intermediate Marsh

Lower in salinity than brackish marsh, intermediate marsh supports a greater diversity of species, some of which, such as bluegill, black crappie, largemouth bass and sunfish, are tolerant of a range of salinity and can also inhabit brackish or freshwater marshes. Intermediate marshes host numerous larval marine organisms and provide habitat for species such as brown shrimp, white shrimp and blue crabs that spawn in the Gulf of Mexico and use various estuarine salinity gradients at different stages of their life. Shifts in salinity can convert intermediate marsh to another marsh type quickly; total acreage of intermediate marsh is in decline, primarily due to saltwater intrusion.



Background Image: National Park Service. Fish Graphics: LA Dept. of Wildlife and Fisheries

## Freshwater Marshes

Freshwater marsh has the richest diversity of flora and fauna of all marsh types, providing habitat for mammals, birds and reptiles as well as for fish. Some of the aquatic species preferring freshwater habitat are brook silversides, gizzard shad, channel catfish, bowfin, darters, carp and gar. Among the fish that spawn in this habitat are warmouth, paddlefish, yellow bullhead and several kinds of bass. The young of many others, such as croaker, seatrout, black drum and flounder, use freshwater marshes as nursery grounds. As a result of saltwater intrusion, canal dredging, and commercial, industrial and residential development, freshwater marshes have declined at the most rapid rate of any marsh type.



Background Image: U.S. Fish and Wildlife Service. Paddlefish: LA Dept. of Wildlife and Fisheries. Northern Pintail, Roseate Spoonbill and Snapping Turtle: depositphotos.com

it's good for the fish, it's likely to be good for the entire community.

Exactly how restoration projects influence fisheries is difficult to determine; usually fish are not counted before and after construction. Nonetheless, Nyman is confident in stating that restoration has positive effects on fish. "We know how fish

react to changes in salinity and vegetative composition. Those conditions are easy to measure in a project area. Broad patterns of fish and wildlife abundance coincide with broad patterns in vegetation and in edge habitat. From these factors we can infer how fish are responding."

Louisiana's coast has always been a landscape of constant change. Restoration projects aiming to maintain diverse marsh habitats assist in preserving the richness and abundance of Louisiana's fisheries. Without such efforts, Louisiana's right to the moniker of Sportsman's Paradise will erode and vanish along with its fish and its wetlands. **WM**



## GOOD FOR THE WETLANDS? GOOD FOR THE FISH!

# Oysters and Crabs: Inhabitants Essential to Louisiana's Ecology and Economy

“Oysters are a barometer of how well the estuarine ecosystem is working,” says Earl Melancon, biology professor emeritus at Nicholls State University and presently a Sea Grant scholar studying coastal restoration’s effects on fish at Louisiana State University. “But I’m not interested in oysters just as animals. I’m interested in oysters because they are intrinsic to Louisiana’s environment, economy and culture.”

But oyster numbers are down throughout Gulf of Mexico states. “On public grounds we’ve seen an overall decline over the past decade,” says Melancon. “We don’t know why. Is it a natural cycle? Are fewer young surviving in eroding wetlands? Is fresh water from

springtime high river levels causing physical stress? Or are the causes anthropomorphic; are we overfishing? Is coastal restoration playing a role? Scientists don’t have the answers yet.”

### Why oysters matter

Oysters are fundamental to both the coastal economy and ecology. Called ecosystem engineers of shallow-water estuaries, oysters remove excessive nutrients that cause algal blooms and dead zones. Oysters filter suspended sediment, allowing sunlight to penetrate marsh waters, promoting the growth of marine grasses, and producing the clean water essential to a healthy recreation and tourism industry. An individual oyster filters up to one and a half gallons of water per hour; economists calculate an acre

of oysters provides \$6,500 of denitrification services annually, reducing the need for wastewater treatment plants.

Clinging to other oyster shells or another hard material, oysters form reefs that stabilize bottom sediments, reduce wave energy and prevent erosion. Across the Gulf Coast, these “horizontal levees” are estimated to provide \$23 billion worth of storm protection annu-

From tonging for oysters from a pirogue to checking crab traps from a motor boat, for decades coastal residents have relied on the fecundity of Louisiana’s wetlands for both food and income. Lives and livelihoods depend on healthy habitats for aquatic organisms; if the wetlands vanish, so do the natural resources that are the basis of numerous coastal occupations.

ally. Recognizing the value of oyster reefs as a barrier to floods and storm surge, restoration specialists have employed artificial reefs to attract oysters and secure shoreline protection.

In addition to their direct market value, oysters foster a commercial industry that employs thousands of workers and generates an estimated \$317 million annually. Oyster reefs provide habitat for numerous marine species and form the base of a food web that makes the fishing industry possible. Economists calculate that a single acre of oyster reef increases the value of fish catch by \$4,200 annually.

### So why are oyster numbers down on public grounds?

The age-old threats of hurricanes and native predators continue to menace oyster populations, as do human activities. Historically, overfishing, destructive harvest-

ing practices and dredging for shells have likely played a role in depressing stock size on public grounds. More recently scientists are asking how often dwindling oyster numbers are due to habitat decline, such as changes in salinity. Permanent residents of a hard substrate, oysters can't pack up and leave if the neighborhood becomes unsuitable.

"Aside from adequate food and oxygen, the conditions most important to oysters are temperature, salinity and substrate," says Steve Beck, oyster program manager with the Louisiana Department of Wildlife and Fisheries. "Changing any one of these could threaten oysters. We saw this happen when river breaches freshened the waters of Breton Sound, causing a decline in oyster production – in waters of low salinity, oysters have trouble physiologically. When saltwater intrusion raised salinity in Calcasieu

Lake, oyster habitat shifted inland. Oysters can survive in highly saline waters, but so do disease and the predators that can devastate reefs."

While natural causes do change habitat conditions, Beck points out human activities that influence hydrology and, consequently, the health of oyster habitats: shipping channels and navigation waterways that induce saltwater intrusion and raise salinity levels; oxygen-starved dead zones caused by high nutrient levels from agricultural and urban run-off; and possibly coastal land loss itself if it loosens and disperses sediment into coastal waters and buries vulnerable reefs.

### Coastal restoration and oysters

Coastal restoration projects that change habitat conditions can potentially affect oyster populations.

- Projects that limit saltwater intrusion could enhance oyster habitat – or, if limiting intrusion reduces water flow, they could negatively affect oyster populations.

When a crevasse opened from the Mississippi River into the wetlands in 1927, Percy Viosca, Jr., fisheries director for the agency preceding the Louisiana Department of Wildlife and Fisheries, wrote, "It is true that on the coast some of the oyster beds close in are destroyed by excessive amounts of fresh-water, but likewise many older reefs are rehabilitated. The result in the case of oysters is largely a shifting of certain fishing grounds but the total oyster crop is decidedly increased."



U.S. Geological Survey





The Nature Conservancy

Conducted under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) the Bioengineered Oyster Reef Demonstration project tested building reefs with rings made of standard concrete or of a bioengineered material designed to attract oysters. Constructed in 2012, the project is succeeding in attenuating wave energy, reducing shoreline erosion and increasing habitat for estuarine species such as oysters, blue crab, red drum, menhaden and spotted sea trout. By protecting the shoreline, the project is enhancing marsh habitat used by a number of threatened, at-risk, or priority species, including diamondback terrapins, seaside sparrows, glossy ibis, brown pelicans and several varieties of plovers.

The project demonstrated how restoring oyster reefs increases job opportunities, especially for small, innovative businesses, from material suppliers to installers to scientific and technological researchers and developers. As the ecological benefits of oyster reef restoration become known, oyster management will cease to focus on the fishery solely as a commodity and will consider its potential for environmental remediation as well.

- Projects that build new marsh by piping dredged material into an area might bury existing reefs.
- Projects that alter hydrology can shift areas of suitable oyster habitat.
- Projects that freshen marshes with river water could result in an array of changes for many aquatic species, depending on how diversions are operated.

“Oysters’ response to a diversion primarily depends on factors such as frequency, duration, and magnitude of flow events as well as water temperature,” says Beck. “Gradually changing the hydrology could allow oyster populations time to relocate – or for oyster farmers to move their reefs to more appropriate parts of the estuary. Reefs have moved before. During the 20th

century, highly saline waters pushed oysters inland. Oyster leaseholders took their cultch material and transferred their enterprises to better areas. If diversions substantially change hydrology, this may need to happen again.”

### A second key shellfish: the current state of Louisiana’s blue crabs

Unlike oysters, blue crabs thrive in a variety of habitats during different life stages and are able to move if conditions become inhospitable. However, like oysters, crab populations in Louisiana are down. “There are different theories about the fluctuation of blue crab numbers,” says Julie Lively, a fisheries specialist at Louisiana State University. “The cause is not necessarily over-

fishing. It could be changes in water temperatures, in weather, salinity, disease, predators – these are all stressors on blue crabs.”

### Why crabs matter

Because crabs are mobile, they are less an indicator of aquatic conditions than are oysters. “Yet there is a relationship between crab populations and wetland health,” says Lively. “Crabs need an ecosystem rich in food sources and with good water quality to maintain population numbers. Larvae and young crabs depend on submerged aquatic vegetation and other wetland plants for protection.”

Economically, crabs are important to coastal Louisiana. In 2014 the crab harvest weighed in at nearly 42 mil-

lion pounds with an estimated value of \$62 million, a new state record. Additionally, crabs are prey for other commercially important species, such as red drum and Atlantic croaker.

### So why are there fewer crabs?

Lively thinks there are a couple probable causes for the present decline in crabs. “Crabs benefit from storms that flush out stagnant water and push larvae into the marsh,” she says, “and we haven’t had a major hurricane for several years. Also, fish with teeth eat larvae and small crabs. When conditions are right for those fish to flourish, the crab population declines.”

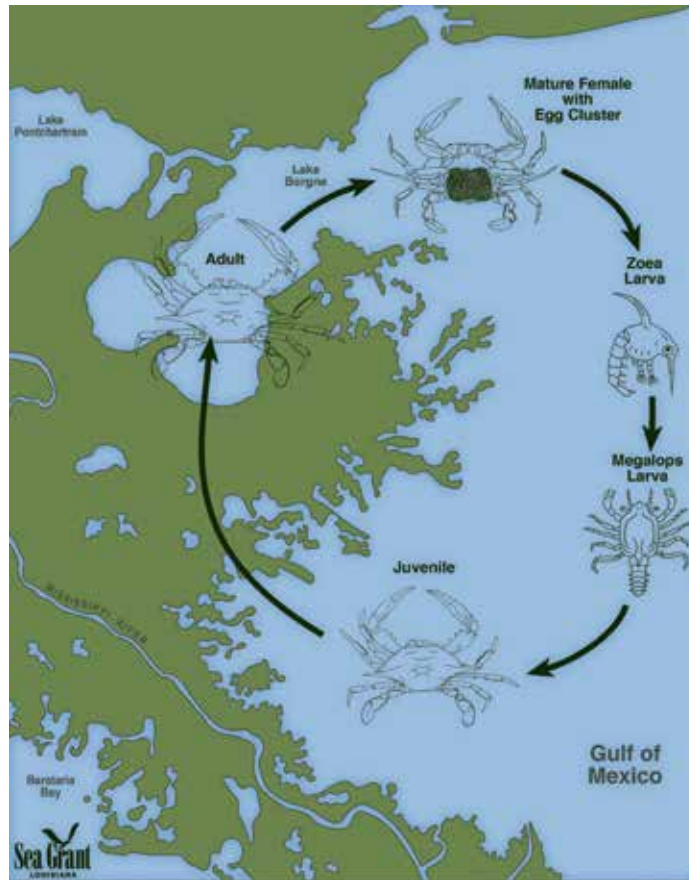
Additionally, anthropogenic changes in coastal wetlands — dredging, filling, impoundment, pollution and hydrological manipulation — alter crab habitat and may be depressing the fishery.

### Crabs in imperiled wetlands

Lively says it’s too soon to say if crabs’ recent decline is linked to Louisiana’s

land loss. “Fragmentation of the marsh could actually benefit crabs by increasing edge habitat and expanding swampy areas where submerged aquatic vegetation grows,” says Lively, “but it could harm crabs by removing a buffer to environmental runoff and by creating

sources — that’s good for crabs. Building more land is good for crabs, but projects that dredge sand from the ocean could adversely affect offshore stocks. Changes in salinity could be good or could be bad. But basically, what’s good for wetlands is good for crabs.”



The Life Cycle of a Crab

large, open areas too deep for vegetation to grow.”

Nor can Lively say if crabs have benefited from coastal restoration. “It takes years to see impacts,” she says. “Projects that reduce turbidity and promote growth of marsh grass improve habitat and increase food

### Maintaining Louisiana’s working coast

While the success of restoration is commonly measured in habitat units or in acres protected or restored, a fundamental purpose of restoration is to sustain the natural resource base upon which the coastal economy relies. The benefits of enhancing oyster habitat, for instance, ripple throughout the aquatic community as other species find shelter and forage among the reefs. Similarly the benefits of

improving fisheries ripple throughout the economy, as fishermen’s profits go up; as demands for fuel, gear and boats increase; as a tourism industry that generates service sector jobs is stimulated — if the wetlands vanish, Louisiana’s coastal culture and economy will vanish with them. **WM**



## WATERFOWL, LANDBIRDS, SHOREBIRDS, WADING BIRDS: AVIAN DENIZENS OF THE WETLANDS

# Restoration Projects Boost Wetland Birds' Chances of Survival

**N**o picture of coastal Louisiana is complete if birds are absent. Populating every terrestrial niche from the bare sands of a barrier island to the shady refuge of a forested swamp, birds enliven the landscape with movement, color and song as they conduct the ordinary affairs of feeding, courting, nesting and brooding. Yet birds are not merely ornamental in the coastal environment; their role is fundamental to the functioning of coastal ecosystems.

### Are bird numbers in decline?

Ornithologists estimate that since 1970 North Ameri-

can bird populations have dropped from 11.5 billion to 10 billion. More than one third of the continent's bird species are at risk of extinction. Forty percent of birds dependent on coastal habitats are on conservationists' watch lists and the risk of extinction for 17 wetland-dependent bird species or subspecies is immediate. Vanishing habitat is cited as a chief cause of birds' dwindling numbers.

The effect of Louisiana's land loss on the many bird species that visit or reside in its wetlands is difficult to determine. Population declines could be linked to habitat loss in coastal Loui-

siana – or to somewhere else in their ranges. A reduction in wetland acreage could be forcing birds into habitats of lesser quality where they fail to thrive and where reproductive success wanes.

Yet in the short term degrading wetlands could have

Not all species in Louisiana's wetlands have a commercial value as food or fur. While the many wading and shorebirds found in Louisiana's wetlands play important ecological roles, their primary economic value now lies in attracting ecotourists, photographers and bird watchers to Louisiana's coast. Once valued for their feathers by haberdashers to the point of threatening extinction, egrets today are sought by naturalists and nature watchers who wish to experience their beauty in the wetlands.



a positive effect for some species. “If you have a marsh where one kind of vegetation predominates, say smooth cordgrass, there’s not much variety for waterfowl,” says Frank Rohwer, president and chief scientist of the Delta Waterfowl Foundation. “But when the marsh breaks up, weedy, seed-producing plants move in. Duck food! Submersed aquatic vegetation starts to flourish. More duck food! And the ratio of water to land shifts to that favored by waterfowl. But in the long term, as ponding progresses and areas of open water expand, wetlands convert to a habitat with poor food resources and degraded breeding grounds, a habitat that is of far less value to waterfowl.”

Rohwer points to the condition of the Louisiana’s birds-foot delta as a harbinger of what an unrestored coast

will become. “There’s no bird habitat. It’s largely open water – the marshes are gone. It’s a grim picture.”

### Why birds matter

Wetlands furnish food, protective cover, breeding grounds and nesting sites to an enormous variety of both resident and migratory bird species, and birds return numerous benefits to their wetland habitats: They eat seeds of weedy species. They prey on insects and other animals that damage vegetation. They spread plants through seed dispersal and, in the case of waterfowl and some shorebirds, disseminate aquatic invertebrates. Raptors feed on rodents, thereby limiting herbivory damage. Nutrient-rich excreta, or guano, concentrated where birds congregate, stimulates plant growth and invigorates the food web.

In addition to their ecological value, birds are important to Louisiana’s economy. Authorities estimate that waterfowling and related activities bring well over \$100 million into the state’s economy. In recent years the importance of ecotourism to the state’s economy has grown, with bird-watching, bird festivals and bird photography drawing thousands of visitors to Louisiana’s coast annually. Birders contribute significantly to the local economy by purchasing food, lodging, transportation and retail services.

### Restoration a boon to wetland birds

Restricting birds’ further decline hinges on protecting and restoring their habitats – protecting and restoring Louisiana’s wetlands directly benefits the multitude of birds that depend on them seasonally or year-round.

Factors that determine which habitat a species of birds will use include

- water depth, temperature and salinity
- shoreline topography
- ratio of land to water
- presence and kind of vegetation
- types of available foods

The various kinds of restoration projects conducted under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) exert an influence on all of these factors. For instance, hydrologic structures control water conditions. Shoreline protection limits erosion. Diversions and marsh creation projects increase land mass. Plantings establish marsh vegetation. Terracing develops edge habitat that harbors prey. As a project alters conditions it changes the habitat, improving its suitability for some species while making it less desirable for others.

“Overall the effects of restoration are quite positive for birds, with some of the benefits available immediately,” says Rohwer. “Restoration reverses the cycle of marsh loss and can produce fabulous duck habitat almost instantaneously. Biological processes happen rapidly and birds are quick to respond.”

Rohwer cites the series of CWPPRA projects at the Sabine National Wildlife Refuge, undertaken with a

number of partners including Ducks Unlimited, as demonstrating ways restoration can positively affect waterfowl. Material dredged by the Army Corps of Engineers to keep the Sabine River shipping channel open is used to nourish and restore the refuge’s wetlands and to promote growth of emergent marshes, thereby improving marsh plant communities; increasing food production; providing sanctuary for migrating, wintering and breeding ducks and geese; and improving the quality and diversity of wildlife habitat.

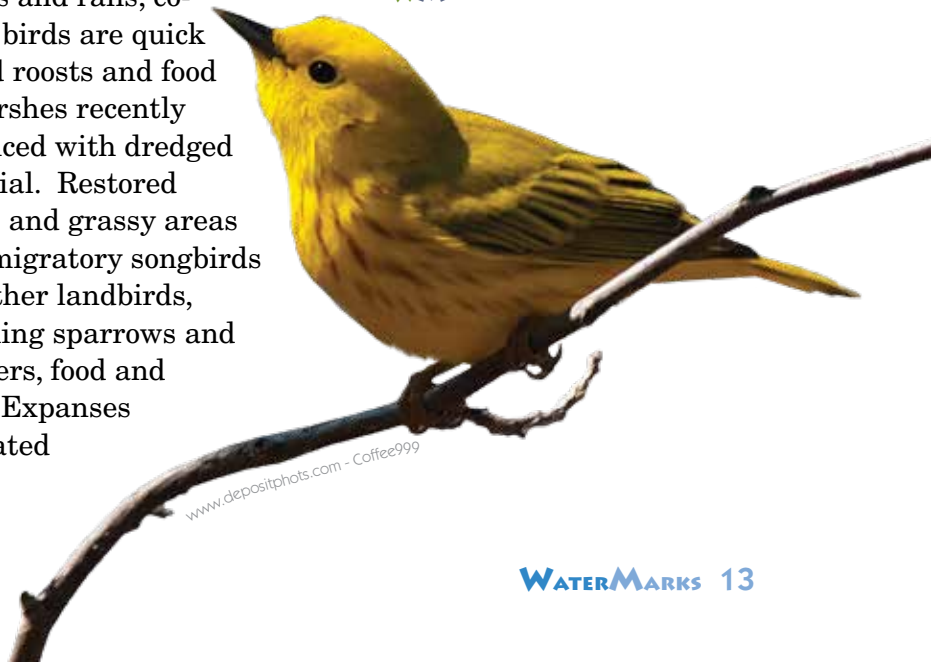
Because of the multiplicity of avian species using wetland habitats, it is probable there are birds that benefit from any ecological change wrought by a restoration project. Newly created mud flats foster organisms upon which shorebirds such as plovers and sandpipers feed. Shorebirds may take advantage of a renourished barrier island beach within the next nesting season. Vegetative plantings increase nesting habitat for wading birds like herons and rails; colonial birds are quick to find roosts and food in marshes recently enhanced with dredged material. Restored ridges and grassy areas offer migratory songbirds and other landbirds, including sparrows and warblers, food and cover. Expanses of created

marsh support a robust food web that produces animals upon which raptors – kites, eagles and hawks – prey.

Brown pelicans could rightfully claim to be the poster child of coastal rehabilitation. Listed as endangered in 1970, Louisiana’s state bird has made a come-back as regulations removed pesticides that were poisoning the birds from the environment and as coastal restoration projects increased areas of nesting habitat. The birds were removed from the U.S. Endangered Species List in 2009.

By protecting existing habitat and creating more, coastal restoration is fundamental to preserving the many bird populations that depend on Louisiana’s wetlands. Birds that live in the wetlands year-round draw residents and visitors alike to the coastal region for myriad outdoor experiences. Migrating birds that stop to rest and feed in the wetlands carry the energy of Louisiana to far parts in their beauty and their song.

WM



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# WATERMARKS INTERVIEW WITH ANDY NYMAN

Professor of wetland wildlife ecology, Louisiana State University

**WATERMARKS:** Restoring coastal Louisiana will cost billions of dollars! Why do you think it is the right thing to do?

**NYMAN:** Inaction saves money in the short term, but in the long term it has very expensive consequences. The high, upfront costs of restoration pay for benefits that won't be realized until restored wetlands become fully functional, years down the road.

**WATERMARKS:** There's a lot of discussion about various approaches to protecting and restoring wetlands. Is there a "best" way?

**NYMAN:** The best and most cost-effective way to restore coastal wetlands is to let the Mississippi River do it. But river diversions pose a couple of problems. The technique freshens marsh waters and changes habitat conditions. Although it does not endanger fish and oysters, a diversion can displace them, pushing them seaward. That can increase the distances to fishing grounds or force the relocation of oyster beds, adversely affecting the people who harvest them. Slowly, over time, a diversion's benefits accrue to a large population, but fishers and oystermen bear the costs of immediate changes that result from its operation.

Another problem is that we can only build diversions within close range – five or 10 miles – of the river. So we have to use other techniques too, such as constructing wetlands with dredged material.

**WATERMARKS:** Do created wetlands and natural wetlands function the same way?

**NYMAN:** Diversions create natural marshes, there is no difference there. In marshes constructed from dredged material the soils are different, the microbial community and the invertebrates are different, and the effects ripple up the food web. But eventually, in a decade or so – certainly within 30 years – the constructed marsh becomes indistinguishable from a natural marsh.

However, I think many constructed marshes are built too high. The argument is that the greater elevation counters subsidence and sea-level rise so that in 20 years the built marsh will be the same height as adjacent, natural marshes. But this doesn't consider the vertical accretion that occurs naturally as dying vegetation adds layers to the marsh soil. That process is why there are marshes that have not succumbed to sinking ground or rising seas, marshes that persist for decades, even centuries. Vertical accretion may not completely match sea-level rise or rates of subsidence in Louisiana's wetlands, but it does occur. When you build marshes too high, they don't perform as natural marshes for years.

**WATERMARKS:** In what ways does performance differ?

**NYMAN:** Excessive elevation restricts tides from washing



into the marsh. That changes the composition of plant communities and reduces access for fish and crabs. It's good to build a constructed marsh a little high because it gives vegetation enough time to become established and develop a good root system. The marsh should, however, reach its target elevation in three to four years, not in 20 years.

In addition to elevation, a project's size influences its function. Project designers look for cost-efficient options and often favor larger projects over smaller ones. But larger projects are not always better. For example, some barrier island projects are large enough that rainwater collects in permanent pools. With a source of fresh water, coyotes and raccoons become year-round residents, a disastrous situation for breeding birds. If we want to provide bird habitat on barrier islands, we need to concentrate on restoring smaller, more isolated islands.

As we build wetlands, fish and wildlife will come to use them. However, we won't be able

to measure the effect of new construction accurately because we don't have a good baseline data set.

**WATERMARKS: Why not?**

**NYMAN:** Unlike vegetation, fish and wildlife don't stay still. They move great distances; they hide. Collecting enough data to show that restoration succeeds in increasing wildlife is complex and costly. Consequently we draw conclusions based on what we already know about the correspondence between vegetation and the increase or decrease in fish and wildlife.

**WATERMARKS: What changes do you expect to see in Louisiana's coastal region during the next 50 years?**

**NYMAN:** I expect the next 50 years to look a lot like the last 50, during which we lost about 20 percent of our emergent wetlands, gained shallow, open water areas and raised the average salinity of marsh waters. In the coming decades we'll have fewer wetlands and saltier marshes. We're unlikely to lose fish species but we'll have a lot fewer fish. We'll probably see a downturn in the alligator population and consequently in alligator farming since eggs are collected from the wild.

**WATERMARKS: What concerns you the most?**

**NYMAN:** My fear is that we will become politically paralyzed. The cost of restoration has to be paid up front while the rewards are in the future. It would be easy to make a token effort while our wetlands convert to a narrow, less diverse band of coastal waters similar to those in neighboring states. Unless we have the will to act, we will lose the expanse of rich wetlands that makes coastal Louisiana unique. **WM**



U.S. Fish and Wildlife Service

Once endangered, brown pelicans have benefited from environmental regulations restricting the use of pesticides that killed the birds outright or caused their eggs' shells to become dangerously thin, cracking under the weight of incubating parents. Restoring wetland habitats has supported their come-back, providing nesting sites in thick ground vegetation, shrubs or exposed tree tops and cultivating a teeming food chain that increases prey.

# WATER MARKS

Louisiana Coastal Wetlands Planning, Protection and Restoration News

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## Estuaries

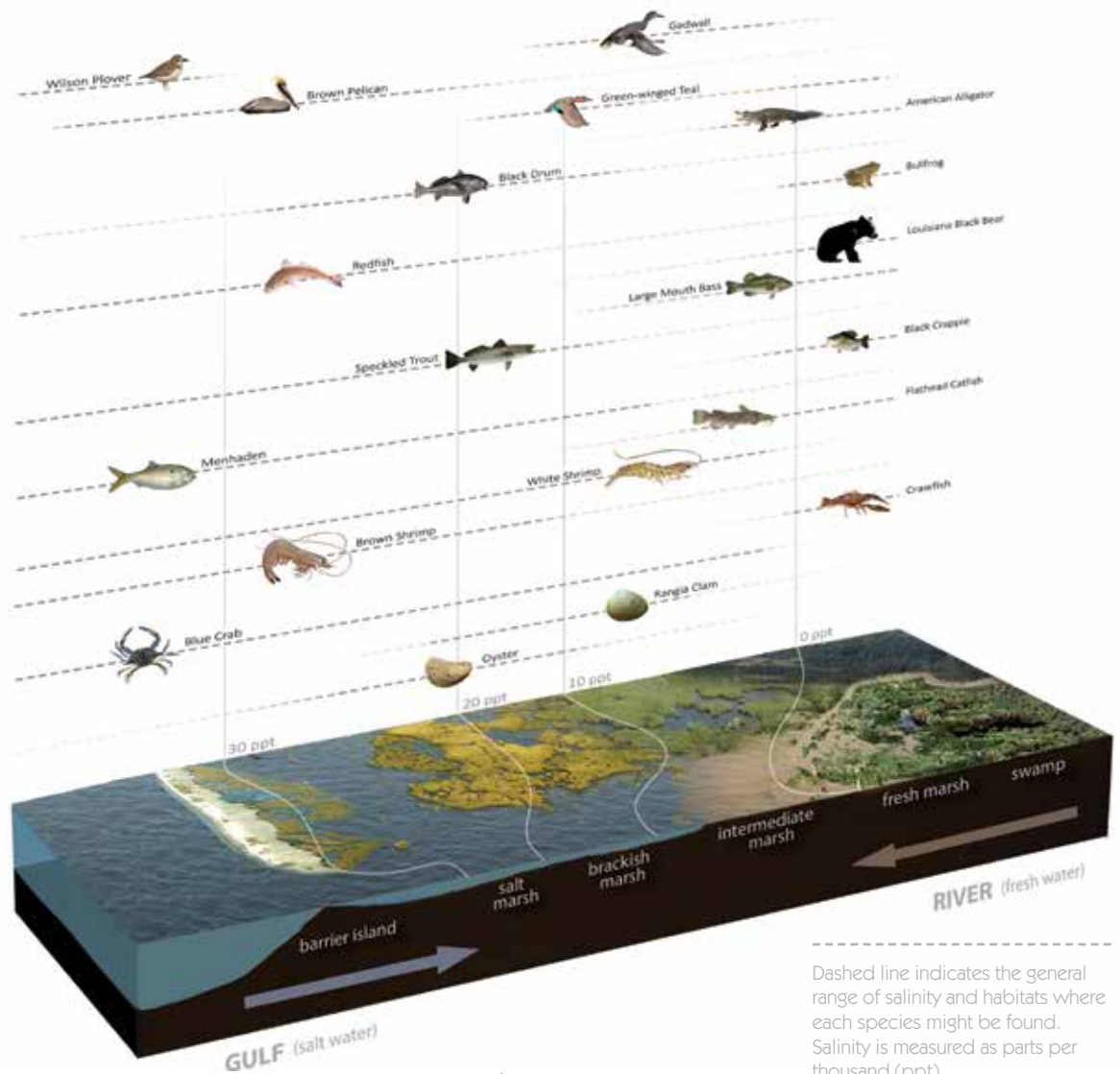
### Critical Coastal Louisiana Ecosystems

The Louisiana coast is like few other places in the world in terms of its abundance and diversity of plants and animals: from cypress swamps to oyster reefs, alligators to speckled trout. Most of these species depend on healthy estuaries—ecosystems formed by connections between the fresh water of rivers and streams and salty water of oceans. This mixing provides a range of fresh and salt conditions needed to support a diversity of habitats, and constantly changes depending on rainfall, river height, wind, tides, and other factors.

The amount of salt mixed into water is known as salinity, and is measured in parts per thousand (ppt). The habitats of Louisiana's estuaries exist along a constantly fluctuating range of salinities between 0 ppt near swamps and freshwater marshes, towards 10 ppt for brackish and intermediate habitats, up to 30 ppt and beyond for salt marsh and barrier islands.

Many species rely on a combination of habitats throughout their lifetime. Blue crabs are a good example of this broad usage. Adult male blue crabs move between the fresh, intermediate, and brackish habitats. Adult females predominantly mate with males in the brackish habitats and then move out to saltier habitats and off barrier islands to spawn. The newly hatched juveniles then travel back into the fresher habitats, beginning the cycle again.

Healthy estuaries are critical for the future of Louisiana's coast.



Dashed line indicates the general range of salinity and habitats where each species might be found. Salinity is measured as parts per thousand (ppt).

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Made possible by the Greater New Orleans Foundation.

Graphic courtesy of Coalition to Restore Coastal Louisiana

