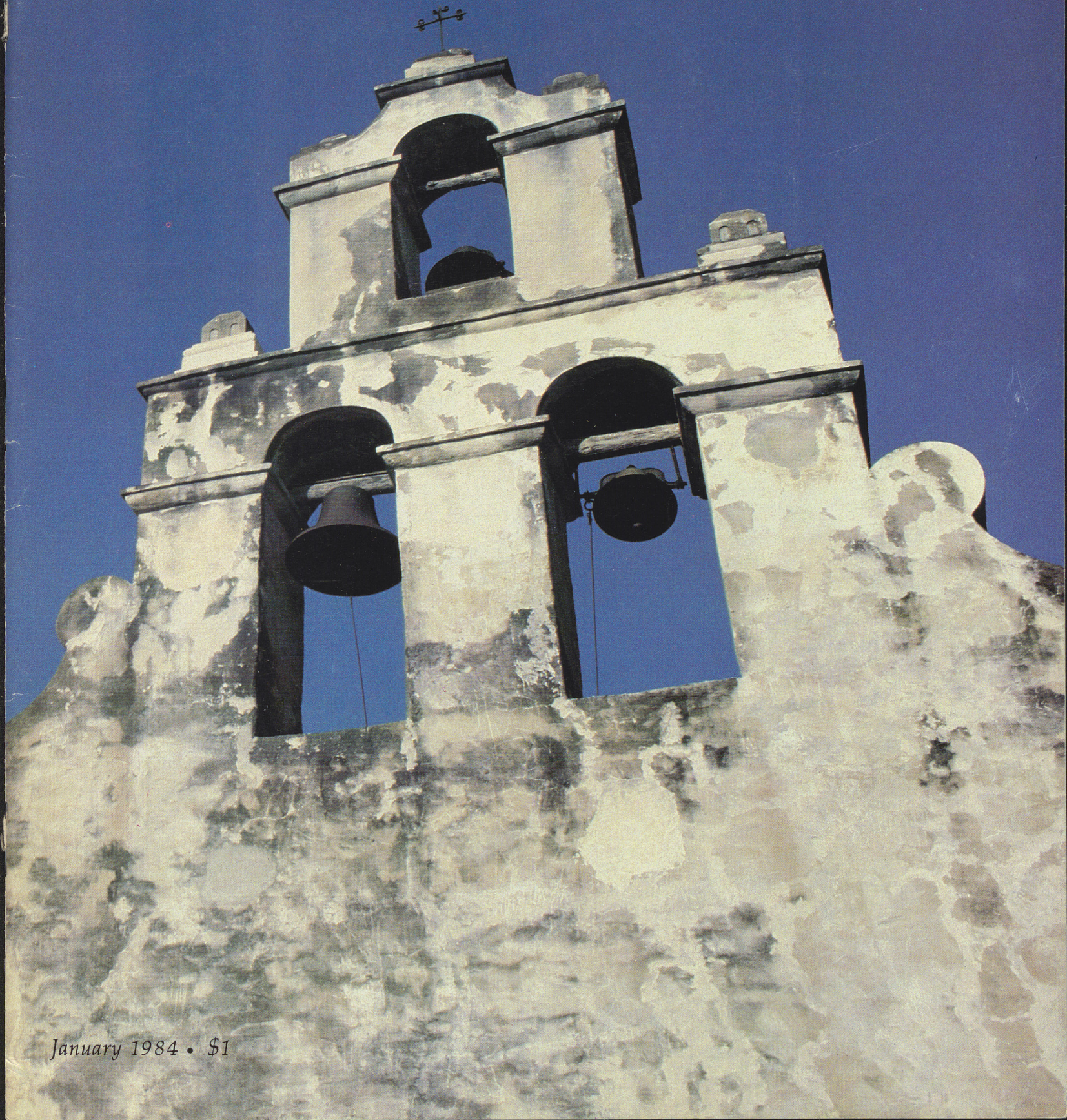
# TEXAS
## PARKS & WILDLIFE



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**Front and Back Covers:** Mission San Juan Capistrano's chapel is simple in construction, the tower being an elevation of a portion of the east wall with open arches for the bells. San Juan and three other 18th-century missions now comprise San Antonio Missions National Historical Park. (See story on page 2.) Photo by Bill Reaves.

**Inside Front:** Bracing itself against the elements, a cottontail huddles in the snow. Photo by Wyman P. Meinzer Jr.



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Dedicated to the conservation and enjoyment of Texas wildlife, parks, waters and all outdoors.

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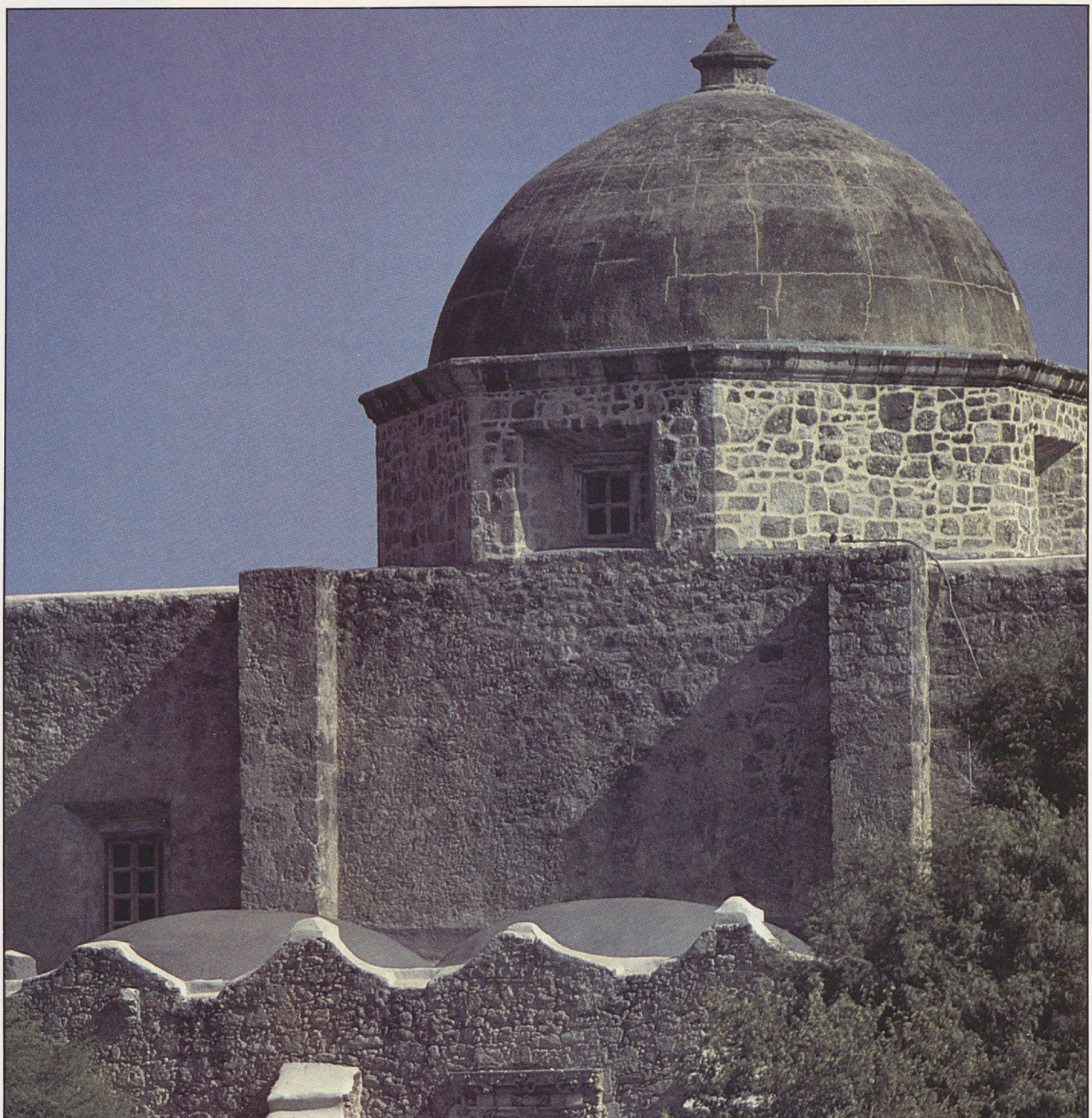


# A NEW ROLE FOR SAN ANTONIO'S MISSIONS

by Joan Pearsall

Bill Reaves

History is still evolving for the grand old missions of San Antonio. Those venerable stone walls, sturdy but beautiful, have witnessed many a tumultuous event during the past two centuries. Now a new era is upon them, in their role as a unique national park.

A ceremonial signing of cooperative agreements took place on February 20, 1983, at San Jose Mission between the Catholic Archdiocese of San Antonio, the Texas Parks and Wildlife Department and the U.S. Department of the Interior. Thus the San Antonio Missions National Historical Park came into being, comprising the 18th century missions of San Jose, Concepcion, San Juan and Espada and the acequia systems of the latter two.

This agreement culminates more than a half-century of efforts to bring about national recognition of these Spanish missions, and to preserve them as a cultural heritage for generations to come.

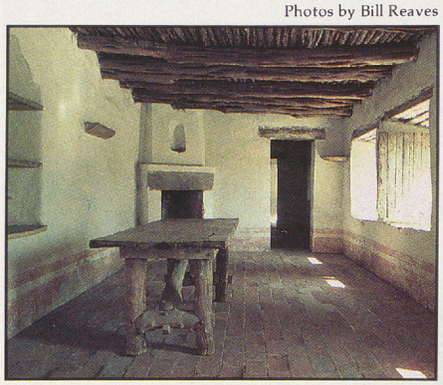
The missions are an integral part of the history of Texas, in its early days a frontier of New Spain. When the New World was discovered in the 15th century, Spain was in the forefront of the race to claim territory. Her campaigns were threefold: military, civil and religious. Along with the conquistadores and civil officials went the devoted friars, to bring Christianity and civilization to the primitive peoples. The Spanish Crown recognized that such influences would be invaluable in retaining and extending its new colonies.

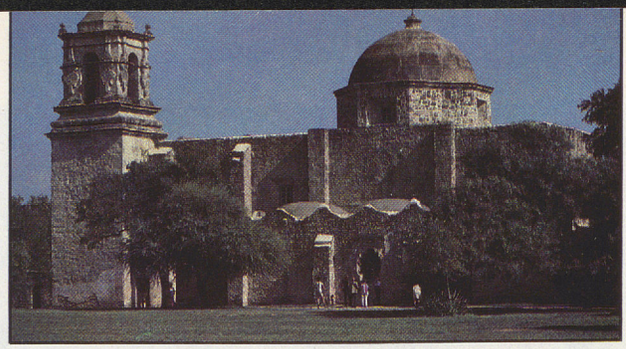
The story of the Franciscan friars is one of dedication and perseverance against overwhelming odds. In order to bring the Faith and improved standards of living to the natives of the wilderness, the friars endured tremendous hardships and dangers. Not only did they contend with hostile Indians, natural disasters and epidemics, but also very often the malice or bad behavior of some officials, other settlers and soldiery.

In South and Central America and Mexico the Spaniards encountered Indians of high culture, in many places already congregated in large groups, which facilitated their missionary and colonial efforts. In the vast area to the north, however, covering present-day Texas, the Indians were more savage and their culture far more primitive. There were some small villages, but mainly the natives were nomadic hunters. To impart civilization it was necessary to gather them into communities, and this gave rise to the general character of the missions. The term does not refer simply to the church or friary, but includes a whole complex—small houses for the Indians; workshops for the carpenter, blacksmith and tailor; granary and kilns; houses for the soldiers; and the cemetery, garden and orchard. These generally were surrounded by a wall with fortified gates or entrances; beyond were cultivated fields, often irrigated by

*Mission San Jose's dome (left), a* media naranja *(half orange), measures more than 39 feet above the roof. At right is a statue of St. Anne, mother of Mary, which is on the right side of the entrance.*

Photos by Bill Reaves





*An early historian called San Jose the "Queen of the Missions." Pictured on these two pages, San Jose was the most successful of the chain. Clockwise from top left: Convento library has hewn-out alcove for the friars' precious books; a side view of the mission showing the rose window, tower and dome, which was restored after it crashed in 1874; the old missions still are living centers of worship and the new park agreement allows continuity of this tradition; the well in the foreground was used by the old convento or friary; massive arches have been restored and are remains of the two-story convento, but the pointed Gothic arches were not in the original Spanish design.*

ditches, then a ranch with cattle, sheep, geese, horses, mules and oxen. A military presidio was located nearby.

The daily routine included regular religious instruction and worship, schooling for the children, training for the adults in a variety of crafts and arts and work in the fields and shops. The Indians also were taught government, electing their own officials under the supervision of the missionary, and management of their own farms. In effect, the missions were agricultural and technical schools, as well as religious institutions.

The missionaries were instructed to learn the languages of the Indians and to teach them Spanish, no small task considering the number of native dialects with no written alphabets. They were ordered not to engage in trade or commerce; to keep all records of births, deaths, baptisms and marriages; and to make periodic inventories of all property. The friars were scrupulously selected and trained and their stipends paid by the Crown for maintenance of the missions.

Franciscan missionaries in Texas were under the jurisdiction of two colleges for propagation of the faith in Mexico—Santa Cruz de Queritaro and Nuestra Senora de Guadalupe de Zacatecas. These in turn were directed by the Superior General of their order.

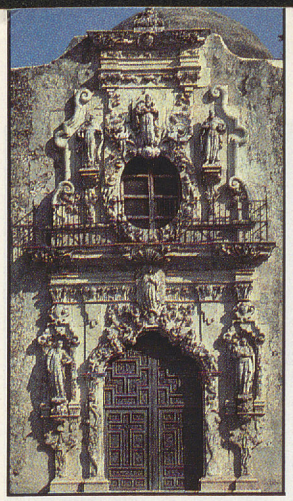
The mission settlements were never intended to be permanent. As soon as their religious and social tasks were accomplished, the aim was to distribute the lands and property to the neophytes and turn the church over to the secular clergy. The missionaries then were to move farther on to a new frontier. In the wild northern regions of Texas, however, there were so many setbacks that these objectives took far longer to realize than originally planned.

Some 40 Spanish missions were established within the boundaries of the present Lone Star State, the first ones predating those in California by nearly a century. Of the few that still stand in Texas, five are in San Antonio.

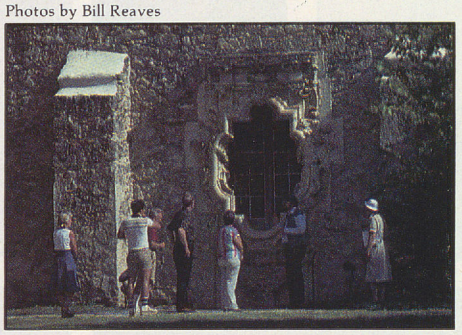
There were several waves of mission activity, but the first effort in Texas was with the expedition in 1540 of Francisco Vasquez de Coronado, who ventured northward from Mexico on a fruitless search for fabled riches. Later explorations resulted in the founding of Santa Fe in New Mexico in 1605, and in the 1680s several missions were established near what now is the West Texas border. But there was no settlement in East Texas until reports of French encroachments reignited Spanish interest in that direction.

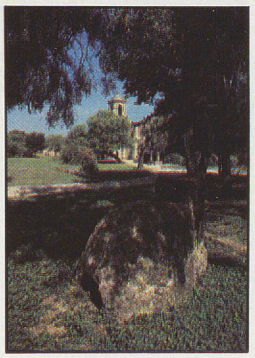
The first East Texas mission, San Francisco de los Tejas, was established near the Neches. A second one was established nearby, Santissimo Nombre de Maria. They were simple log structures, and a representation of the former can be seen in present-day Mission San Francisco de los Tejas State Historical Park. The foothold of these missions was precarious. Drought, famine and disease took their toll and military protection was inadequate. For these reasons, and the fact that fear of the French had subsided, the viceroy decided to abandon these missions in 1693.

Renewed French trading activity spurred the refounding of San Francisco de los Tejas in 1716 near the site of the old one, as well as several others in the vicinity. The viceroy saw the wisdom of establishing a halfway post between these East Texas missions and the Spanish presidio in northern Mexico. It was through the recommendation and persistence of an aged missionary, Fr. Olivares, that the site chosen was on the San Antonio River and the first mission there was San Antonio de Valero—later to be known as the Alamo. This mission had several other locations before it was moved to San Antonio in 1718. Founda-



Photos by Bill Reaves





*Statues on San Jose's ornamented facade (top left) include Our Lady of Guadalupe above the door; St. Joachim, left, and St. Anne, right, parents of Mary; San Jose (St. Joseph) with the Infant above the window; St. Dominic, right, and St. Francis, left. Such ornaments were to glorify God and were visual aids in teaching the Indians. Clockwise from top middle: San Jose, patron saint of this mission; rose window; an example of the bold bands of color early mission artists used to give depth and background (few of these bands and colored frescoes remain); a kiln; mariachis and folkloric dancers take part in the festivities at the new park.*

tion also was laid for the presidio of San Antonio de Bejar.

In 1720, Mission San Jose de Aguayo was founded by Fr. Antonio Margil de Jesus. Three more missions came to San Antonio in succession, which were re-establishments of ones abandoned in East Texas. These were: La Purisima Concepcion de Acuna, San Juan Capistrano (originally San Jose de los Nazonis) and San Francisco de la Espada.

Other mission settlements were made farther south on the San Antonio River, along the Rio Grande, on the San Xavier (now San Gabriel) River, and on the San Saba, with fluctuating degrees of success. The last one, Our Lady of Refuge, was moved to the site of present-day Refugio in 1795. Secularization of all the Texas missions was completed by 1830.

The missions always were beset by practical problems, as well as Indian hostilities and treachery. Yet, even in the midst of seeming failure, with their courage and persistence the padres accomplished a great deal in sowing the seeds of faith and civilization. The missions of San Antonio were the most successful and are a lasting monument to their achievements.

Since four of these missions now form the long-awaited national park, it is worthwhile to take a closer look at them.

The Alamo is not part of this park, but its history certainly is interwoven with that of the others. At the insistence of Fr. Olivares, an expedition led by Martin de Alarcon established this mission, San Antonio de Valero, and the accompanying presidio San Antonio de Bejar (Bexar) at the site which was to form the nucleus of the modern City of San Antonio. The mission is believed to have existed earlier on the Rio Grande, but the date of its consecration as a simple wooden building on the San Antonio River was May 1, 1718. After several temporary relocations, the foundation of the present stone church was laid six years later on one side of a walled plaza designed to hold cattle and provisions and be a defense against raids. Fields were cleared and an acequia dug to carry water from the river. This was the start of the first irrigation system developed by Europeans in the present United States. Under the friars' supervision, it was developed to serve a total of 4,200 acres of cultivated fields and made possible the nurture of the hardy longhorn cattle destined to be prominent in Texas history. Water still flows in part of the old acequias that now are within the national park. And Texas water distribution laws still are based on the Spanish, as are the Grange Laws regulating cattle.

In 1731, 15 families from the Canary Islands were brought in to settle at the Bexar presidio, which then became known as the Villa de San Fernando.

Fr. Antonio Margil de Jesus, president of the Zacatecan missionaries, in 1716 had been placed in charge of three ill-fated East Texas missions. Forced to retreat, he spent 1½ years at the Queretaran Mission San Antonio (the Alamo) and recommended to the governor that a Zacatecan mission also be built on the San Antonio River. Accordingly, San Jose y San Miguel de Aguayo was established February 23, 1720, about seven miles south of Mission San Antonio. This mission also was moved a couple of times, finally to a healthier, more elevated spot from the river. During the 1740s its first permanent buildings were constructed. From the beginning it made remarkable progress, soon recovering even after a severe epidemic in 1739.

The present church was built between 1768 and 1782. Texas' first historian, Juan Augustin Morfi, who had visited all the frontier establishments, described San Jose as the "Queen of the Missions," for its beauty, plan and strength. With its magnificent facade, statuary, rose window and brilliant frescos, the church

Bill Reaves

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Leroy Williamson

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*Concepcion, pictured on this page, is the oldest unrestored stone church in America. Clockwise from top left: In the baptistry, traces of fresco are discernible above the sculptured stone front; a strong Moorish influence is seen in the mission's architecture; the acoustics of the vaulted church are said to be on a par with those of the Mormon Tabernacle; shield at the top of the entrance has an inscription meaning "Hail Mary," the medallion at upper left is a Franciscan coat of arms and the one at right represents the Five Wounds of Christ; tranquillity of the cloisters touches present-day visitors; mission exterior.*

must indeed have been a marvel in the wilderness. Such mission decorations were both for glorification and a means of teaching the faith to the Indians. What went into the actual construction of the mission complexes is remarkable. The Indians of this region had no building techniques or technology. All the crafts had to be taught to primitive people to whom the very concepts often were strange. Yet they had a great deal of natural talent for craftsmanship and music, which the missionaries were able to bring out and develop.

San Jose prospered and altogether counted the largest number of neophytes and baptisms. About 1,200 acres were under irrigation during its peak years and there was a herd in excess of 4,000 longhorns. It had the largest granary of all the missions and the friars were able to supply surplus crops to the military and townspeople. An ingenious flour mill also was built here along the irrigation ditch.

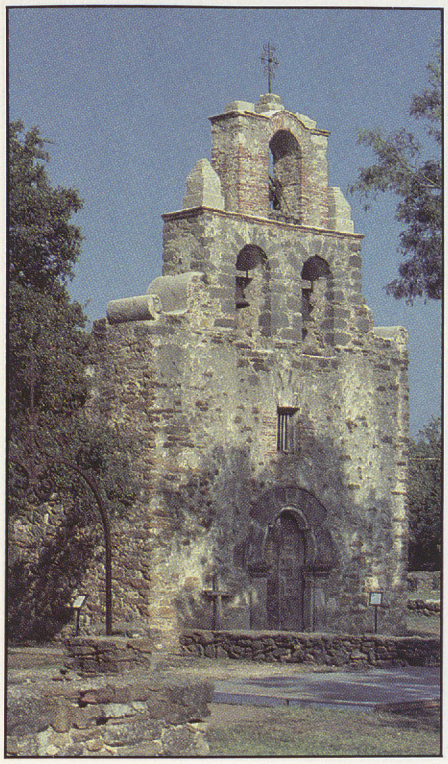
In 1731, San Antonio received its three other missions, relocated from East Texas. The name of one, San Jose, was changed to San Juan Capistrano; the second retained its original name of Nuestra Senora de la Purisima Concepcion; and the third, which as San Francisco de los Tejas had been the first in the province, assumed the name of San Francisco de la Espada.

Concepcion was the more prominent of these. It was located nearest the Alamo and the city, and its beautiful church building and other structures rank next to those of San Jose. Acoustics of the vaulted chapel have been compared to those of the Mormon Tabernacle. Concepcion is the oldest unrestored stone church in America, never having fallen into ruins like the other missions. Substantially, the church is the same as when it was completed in 1755, although today there is much need for preservation work.

The first temporary structures at Mission San Juan Capistrano were erected in 1731, but progress was slow due to Apache raids, lack of military protection and an epidemic in 1739. A simple stone church, a friary and granary were completed by 1756. A few years later a larger and better church was started, but was abandoned half-completed.

Mission San Francisco de la Espada was established on the west side of the San Antonio River, about nine miles from present downtown San Antonio. Since it was the last in the chain, it was more exposed to the frequent Apache raids. It, too, suffered from inadequate military protection and the fearful epidemic of 1739. Remarkable progress was made by 1745, however. A stone friary had been built, a church of stone and mortar had been started, and an aqueduct completed, which still is standing and carries water. A few years later, a larger church was begun, but this had to be pulled down because of poor construction. What has been described as the first textbook in Texas was compiled at Espada in 1760. Painstakingly gathered, this was the first written record of the Coahuiltecan Indian language.

In the 1780s the missions in general were at their peak. One of the reasons for their sharp decline thereafter was a government decreee appropriating all unbranded cattle and requiring anyone taking or slaughtering such cattle to pay a fee of four *reales* per head. Cattle was the principal wealth of the missions but many of the animals were not branded because all but a few of the horses needed to round them up had been stolen by Apaches. The decree instantly impoverished the missions, the friars having to buy their own cattle with corn they had raised to feed the Indians. It soon became impossible to gather and care for enough Indians to maintain the lands, a vicious circle.



Photos by Bill Reaves

*Mission San Francisco de la Espada was a reestablishment of the first East Texas mission, San Francisco de los Tejas. It was the last in the chain of San Antonio missions and is about nine miles from present downtown San Antonio. Espada, pictured on this page, suffered frequent Apache raids, but by 1745 stone buildings and a wall were completed and the compound was well-protected. The Espada dam, aqueduct and acequia form the oldest water system in use in the United States. Clockwise from left: mission exterior; interior of the restored chapel; holy water font inside chapel entrance; acequia.*

In 1793, Mission San Antonio (the Alamo) was completely secularized, with lands and supplies distributed to the mission Indians and church, friary and furnishings turned over to the pastor of San Fernando. The other four missions were partially secularized the following year and completely so by 1824.

When the American explorer Zebulon Pike came to San Antonio in 1807, he was amazed at the fine culture to be found there and the beauty of the missions, which then still retained their brilliantly colored frescos. He remarked that one would expect to find a church like San Jose in Europe, not in the wilds of Texas.

The buildings of Mission San Antonio were put to various uses after its closing and a Mexican cavalry unit was stationed there in the 1820s. The Alamo became forever famous in Texas history when the climactic battle was fought there in 1836 between "Texian" and Mexican forces. Concepcion also was the scene of a battle of the Texas Revolution in 1835, when a band of Anglo-Texans defeated regulars of the Mexican Army. Another struggle took place at Espada in 1835, when James Bowie and James W. Fannin Jr. headquartered there with a force of recruits and withstood a Mexican attack.

The Alamo was in use by the Confederate and U.S. Armies until the 1880s when it became the property of the City of San Antonio and later was placed in the care of the Daughters of the Republic of Texas.

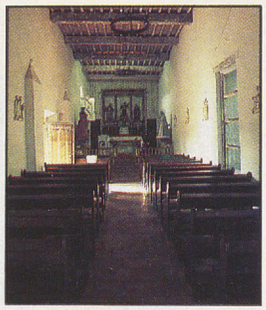
After 1824, the other four San Antonio missions did not fare so well. For 16 years they were completely neglected, except for housing horses, cattle and sheep. When the first bishop of Texas, John M. Odin, visited them he found San Jose and Concepcion to be structurally sturdy, though statuary had deteriorated from the weather and from being used for rifle targets. The other two were a mass of ruins.

Bishop Odin's petition to the Republic of Texas to return to the diocese the missions, buildings and adjoining lands, which had been church property under the Spanish government, was approved in 1841. From then on, he took steps to save whatever was possible, restoring some religious services and classes and bringing in successive groups of religious orders who made determined restoration efforts. However, in 1874 the dome and greater part of the roof of San Jose crashed to the floor. After 1888 this mission went through 34 more years of abandonment. In 1914, in the first action ever taken by San Antonio citizens, the Daughters of the Republic of Texas and Texas Historical Landmarks Association managed to do some rebuilding and propped up the front doorway to keep the arch from falling.

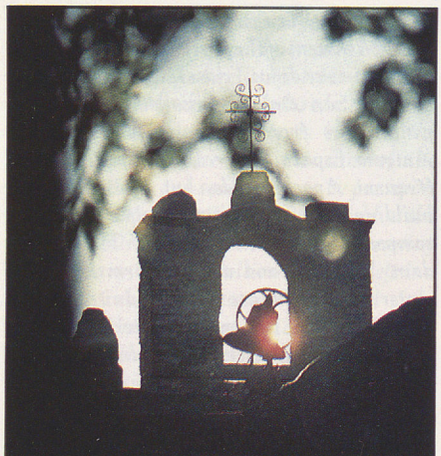
Although Concepcion suffered also from years of disuse, it did remain substantially intact. From 1855 to 1911 it was in care of the Brothers of Mary, who established a school, the forerunner of St. Mary's University. An adjacent orphanage was built in 1911 and St. John Seminary started in 1919.

Over the years vital contributions have been made by many groups and individuals, both religious and lay, toward saving the missions and it is hard to single them out. One perhaps should be mentioned, Father Francis Bouchu who, from the time of his arrival in San Antonio in 1858 until his death in 1907, devoted his life to Mission Espada in particular. It is said that this mission might not still be in existence but for him. He personally did much of the rebuilding, and made records of everything including all the painted artwork at Espada and Capistrano, which was becoming obliterated.

Father William Hume, who arrived in 1917, was another driving force in restoration of the missions, particularly San Jose. The Franciscans were brought



Photos by Bill Reaves



*Mission San Juan Capistrano also was relocated from East Texas, where it had been called San Jose de las Nazonis. It was renamed for a great Franciscan saint when it was moved to San Antonio. San Juan's mission building, pictured on this page, is less distinguished than the others, having plainer construction and a tower that is merely an elevation of a portion of the east wall with open arches for the bells. Like the other three missions, San Juan is an active Catholic parish. Clockwise from top left: nave and sanctuary; Ecce Homo and Blessed Virgin statues in the chapel; door handle and ornate keyhole; mission exterior; mission bell, which still chimes to bring the faithful to the chapel; an ancient archway inviting entrance to the compound.*

back to San Antonio in 1931 and reconstruction work continued under the auspices of the archdiocese, the San Antonio Conservation Society and the County of Bexar. In 1937, the restored church of San Jose was rededicated. A highlight in the history of this mission was its declaration both as a National and State Historic Site in 1941. In that year also it became a Texas State Park, with the county, conservation society, archdiocese and state entering into a unique treaty whereby the church structure still could operate as the center of a parish. This proved to be a very successful arrangement, the old mission still a living religious entity as well as a delight and a historical experience for park visitors.

Another surge of extensive restoration began in 1963 under Archbishop Robert Lucey, aided by the Texas Old Missions Restoration Association, which focused on Capistrano and Espada. The Espada aqueduct was designated a National Historic Landmark in 1965, and in 1967 the first missions archaeological dig took place at Capistrano.

The professional advice and expertise of the National Park Service proved very valuable in the preservation efforts during the 1930s, and interest had started to grow in joining all four missions under national designation. In 1964, the City of San Antonio asked the National Park Service to determine the feasibility of such a plan. The criteria at the time were not met, but in 1973 the community developed its own proposal for a local parkway and mission preservation program. In 1975, the NPS finally concluded that the missions met their criteria of national historical significance and a bill was introduced in 1976 to authorize creation of the park. Opposition from the Carter Administration delayed its enactment until 1978. Since then several delays occurred due to disagreements over the separation of church and state.

The four missions are active Catholic parishes, beloved centers of community life that wished to continue operating and not merely become museums. However, federal funds cannot be used to refurbish and help maintain active religious institutions. "Many people said we couldn't work out the differences that exist between church and state," said Archbishop Patrick Flores at the eventual signing ceremonies. "But we were able to settle those differences because of a willingness and sincerity on everyone's part."

The problems were resolved in a 1982 legal opinion by the Department of Justice, allowing the National Park Service to maintain the secular buildings and landscape and inform the public on the missions' historical significance while allowing parish functions to continue. The churches must be maintained and restored by the archdiocese and private groups. The precedent-setting agreement will be a guide for similar negotiations in other areas of the country.

Photos by Bill Reaves

The law that established the park authorized the Secretary of the Interior to acquire the four missions and adjacent lands, a total of 475 acres, through various means including purchase, donation, exchange and cooperative agreements. It authorized establishment of a citizens Advisory Commission and required development of a mission management plan.

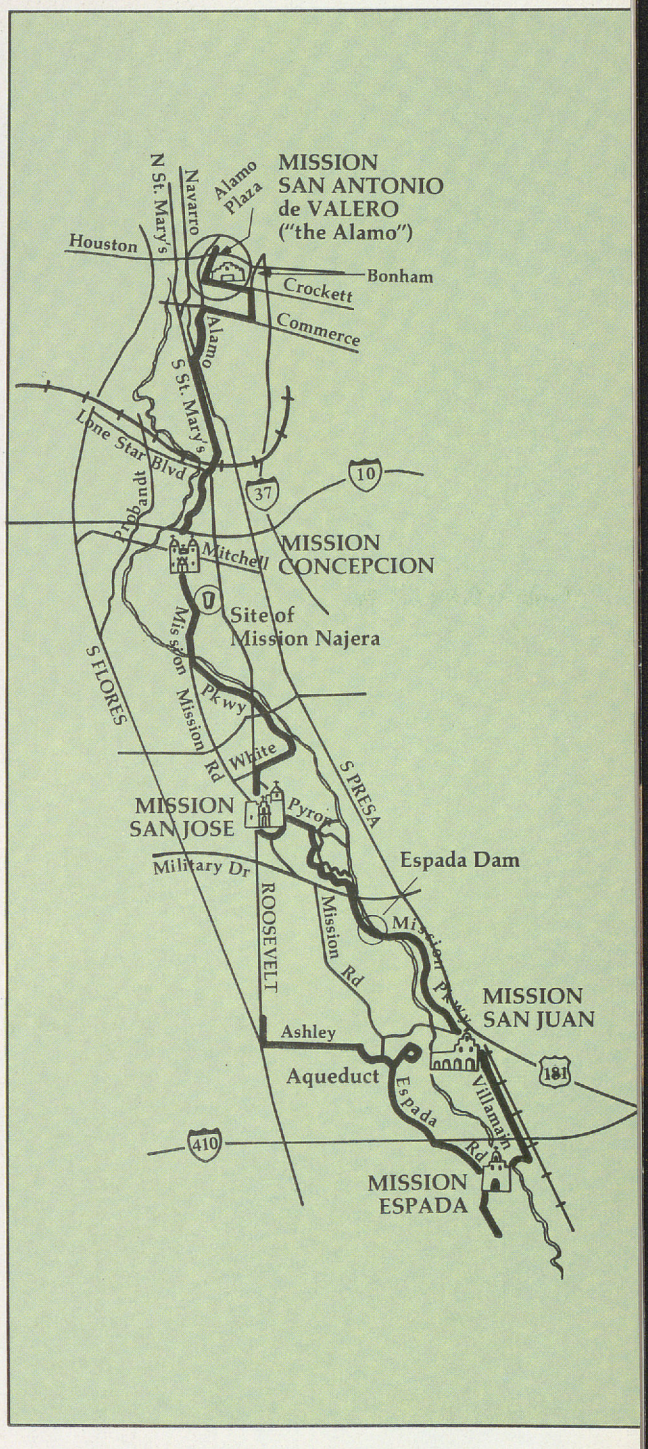
The first Advisory Commission was organized in June 1980, representing the city, county, state, historical organizations, the archdiocese and the public at large. The General Management/Development Concept Plan has just been issued, to guide the park's operation for a 10- to 15-year period. A Land Protection Plan also has been developed to minimize the impact on local residents, many of whom are descended from the mission Indians. They have been granted lifetime easement and none has been forced to move. Cooperative agreements have been entered into, giving the National Parks Service authority to use lands along the river for historical park purposes while retaining present recreational use under auspices of the City Parks and Recreation Department and the San Antonio River Authority.

The park also has acquired a donated scenic easement over the San Juan Acequia and work is in progress to restore the water flow.

Recent historical research sheds new light on the early mission period. Included are studies on landscapes, decorative arts, the Mexican period and archaeological investigations. Nearly completed is a Historic Structures Report which will document the complete history of each structure, including almost 1,000 old photographs, and will serve as a valuable basis for rehabilitation work.

That day when the new missions park officially was born was a joyous one indeed. Mariachi music added to the excitement, and dignitaries gathered on a platform decorated with huge paper flowers under the famed rose window at San Jose. A fiesta followed the speechmaking, with tables laden with typical San Antonio delicacies. The actual transfer of secular management and secular interpretation at Mission San Jose from the Texas Parks and Wildlife Department to the National Park Service took place March 31, 1983, at a simple ceremony of turning over the keys.

Full recognition now has been realized of the great part played by the missions in the settlement of the Southwestern United States. Besides their enduring spiritual effect, their contributions were outstanding in farming, cattle-raising, irrigation, architecture, language and many other elements of the regional flavor and culture. Actually, they were a factor in bringing together two great cultures and developing a new civilization in the Southwest. This new national park, a joint effort between government and citizens, will help ensure that the missions remain a living historical legacy for all. **



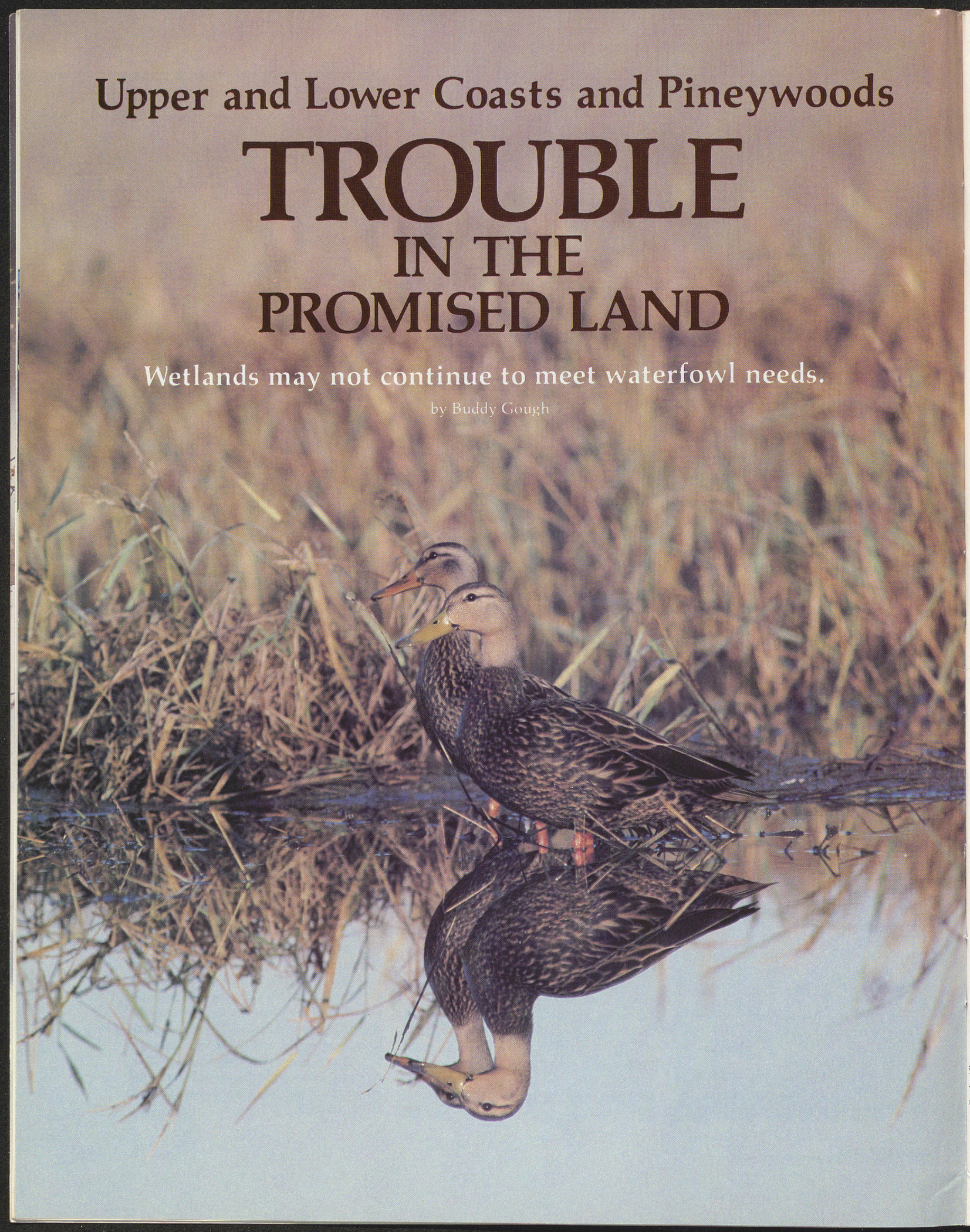

*Success of their crops was vital to the missions, so priority was given to building acequias such as the ones pictured on this page. River water was channeled into the fields as well as into the mission proper. Missionaries and Indians built the earliest acequias, and the Concepcion Ditch was wide and deep enough for boats. The acequia systems of San Juan and Espada now are part of the San Antonio Missions National Historical Park.*

## Upper and Lower Coasts and Pineywoods

# TROUBLE IN THE PROMISED LAND

### Wetlands may not continue to meet waterfowl needs.

by Buddy Gough



Grady Allen

Bill Reaves

Out of the north they come—white-fronted geese from the north slope of Alaska, big Canadas out of the Central Arctic, snow geese out of Hudson Bay, pintails from the Canadian prairies and mallards from the potholes of Montana.

Millions of waterfowl, impelled by the common need for a winter haven, come funneling down the ancient flyways with the age-old assurance the promised lands lie to the south.

This is the miracle of migration; this long, looping odyssey over the northern hemisphere is the "arc of life" that has sustained waterfowl since time out of mind.

Coming down the Central Flyway each year are as many as seven million ducks and geese with Texas on their minds.

Some, like the snows and blues of Western Hudson Bay, climb high on the north winds and, flying through night and day, wing their way straight to the Texas coast in one non-stop, 2,500-mile flight. Others, like the mallards, puddle-hop down through the grain-rich High Plains in a leisurely retreat before the snows of winter and then scatter throughout the state from the Panhandle playas to backwater bays.

For a few, like the blue-winged teal, the state is just a September stopover on the way to Central and South America. But for most, Texas is the terminus. Here, more than any other state in the flyway, is where the duck stops . . . and the goose too. Here in the diversity of the state's wetlands more than two dozen species find winter refuge.

This diversity of habitat, unique among the flyway states, ranges from the deep marshes of the Upper Coast and the nutrient-rich lagoons of the Lower Coast to the isolated springs and wet reaches of the Rio Grande and other streams far to the west. In the vast expanse of central and northern Texas, the wetland array includes numerous reservoirs, lakes, streams, playas and seemingly countless farm ponds. In the eastern regions of the state, it is typified by seasonally flooded bottomlands, swamps, sloughs and several large reservoirs.

It is this cornucopia of habitat types that makes the state such an essential haven for the varied migratory species, each of which has its own set of wetland requirements and tolerances and its own inherent ability or inability to adapt to habitat changes and challenges.

For centuries, the wetlands of Texas have fulfilled their promise to wintering ducks and geese. But, there is trouble in the promised land. Worrisome signs suggest some of the state's most important waterfowl habitats are reaching their capacity to provide sustenance, especially during late portions of dry winters.

The causes of the problems are not new. They are all the by-products of growth. The seeds were planted with the first settlement of the state and have grown with the accelerating pace of that settlement throughout the past century. Industrialization, urbanization, changes in land and water use by agricultural interests and a host of other users of natural resources all have combined to squeeze crucial wetlands.

Economic and demographic projections suggest Texas will continue to place increasing demands on its natural resources past the year 2000. This mild understatement refers to the Sunbelt Boom. America is bullish on Texas and the stampede is on. Wetland habitats of importance to waterfowl will not be excluded from this pressure.

Without a concerted conservation effort, the irretrievable loss of wetland habitat in the state may become a limiting factor for a significant portion of the waterfowl populations of North America. Faced with this foreboding, we need a judicious integration of habitat management,

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*The Upper Coast is the year-round home of the mottled duck (left), and habitat problems that threaten migratory species also affect this native bird. Generations of hunters have enjoyed superb waterfowl hunting in Texas, but this resource is facing an uncertain future.*

Grady Allen


development and acquisition supported by prudent research.

This story is the first of a two-part series of descriptions and prescriptions directed to the present and future threats to the state's major wetland regions: the Upper Coast, Lower Coast, Pineywoods, Panhandle, North-Central, South and West Texas. In this first part we'll concentrate on the Upper and Lower Coasts and the Pineywoods.

## THE UPPER TEXAS COAST

When the U.S. Fish and Wildlife Service established a national priority system ranking wetlands by their value to the nation's waterfowl resource, the Upper Texas Coast was identified as one of the most important waterfowl regions in North America.

The area's winter concentrations of waterfowl exceed any other geographical or ecological unit of the Central Flyway. Approximately one-half of the ducks and more than three-fourths of the geese of the entire flyway population depend on this coastal clime. It is also the year-round home of the native mottled duck.

The habitat of the wetland region consists of the major estuarine complexes of Lake Sabine, Galveston and Matagorda Bays and their adjacent saline and freshwater marshes. Backing these vast tidelands is a broad band of coastal prairie, which prior to the past half-century existed primarily as undeveloped rangeland. In its untouched state, this environmental "stew" of bay systems, marshes and prairies produced a wealth of native seeds and grasses, aquatic vegetation and marine life sufficient to sustain a wide variety and immense number of ducks and geese.

After World War II, extensive rice production and water management in the prairies increased the lure of the area to wintering waterfowl. Adaptable and highly mobile species such as geese and pintail ducks were able to seek the best of three worlds: marsh, rangeland and cereal cropland.

For a time, the agricultural developments were able to offset the inroads into prime habitat by petrochemical industrialization and maritime canalization. But, inexorably, the encroachment increased, particularly during the past decade.

In the present, major industrial complexes and rapidly burgeoning cities characterize the region. Clusters of oil refineries, some of the largest in the world, rise in the marsh lands. Suburban tentacles, exemplified by the westward expansion of metropolitan Houston, reach into the prairie. Channels and canals crisscross the terrain in a man-made

*As many as seven million ducks and geese including mallards (inset top) and snow and blue geese (inset bottom) head for Texas every fall. Extensive rice production on the Upper Coast increased the area's lure to wintering waterfowl. But in recent years, intensified farming practices have included a shift away from rice production. More and more birds are being forced to use less and less territory each winter.*

Bill Reaves

Ed Dutch

Grady Allen

maze. Resort communities dot the shorelines of the bays.

The pervasive alteration of natural habitats has been occurring at a time when the agricultural alternative has been weakening. As more and more birds have been forced to use less and less territory, intensified farming practices, including a shift away from rice production, have decreased the access of waterfowl to the essential water and foodstuffs on which they had come to rely.

The combined impacts have squeezed waterfowl and habitats ever closer to the point where this portion of the coast may no longer be able to send the wintering birds back to their breeding grounds in good physical condition. Information is accumulating which indicates nutritional deficiencies among wintering geese which may hinder their productivity. The impacts threaten the mottled duck as well.

The bountifulness of the upper coastal region depends on the continued vigor of all elements of the habitat triad: estuarine, marsh and agricultural complexes. But, the squeeze on these areas is expected to continue into the forseeable future. Since no alternative areas in Texas are capable of providing for the great numbers of resident, migrating and wintering waterfowl that depend on this area, its problems are the most critical in the state. Thus, waterfowl's most important wintering region has become its Achilles' heel.

In view of the uneasy future facing waterfowl on the Upper Coast, two areas of concern need to be addressed simultaneously. The first area includes the band of nutrient-rich wetlands that hug the coast. The wetlands controlled by the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department should be developed and managed as an integrated whole to enhance their ability to support waterfowl. In addition, a vigorous program of wetland acquisition should be pushed. The two agencies have identified 13 high-value wetland areas which should be acquired to preserve waterfowl's shrinking "safety net" in the region.

The other waterfowl habitat of concern is the extensive rice prairie adjacent to the marshlands. An immediate project to assess the habitat limitations on the rice prairies is needed. Innovations which in some way offer farmers incentives to compromise agricultural operations to favor waterfowl needs must be sought.

Cooperation between concerned agencies and landowners, habitat acquisitions, and imaginative and hitherto untried management programs will all be needed to salvage the remnants of the Upper Coast on which millions of waterfowl depend.

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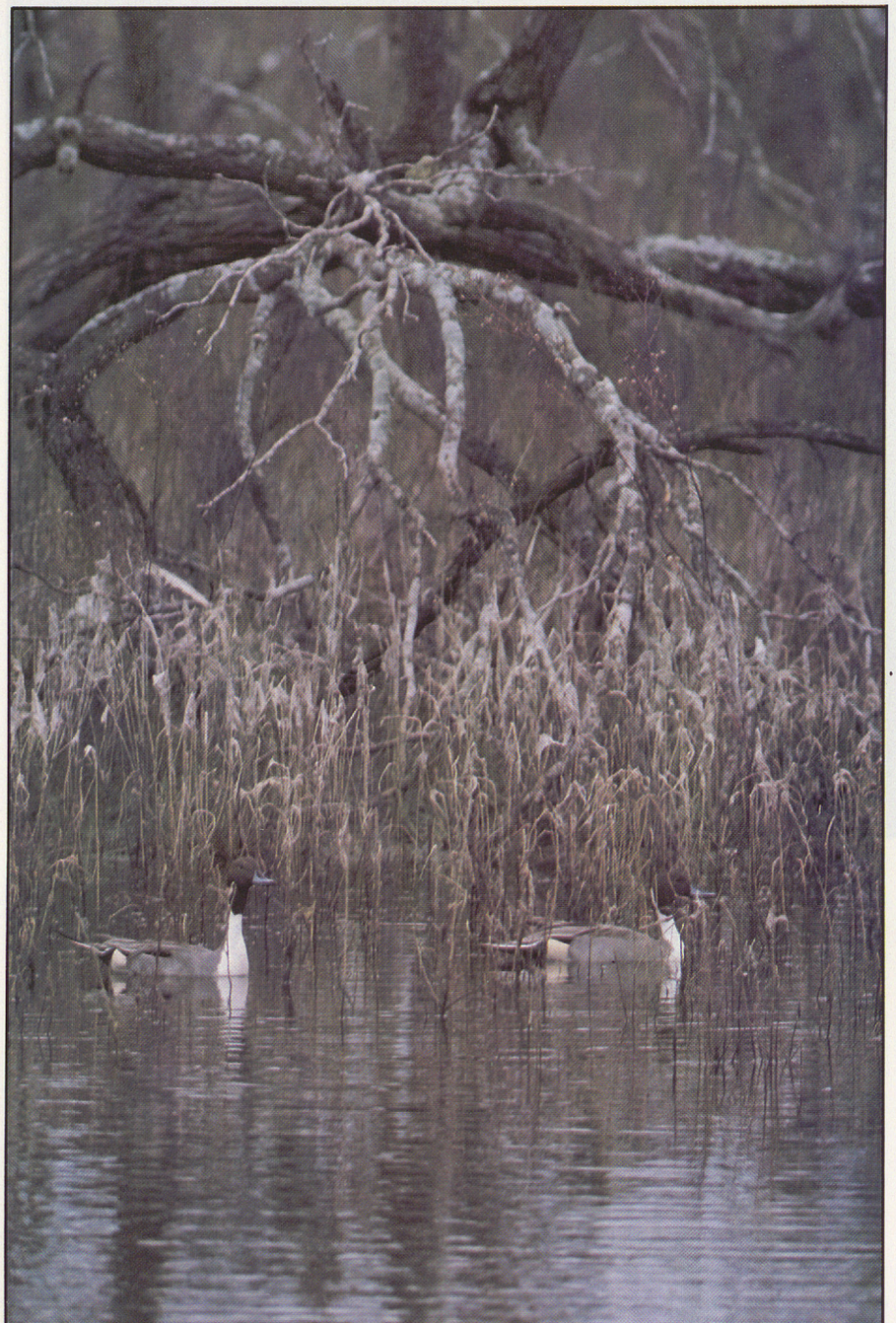
*Snow geese (inset bottom) are one of more than two dozen waterfowl species that find winter refuge on the Upper Coast. More than three-fourths of the geese of the entire Central Flyway population depend on this area. Cooperation between agencies and landowners, habitat acquisition and innovative management will be required to preserve this area's outstanding hunting opportunities.*

Ed Dutch



*Pintails (above) are one of the flocking species that winter on the Lower Coast. Food supplies in this region are adequate, but harassment by encroaching human populations probably makes large portions of the food unavailable to the birds.*

## THE LOWER TEXAS COAST

Sprawling behind barrier islands and their sheltering dunes, the wetland habitat of the Lower Coast consists of open bays and lagoons and tidal marshes backed by unspoiled prairie rangeland with numerous food-rich ponds and swales.

Here broad expanses of shallow mainland and island flats, abundant with submerged aquatics, offer refuge and sustenance to flocking species of waterfowl such as pintail, gadwall, widgeon, redhead, scaup and canvasback ducks. Wheeling about the bays in large feeding flocks, these species graze on the rich underwater meadows exposed by wind action on the shallow flats.

The region is especially important to redhead ducks since it is the winter haven for most of the continental population of the species. It is also the northern breeding ground for black-bellied whistling ducks and masked ducks from Mexico.

In general, the waterfowl habitats of this region are controlled by governmental agencies and extensive private holdings, such as the King Ranch, with strong concerns for wildlife conservation. Nevertheless, the area is not without specific problems.

Dredging of the Intracoastal Waterway and numerous lateral channels has significantly increased man's activities in the region. The commercial and recreational use of shallow-draft craft has compounded human disturbances and decreased waterfowl sanctuaries.

While food supplies of the region have been assessed as adequate for waterfowl, harassment caused by human encroachment probably makes significant portions of the supply unavailable. This harassment factor is particularly relevant to the flocking species which congregate in large concentrations. In these flocks, a couple of fretful individuals, disturbed by a passing boat, can panic the whole group into flight. As more remote areas are penetrated more frequently by air boats and other craft, the problem could become acute.

The seriousness of the situation in this important waterfowl haven requires a close monitoring of the magnitude of human disturbance and its full impact on waterfowl in the region. With the accumulation of information, it may be possible to alleviate the problem by simple compromises regarding the timing and spacing of significant disturbances.

## THE PINEYWOODS

Historically, the value and importance of the Pineywoods as a waterfowl region has been in its stream and bottomland character. Its myriad rivers, streams, sloughs, ox-bow lakes, swamps and periodi-

cally flooded hardwood bottoms have provided a rich habitat for resident wood ducks and during the winter have attracted many more "woodies," mallards and other mast-eating species. The cumulative total of these ribbons of wetlands has enabled the region to nurture and winter large numbers of waterfowl.

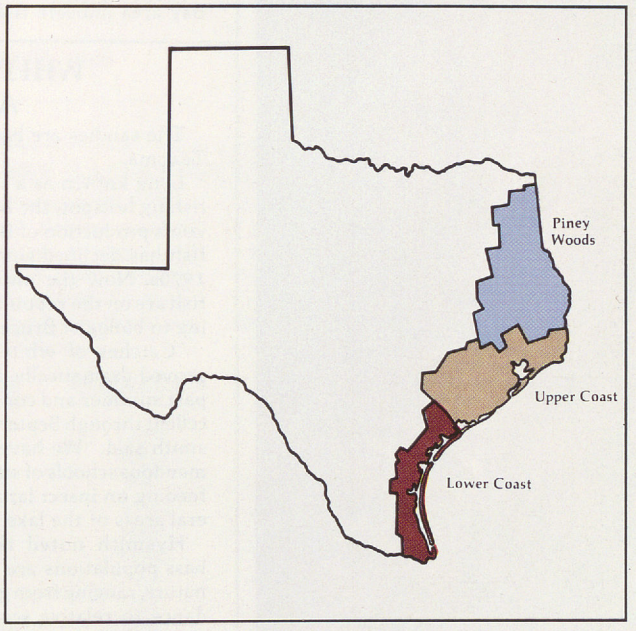
However, the character of the Pineywoods and its future prospects have been drastically altered in recent decades with the construction of large reservoirs. These impoundments—Toledo Bend, Rayburn, Livingston, Conroe and others—have inundated extensive bottoms. The loss is irretrievable. Furthermore, bottomland areas downstream from the reservoirs have been degraded by the dams that curtail the natural flooding beneficial to waterfowl.

As a result, the historical breeding habitats of the wood duck have been severely damaged. While impoundments have introduced new wetland areas into the region, these waters have only marginal value to resident and wintering waterfowl. This can be attributed to the low consideration given waterfowl resources in the planning, construction and operation of reservoirs, more of which in the planning stage further cloud the future of this region.

However, in the midst of present adversity and a cloudier future facing the Pineywoods, waterfowl management opportunities do exist. The department, working with the cooperation and aid of the U.S. Corps of Engineers and other authorities controlling existing reservoirs, could instigate activities to enhance the potential of existing waters to benefit waterfowl. These could include efforts as elementary as providing waterfowl with scattered shallow coves free of human disturbance. Manipulation of reservoir pool levels to increase shoreline habitat and improve downstream areas could be even more beneficial.

Most important, a "waterfowl interest" could be established for all planned water projects. Making waterfowl habitat enhancement programs an integral part of reservoir construction and operation would help mitigate critical loss of habitat.

Grady Allen




The wetland habitats of the Upper Coast, Lower Coast and Pineywoods, despite a diversity of terrain, share much in common. All are important to native and wintering waterfowl populations and their productivity. All have suffered habitat loss and degradation. All share trends which, unless corrected, portend an uneasy future. Much of the same can be said for the state's other major waterfowl habitats: Panhandle, North-Central and South and West Texas. The problems of these four regions will be described in the next article of this series. **

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*For many years, snow geese have grown fat during their winter stay on Texas' nutritious food supplies. But information indicates nutritional deficiencies among wintering geese that may hinder their productivity when they return to their breeding grounds.*

# Outdoor Roundup

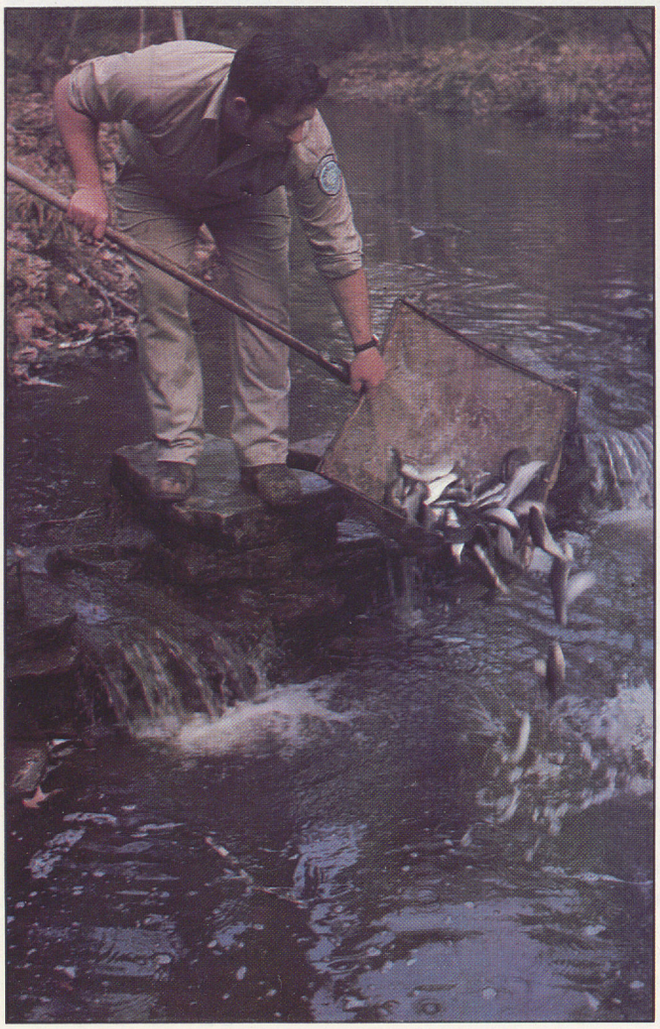
## COMPILED BY THE PARKS AND WILDLIFE DEPARTMENT'S NEWS SERVICE

### FIRST STOCKINGS OF TROUT COMPLETED IN NOVEMBER

The first shipment of rainbow trout from Arkansas has been distributed to four public fishing areas in Texas.

Texas Parks and Wildlife Department crews have stocked 20,000 trout in the Guadalupe River below Canyon Reservoir Dam, 21,000 in the Brazos River below Possum Kingdom Reservoir Dam, 4,300 at Boykin Springs Lake in Jasper County and 3,100 in Foster County Park at San Angelo.

The trout range in size from eight to 10 inches. Officials said barring unforeseen problems, additional stockings will be done each two weeks until March at all four sites.



### TAGGED RIDLEY TURTLES APPEARING ON COAST

Several recent reports of tagged sea turtles in the Aransas Bay area indicate that some of the endangered Ridley turtles released during June 1983 may still be in the area.

Texas Parks and Wildlife Department biologist Terry Cody said possession of the Ridleys is unlawful, but fishermen capturing or sighting tagged turtles should report as much information as possible. Important data include the tag number, date, location of capture or sighting, condition of the turtle and release site if released.

Cody said captures or sightings should be reported to Parks and Wildlife Department offices at Rockport 512-729-2328, or at Flour Bluff 512-937-6323; the University of Texas Marine Science Institute at Port Aransas 512-749-6341; or the Padre Island National Seashore office, 512-933-8177.

### WHITE BASS ON REBOUND AT LAKE TEXOMA

The sandies are back at Lake Texoma.

Long known as a white bass fishing hotspot, the huge reservoir's production of the popular fish has declined since the late 1970s. Now the unpredictable fish are on the rebound, according to biologist Bruce Hysmith.

"Catches of white bass improved dramatically during the past summer and continued excellent through September," Hysmith said. "We have seen tremendous schools of small whites feeding on insect larvae in several areas of the lake."

Hysmith noted that white bass populations are cyclical in nature, ranging from great abundance to relative scarcity over the span of just a few years.

"The decline in white bass populations here seemed to correspond with the bumper crop of introduced striped bass produced by a natural spawn in 1979," Hysmith said. "This led a lot of fishermen to believe that the stripers were responsible for the scarcity of white bass."

The lake still has excellent striped bass populations and an obvious resurgence of whites. "I believe the decline was more likely a natural cyclic decline rather than a competition problem," Hysmith said.

Another factor which may have inhibited the white bass recovery was a crash in threadfin shad populations in 1981-82. The threadfin now are back in great numbers, providing dependable forage for stripers, whites and other predator species, he noted.

The predatory stripers will eat small sandies, but stomach analyses at Texoma and other reservoirs have revealed that shad are the predominant food item for stripers. "We actually have seen more young stripers in the stomachs of striped bass than young white bass," Hysmith commented. "It appears to me that conditions are good for both species, and we are maintaining successful coexistence of the two."

## LOUISIANANS CAUGHT WITH 655 QUAIL

Six Louisiana hunters put a dent in the Dickens County quail population when the season opened October 29, but in the end it was their own pocketbooks that took a beating.

Texas Parks and Wildlife Department game wardens received a telephone tip on November 1 that some excessive shooting was in progress.

Arriving on the scene, the game wardens found the Bayou State marksmen already had killed 145 quail that day, and further searches turned up 520 dressed quail they had bagged earlier.

The four adults in the hunting party paid over $1,600 in fines at a justice of the peace court in Dickens after pleading guilty to exceeeding the quail bag and possession limits. The daily limit in Dickens county is 20 per day, 60 in possession.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## SNOOK PRODUCTION PLANNED AT JOHN WILSON HATCHERY

The Texas Parks and Wildlife Department anticipates receiving approval from the Gulf Coast Conservation Association (GCCA) to proceed with a snook culture program at the John Wilson Saltwater Fish Hatchery near Corpus Christi.

Construction of the $1.3 million hatchery was funded by the GCCA expressly to raise red drum (redfish) for restocking Texas coastal bays. However, the organization's executive committee authorized the snook project because it will utilize hatchery ponds during the summer when water temperatures are too warm for rearing redfish.

Bill Rutledge, Texas Parks and Wildlife Department hatchery section chief, said snook culture techniques already have been developed in Florida and should pose no problems at the Wilson facility. "Snook can be induced to spawn in tanks by the same light-photoperiod method we use on redfish," Rutledge commented. "I think we can realistically expect to produce between 600,000 and a million fingerlings each summer, depending on the availability of brooders."

If successful, the program will be the first of its kind anywhere, since the Florida program was limited to culture studies only, with no stocking program. "Florida had no saltwater rearing ponds such as we have at the Wilson hatchery," Rutledge said.

Snook are popular game and food fish found in inshore areas throughout most of the Caribbean and southern Gulf of Mexico. They were fairly abundant along the lower Texas coast several decades ago, but now appear only sporadically, Rutledge noted.

## TEXAS OUTDOORS RADIO PROGRAM

"Texas Outdoors" is a weekly radio program produced by Texas Parks and Wildlife Department in conjunction with the State Network in Dallas. It's heard on many TSN-affiliate stations throughout the state.

Each week the 15-minute program covers a variety of outdoor-related topics, including state parks and historic areas as well as special features on hunting and fishing.

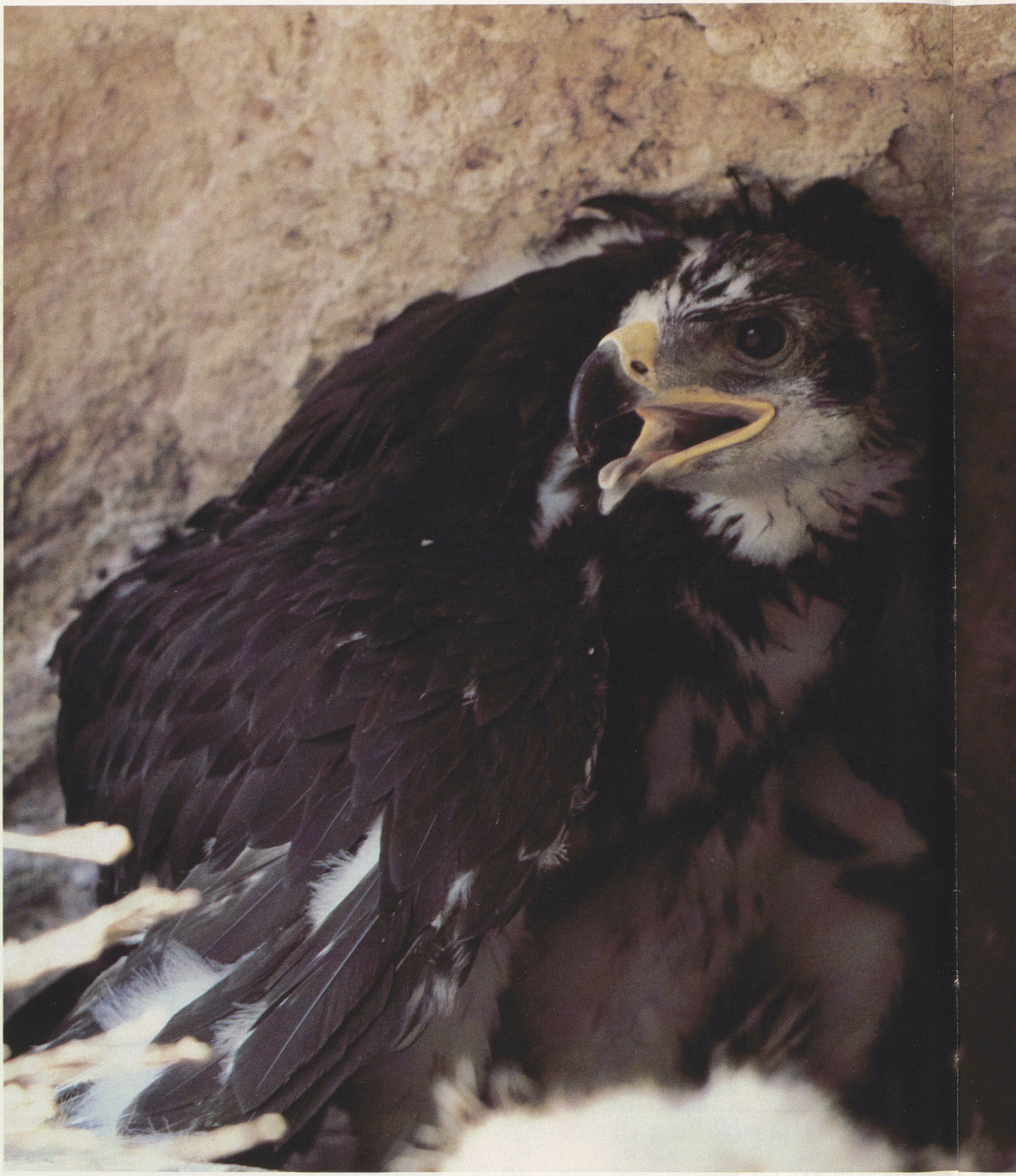
Tune into one of the stations listed below before you start out on a trip anywhere in Texas to camp, fish, hunt or relax in the Texas outdoors.

| CITY | STATION | AM/FM | FREQUENCY | DAY | TIME |
|---|---|---|---|---|---|
| Andrews | KACT | AM | 1360 | Saturday | 9:00 a.m. |
| Andrews | KACT | FM | 105.5 | Saturday | 9:00 a.m. |
| Atlanta | KALT | AM | 900 | Saturday | 9:00 a.m. |
| Austin | KLBJ | AM | 590 | Saturday | 5:45 a.m. |
| Boerne | KNCI | AM | 1500 | Sunday | 8:30 a.m. |
| Bonham | KFYN | AM | 1420 | Sunday | 8:30 a.m. |
| Bonham | KFYZ | FM | 98.3 | Sunday | 8:30 a.m. |
| Breckenridge | KROO | FM | 93.5 | Sunday | 8:30 a.m. |
| Carrizo Springs | KBEN | AM | 1450 | Saturday | 9:00 a.m. |
| Center | KDET | AM | 930 | Sunday | 7:25 a.m. |
| Daingerfield | KEGG | AM | 1560 | Saturday | 10:00 a.m. |
| El Campo | KULP | AM | 1390 | Saturday | 10:00 a.m. |
| Henderson | KWRD | AM | 1470 | Saturday | 12:30 p.m. |
| Junction | KMBL | AM | 1450 | Saturday | 9:00 a.m. |
| Littlefield | KZZN | AM | 1490 | Sunday | 4:00 p.m. |
| Marshall | KKYR | AM | 1410 | Saturday | 10:00 a.m. |
| Palestine | KNET | AM | 1450 | Saturday | 9:00 a.m. |
| Pecos | KIUN | AM | 1400 | Saturday | 10:00 a.m. |
| Rusk | KTLU | AM | 15.80 | Sunday | 8:30 a.m. |
| Rusk | KWRW | FM | 97.7 | Sunday | 8:30 a.m. |
| Sonora | KVRN | AM | 980 | Sunday | 5:00 p.m. |
| Sonora | KVRN | FM | 98.0 | Sunday | 5:00 p.m. |
| Sulphur Springs | KSST | AM | 1230 | Saturday | 6:05 a.m. |
| Woodville | KVLL | AM | 1490 | Saturday | 12:45 p.m. |

FEBRUARY IN . . .

# TEXAS PARKS & WILDLIFE

Stretching some 66 miles alongside the Lower Coast, Padre Island National Seashore is filled with history, ecological significance and beauty. It provides the rare opportunity to enjoy primitive beach recreation on the country's longest undeveloped beach, and in the February issue we'll take you there. Also next month is Part 2 of "Trouble in the Promised Land," an examination of problems besetting the state's waterfowl habitats. Next month's installment covers the Panhandle, North Central and South and West Texas. Other stories in the February issue include the river otter, Lake Fork in East Texas, Daingerfield State Park, a photo story showing Texas under ice and a Young Naturalist feature on the pantograph.



David Rideout

# WHERE THE GOLDEN EAGLES NEST

by David W. Rideout and Danny A. Swepston,
Wildlife Division

Golden eagles, the "war eagles" of the Comanches and Kiowas, once nested over much of western Texas, but today are found primarily in the mountainous areas of the Trans-Pecos and the canyons and bluffs of the Panhandle.

Eagles are not very tolerant of man's presence, and throughout history, man often has been intolerant of eagles. Stories have been told of eagles preying on domestic animals and babies, causing many people to kill the birds and destroy their nests. Virtually all of the golden eagles around today are found on large, remote ranches where there is little or no human interference.

In 1975, the Wilson Ornithological Society (WOS) estimated the entire North American golden eagle population to be 100,000. Other estimates have been as high as 500,000. In comparison, the WOS estimated that bald eagles, *Haliaeetus leucocephalus*, which are classified as endangered in the lower 48 states, number between 35,000 and 60,000 birds, with only 1,000 nesting pairs south of Alaska and Canada. A survey by the Texas Parks and Wildlife Department located 15 active bald eagle nests during the 1982-83 nesting season, primarily along river systems in some of the southeast and coastal counties.

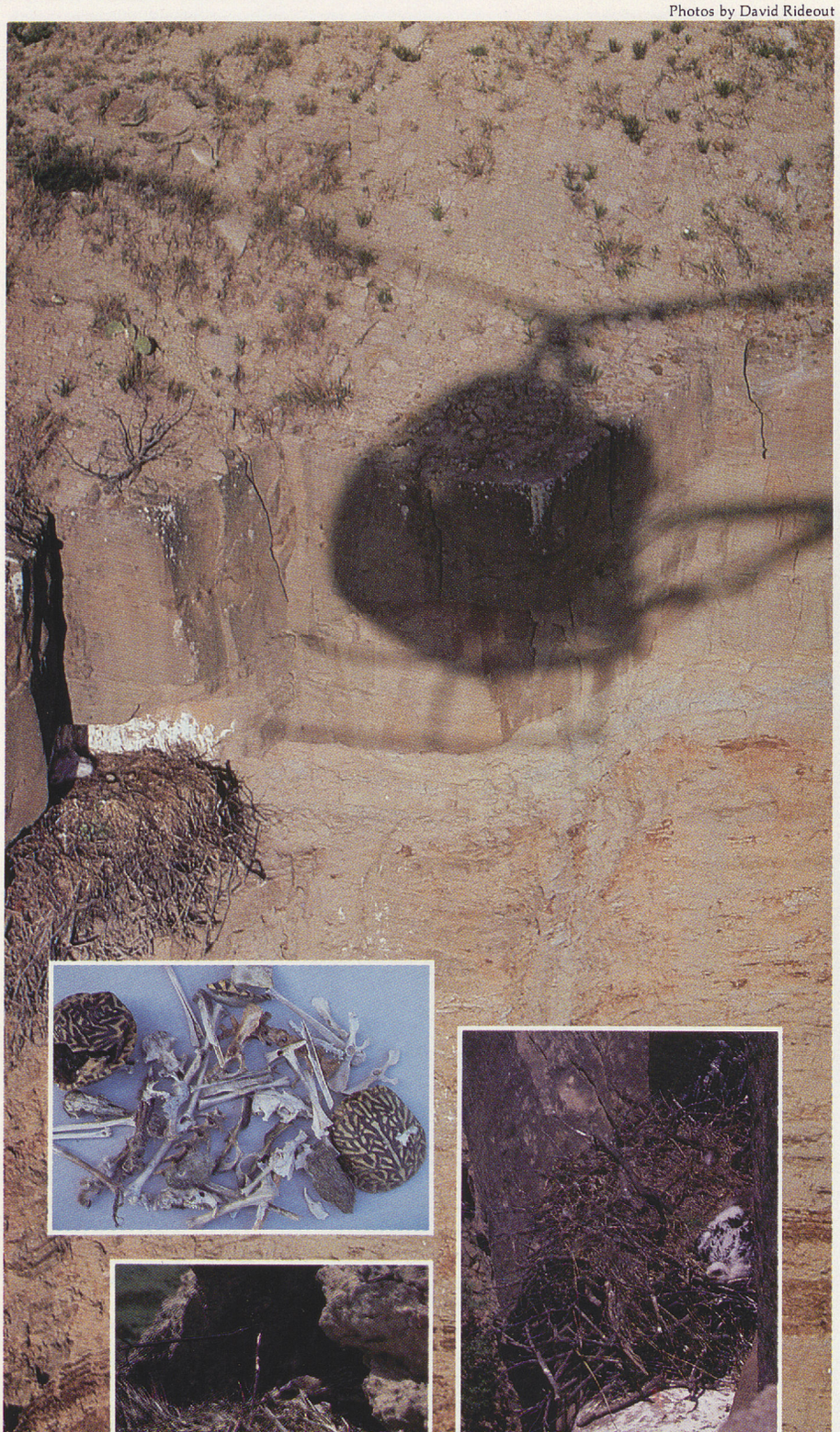
*Freedom from human disturbance and harassment is essential to the nesting success of golden eagles. Consequently, almost all existing nests of these avian predators in Texas are located in rugged and remote terrain of large, isolated ranches.*

Texas also supports a large wintering population of bald and golden eagles. Although the birds may be sighted in any portion of the state, the largest concentrations of golden eagles occur in the Panhandle, Edwards Plateau and Trans-Pecos regions.

In 1980, the department initiated a study to determine the status of resident nesting golden eagles. Previous studies had dealt mostly with only a few nesting pairs or with the winter migrant population in the Trans-Pecos. Information was needed for a more comprehensive picture of the golden eagle population in Texas during the spring and early summer; their number, density and distribution, nesting habitat, annual production, prey species and other factors influencing these large birds of prey. During the last year of this study, helicopter time became available to survey a portion of the Panhandle study area.

As we lifted up over the Palo Duro Canyon, we knew this helicopter survey would be superior to previous ground searches for locating active golden eagle nests and checking production. We first

Photos by David Rideout



headed up a part of the canyon where I (David Rideout) knew eagles were nesting so Fred Evans, a veteran 'copter pilot, and I could familiarize ourselves with the procedure for locating eagle nests by helicopter. In less than 30 minutes, we had spotted three active eyries (nests). As the 'copter hovered near each one, I recorded the number and age of the eaglets, photographed them and marked the spot on a topographic map for future reference.

Golden eagles, *Aquila chrysaetos*, usually have two to three nests in their territory, which are used alternately year after year. Since these nests may be several feet to a mile from each other in relatively inaccessible, rugged locations, finding an active pair one year doesn't mean it will be simple to check them for production the following year.

During the next two days we were able to search practically all of the Palo Duro Canyon in Randall, Armstrong, Briscoe and Floyd Counties. We knew that this area, which is primarily cattle ranching country, had the best habitat in this part of the state for golden eagles. Ground searches the past three years had located a few active nests, but the rugged terrain prevented a thorough search. The current aerial survey was more productive. Twenty-two active eyries were located and checked in the canyon, 15 of which were previously undiscovered sites. We located four more new eyries in an area in Deaf Smith and Oldham Counties west of Amarillo.

Due to the inaccessibility of the mountainous terrain and the amount of manpower and funds allocated, the Trans-Pecos portion of this four-year study was limited largely to a 1980 aerial survey and information from past studies. As a result, field studies were concerned primarily with the nesting population in the high and upper rolling plains of the Texas Panhandle and, unless stated otherwise, results refer only to this area.

Golden eagles are large, about three feet long, with a wingspread of six to 7½ feet. They weigh eight to 12 pounds.

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*A survey done by helicopter found 22 active nests in Palo Duro Canyon, 15 more than previously discovered by foot in this mountainous region. Top left inset: Animal remains in nests indicate a diet primarily of rabbits, rodentlike animals, turtles and birds. Lower left inset: The sturdy nests are most often constructed of the dead brush of mesquite, juniper and yucca. Right inset: Active nests normally fledge a single eaglet.*

Females are larger than males, a common characteristic of birds of prey. Some researchers believe this size difference enables the female to accommodate the weight of the eggs prior to egg laying and to handle incubation, brooding and protection of the young.

These eagles are named for the golden-buff feathers on the crown of the head and nape of the neck. Adults are dark brown, with brown, black and gray barring of the feathers. The hooked bill is black with a yellow cere (fleshy base), the feet are yellow with black talons and the eyes are brown. At fledging, the base of the tail, secondary and primary wing feathers are white, tipped with black or dark brown. With each molt, there is less white remaining, and by the time the eagles reach sexual maturity at three to four years, there is very little or no white remaining.

Resident golden eagles begin repairing old nests or building news ones in January and February while migrant eagles, that arrived in October, are still present. More than 95 percent of the active pairs in the Panhandle study built nests on ledges of steep, relatively inaccessible cliffs, 20 to 300 feet high. Cliffs and bluffs in this area are sandstone, gypsum rock, dirt or a combination of the three. The more permanent sandstone was the preferred site when available. Fewer than five percent of the nests were in the upper portion of cottonwood trees, 50 to 65 feet tall. Pairs using tree nests did not have alternate nests.

Nests are constructed primarily of sticks from dead mesquite, juniper and cottonwood trees and dead yucca stalks. Green vegetation such as small juniper branches or sagebrush usually are found in active eyries. However, unusual items also occur including a five-eighths-inch steel cable 20 inches long, found in one tree nest that had fallen when the supporting limb broke. Another nest was built in the same tree the following season.

In this part of the Southwest during April, May and June, nests with a western exposure might be fatal to eaglets, as they could be subjected to higher nest temperatures from the direct afternoon sun and heat radiating from the cliff walls. Some researchers think nest exposure is significant, but others think it is merely random selection. Examination of 69 Panhandle nests actually used in nesting attempts during this research showed no overall correlation in nest exposure selection to fledging success.

Other factors that may influence nest site selection more are the cliff faces available for nest sites that face east or west, the prevailing southwest winds at this time of year and the wind drafts and currents in a particular canyon or valley. An adult approaching the nest carrying normal-sized prey of two to four pounds would have a definite advantage and use less energy if it could approach into the wind. As any pilot knows, landing into the wind is highly preferred.

Glen Mills

One to three, but usually two, eggs are laid in February or early March with two to four days between laying of successive eggs. Actual average egg production was not determined in this study due to the detailed observation necessary and the likelihood that the birds would abandon the nest if humans disturbed them during this critical period of the nesting season. The three-inch-long eggs range in color from off-white to tan with dark brown splotches. Separate studies of golden eagles in this area by R.W. Strandtman and Dan True demonstrated an incubation period of 40 and 41 days, respectively. The female does almost all of the incubation, and the majority of the eaglets in the Panhandle hatch during the first two weeks of April.

Newly hatched eaglets are a little larger than a sparrow. Incubation starts when the first egg is laid and when there is more than one eaglet, the two- to four-day interval between hatching dates causes one eaglet to be a little larger than the other. New eaglets are covered with short, thick, grayish-white down, which is replaced with longer, thicker, pure white down in about a week. By five weeks of age, the young birds are about the size of a full-grown chicken, and black juvenile feathers have begun to replace the white down. At nine to 11 weeks of age they have attained the full plumage of juveniles as previously described and are able to fly from the nest, a process called fledging. The majority of Panhandle eaglets fledge by June 15 each year.

Eaglets are naturally aggressive and, during the first few weeks, this trait sometimes results in one pecking, jabbing and harassing its sibling to death. This often has been referred to as the "Cain and Abel" struggle, but the reasons for this struggle are not clearly understood. In our study, 52 percent of the nests that fledged young produced only one eaglet. This would indicate some mortality may have occurred from sibling aggression; however, it was not known how many of these single fledglings had siblings originally.

During the first three or four weeks after hatching, the adult female is very attentive to her offspring, carefully brooding and feeding them. The male catches and brings most of the prey to the nest. As the eaglets grow older,

*By five weeks of age, black juvenile feathers begin to replace the white down of infancy; at nine to 11 weeks, the eaglets attain full juvenile plumage and are able to fly.*

Glen Mills

David Rideout

adults spend less and less time at the nest, but they continue to bring prey until the juveniles are able to fly and learn to capture prey on their own.

With the addition of the 19 previously undiscovered active pairs located during the helicopter survey, a total of 36 pairs of golden eagles was known to have nested, produced young, or apparently attempted nesting from the spring of 1980 through 1983. There may very well be 10 to 20 additional pairs in unsurveyed areas of the Panhandle. Six other pairs were determined to have nested between 1976 and 1979, but not during the study period. At least four of these six pairs stopped nesting and/or apparently left their respective territories due to human disturbance.

Average yearly production, or number of eaglets fledged per total active nest, was based on five active pairs for which production was known for three successive years, 1981 through 1983. Average production for the three-year period was 1.07 fledglings per nest. Four of the five pairs failed to fledge an eaglet during one of the years.

*Upper left: Golden eagles are large raptors, about three feet in length, with wing spans of six to 7½ feet, and weighing eight to 12 pounds. Upper right: Whether tucked into crevices of high cliffs or the tops of tall cottonwoods, the nests are used year after year.*

An aerial survey with fixed-wing aircraft by the U.S. Fish and Wildlife Service in 1980 indicated a significant breeding population also exists in the Trans-Pecos. A total of 59 active or occupied nest sites was discovered with an average of 0.83 eaglets per nest.

Studies in Colorado, Idaho, Utah and Montana with higher eagle populations show similar overall production. Also, of equal or more importance, it is estimated that about 75 percent of juveniles, especially recent fledglings, never reach maturity. Recent fledglings are very awkward flyers and equally awkward in their landings, often resulting in impact injuries such as broken necks.

Other studies also have revealed that two major causes of death are electrocution, as a result of perching on high-voltage power lines, and illegal shooting. Power companies have begun to modify construction of power lines in some areas with high eagle populations, which reduces the chance that the eagles' large wingspread will make a fatal connection. Golden eagles have been protected by federal law since 1963 as a result of an amendment to the Bald Eagle Act of 1940. Enforcement of this law and educational efforts have reduced shooting deaths except in some localized instances.

Considering fledging success and various mortality factors, it takes eight to 10 years before a pair of sexually mature adults replaces itself.

As a result of the 1983 helicopter survey, enough active pairs were located to determine the distance between active eyries. In the rugged Palo Duro Canyon, an average distance of 4.33 miles between sites was calculated, while sites in the more open, flatter terrain of Deaf Smith and Oldham Counties were 6.85 miles apart. Using this information, the average minimum size of a pair's territory would be almost 19 and 47 square miles, respectively. Radio telemetry studies of adults would be necessary to determine the actual size and extent of their nesting and hunting territories.

Golden eagles apparently mate for life, which may be 20 years or more in the wild. The same pair of eagles uses the same territory year after year but, if one or both eagles die, the void usually is soon filled. A nest in Donley County is a good example of this. The rancher said this particular nest had been used every other year since at least 1910.

Resident nesting pairs in Texas apparently stay in the same area throughout the year, defending it from other local eagles and winter migrants. This also is thought to be true for resident eagles in the remaining lower 47 states. Winter migrants come chiefly from Alaska and Canada.

An important objective of this study was to determine the identity of the prey species being brought to the eyries and the eagles' general preference. This was

Glen Mills

accomplished by examining active or recently active nests for prey remains or identifying remains collected from beneath these nests. Remains from 35 nests were collected and identified, representing the diets of 24 different pairs and their young.

Seventy-one percent of the 24 pairs had black-tailed jackrabbit remains at their nests. Cottontails were eaten by 25 percent of the pairs, with 92 percent taking rabbits. Other prey species found and their respective occurrence at these nests were as follows: black-tailed prairie dog, 25 percent; ornate box turtle, 21 percent; ducks, 13 percent; thirteen-lined ground squirrel, eight percent; desert mule deer, four percent; Swainson hawk, four percent; lesser prairie chicken, four percent; plains pocket gopher, four percent; and mud turtle, four percent.

Box turtles, which might be considered an unusual prey for eagles, are eaten by tearing apart the cartilage connecting the plastron and carapace. In a few instances, the carapace was cracked into several pieces, evidently the result of being dropped from a great height.

Golden eagles have been known to kill both young and adult deer and pronghorns, but such predation always has proved insignificant. Most of the active eyries in this study were in areas that had at least moderate populations of mule deer and/or pronghorn. But except for one instance, there was no indication of eagles killing or feeding on either of these big game animals or aoudad sheep that are common in Palo Duro Canyon.

If such predation is occurring in this area, it likely would not show up during the nesting season when prey collections were made. Fawns of these species would appear to be much easier prey than the adults, but they are not usually available until after most juvenile eagles have fledged. The fawning period in the Panhandle for pronghorns begins about the first week of June and not until late June or July for mule deer.

No remains of domestic animals were found at Panhandle nests, nor were there any reports of such predation during the study. Virtually all eagles were found in cattle ranching country. The amount of prey found at nest sites indicates that adult eagles apparently had no trouble finding food.

From this study the Texas population of golden eagles appears to be stable. The birds exist in moderate numbers in localized areas where there is suitable habitat. Almost all of their nests are located in rugged, remote terrain on private ranches where there is little human interference or development, the apparent primary limiting factor. Continued human disturbance and encroachment on habitat, although relatively minor, seems inevitable in our ever-expanding, mobile society, although some of this disturbance can be avoided through education and foresight.

Possible future research on golden eagles might include a radio telemetry study of juveniles to determine survival and dispersal. It's possible that Panhandle juveniles contribute to the winter population in the Edwards Plateau and Trans-Pecos region or elsewhere in the state.

Many TP&WD and U.S. Fish and Wildlife Service personnel, Audubon Society members, researchers and interested people provided valuable information and assistance in this study. But ranchers, on whose land these eagles reside, deserve the most credit and appreciation. Without their interest, assistance and genuine appreciation of these impressive birds of prey, this study would certainly not have been possible. **

**Editor's Note:** This study was financially supported through the Texas nongame program and reimbursement through the Pittman-Robertson Federal Aid in Wildlife Restoration program, Project W-103-R.

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*The eagles are named for the golden-buff mantle on the crown of the head and nape of the neck. Adult coloration is further distinguished by brown, black and gray barring of feathers. The bird's chiseled profile is characterized by brown eyes and a black, hooked bill with a yellow cere (fleshy base).*

# Mushrooms

# Woodland Ornaments

by Mary-Love Bigony

Bill Reaves

*"Fungus" seems too crude a word for something as beautiful as mushrooms, but that's what they are. And despite such a prosaic classification, mushrooms have been the inspiration for legends, tales and superstitions for generations. We have made no attempt to identify them, since identifying mushrooms from photos is not recommended. Experts rely on spore prints and other variables for a positive identification. No one but an expert should eat wild mushrooms, since some are deadly. We simply present the beauty and variety that can be found, often nearby.*

Paul Montgomery

Paul Montgomery

Paul Montgomery

Leroy Williamson

Glen Mills

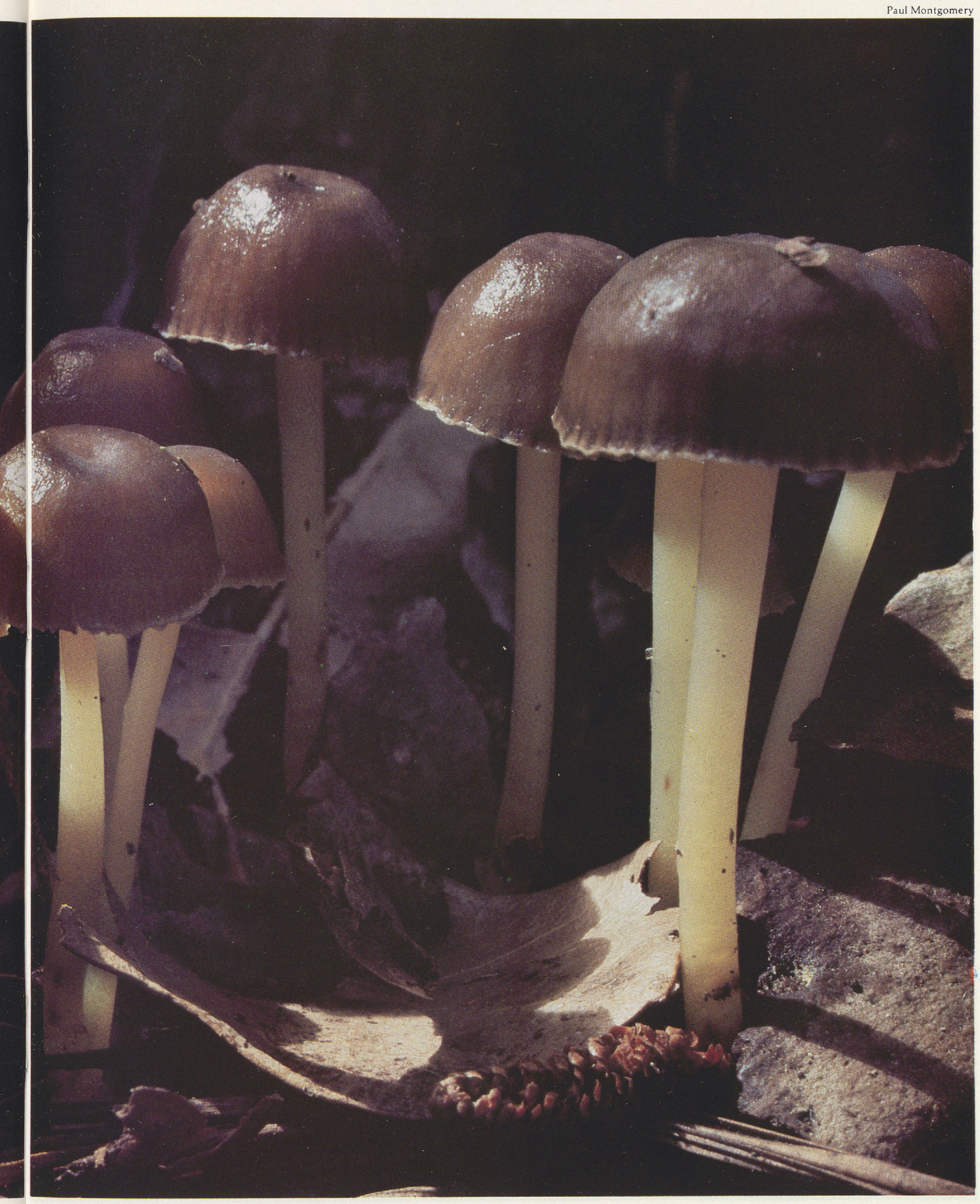
*Although mushrooms are plants, they have no chlorophyll—the green coloring matter of other plants—and cannot manufacture food by photosynthesis. Mushrooms strain their food from other plants, thereby converting wood and leaf matter to humus, which enriches the soil. Fungi that feed on fallen leaves are called terrestrial, while those that live on wood are lignicolous. Parasites feed on living organisms and saprophytes live off dead or decaying organic matter. Mushrooms and other fungi have a unique and important niche in nature.*

Reagan Bradshaw

Paul Montgomery

*Mushrooms' fleshy caps protect the membranes on the underside that contain millions of microscopic spores, from which a mushroom's life begins. The gills on the underside must be in perfect position for the spores to be distributed most efficiently, and a large mushroom can release as many as 10,000 spores per second for several days. The stem keeps the mushroom upright, and the plant tries to correct itself if it starts growing horizontally. Mycelia, the food gathering parts, spread under tree bark or under the ground and secrete an enzyme to digest the host's food matter.*

Paul Montgomery



Reagan Bradshaw

Leroy Williamson

Leroy Williamson

Paul Montgomery

*Sometimes mushrooms seem to be everywhere—studding the forest floor, peeking out of decaying logs or popping up in the lawn or flowerbed. "To say where mushrooms . . . do not grow would be easier than to give even a few of their numberless habitats," wrote one mycologist. "That they grow everywhere except in fire and in boiling water would be a statement approximating the truth," he continued. Mushrooms can be fascinating to study and photograph, but please let us reiterate—if you're not an expert, don't eat any mushroom unless it was bought in the supermarket.* **

Glen Mills

# THE EARLY
## TEXAS' FIRST

Leroy Williamson

by Jerry M. Sullivan,
Parks Division

Ask almost anyone to describe their image of an American Indian living in the wilderness. The general response will be one of a noble savage, stripped to the waist and covered with war paint, dashing into battle astride a galloping steed with feathered headdress streaming in the wind. Such is the legacy of dime novels and western movies.

But many Indians other than the legendary nomads of the Plains lived in Texas—among them were Indians who built large houses, lived in permanent villages and farmed the land.

# CADDOS
## ST FARMERS

When the Spanish arrived in the forests of East Texas about 300 years ago, they encountered several groups of sedentary peoples who have come to be known collectively as Caddos. The word "Caddo" is a corruption of the name of one of the groups, the Kadohadachos. Another group was the Hasinais, whom the Spanish called Tejas.

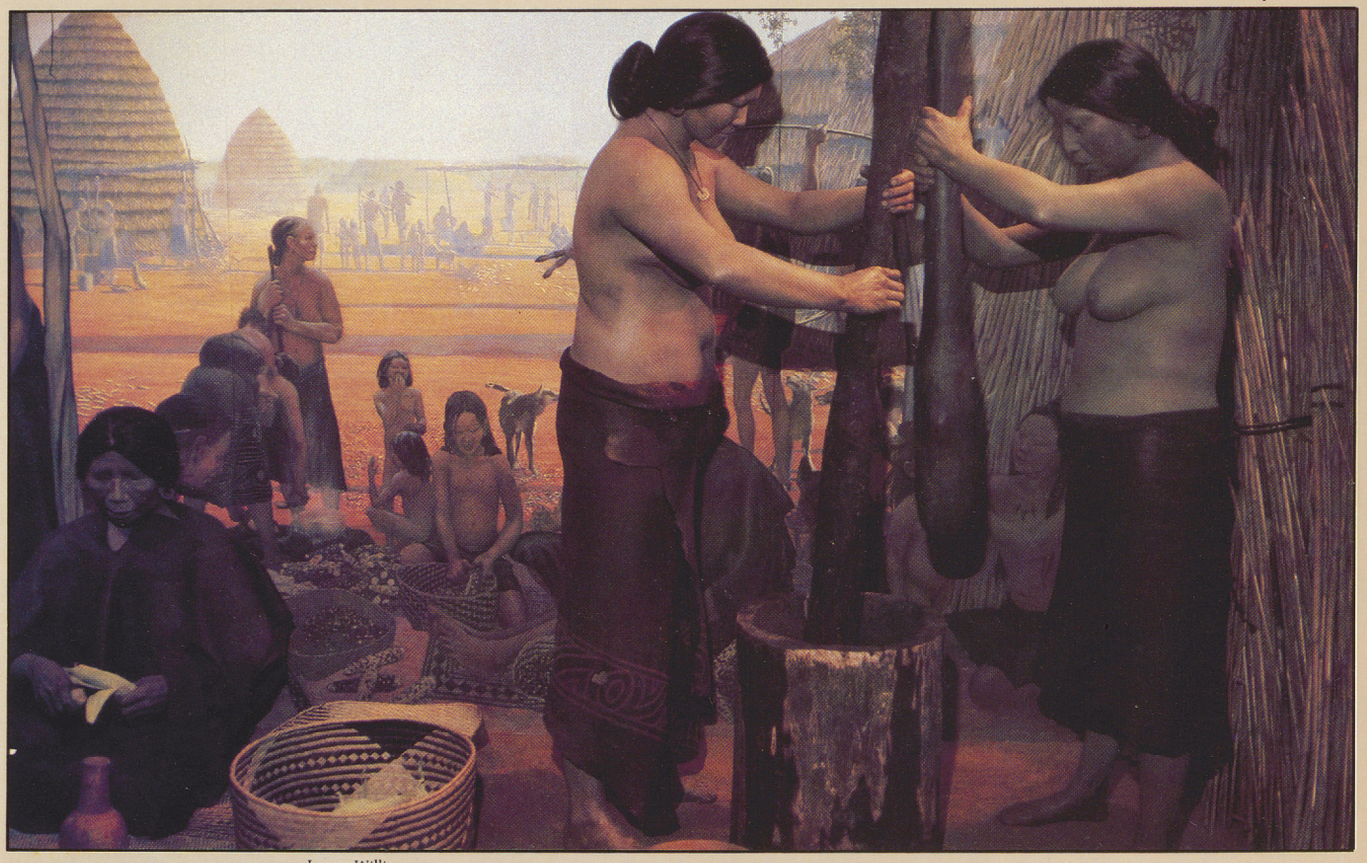
Who were these farmers? From where did they come?

Near the Neches River in southern Cherokee County, three earthen mounds rise from a small prairie—the remnants of a large Indian village abandoned 400 years before the Spanish set foot into the region. None of the Hasinai then living in the vicinity could answer Spanish questions about who had lived there. In and around the mounds are artifacts and surface features that cast light into the darkness of prehistory and answer many questions about the cultural heritage of East Texas.

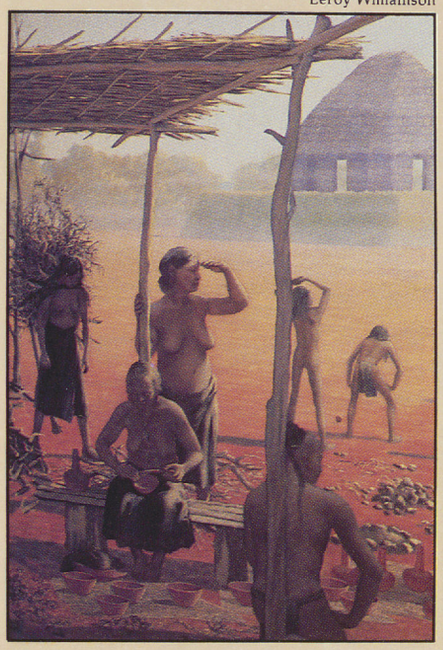
For 50 years professional archaeologists have been investigating this

*Nature provided the Caddos with a wealth of materials. They harvested cane for thatching their dwellings (above) and quarried soil (left) for building mounds in which to bury their honored dead.*

Leroy Williamson



Leroy Williamson



ancient village, excavating hundreds of thousands of artifacts and features. The archaeological evidence speaks for itself. Each tiny flint chip and pottery fragment, each post hole and burial pit contributes information to archaeologists, who analyze, organize and translate that information into a fascinating story of Indian life 1,000 years ago.

Caddoan Mounds State Historic Site was the home of a group of Early Caddos who migrated from the region of the Great Bend of the Red River in southwestern Arkansas about A.D. 800. They brought a new way of life to the older nomadic hunters of East Texas, introducing the bow and arrow, agriculture and a tradition of living in permanent villages.

The early Caddoan culture occupied a large area of northeast Texas, northwest Louisiana, western Arkansas and eastern Oklahoma. Their culture had developed under the influence of older mound-building groups in the Mississippi Valley and beyond.

The cultures that spawned the mound-building heritage and social systems based on complex ceremonialism had been evolving and spreading across eastern North America for almost 2,000 years. Many great cultural centers rose and declined over the centuries. Farming methods were developed. Populations grew larger and became more diverse as the people entered new territories. Trade networks among scattered groups were established. By the time of the settlement of Caddoan Mounds, the prehistoric mound-builders had extended their influence and traditions from the edge of the Great Plains to the Atlantic Ocean and from the Great Lakes to the Gulf of Mexico. The Early Caddos were the westernmost group of mound-builders, and Caddoan Mounds the farthest southwest ceremonial center of this great cultural tradition.

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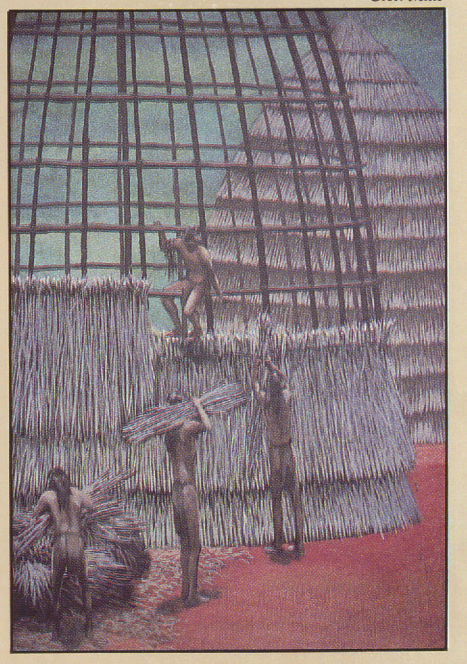
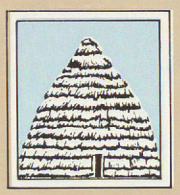
*Displays offer insight into the Caddos' ways of life, which included farming and a tradition of living in permanent villages. A life-sized, three-dimensional display with faces of modern Caddos (top) was life-cast by Peggy Maceo. Nola Montgomery's 28-foot mural (detail above left) portrays village life.*

Rodney Florence

Leroy Williamson

Glen Mills





Based on the locations of mound-builder sites throughout the woodlands, these prehistoric groups considered at least three factors when selecting a new site for settlement: Convenient sources of water and natural foods, and a fertile prairie for farming. The location of Caddoan Mounds has all these attributes.

The abundant edible plants and animals in the area provided more than half of the Early Caddo diet. Hickory nuts and deer apparently were the primary wild foods gathered and hunted in the forest. Corn was the mainstay among cultivated crops, which probably included some sort of squash or pumpkins and beans or lentils.

At Caddoan Mounds the Early Caddos established a typical woodlands ceremonial center and village, including two ceremonial platforms, a burial mound and separate residential areas for the social classes. The area on and immediately around the mounds, the inner village, was reserved for the upper class, or elite. The common people lived in dwellings scattered across the prairie, or the outer village.

The most important features in the prehistoric communities were special-use structures, commonly called temples, located within the inner village. The elite class governed from these temples, conducting the religious, political and economic affairs of the people.

The Caddos did not build the imposing ceremonial platforms, or temple mounds, immediately upon their arrival, but constructed them in several stages over a 400- to 500-year period. The oldest temples, the largest structures yet found, are located beneath the mounds at ground level. Periodically, the Caddos intentionally destroyed the temples, covered the remains with fresh earth and built new temples atop the slowly emerging mounds. The reasons for this repeated cycle of events remain among the un-

*Thatched dwellings were at the center of domestic activities in a Caddo village (above left). Building the beehive-shaped structures was a community effort. Archaeologists constructed a Caddo house for the park with materials and tools similar to those the Caddos probably used. (See accompanying article.)*

Leroy Williamson

James Presnal

answered mysteries of the mounds.

Like the temple mounds, the burial mound evolved slowly in stages over the same period of time. The elite class also reserved this sacred area for the burial of their honored dead. An estimated 90 individuals were interred in 30 or so burial pits. The presence of multiple burials, more than one person in a single pit, suggests the possibility that the Early Caddos sacrificed family members or servants upon the death of an important leader.

Offerings were included in the burials for the use of the dead in afterlife. These items reflect the apparent wealth of the culture and the contacts it had with distant places, as well as the artistic talents of Caddo craftsmen. Large carved stone human effigy pipes, an 18-inch flint blade, and two stone sceptrelike implements called celts are examples of the symbols of status placed in elite graves. These objects probably were manufactured elsewhere and imported through trade.

Exotic materials, not found locally, include flints from Central Texas and Oklahoma, fine siltstone from Arkansas and possibly as far away as the Appalachian Mountains, copper from the Great Lakes region and a certain type of marine shell found only along the eastern Gulf Coast. Local Caddo potters produced exquisite vessels in varied graceful forms decorated with intricate geometric designs.

About A.D. 1300, after 500 years at Caddoan Mounds, the Early Caddos suddenly disappeared from the Neches Valley. Their departure obviously was well planned and orderly, for they capped the mounds with a final thin layer of new earth. Why they left and where they went are more mysteries, perhaps unsolvable. But they left behind many traditions.

Later Caddo groups, including those encountered by the Spanish,

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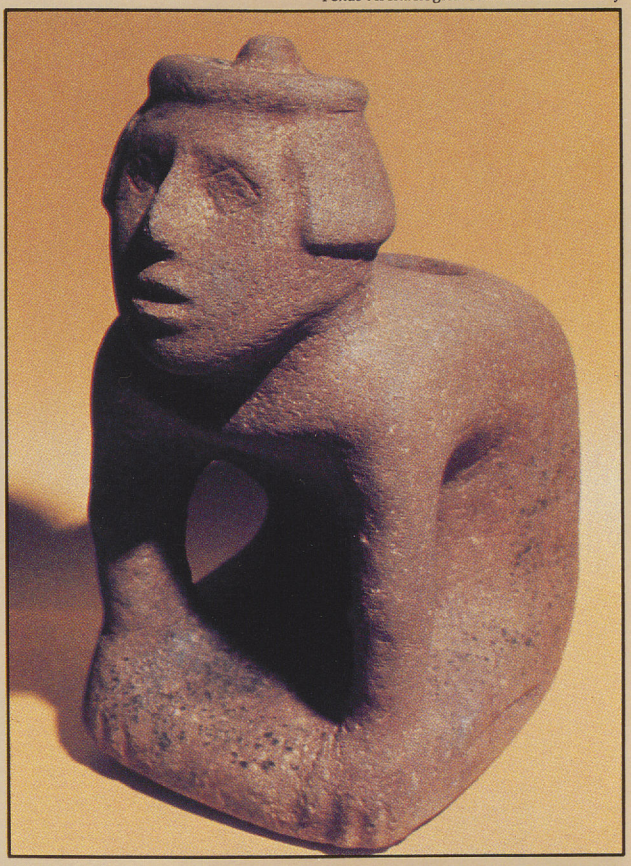
*Archaeologists at Caddoan Mounds have reconstructed a story of Indian life 1,000 years ago through the analysis of artifacts from the site. Pottery shards (top) and clay pottery vessels (above left) are representative of the types of artifacts that have been excavated. These and other items provide information that contributes to the story.*

James Presnal

Texas Archaeological Research Laboratory



continued to build large houses, grow corn and manufacture fine pottery. But they lacked the wealth of the Early Caddos, and their social and political systems were less complex. Settlements became smaller and more scattered. Trade was curtailed, and access to exotic goods apparently ceased.

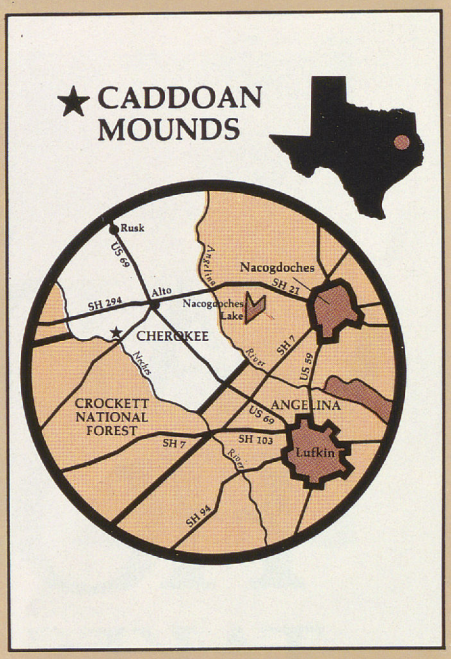
Mound-building continued for a time, but on a smaller, more limited scale. Burial mounds gradually disappeared from ceremonial centers. By the time of Spanish colonization, temple mounds also had vanished from Caddoan villages. The memory of the grand ceremonial center at Caddoan Mounds slowly became lost through many generations of cultural decline.

But Caddoan Mounds remains—a reminder of the greatness to which native Americans aspired 1,000 years ago.

Caddoan Mounds remains, also, as a laboratory and a treasure trove for archaeologists. Excavations continue periodically, and with every turn of a trowel, new information is gleaned from the ancient site. Answers to old questions about Caddoan life grow clearer, and new questions arise.

Caddoan Mounds State Historic Site is located on State Highway 21, between Crockett and Alto. Camping and picnicking are not allowed, but such facilities are available at Mission Tejas State Historical Park, six miles south. Visitors to Caddoan Mounds will be treated to extensive exhibits on Caddoan life, including a 28-foot mural of the village as it may have appeared about A.D. 1100. Many artifacts excavated at the site are on display. An interpretive trail meanders among the mounds, passing several informative wayside exhibits and a reconstructed Caddo House (see accompanying article).

With a little imagination, a mental image easily comes to mind while walking across the prairie—an image of people living their lives in peaceful concert with nature. **




*Grave offerings such as ceramic bottles (above left) and a stone human effigy pipe (above right) were included for the use of the dead in afterlife. These items reflect the wealth of the Caddo elite class and attest to the craftsmanship of the Early Caddos.*

Leroy Williamson

Leroy Williamson



# A CADDO HOUSE TAKES SHAPE

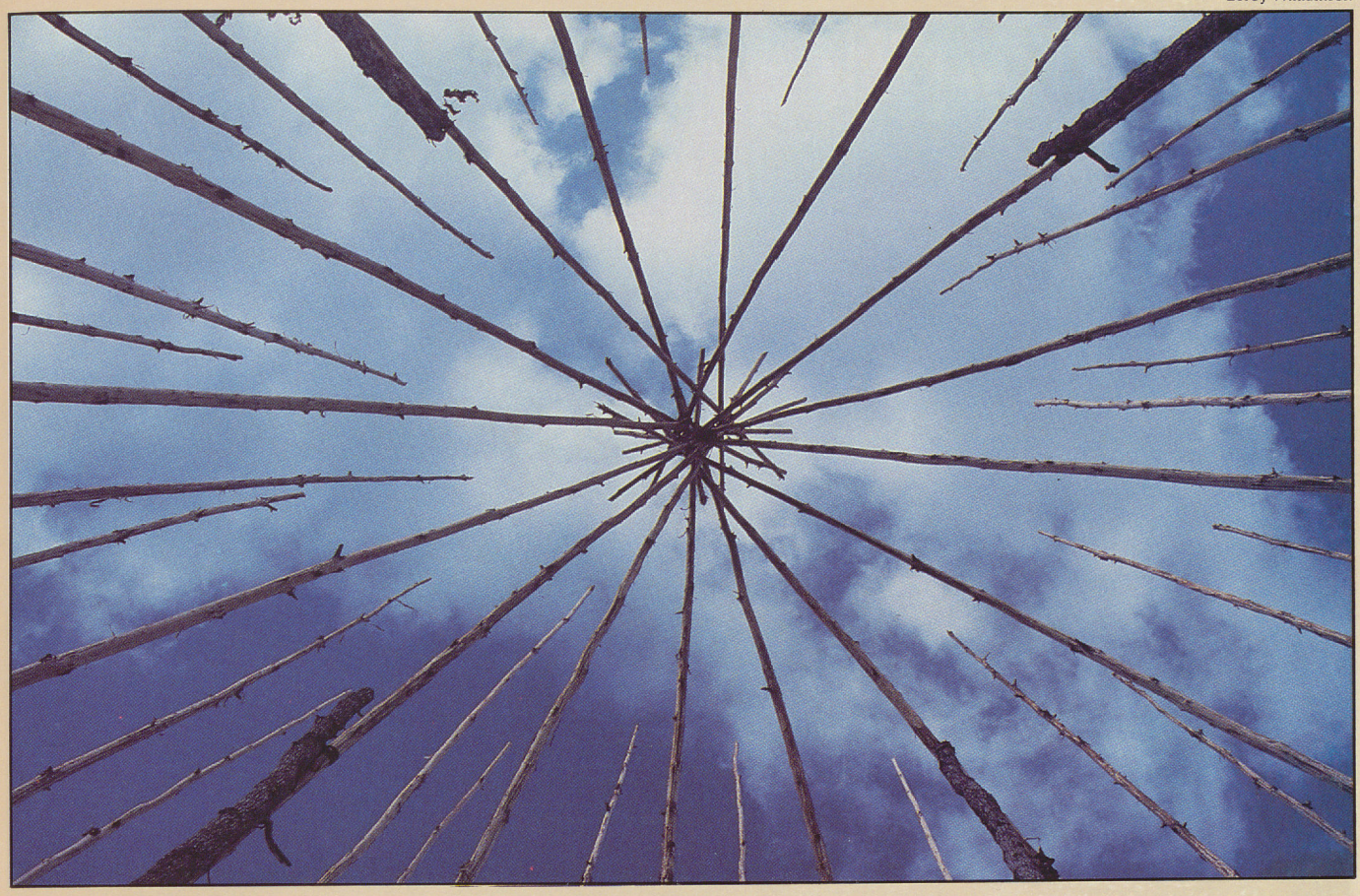
by Jerry M. Sullivan,
Parks Division

When the Parks and Wildlife Department staff began planning the interpretive program for Caddoan Mounds State Historic Site, they realized the small prairie dotted with three piles of dirt lacked the visual interest and impact deserving of such an important site. The solution to the problem was obvious. A structure representative of the dwellings of the Early Caddo inhabitants should be built.

After consulting with professional archaeologists involved in the excavations of Caddoan Mounds, the staff determined the reconstruction should be as nearly identical to the original structures as possible. Therefore, no modern building materials should be used. The project took on an aura of a grand experiment.

Drawing from archaeological evidence excavated at Caddoan Mounds, and from Spanish and French descriptions of 17th and 18th century Caddo houses, a team of experimental archaeologists set out

Leroy Williamson



Leroy Williamson

*The framework of the Early Caddo house is poles set in the earth (inset, opposite page). These poles were bent (opposite page) and lashed together at the peak (top photo). No modern building materials were used; all attachments were done with leather lashings (above). Archaeologists used evidence excavated at Caddoan Mounds as well as Spanish and French descriptions of Caddo houses to duplicate tools and building methods that might have been used by prehistoric Caddos.*

to duplicate the tools and methods of prehistoric Caddo construction.

Stone tools were reproduced using traditional stone-working techniques. Wooden tools, which did not survive centuries buried in the earth, were improvised as needed. When a tool or method was unknown, the team experimented with materials available to the Early Caddos. In this manner much was learned about the materials and methods the Early Caddos may have used.

Structurally the house is a framework of upright poles, bent and lashed together at the peak, with a series of horizontal rings added for strength and stability. The frame is thatched with cane bundles held in place by a second set of horizontal rings lashed to the first set. Properly maintained, a sturdily built Caddo house should last 30 to 40 years.

The reconstructed dwelling is 25 feet in diameter and about an equal height, smaller than the average 35-foot-diameter houses built by the Early Caddos. The post hole outline of a ceremonial structure located

Leroy Williamson

Jerry Sullivan

*Horizontal rings lashed to the upright poles (top) added strength and stability and provided a framework for attachment of hundreds of cane bundles (above). The archaeological team spent 2½ months harvesting and preparing the materials and building the house, whereas Caddo villagers could erect and thatch a dwelling in a single day. But the Caddos were familiar with the work and building the houses was a community effort. The team gained respect for the Caddo people from this project.*

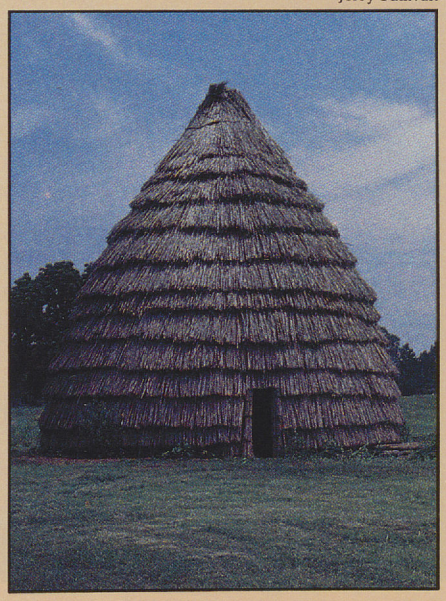
beneath one of the mounds measured almost 60 feet in diameter, the largest yet excavated at Caddoan Mounds.

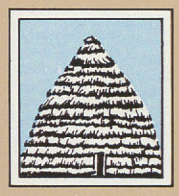
House building was a community effort among the Caddos, analogous to an American barn-raising. With all materials gathered and prepared, a village could erect and thatch a dwelling in a single day. The archaeological team harvested and prepared the materials and built the Caddo house in 2½ months. That should serve as testimony to the old saying: "practice makes perfect." Of course, many more than seven Caddos worked on their houses.

Some concessions were made to current technology in the interest of time and safety. After team members had completed experiments on long, time-consuming activities, such as cane harvesting or digging post holes, the tasks were completed with modern tools and equipment. Scaffolding and ladders provided a margin of safety not afforded the Caddos, although there were still many tense and precarious moments.

Leroy Williamson

Jerry Sullivan





*Cane thatch layered 12 to 18 inches thick (top) has excellent insulating qualities. The finished house (above) would have been ideal living quarters, warm in winter and cool in summer. The reconstructed house is smaller than the average one built by Early Caddos. A well-built house should last 30 to 40 years with proper maintenance.*

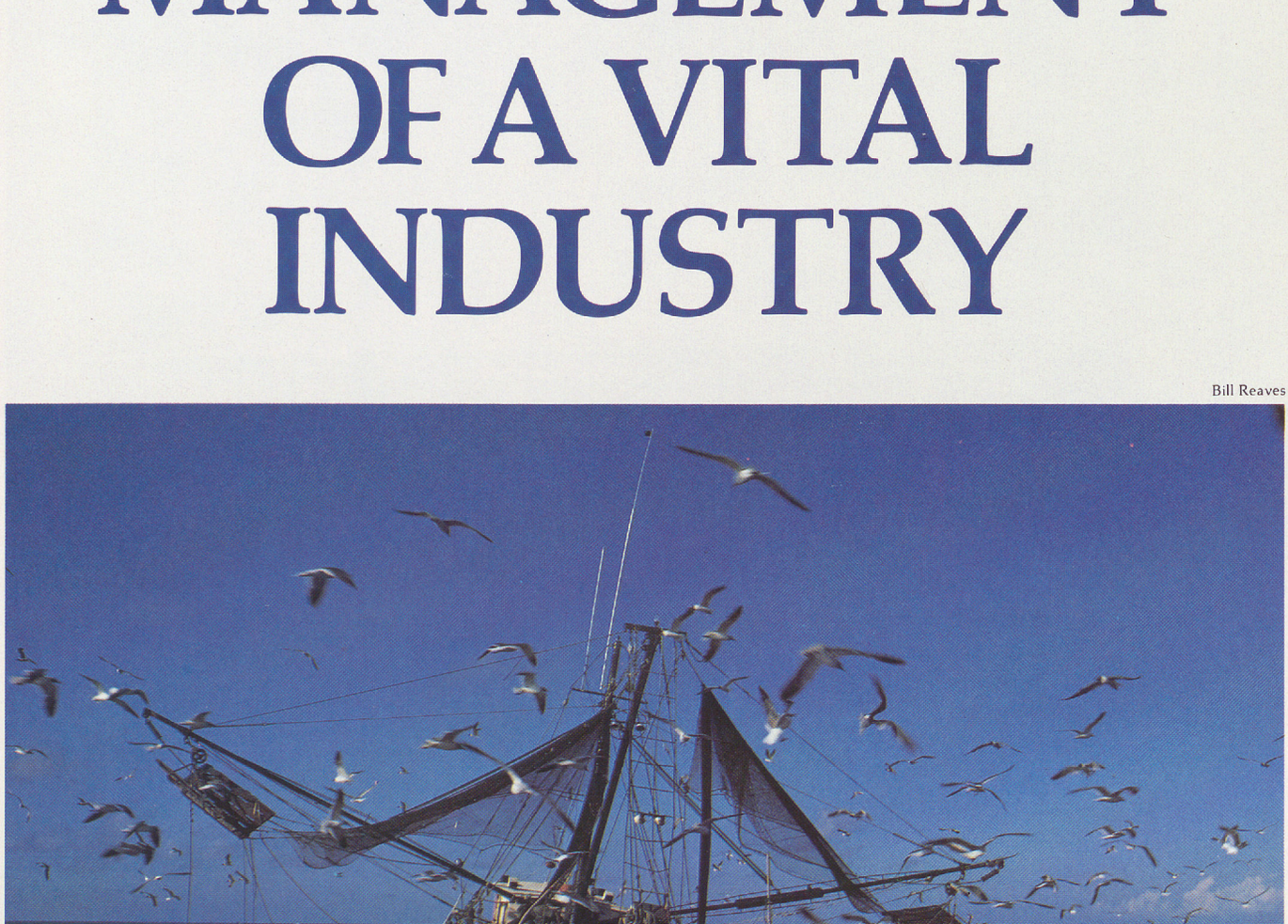
Thatched dwellings of this type were ideal for the sedentary Caddos, providing comfortable weatherproof living quarters—warm in winter and cool in summer. A small fire on the hearth in the center provided warmth and kept the interior and all stored goods dry. Smoke from the fire filtered out through the thatch and discouraged insects from nesting in the cane.

As many as 20 people could have lived in such a dwelling, possibly an extended family of grandparents, parents and children. Although most daily activities, such as food preparation and basket and pottery making, took place outside, under or around nearby shade shelters, the Caddo house surely was the center of family life.

Upon the completion of the unusual project, the archaeological team exhibited pride of accomplishment, but they walked away with a humble respect for the ingenuity and abilities of the last people who built such a house at Caddoan Mounds. **

# TEXAS SHRIMP
# MANAGEMENT OF A VITAL INDUSTRY

Bill Reaves




by Jim Cox

When a brown shrimp approaches maturity and ventures from one of Texas' shallow bays into the Gulf of Mexico, it automatically makes everybody's "Most Wanted" list.

The shrimp, along with millions of its fellows, could likely grace an expensive seafood platter, a bowl of gumbo or wind up down the gullet of a hungry redfish or speckled trout.

Thanks to their prolific nature, shrimp can stand remarkably high harvests by man and aquatic animals and still rebound to abundance in one spawning season. However, even with the natural resiliency of shrimp, increased pressure on the resource has necessitated regulations and intensive management to balance the scale between public demand and resource protection.

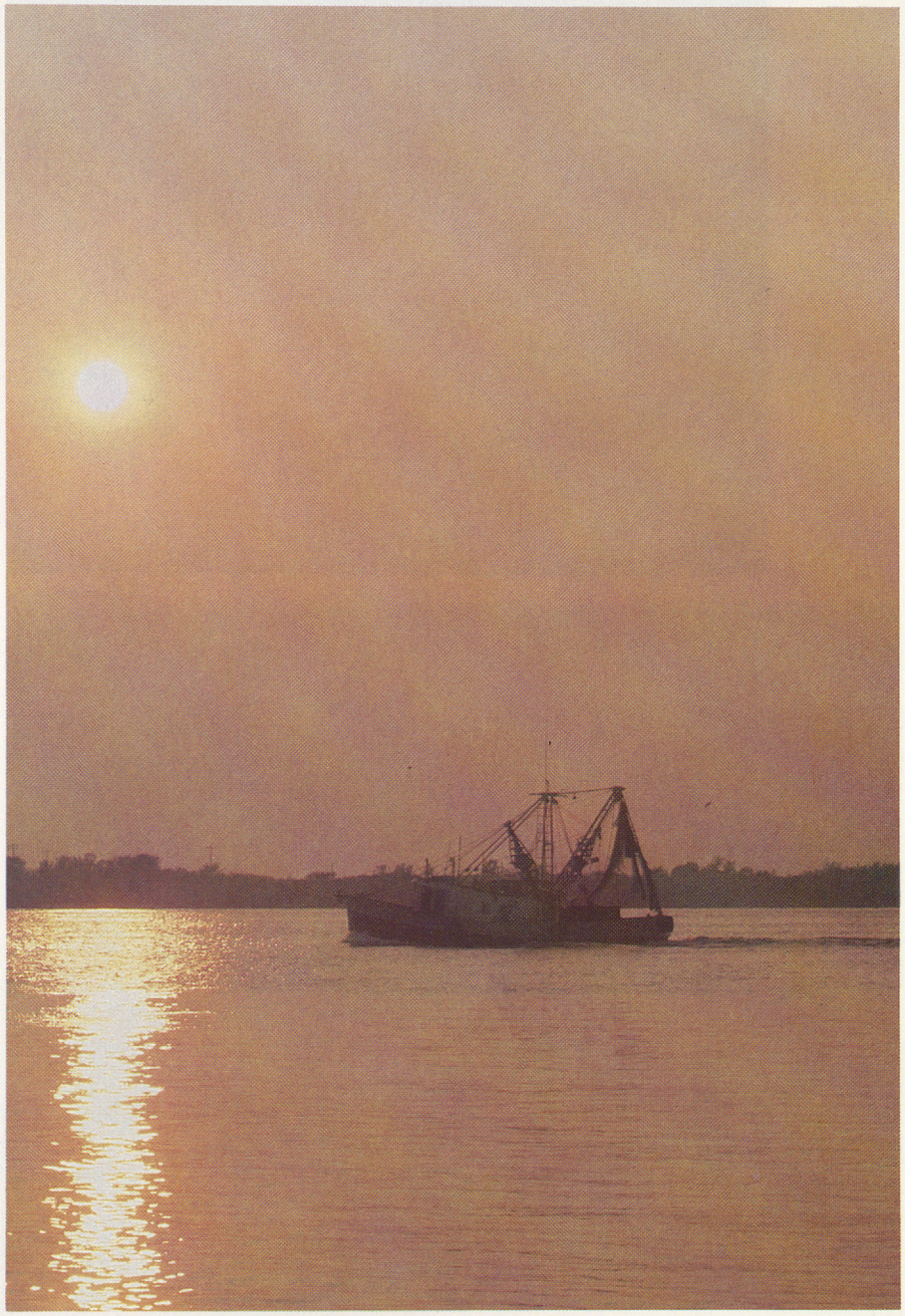
The explosion in popularity of shrimp as seafood and sportfishing bait in the past few decades has made shrimping a $150 million-per-year industry in Texas, and the catch accounts for an estimated half-billion dollars annually in the marketplace.

The Parks and Wildlife Department has the responsibility for studying this valuable resource from the bays out to the limits of state waters nine nautical miles from shore. Beyond that line, the Gulf of Mexico Fishery Management Council and the National Marine Fisheries Service have authority. The agencies have found increasing opportunities in recent years to coordinate their management efforts, since most shrimp migrate back and forth between state and federal waters.

Shrimp management, in fact, is more complicated than one might expect, with several species found in Texas waters, each with its own habits and seasonal movements. The two primary ones are the brown and white shrimp, with the brown shrimp providing from 70 to 80 percent by weight of the annual Texas harvest.

Browns begin life in Gulf waters as tiny eggs released by adult shrimp. The eggs drift shoreward with the wind and currents while developing into the larval swimming stage. In

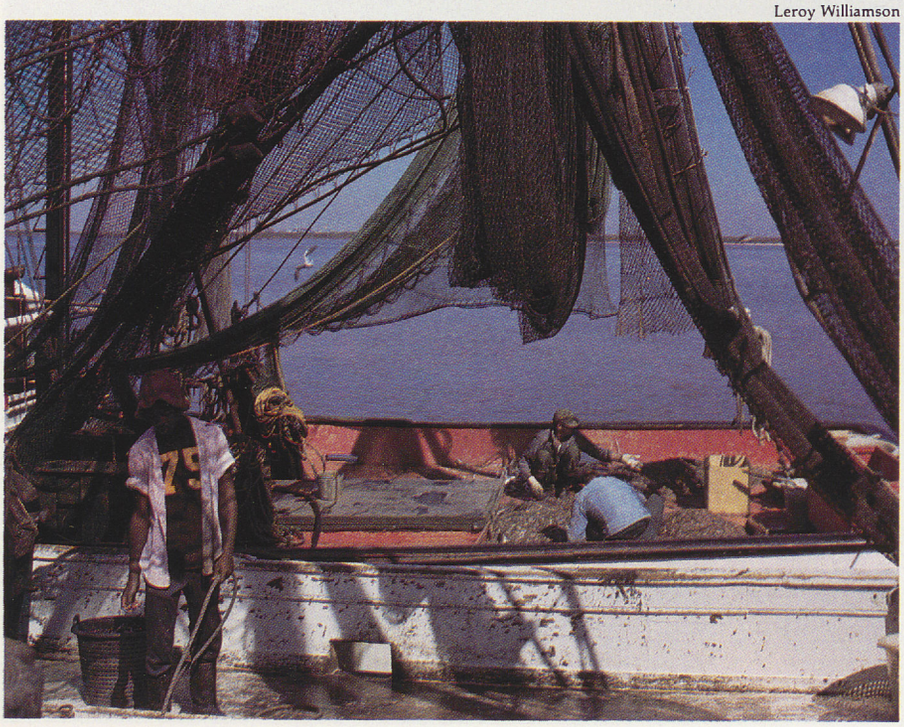
Frank Aguilar



*Sunrise finds a solitary shrimp boat chugging out for a day of trawling in the bay. The clamor raised by feeding gulls (left) indicates a trawler crew is culling their overnight catch of shrimp. Hundreds of such vessels ply Texas' bays and offshore waters to satisfy the demands of a $150 million-per-year industry. The Texas shrimp catch accounts for an estimated half-billion dollars annually in the marketplace.*

Leroy Williamson


Leroy Williamson



February and March, they enter tidal passes and find their way into protected "inside" waters, and eventually into tidal creeks, shallow bays and marshes referred to as "nursery areas." They spend two to four months in the estuarine environment, gradually moving back toward the deeper waters of major bays. When they reach juvenile and subadult stages (three to five inches long) they migrate back through the passes into the Gulf.

The life cycle of white shrimp is similar; however, there normally are two "broods" of white shrimp annually instead of one. Also, white shrimp stay closer to shore than browns, usually spawning at a 60-foot depth or shallower. The young begin entering the bays in June, filling the niche left by the brown shrimp, which begin returning to the Gulf.

The department's shrimp monitoring program is designed to track shrimp stocks during their key periods of development and movement. Biologists sample the populations along bay shorelines to determine recruitment of young shrimp; similarly, sampling nets are used in the deeper portions of bays to determine recruitment in those areas. Samples also are taken in passes to measure when and at what size the various species leave the bays, and later in the open Gulf where the shrimp complete their life cycle.

In addition to shrimp sampling, crews also take water samples and collect other data at each stop to identify any environmental factors that may affect abundance.

The task of monitoring a half-billion-dollar resource with limited manpower and funding is fairly monumental, especially considering the state's waters encompass an area of some four million acres. However, department officials believe the current management philosophy of protecting young shrimp

*Shrimp boats are rigged with trawls, small mesh nets which are pulled at varying depths to intercept schooling shrimp. A shrimping crew's hard labors are rewarded with a profitable catch. A 1959 law established gear restrictions and other regulations for shrimpers.*

and allowing a controlled harvest of larger, more valuable specimens is paying dividends.

Shrimp management took a major forward step with passage of the Shrimp Conservation Act of 1959, which established licenses, license fees, seasons, gear restrictions and a minimum size for retention of shrimp. Subsequent modifications to the act in 1963 and 1979 provided a classification system for managing the various bay shrimp fisheries. The deeper bays, which normally have the larger shrimp, were designated "major bays," and given a shrimping season. Shallower areas, usually populated with smaller shrimp, were classified as "bait bays," wherein shrimpers catch bait for sale to sportsfishermen. Some of these bait bays have been further designated as "nursery areas" in which only limited shrimping is currently being allowed, and where all shrimping will be prohibited in 1991 under a "grandfather clause" in the law.

Thus the state's shrimp management program was diversified through establishment of separate seasons for shrimping in the bays and the Gulf. However, regulations in Gulf shrimping still were not sufficient, because until 1981 Gulf shrimpers were being allowed to operate in federal waters during the state's closed season, causing waste of small shrimp caught and discarded.

In 1976, the Magnuson Fishery Conservation and Management Act was enacted by Congress, forming the Regional Fishery Management Councils and authorizing these councils to establish shrimping regulations for federal waters.

The Gulf of Mexico Fishery Management Council subsequently approved a shrimp plan which among other things complemented Texas management by closing United

Jim Whitcomb

Leroy Williamson

*Flotillas of shrimp trawlers symbolize the pressure on the state's shrimp resource. Shrimping season in state and federal waters is timed to protect shrimp until they reach a larger size. A bumper shrimp harvest in 1981 reassured fishery managers that such programs are working.*

States waters during the same period state waters are closed. This was known as the "Texas Option," and since becoming effective in 1981, it has been credited with increasing the poundage of shrimp landed.

Another federal-state cooperative program which assists in the monitoring of Gulf shrimp stocks is the five-state Southeastern Area Monitoring and Assessment Program (SEAMAP). Crews on the department's research vessel *Western Gulf* sampled bottom fishes and shrimp during June and July 1983, and furnished their findings to the Gulf States Marine Fisheries Commission. The Texas data will be combined with findings from the other four states and federal government to give fishery managers, seafood processors and scientists an overview of the Gulf shrimp situation. The study area extends from the 15-fathom line out to a depth of 45 fathoms.

Biologists feel that it was more than coincidental that the 1981 shrimp landings of 49 million pounds was the second highest total on record, exceeded only by the 55 million pounds docked in 1967. Favorable environmental conditions were a factor in spring 1981, but officials also believe the simultaneous closure of state and federal waters protected the shrimp until they reached larger, more valuable sizes. The National Marine Fisheries Service estimated the closure resulted in a $9.4 million net benefit for shrimpers. The total catch declined somewhat in 1982, but higher dockside prices brought shrimpers comparable value for their season's efforts.

The Texas Legislature also played a role in better control of the shrimp harvest by increasing penalties for shrimping during the closed season. As a result of the legislation, the department's Law Enforcement Division filed fewer than 25 cases for closed-season shrimping violations in the Gulf during 1981-82, compared to an average of more than 150 cases for the same offense in prior years.

Bumper shrimp harvests such as that of 1981 serve to reassure fishery managers that their programs are working. However, studies conducted in Texas and other Gulf states have indicated some shrimp stocks may be suffering from overharvest, habitat loss or a combination of the two. A downward trend in shrimp sizes in the annual catch of both brown and white shrimp was documented in Texas and Louisiana from 1959 to 1976. A similar study which focused on landings during the May-August period from 1960 to 1978 also showed that the size of brown shrimp in catches was declining.

From 1979 to 1982, the catch of small brown shrimp in Texas bays doubled from historical levels. Officials believe if the trend continues, the minimum effect will be an overall decrease in the value of the shrimp resource in Texas. Continued monitoring combined with flexibility in shrimp management techniques are seen as the only assurance for maintaining Texas' eminence in the industry. **

# Letters to the Editor

## Well, It Had Eight Legs

I enjoyed the article "Daddy Longlegs" in the October issue so much that I took it to school and shared it with my sixth graders. About five minutes after I finished reading the article, there was a commotion in the corner of the room. Three of my students excitedly informed me that they had cornered a harvestman. It blended in with the carpet, but I saw a leg and picked it up.

As I was standing in front of the class telling them how lucky we were to have caught one after having read about it, the "harvestman" started to wriggle. I noticed it had a nice waist (harvestmen have none) and that its eyes were not on its back. What do you do when you realize you are holding an angry, nervous spider that is reaching for your finger?

My students gradually forgave me for what I did to the spider in my moment of panic.

Sheila S. Moore
Conroe.

## Wrong Number

Things have been a little hectic for a woman in Harris County since our November issue was published, and it's our fault. Somehow her phone number was listed for Game Warden Garry K. Collins, and her phone hasn't stopped ringing. We are pleased that our readers are using the numbers listed in the "Know Your Wardens" story, but hope those in Harris County will contact Warden Collins at 713-476-5692 in the future.

## Hunting As A Management Tool

Something has been bothering me since I read the letter from Joycelene Odum in the July 1983 issue. Then in the October 1983 issue, Chris Malone responded to her letter stating, "If Ms. Odum and her family would take the time to actually read some of the issues, she might be surprised to find out that the legal harvest of game is one of the most efficient and humane methods of wildlife management."

I am a family member of Ms. Odum's, but I absolutely agree with Chris Malone and believe that J.T. Geddes' letter summed up wildlife management most accurately. I would much rather see wildlife controlled by laws and established hunting seasons than to see animals dying because of overpopulation and lack of food. My father brought my brother and me up to respect the sport of hunting and to abide by the rules of being a sportsman. He did not in any way teach us to cold-bloodedly murder any animal. He taught us to respect nature.

I thoroughly enjoy *Texas Parks & Wildlife* and will continue to support the role it takes in the preservation and management of wildlife.

Mrs. Debra Odum Shew
Houston

## Education Is the Answer

I am writing in response to Margaret Rouillard's letter in the November issue. I think she has a good idea in stopping her subscription to *Texas Parks & Wildlife* since she is obviously not reading all the articles and thereby not becoming educated to the facts about "preservation and humane treatment of all animal life."

Education is the answer, whether it is hers, mine or the nine-year-old youngsters learning gun safety she spoke of as being pictured in your magazine.

As for her reference to "our diminishing wildlife," many species have increased their numbers through effective game management. Please keep printing the facts in your unbiased format.

David W. Williams
La Porte

## Too Many People

I have backpacked in a number of state parks and enjoyed Mike Herring's article in the October issue. Such a camping experience is often sought by individuals who desire to confront nature with a minimum of human intrusion, and the Parks and Wildlife Department's effort to provide such an experience is to be applauded.

However, some the primitive camping areas, such as in Pedernales Falls State Park, have serious problems with camp overcrowding, trail degradation and waste disposal. Perhaps consideration should be given to further limiting access to such areas so that a higher quality camping experience can be realized.

John Peslak Jr.
Abilene

## Honey Creek

Bob Parvin's article on Honey Creek Ranch in the November issue resulted in numerous requests for tours of the preserve as well as requests for information about membership in the Texas Nature Conservancy. We are providing guided tours of Honey Creek Ranch by appointment only and it is recommended that appointments be made at least a week in advance to avoid last-minute disappointments. For appointments and information, your readers may call 512-438-2743.

Keep up the good work. Your magazine improves with each issue.

Luke Thompson
Bulverde

## A Likeness

I received the September issue on August 29, my 81st birthday. As I always do, I slowly turned through the complete magazine. When I came to the inside back cover I stopped and really cried as the picture could have been my husband. That is the way he always laid his fish ready for cleaning. Thank you.

I'm also a bird watcher so I have the magazine lying open to some of your beautiful pictures. They help make my days a pleasure.

Kathryn Besch
San Benito

## INSIDE BACK COVER

San Antonio's 18th-century missions are active Catholic parishes and centers of community life. Celebrations are frequent and joyous. In this photo, mariachis take part in festivities in the courtyard behind Mission San Jose following a noon Mass at the church. (See story on page 2.) Photo by Bill Reaves.