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Texas' vanishing Wetlands

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If you asked water managers to rank today's most controversial issues, wetlands regulation would probably be right at the top of many such lists and circled in bright red. Why is wetlands regulation so controversial? The answers include scientific, political, economic and environmental issues.

A large part of the problem is that no one really agrees on how to define a wetland. Many environmentalists argue that virtually anything with saturated soils, including oftendry prairie potholes, should be protected as wetlands. Most developers counter that only "obvious" wetlands like swamps and marshes deserve regulatory protection.

The argument about what constitutes a wetland came to a head about a year ago. Until 1989, Federal agencies including the Army Corps of Engineers (ACE), the Fish and Wildlife Service (FWS), the Soil Conservation Service (SCS), and the Environmental Protection Agency (EPA) each used their own manual to define which areas were wetlands. To streamline things, a manual was developed in 1989 that all the agencies could use. To many people, especially those with wetlands on their property, this manual defined too many areas as wetlands. In 1991, after that manual had been evaluated, the Bush Administration developed proposed revisions. These, in the minds of many environmentalists, defined too few areas as wetlands.

As you read this, you may be wondering, "What's all the fuss about a definition?" It may seem trivial, like arguing about who real/ydiscovered America (we all *known'* was Leif Erikson). The problem is that areas defined as "regulatory wetlands" receive special protection through a variety of Federal and State programs. Living with the regulations can bring about financial hardships for those trying to live on, work around, or develop lands with wetlands on them.

For example, farmers have often been told by Federal agencies that they may lose payments and benefits if they modify wetlands on their property. Houston and other coastal cities with flat terrain and large amounts of rainfall argue that much of the developable land in their area could well be classified as wetlands under the 1989 manual. Often, developing those lands is either extremely timeconsuming or impossible. Many developers argue that they are left in limbo while waiting for Federal agencies to decide if a land contains wetlands or not. In the meantime, those land values sink and the lands themselves are untouchable. Some legal experts argue that the wetlands regulations may even be unconstitutional because they take the rights to use or develop private property away from individuals without due compensation.

Finally, there seems to be some misunderstanding about why wetlands are important and why preserving them is important. Are wetlands simply swamps and bogs that serve as breeding grounds for mosquitoes? Or are they an extremely valuable natural resource that prevents flooding, improves water quality, and is more productive than even the best agricultural cropland? If they are important, is it necessary to take swift actions to save them?

This issue of *Texas* WaterResourceswill touch briefly on wetlands policy issues. What we really want to look at are some of the scientific issues concerning Texas wetlands. For example, what are universities and agencies in the State doing to protect and learn more about this important resource?

Topics we'll explore include efforts to inventory changes in the amount of wetlands along the Texas coast, methods of managing agricultural production to increase the number of birds and other species that use wetlands, and programs to create new wetlands to replace those that are lost to development.

MANUAL WARFARE: HOW THE REGULATIONS CHANGED

Much of the controversy centers around the definition of what constitutes a wetlands and how that translates into regulatory action.

The 1991 proposals differ from the 1989 manual in a number of respects, most of which make it harder to classify areas as wetlands.

In broad terms, three tests must be met for an area to be classified as a regulatory wetlands.

First, the proposed1991 manual says that wetlands must be covered with water for 15 consecutive days or must be saturated to the surface for 21 days in a row during thegrowing season. The 1989 manual says that wetlands only have to be saturated for aweek to qualify. The proposed 1991 manual defines the growing season as beginning 3 weeks before the first local frostfree date in the spring and ending 3 weeks afterthe first average killing frost in the fall. That shortens the growing season.

Second, the proposed 1991 manual changes the soils criteria in two ways. Saturated soils are defined by a simple test_you must be able to squeeze or shake a handful of soil and get water out of it. Wetlands are also required to have hydric or saturated soils.

Third, the proposed 1991 manual requires that key plants (those adapted to live in wetlands) be present in regulatory wetlands. In areas where plants have been destroyed, soils can be examined to determine if such plants are likely to live there.

WETLANDS FUNCTIONS AND VALUES

Wetlands are important because they provide a number of functions including groundwater recharge and discharge, reducing flood flows, controlling erosion, retaining toxic chemicals in sediments, transforming and reducing nutrients, and increasing the diversity and abundance of fish, aquatic organisms, and other wildlife. Many of the values such as water quality improvement, have not been well quantified. Wetlands also have recreational and aesthetic values.

Some experts favor classifying wetlands as having differing degrees of value. For example, "high value" areas could include obvious wetlands such as coastal marshes and swamps. Those areas could be provided the most regulatory protection. Other "less valuable" wetlands would be given less protection and would be much easier to modify or develop.

What would the impact of the proposed 1991 manual be on wetlands acreage if it were implemented? A study by the Environmental Defense Fund (1992) contains a few insights. Field testing along the Gulf Coast by the ACE Galveston District shows that 30% to 40% of areas now classified as wetlands would not be wetlands under the new criteria, the study said.

The Greater Houston Partnership estimates that using the soils and vegetation criteria in the 1989 manual would result in more than 85% of the acreage in Gulf Coast counties being classified as regulatory wetlands. They estimated that imposing regulations on that much land would cause delays and higher costs to develop and sell private property and lowered values on undeveloped lands. Such issues as the availability of new housing, transportation systems and industries could be impacted.

TEXAS WETLANDS TRENDS: ARE WE GAINING OR LOSING?

Texas wetlands can be broadly grouped into two main categories: interior wetlands such as playa lakes, and coastal marshes and wetlands. As many as 25,000 playa lakes (shallow, naturally occurring circulardepressions) dot the landscape of the Texas High Plains.

Although the playas host as few as 500,000 wintering water fowl during dry years, activity increases dramatically during rainy periods when as many as 1 million migratory birds visit and roughly 250,000 ducks are born nearby. Bottomland hard woods are found along almost all major Texas streams. Coastal wetlands include fresh and salt water

marshes. Many wetlands are being modified or destroyed. For example, the ACE received more than 27,000 proposals to dredge and fill coastal wetlands between 1981 and 1985 (NOAA,1991). Most of those applications were approved.

Many agencies have been monitoring wetlands trends. The FWS (Dahl, 1991) compares changes in wetlands acreage. They found that Texas lost more than half its wetlands during over the past 200 years and estimate that Texas now has 7.6 million acres of wetlands habitat.

The FWS also produces detailed maps that provide resource managers with information on wetland types and locations. Many are being produced in a digital format so they can be incorporated into geographic information systems (GIS).

The National Oceanic and Atmospheric Administration (NOAA) has been developing a database on coastal wetlands trends since 1985. Results show that the Gulf Coast accounts for more than half the nation's coastal wetlands and that estuaries from the Gulf led the nation in each type of coastal wetland. Texas contains the second most salt marshes (480,000 acres) of any state, the third most freshwater marshes (500,000 acres), and the most tidal flats (300,000 acres).

Since 1988, the Texas Parks and Wildlife Department has used satellite images to develop computerized maps of coastal wetland habitats. The program includes case studies to assess the accuracy of using these images, mapping submerged vegetation, and analyzing changes that have occurred at a whooping crane sanctuary and in the Nueces Bay estuary.

William White and Tom Calnan of the Bureau of Economic Geology (BEG) at the University of Texas at Austin (1990) have been documenting wetlands losses along the Gulf Coast. Their studies have focused on comparing the rates that deltas form near the mouths of the San Jacinto and Neches Rivers (and other bays and estuaries) to rates of relative sea level rise, and subsidence. Results show that the Colorado River was the only watershed which showed a slight gain in deltaic wetlands. Losses of wetland deltas were most severe in the San Jacinto and Neches River Basins (each 40%), where many wetlands were converted into unvegetated tidal flats. Submerged marine grasses declined by 90% in Galveston Bay and the Laguna Madre has lost nearly 2,500 acres of marine grasses since the 1960s.

Studies have been conducted for Galveston Bay (Pulich and White, 1991). Results show that urban development, wastewater discharges, chemical spills and dredging are reasons submerged seagrasses have vanished in much of the bay.

BEG studies are now under way to investigate wetlands losses in Galveston Bay. Jerry Wermund is verifying FWS mapping information with field studies and entering that data into a GIS. Information on wetlands changes will be produced for specific transects. The project will clarify why wetlands changes occurred.

Efforts to gauge wetlands trends are being undertaken by EPA's Dallas office. They are developing a GIS to map changes in wetlands acreage. Case studies have been conducted on the upper Trinity River Basin and Galveston Bay. The system could be useful for regulatory programs that have to constantly monitor which specific parcels are being developed and protected.

The Texas Water Development Board (TWDB) conducts long range studies of coastal ecosystems. Their efforts include assessing the impact of different flow regimes on wetland habitats.

Larry Wilding of the Soil and Crop Sciences Department at Texas A&M University and Richard Griffin of Prairie View A&M University have been involved in national wetlands assessments. The goal of their studies is to assess lands with hydric soils to help determine whether they are regulatory wetlands. Many of their studies have focused on clay-pan areas along the Texas Gulf Coast that have seasonally wet soils. One aspect of the studies involves gauging how groundwater levels fluctuate to determine if areas are seasonally or permanently wet.

REPLICATING MOTHER NATURE

In many parts of Texas, wetlands are being created and restored. Two factors are largely responsible forthis phenomena. First, federal laws require compensation for areas that are destroyed. Secondly, many conservation and hunting groups want to enhance the environment and recreational opportunities.

Do we have enough knowledge to produce wetlands that not only look like but really function as well as natural ecosystems? Some studies show that as many as half of all created wetlands fail to achieve desired goals (Rude, 1991 and NAS, 1989). Concerns revolve around such issues as the complexity of reproducing natural systems, the difficulty of measuring the success of man-made wetlands, the abilityto mimicwetlandfunctions such as flood control or water quality improvement, the extent that aquatic life will utilize the sites, and long-term success.

Many projects are assessing the success of wetlands creation.

Corpus Christi State University has evaluated the success of mitigation efforts. One study (Cobb and Tunnell, 1987) compiled data and conducted on-site studies on 227 proposals to mitigate wetlands losses in South Texas from 1975-86. Results show that almost 80% of the proposals were approved by the ACE with no changes, and that only 71 acres were created to replace 114 acres that were destroyed. The most successful efforts included those that enhanced water quality and avoided dredging or realigning bulkheads. Efforts to develop new habitats were the least successful.

Tunnell and Barbara Ruth (1990) also compared a man-made marsh to a nearby coastal natural marsh in terms of water quality, vegetation, and the area's use by aquatic organisms. Results suggest that the manmade marsh is not duplicating the functions of

the natural marsh because it features steep slopes, and because cordgrass has been planted in low-lying areas that are frequently flooded.

Jim Webb and William Wardle of the Marine Biology Department at Texas A&M University at Galveston are comparing natural and man-made salt marshes in Galveston Bay. They want to compare many of the aspects of the marsh systems including vegetation, use by aquatic organisms, hydrology, and waterquality and sediment levels.

WETLAND CREATION AND RESTORATION EFFORTS

Efforts to restore and create wetlands have been led by state and federal agencies, universities, and conservation groups.

The ACE is enhancing wetland habitats at many of their sites including Cooper Lake, Ray Roberts Lake, Lake O' the Pines, and Wright Patman Lake. The projects involve developing wetlands in bottomland hardwoods by installing detention dams, diversion channels, and water control structures.

At Lewisville Lake, ACE researchers are studying the biology and ecology of wetland plants at the Aquatic Plant Research Facility. Some of the field studies are examining the impact of varying levels of submerged wetlands plants on fish production. A portion of this site is available to university researchers throughout North Texas.

At Ray Roberts Lake, Robert Doyle of the Institute of Applied Sciences at the University of North Texas is working with the ACE to identify water and vegetation management strategies to produce the greatest benefits for migratory birds and other aquatic species. Doyle will compare the plant composition of newly created wetlands that have been planted with specific species to those that develop naturally. Benefits from moist soil management and regularly flooding wetlands areas will be compared. Water quality studies may are underway to quantify how well wetlands remove atrazine and other pollutants.

The TPWD oversees many wetlands programs and developed a statewide wetlands management plan in 1988. They are working with the ACE to design, fund, and construct a control structure in Jefferson County that will keep saltwater from the Gulf from intruding into 60,000 acres of coastal wetlands.

Two innovative efforts are being studied by the TWDB. A demonstration project has been proposed in the Nueces River Delta near Corpus Christi where treated wastewaters would supplement freshwater supplies. TWDB staff say that the effluents could enhance the productivity of the wetland by 300% to 500% more than freshwaters because they provide added nutrients. The TWDB is also helping plan and fund a project near Beaumont where 650 acres of wetlands will be developed to aid in wastewater treatment. Effluents will flow into an existing natural wetland. A similar study has been proposed by the ACE at the Richland-Chambers Creek Reservoir.

Since 1985, Robert Nailon, a Marine Extension Agent with the Texas A&M University Sea Grant Program and Ed Seidensticker of the SCS have been working to transplant cordgrass to protect shoreline areas and create wetlands habitat. Early efforts failed because the seedling plants were being washed away by coastal waves. As an alternative, cargo parachutes were used as barriers to protect the plants until they became established. So far, cordgrass has been established along more than 6,000 feet of shoreline in East Galveston Bay and the upper San Jacinto River.

Ducks Unlimited's (DU) "Marsh" Program has enhanced 10,000 acres of wetland habitats at wildlife management areas in the High Plains, along the Texas Coast, and at many inland sites. Many of the projects involve manipulating seasonal water levels by construction of dikes and levees, periodic drainage, and small reservoirs as well as planting foods that migratory birds require.

Two parts of the North American Waterfowl Management Plan_the Playa Lakes Joint Venture and the Coastal Plains Joint Venture_illustrate efforts between regulatory agencies and conservation groups. Both programs encourage landowners to become involved in managing their properties so that waterfowl habitat can be improved.

Milton Weller of the Wildlife and Fisheries Sciences Department at Texas A&M University has assessed the impact of water management strategies on wetlands health in the Gulf Coast. He notes that different strategies will need to be utilized to successfully develop wetland areas based on soils, climate and other factors (Weller, 1990). "Green tree" reservoirs flood trees during dormant periods to encourage ducks to fly in and feed on acorns and maple and elm seeds. Weller is also developing methods to enhance wetland areas for wildlife use in regions which have been damaged by coal mining and other activities.

MANAGING FARM LANDS TO KEEP WETLANDS

There are many examples of how agricultural activities can benefit and improve wetlands.

The Texas Agricultural Extension Service conducts studies at the Chocolate Bayou Demonstration Farm in Brazoria County to study management practices that merge rice and cattle production and wetlands enhancement. Goals are to develop cropping practices that enhance winter habitat for waterfowl, to encourage the growth of coastal vegetation and habitats for migrating birds, and to preserve existing wetland areas.

In the High Plains, Loren Smith and other scientists at Texas Tech University's Range and Wildlife Management Department are developing "moist soil management strategies." These involve making sure that playas receive enough water in spring and winter months to encourage the growth of plants waterfowl need for food. Smith's research focuses on creating conditions so that foods preferred by ducks (barnyard grass and smartweed) will flourish (Haukos and Smith, 1991). If habitat for ducks can be enhanced, many property owners can often sell hunting leases for as much as $10,000 per season.

In some areas, farmers are now combining their operations with wetlands development so that potential hunting opportunities can be increased. In the El Campo area outside of Houston, farmers are pumping water to flood rice and soybean crops that serve as a food source for ducks and geese; leveling fields and building oversized levees to provide wintering ponds; and taking lands out of production to make them more attractive for migratory birds.

Sometimes, individuals can even get together to help cope with emergencies. In one case, a group called the Wetlands Habitat Alliance of Texas pumped 1,500 acre-feet of water into 10- to 30-acre ponds near Houston to help lessen the effects of an outbreak of avian cholera.

There are still some institutional obstacles that may deter farmers from taking part in the program. A study by Robyn Witten and William Zemites at Corpus Christi State University (1989) examined if landowners would be willing to enroll farmed areas into the Conservation Reserve Program (CRP) to enhance wetland habitats. Results suggest that many farmers were interested but did not participate because their lands did not meet the erosion or cropping history criteria required by the CRP; croplands that were converted to wetlands previously often did not qualify, and that compensation payments were not competitive with other Federal programs.

MITIGATION BANKING

How can wetlands be protected while still allowing development to occur? One option may be to utilize "mitigation banks" (Short, 1988). The banks would utilize a credit and debit system in much the same way that commercial lenders operate. The only difference would be that wetlands, not money, would be "deposited" and "withdrawn." Property owners and developers could earn credits by creating or restoring wetlands well in advance of developing any property. When they are ready to develop those lands, credits could be withdrawn to compensate for wetland losses that cannot be avoided.

The process could be used on a regional basis where wetlands are being developed, may aid in planning efforts, and could reduce regulatory delays. Critics say the process may hasten the rate of wetlands losses and that created wetlands may not match wetlands types that are lost.

Efforts are now under way by the General Land Office and other offices to form a Mitigation Management Commission that may incorporate mitigation banking as a way to offset wetlands losses. The Greater Houston Partnership is working with ACE to develop a regional mitigation bank.

The Texas Water Commission is now drafting a Comprehensive State Wetlands Conservation Plan. The goal is to make sure that "no net loss" of wetlands occurs. The plan hopes to establish a functional definition of specific Texas wetlands (including playa lakes, bottomland hardwoods, and coastal and riparian wetlands) that could be incorporated into regulatory programs, mitigation activities and assessment efforts.

The GLO is developing a Coastal Wetlands Management Plan to accomplish many of the same goals in coastal areas.

SUMMARY

It is obvious that Texas and many other areas are losing large amounts of wetlands acreage. If these trends continue, Texas may be left without the valuable wetlands acreage it needs for such diverse purposes as habitat for migrating birds, fish, shellfish, and other aquatic species, water quality improvement, flood control and other purposes. Some have argued that while losing some "high value" wetlands would be detrimental, other less valuable wetlands may not be worth preserving. A solution may be to come up with a classification scheme that would sort wetlands by type and relative value.

Policy issues must be addressed. Protecting all the wetlands in areas where they are plentiful may it make hard to develop any land. Many property owners have complained that the regulatory process surrounding wetlands is too time consuming and burdensome. Mitigation banking may be a way to make living with the regulations easier while still protecting valuable ecosystems.

Groups create and restore wetlands for different reasons: some because they are required to by law, others because they want to improve conditions for hunting, still others because they are interested in resource conservation. These efforts are applauded. More follow up needs to be done to ensure that created wetlands function properly . More science is needed so that successful wetlands can be created more often.

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TWRI also published the proceedings of a workshop, *Water for Texas: Setting the Research Agenda* . TWRI is publishing a newsletter on septic tanks called *On-Site Insights* and a newsletter on research titled New Waves. Call TWRI at 409-845-1851 for details on any of these publications.