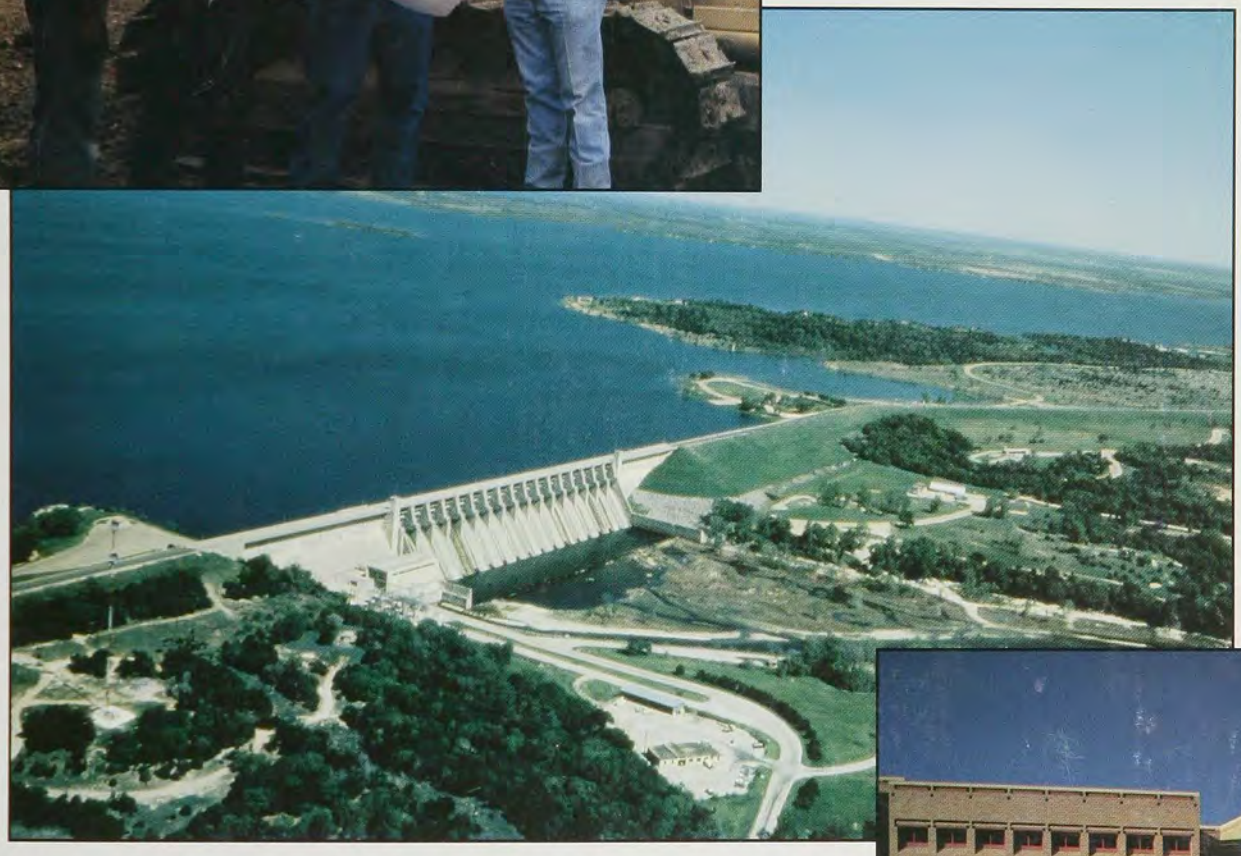
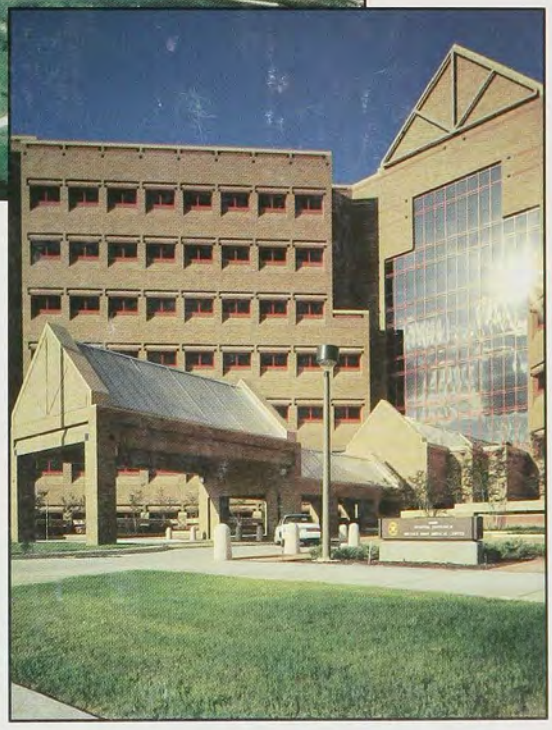
Service – Tradition – Change





A History of the Fort Worth District, U.S. Army Corps of Engineers 1975 - 1999

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Service – Tradition – Change

A History of the Fort Worth District, U.S. Army Corps of Engineers 1975-1999

by
Lisa Mighetto
William F. Willingham

2000

The photographs used on the cover and
in the text are courtesy of the Fort Worth District.

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Foreword

This is the second publication to highlight the history of the Fort Worth District. The first, *Rivers, Rockets and Readiness: Army Engineers in the Sunbelt*, by Dr. Clayton Brown, lends some insight into the first 25 years of the District's proud past. Col. John Wall, in the foreword, praised district employees who had so diligently served the citizens of Texas and the Southwest during that period.

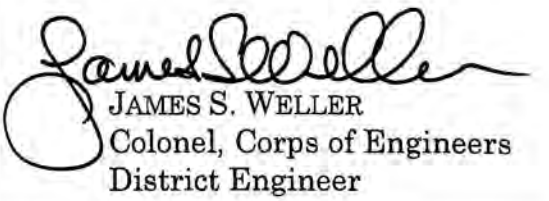
It is my pleasure, as the current district engineer, to introduce this update of the Fort Worth District's history from 1975 to 1999. While this book highlights our trends, challenges and accomplishments during this period, I must, like John Wall, recognize the accomplishments of those who have gone before us and challenge those of us currently carrying the torch to continue the district's impressive track record of service to the region and the nation.

Established following the great flood of 1949, the Fort Worth District had as its primary focus flood control and the construction of large dams. The district's role in the development of water resources began to change in the 1970s, when we moved to more non-structural projects. In 1991, as the district's last major dam was completed, we were working on smaller community-based flood control problems.

In the past 50 years, we have witnessed the tremendous growth of the Dallas-Fort Worth Metroplex, the largest inland metropolitan region in the nation, and other urban centers in Texas, which has placed increasing demands on water supply and recreational facilities. In response to the nationwide environmental movement in the 1960s and 1970s, the district also became more involved in managing watersheds and restoring wetlands.

The Reagan Administration's support of the military in the 1980s resulted in increased military work for the Fort Worth District, with the construction of some highly sophisticated projects in the technical arena. Two such projects are the Large Blast Thermal Simulator at White Sands Missile Range, New Mexico and the Brooke Army Medical Center in San Antonio, Texas.

As we enter the 21st century, we are reminded how ***service, tradition,*** and ***change*** are intertwined. Our roles as public servants are strengthened through the knowledge and experience of a two-centuries old nationwide Corps of Engineers. At the same time, our missions will continue to evolve and we will continue to incorporate new technologies, providing a skilled and dedicated workforce to the region and the nation. I hope the stories in this history will serve as a reminder of what we have accomplished and as a beacon to the possibilities of achievement that lie ahead of us.



JAMES S. WELLER
Colonel, Corps of Engineers
District Engineer

Acknowledgments

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The staffs of various repositories provided assistance. These include the Fort Worth District Technical Library and Records Holding Center; National Archives and Federal Records Center, Southwestern Region; Science and Engineering Library, Southern Methodist University, Dallas; Fort Worth Public Library; Trinity River Authority, Arlington; U.S. Fish and Wildlife Service, Arlington; J. Erik Jonsonn Central Library, Dallas; and Texas State Archives, Austin.

Lisa Mighetto
William F. Willingham
Historical Research Associates, Inc., 1999


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Introduction

"We're on the leading edge of reinventing how the Corps does business with customers. It's an exciting time."

– Ralph Barrett, Chief of Engineering Support Branch, 1997

A District on the Leading Edge

When the U.S. Army Corps of Engineers opened the Fort Worth District (FWD) in 1950, few people could have predicted how influential it would become in the development of Texas and the Sunbelt. In the last half-century, the district's responsibilities have expanded far beyond the Corps' traditional role in providing navigation, flood control, and water supply. The following history updates the book *Rivers, Rockets, and Readiness: Army Engineers in the Sunbelt,* published in 1979.[1] It describes how the FWD emerged as one of the Corps' premier districts, focusing on the period 1975-1999.

Fort Worth is one of the largest districts in the Corps. During the last 25 years, it maintained a staff of approximately 1,000 people, and it was one of the leaders in terms of new construction and maintenance of existing projects. It encompassed more than half of the land area in Texas, and approximately 58 percent of the state's population. It also provided 35 percent of the water supply in a state that faced extensive demands on this resource. Its military boundaries were especially expansive, including installations in New Mexico and Louisiana as well as Texas.[2]

Most Corps districts see themselves as distinctive. What distinguished the FWD was the pervasive view that it was on the cutting edge of technology, engineering, and business practices. In addition to traditional water resources projects and military construction, it moved into new areas, such as disaster relief and support for the Immigration and Naturalization Service (INS). Between 1975 and 1999, the Corps' regulatory responsibilities developed considerably, and environmental protection became one of the agency's missions. The FWD was on the forefront of this development, which included creation of an innovative public involvement program in Texas. Colonel Peter T. Madsen, who served as district commander from 1995-1997, described the FWD's capabilities as wide-ranging, adding that "most districts are lean enough to have holes in them." Accordingly, its work on civil and military projects has expanded to other districts.[3]

The district has gained a reputation for being advanced in its use of technology. As Chief of Emergency Management Jesus Rangel recalled in 1998, district personnel were among the first to use personal computers and Geographic Information Systems (GIS). He attributed this characteristic to the district's leadership, which delegated responsibility to staff. "If the employee comes up and says we need to do this," he observed, management in

the FWD responds, "okay, let's try it out, versus ... let's wait and see what other people are doing before we jump into it."[4] By the 1990s, the district had developed a Computer Aided Design (CADD) and GIS Center that offered state-of-the-art planning support to civil and military customers. Recognizing the progressive nature of the FWD, Corps Headquarters chose it as the beta testing site for the Corps of Engineers Financial Management System (CEFMS).

The FWD was also characterized by its commitment to business development. "Without our military and civil customers, we would be out of business," explained Colonel James S. Weller, district engineer in 1999. He pointed out the importance of personal contact and individual effort to the FWD's work, noting that "each and every one of us has the opportunity to influence our customers on a daily basis."[5] This became a recurring theme during the 1980s and 1990s. "We're on the leading edge of reinventing how the Corps does business with customers," explained Ralph Barrett, chief of the district's Engineering Support Branch, in 1997. "It's an exciting time."[6]

In part, the character of the FWD was derived from its personnel, who viewed themselves as unusually cooperative and committed. It also stemmed from the personable quality of the region. As Jimmy Baggett, chief of the Civil Planning and Engineering Branch, explained in 1997, "Fort Worth has sort of a unique quality of friendliness, a helpful ... attitude that I think permeates throughout the district."[7] Marty Hathorn, chief of the Environmental Resources Branch, agreed. "I like the attitude of the people," he noted. "Not just the district but the community." Hathorn exemplified the attachment to the area that many FWD employees shared. He grew up in Texas and had turned down opportunities to work elsewhere. "I like the country here," he explained, "and my roots are here."[8]

Lovena Hull, who began her career with the Galveston District, worked for the FWD for 43 years without a break in service. She reflected the spirit of commitment and the enthusiasm that characterized the district. "I didn't want to miss anything," she recalled in 1997. "I wanted to be at work."[9] These employees displayed an interest not only in the Corps' work but also in their communities. The district's interest in maintaining employee satisfaction was demonstrated in its participation in a Gallup Workplace Survey in 1995 and 1997.[10]

The Geography and Climate of the FWD

Much of the Corps' civil work is shaped by the natural environment — and Texas is a vast state. A land of awesome expanses, it contains four principal regions: the Central Lowland, the Great Plains, the mountainous Trans-Pecos area, and the Coastal Plain. The first of these regions encompasses much of the FWD, extending southward and westward in a line from Fort Worth through Abilene, to Big Spring. To the north, the Great Plains region reaches westward from the Central Lowland into New Mexico and includes the bulk of the panhandle. The Trans-Pecos area includes the high, rugged western section of the state, while the Coastal Plain to the south and east extends from the Gulf of Mexico to the Balcones Escarpment. Even within these regions, the terrain differs widely. The FWD in the Central Lowland includes blackland prairies in its northeastern reaches, and plateaus to the west.[11]

The climate of the Central Lowland also varies. It can be considerably volatile, characterized by drought and sudden, heavy rainfall that results in severe flooding. These capricious and diverse conditions affect the Corps' work in the FWD, as periodic droughts have encouraged state and local planning for water supply needs, while flooding has strengthened calls for controlling rivers and streams.[12]

The geography and climate of the FWD have contributed to its status as a premier district, encouraging development of innovative projects. Proximity to Mexico, for example, has positioned the district to provide border support services for the INS. The district's location has also influenced its distinctive character. Based in the Dallas-Fort Worth area (called the "Metroplex"), it lies at the intersection of a number of geographical and cultural boundaries. Historian Martin V. Melosi has pointed out that Dallas is "where the East runs out," while Fort Worth is "where the West begins." Dallas, located 35 miles

Comparison of Civil Works Activities,
Four Large U.S. Army Corps of Engineers Districts.

District	1992-1995	1988-1991	1984-1987	1980-1983	
Fort Worth	$120,000,000 $181,000,000 *# projects*: 38	$232,000,000 $146,000,000 *# projects*: 36	$258,000,000 $132,000,000 *# projects*: 34	$231,000,000 $73,000,000 *# projects:* 38	New construction Maintenance Active Projects
Seattle	$63,000,000 $160,000,000 *# projects*: 38	$61,000,000 $151,000,000 *# projects*: 36	$55,000,000 $105,000,000 *# projects*: 30	$100,000,000 $80,000,000 *# projects*: 30	New construction Maintenance Active Projects
Mobile	$173,000,000 $480,000,000 *# projects*: 59	$210,000,000 $434,000,000 *# projects*: 57	$210,000,000 $452,000,000 *# projects*: 52	$564,000,000* $319,000,000* *# projects*: 34	New construction Maintenance Active Projects
New York	$212,000,000 $58,000,000 *# projects*: 25	$128,000,000 $83,000,000 *# projects*: 32	$46,000,000 $83,000,000 *# projects*: 28	$66,000,000 $59,000,000 *# projects*: 28	New construction Maintenance Active Projects

Note: Dollar amounts rounded to millions. Figures serve as relative approximations and include both federal and contributing funds. Maintenance dollars include rehabilitation.

* Over $467 million for one project alone. Waterway connecting Tombigbee and Tennessee Rivers, Alabama and Mississippi.

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east of Fort Worth, is known for "being southern but with an eastern taste for culture and formality." Fort Worth, on the other hand, remains "the consummate Texas city, ten gallon hats and all."[13] John Schaufelberger, who served as district commander during the late 1980s, characterized Fort Worth as "a very friendly town," more "laid-back" than Dallas. "In the middle of the afternoon in downtown Fort Worth there were hardly any cars on the street," he recalled in 1998. "And I certainly enjoyed that."[14]

The Growth of Texas and the Metroplex

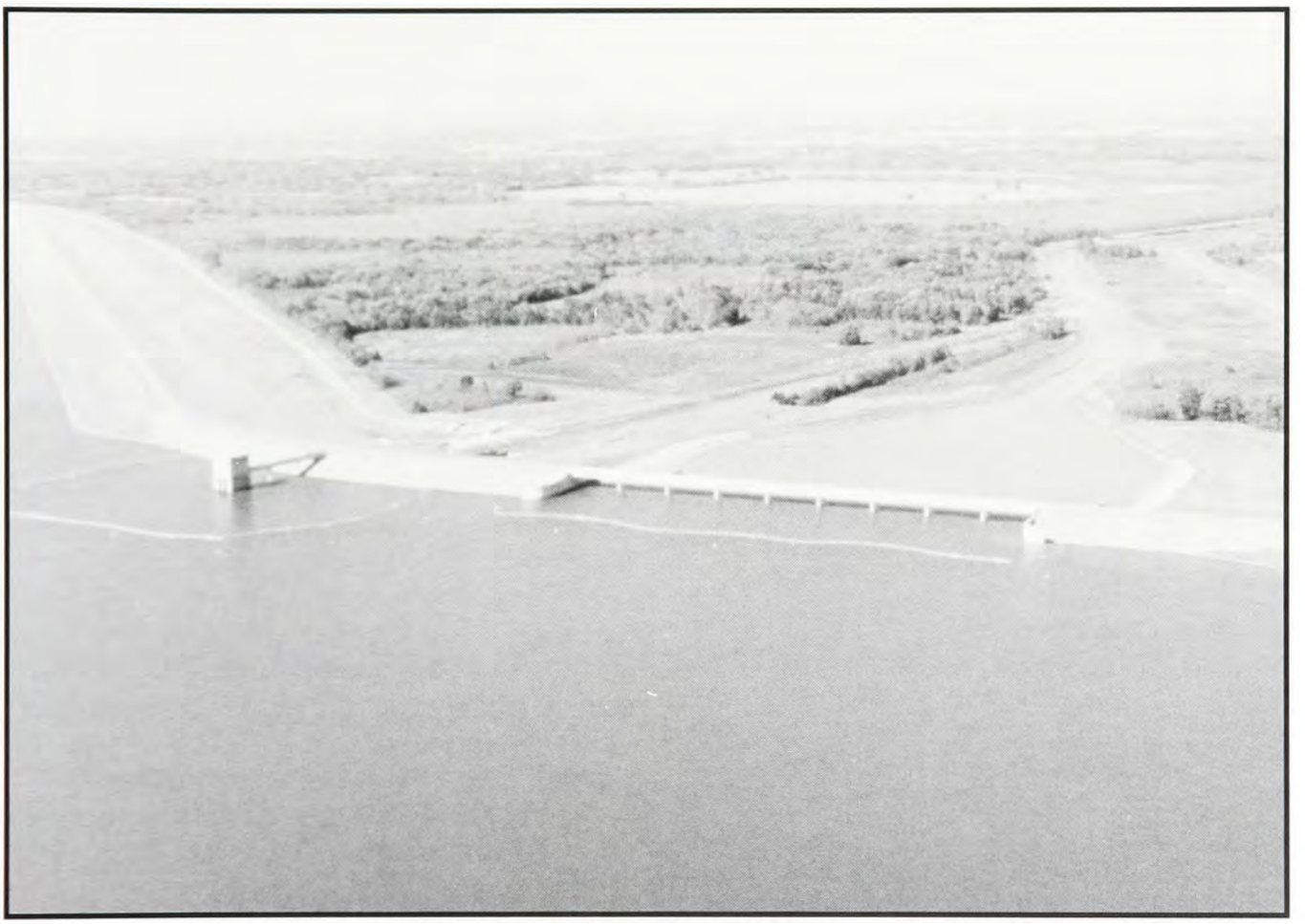
Texas has long been known for ranching and farming. During the early 20th century, an oil boom in the eastern section of the state broadened its economic base. By that time, Texas led the nation in production of cattle, cotton, and oil. After World War II, interest in the Sunbelt accelerated the growth of the economy and population of Texas — and the state attracted a variety of industries, including aerospace research and aircraft manufacturing. The creation of the FWD coincided with this development, marking an expansion of the Corps' civil and military work in Texas. The opening of the Dallas-Fort Worth Airport in 1974 further demonstrated the prominence of Texas in the economy of the Sunbelt.[15] By 1990, the state had nearly 17 million people — the nation's third largest in population. Dallas and Tarrant counties, which encompass the Metroplex, had become two of the most populous in the state, with 3 million residents.[16]

This historical update is organized into six chapters. The first of these describes the FWD's involvement in one of the most valuable resources in Texas: water. Some state residents considered this resource to be the oil of the future. Accordingly, the Corps' role in water resources development remained significant during the period 1975-1999, as the agency continued to face the problems of too much rain and too little water. While earlier eras were distinguished by construction of large-scale water resources projects, however, during the last 25 years the FWD increasingly incorporated environmental values into planning and construction, turning to non-structural alternatives in many instances. This trend is further explored in Chapter Two, which describes the Corps' cultural

resources and regulatory work, and in Chapter Three, which analyzes the Corps' changing role in providing recreation. Chapter Four discusses the district's military work, while the fifth chapter examines the FWD's involvement in disaster relief. Chapter Six analyzes the Corps' efforts to reorganize and change its business practices, in response to a rapidly changing work environment.

Since 1824, the Corps has served as the nation's primary water resources development agency, applying engineering science and comprehensive planning to federal public works. Initially, the Corps focused its engineering expertise on navigation improvements in the nation's rivers and harbors. During the mid-19th century, it also engaged in extensive reconnaissance and surveying of transportation routes in the West. During the first half of the 20th century, Congress assigned the Corps a new mission, involving flood control and the development of massive multipurpose dams for hydropower, navigation, flood control, and recreation on such major river systems as the Columbia and Missouri. As Congress has continued to refine the Corps' missions during the final quarter of the 20th century, the agency has adapted its approach to civil and military work. The following book explores how the activities of the FWD have contributed to this process. ■

The federal building in Fort Worth houses the district offices.



Cooper Dam.

I. Water Projects

"The biggest development that I've seen in the Fort Worth District ... is that shift in focus from hard flood control structures to non-structural flood damage reduction with other purposes for environmental quality, enhancement, and restoration."

– Paul M. "Marty" Hathorn, Chief of Environmental Resources, 1997

"The environment is on the front end of everything we do."

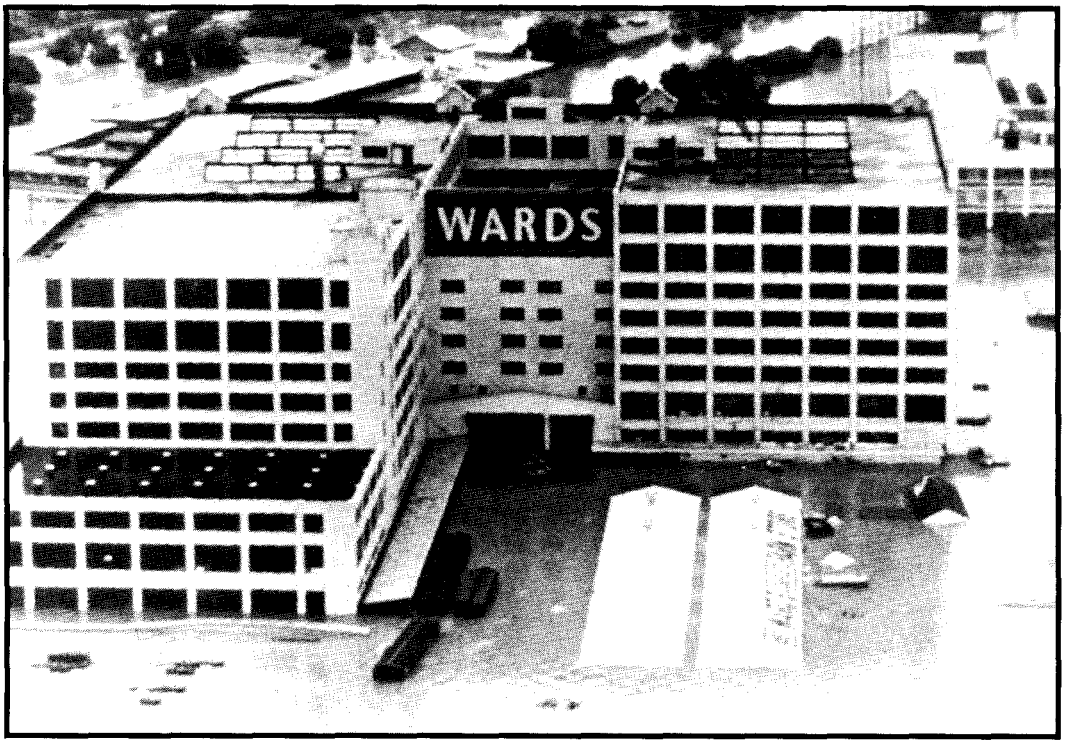
– Col. Peter T. Madsen, 1997

Charting New Courses

The story of the Fort Worth District is linked to the development of water resources. Throughout the late 20th century, the Corps has helped the residents of Texas tackle the alternate problems of downpours and droughts. The agency created the FWD in 1950, partly in response to a devastating flood that hit Fort Worth the previous year. As late as the 1990s, city residents still recalled the "Big One" that buried sections of downtown in 10 feet of water.[1] Images of the floodwaters rising to the second story of the Montgomery Wards department store on 7th Street proved to be especially enduring, reminding people in the Metroplex of the destruction that sudden, heavy rainfall could bring. "The popular white building," wrote one historian, "rose out of the water like a structure from the lost city of Atlantis."[2]

Floods during the late 1980s and early 1990s reinforced the continuing need for water management. During the last 25 years, flood control remained an important objective for the Corps, and the FWD was responsible for 25 lakes, including eight in the Trinity River Basin and nine in the Brazos River Basin. These reservoirs comprised a system that helped alleviate flooding on two principal rivers in Texas. Water supply and navigation also remained important objectives, as did the operation and maintenance of numerous projects constructed before 1975.[3]

Even so, the Corps' role in the development of water resources began to change in the 1970s, reflecting national trends. In subsequent decades, Congress moved away from structural solutions to water problems, and authorizations for large reservoir projects declined, in favor of managing watersheds, restoring wetlands, and providing associated recreation. Paul "Marty" Hathorn, a fisheries biologist and chief of Environmental Resources at the FWD, observed this change in direction in 1997. He began his career as a ranger at Benbrook Lake 20 years earlier. "When I came on," he recalled, "the Corps was kind of ending an era of construction of large flood control projects." Since the 1980s, "there hasn't been a new major reservoir type project" — and to Hathorn's mind, that development signaled a "major milestone in history." The most significant change that he witnessed "was that shift in focus from hard flood control structures to



A devastating flood hit northern Texas in 1949, prompting formation of the Fort Worth District. Flood waters rose to the second story of the Montgomery Wards building, trapping employees inside (top photo). Red Cross volunteers traveled by canoe to deliver food to the flood victims (bottom photo).

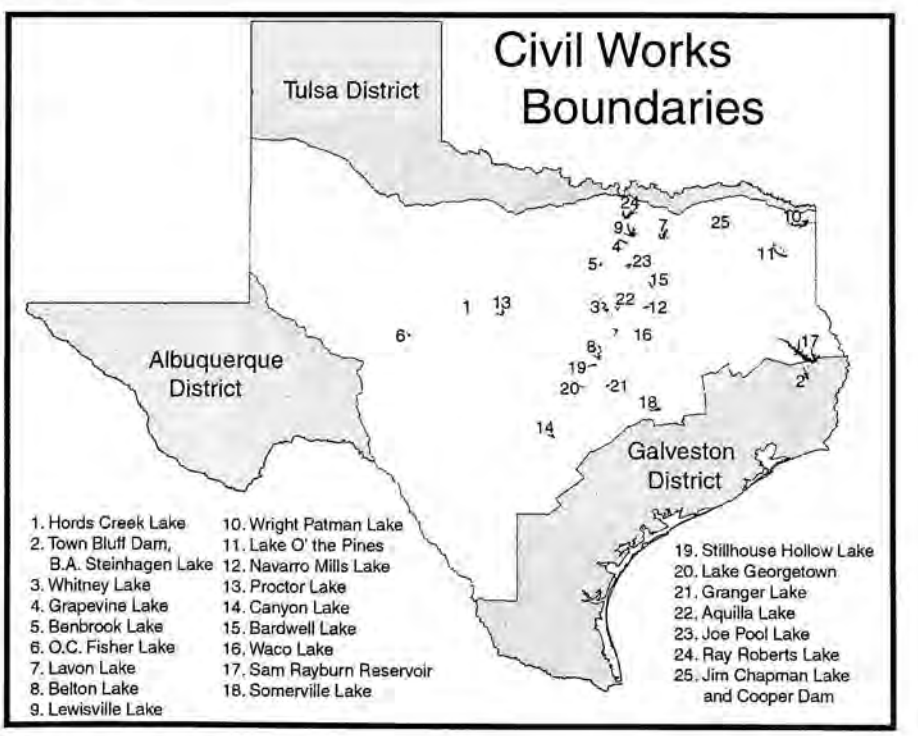
Existing Civil Projects in 1975, Fort Worth District.

Brazos River Basin	Belton Lake	Proctor Lake	Somerville Lake	Stillhouse Hollow Lake	Waco Lake
Colorado River Basin	Hords Creek Lake	O.C. Fisher Lake			
Guadalupe River Basin	Canyon Lake				
Neches River Basin	B.A. Steinhagen Lake	Sam Rayburn Reservoir			
Trinity River Basin	Bardwell Lake	Benbrook Lake	Grapevine Lake	Lavon Lake	Lewisville Lake

non-structural flood damage reduction with other purposes for environmental quality, enhancement and restoration."[4]

This transition was not unique to the FWD; it affected the Corps throughout the nation. The Water Resources Development Act of 1990 established environmental protection as a primary mission of the Corps in planning, designing, constructing, operating, and maintaining projects. Other, long-standing missions included navigation, flood control, hydroelectric power, and recreation. On February 14, 1990, Chief of Engineers Lieutenant General Henry Hatch signed a policy memo requiring that environmental concerns have equal standing with other considerations. According to one source, his staff referred to this policy memo as the Corps' "Valentine Message to Mother Earth."[5]

As Hathorn noted, however, the FWD has "always been on the leading edge of the change." A decade before the Water Resources Development Act of 1990, district personnel "were looking at watershed management, floodplain management, open space, [and] restoration, as a means of flood damage reduction." The FWD, according to Hathorn, "was recommending those types of actions before Congress was authorizing those types of projects." He attributed the FWD's leadership to its identification with local communities, and to the responsiveness of its personnel to changing attitudes and values.[6]



The Environmental Movement

Few forces have proven more influential in altering the course of federal water resources development than environmentalism. Emerging during the 1960s and 1970s, this movement affected the way Americans looked at the natural world, inspiring the Corps to devise new approaches to water resources development. Traditional conservation, which dated back to the late 19th and early 20th centuries, had emphasized protecting natural resources for efficient use and continued productivity. It sprang from an era characterized by such rapid, large-scale use of resources that some historians dubbed it the "Great Barbecue."[7] The conservation movement provided legislation for orderly development of the nation's water, timber, and wildlife, while ensuring that these resources would not be destroyed. Many of its advocates welcomed reclamation projects that promised to harness rivers and streams, providing flood control, irrigation, navigation, and electricity. The Reclamation Act of 1902 was an expression of the conservation movement, and the Corps and the Bureau of Reclamation became the primary agencies for accomplishing federal water resources responsibilities.[8]

Environmentalism has had a very different emphasis. It emerged from modern concerns, including the fear of the effects of pollutants and hazardous materials. Rachel Carson served as one of the movement's early voices. She alerted the public to the hazards of chemicals and radiation fallout in her book, *Silent Spring*, published in 1962. With an eye for detail and a sense of wonder for the natural world, Carson appealed to a generation of readers. Ostensibly, *Silent Spring* publicized the effect of DDT on birds, including eagles. Even more alarming was the book's undercurrent: the possibility that DDT and other substances might seriously harm humans for generations to come. The publication of *Silent Spring* marked the beginning of a general concern about pollution of the nation's air, land, and waterways.[9]

Environmentalism is a multifaceted movement that has drawn its inspiration in part from the counterculture's questioning of traditional values. Along with Rachel Carson, Aldo Leopold became a principal spokesperson. During the late 1940s, Leopold concluded that conservation, for all its useful policies, had not provided the philosophical foundation necessary for protection of the natural world. In his estimation, efficient use and careful management had proven insufficient; he believed it was also necessary that the natural world "be loved and respected" as more than a commodity. What was missing from conservation thought, Leopold concluded, was a land ethic. No longer could human actions be determined by economic expediency. "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community," he suggested. "It is wrong when it tends otherwise." To Leopold, the term "land" meant more than mere soil; it included the complexity of living things that made up an ecosystem.[10]

Like Carson, Leopold reached a large and receptive audience — and his expression of the land ethic helped provide the philosophical underpinnings of the environmental movement. So influential were his writings that many of his readers came to view him as a "prophet." His book, *A Sand County Almanac with Essays On Conservation From Round River*, published posthumously in 1949, articulated the ideals that would gain prominence in the 1960s and 1970s. Whereas conservationists called for the wise use of resources, environmentalists promoted a holistic

approach to protecting the natural world, pointing to the importance of saving ecosystems.[11]

The environmental movement had significant consequences for the Corps and other resource development agencies. Throughout the 1970s, it prompted legislation establishing new — and often controversial — procedures for projects.

From Structural Projects to Environmental Restoration

When I came on [in 1977], the Corps was kind of ending an era of construction of large flood control projects.... I think the public has kind of looked to the future a little bit and seen that when you build reservoirs, they will alleviate flood damages but they also induce development and they drown the natural resources, the bottomland hardwoods and the river systems. It's not just in Texas but across the country. People have begun to realize that those resources are limited and that if they want something left of environmental quality for the future, for their grandchildren, then they've got to look at different ways of dealing with floodplains and dealing with flood damages. I think the grassroots pressure has affected Congress to authorize projects that are nonstructurally oriented.

– Paul M. "Marty" Hathorn, Chief of Environmental Resources Branch

The National Environmental Policy Act (NEPA), for example, brought the protection of natural and cultural resources into the forefront of the planning process. Signed into law in 1970, it required federal agencies to employ an interdisciplinary approach to project evaluation, which resulted in the hiring of new staff, including wildlife and fisheries biologists as well as historians and archaeologists. It also required agencies to complete an environmental impact statement (EIS), which included public input into the decision-making process. Moreover, the act was retroactive, directing agencies to prepare EISs for then current projects, regardless of the stage of planning, design, or construction. By 1975, the Corps had prepared 1,750 EISs for projects throughout the nation.[12]

In addition to NEPA, Congress passed the Federal Water Pollution Control Act of 1972 (FWPCA), renamed the Clean Water Act in 1977, which also significantly affected the Corps and other federal resource agencies. This statute, designed to address water quality and control pollution in the nation's waterways, prohibited discharging dredged or fill material into the "waters of the United States" without a permit from the Corps of Engineers. The most controversial aspect of the law was the extent of wetlands protection afforded by the Corps' permitting responsibilities. Environmentalists and other concerned citizens had become alarmed at the continuing erosion of the nation's wetlands, due to their ecological value. Over the past 200 years, almost 50 percent of the wetlands in the lower 48 states had been converted to other uses, through such activities as agriculture and urbanization. The Corps' regulatory program, established under Section 404 of the Clean Water Act (CWA), potentially provided the major means of controlling wetland losses.[13]

The Endangered Species Act (ESA) was another landmark statute that affected the Corps and other federal agencies. Passed in 1973, it resulted from a growing awareness of the importance of biodiversity — and it was the nation's first comprehensive attempt to protect wildlife, fisheries, and plant species from extinction. The ESA directed the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to list species as endangered or threatened, and to identify critical habitat necessary for continued survival.[14]

Environmental legislation embroiled federal agencies in litigation throughout the country. Using the ESA, environmentalists filed suit in 1975 to stop construction of the Tellico Dam on the Little Tennessee River — the habitat of the endangered snail darter.[15] NEPA proved to be especially effective in prompting litigation. As one attorney observed, this statute "may have led to more lawsuits than all our other environmental laws combined."[16] If an agency failed to consider the impact on the environment in the planning process, the courts had the power to stop the project until compliance with NEPA had been completed. During the early 1970s, the Corps, like other federal agencies, found itself the target of litigation that was largely initiated by environmental groups. The Sierra Club Legal Defense Fund, for one, served as an especially vocal monitor of NEPA compliance. One of its attorneys argued in 1973 that NEPA "would be but empty rhetoric if the Sierra Club and other conservation organizations had not determined to watchdog its enforcement."[17]

Among federal agencies, the Corps responded quickly. Meeting this challenge, however, required nothing short of a change in mindset. The Corps had entered the 1970s "as an agency steeped in tradition." Its original water resources development mission dated back to the early 19th century — long before the environmental movement. During the early 20th century, however, the Corps had adopted the "wise use" philosophy of the conservation movement, which emphasized efficient utilization of the nation's natural resources. In the 1970s, the Corps similarly began incorporating the objectives of environmentalism. According to William Hedeman, an environmental specialist with the Corps' Office of Counsel, "the Corps pulled out all the stops to comply with NEPA." As General Frederick J. Clarke explained, the Corps "learned earlier than most federal agencies" that they had "better be serious about the preparation of Environmental Impact Statements." Another senior Corps officer remarked that environmental litigation placed "external pressures" on the agency, resulting in "healthy change." When critics charged, for instance, that the engineers had failed to write EISs for water projects in a readable, accessible manner, the Corps resolved to produce more readable, accessible documents that encouraged the public involvement that NEPA required.[18]

Some environmentalists appreciated the Corps' responsiveness to NEPA. Activists concerned with "The Hard Corps and Our Soft Environment" commended the agency's approach to environmental problems as "far more advanced than many of the other federal agencies."[19] Environmental lawsuits against the Corps began to decline after the mid-1970s.[20]

This nationwide trend was visible in the FWD. Marty Hathorn recalled that the environmental community became increasingly receptive to the Corps during the 1970s. "I went to some public meetings," he remembered, "and the environmentalists would get up and play guitar and do folk songs, 'The Corps of Engineers March,' and things like that." At that time, "we were closing out some of those large projects that were authorized in the '50s and '60s." The FWD, however, "worked real hard to establish a relationship with the environmental community." By the 1980s, this effort had resulted in the formation of a group called the Environmental and Recreation Assistance Committee, consisting of representatives of environmental organizations throughout the state. As Hathorn explained it, "we let them know what we are doing and listen to them as to what they want us to do. And we haven't

had a lawsuit on an environmental issue since we started that."[21]

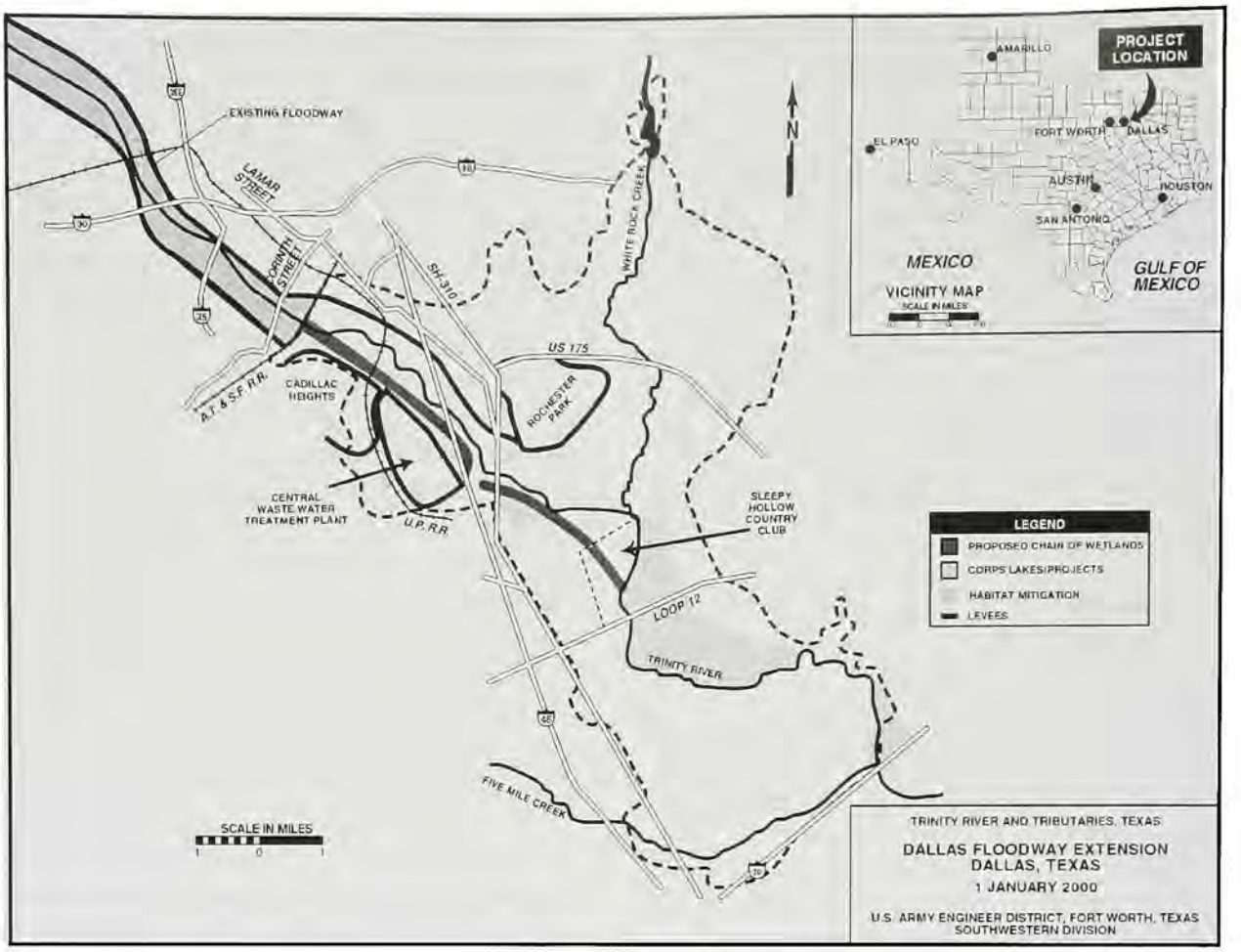
One reason that the FWD adapted quickly to environmental concerns was the influx of new staff, beginning in the 1970s. Outside observers sometimes viewed Corps personnel as "slide-rule types who look for structural solutions to problems because they are builders."[22] As the Corps began to attract a more culturally diverse workforce, adding wildlife and fisheries biologists and other personnel from disciplines outside engineering, perspectives began to change inside and outside the agency.

Part of the Corps' responsiveness to environmental concerns was reflected in its move away from structural work. As early as 1975, Friends of the Earth, a leading environmental organization, complimented the engineers for designing "exemplary" non-structural flood control projects.[23] This development gained momentum as the decade progressed. By the late 1970s, President Jimmy Carter had questioned the need for a number of federal water projects, producing a "hit list" of proposed dams — and many Texans supported his effort.[24] Not since the Reclamation Act of 1902 had the federal water resources program stirred such debate or received such scrutiny. According to journalist Marc Reisner, in the 1980s, President Ronald Reagan "proved as uninterested in more water development as Carter was opposed to it, and Reagan in fact achieved much of what Carter had only sought."[25] The Water Resources Development Act of 1986 brought significant change to the FWD. It required a cost-sharing approach to water resources work, signaling a major departure in authorization and funding of federal projects. As local and state agencies assumed more responsibility for expenses, water resources projects were scaled back or completed in increments.[26]

This trend signaled the end of the era of large-scale construction for water resources development agencies. "The Corps," Lieutenant General Hatch explained in the early 1990s, "thinks of itself as a 'nation building' organization. But nation building means something quite different today than it did 150 years ago or even 50 years ago. Nation building no longer means large construction and maintenance projects." In his view, the Corps had evolved into an "environmental engineering organization."[27] By the 1990s, then, environmental concerns had permeated nearly all aspects of the Corps' work in the FWD. Colonel Madsen observed that "the environment is on the front end of everything we do."[28] This point is reflected throughout the story of the Trinity River project, which exemplifies how the environmental movement influenced the FWD.

"The Corps thinks of itself as a 'nation building' organization. But nation building means something quite different today than it did 150 years ago or even 50 years ago. Nation building no longer means large construction and maintenance projects."

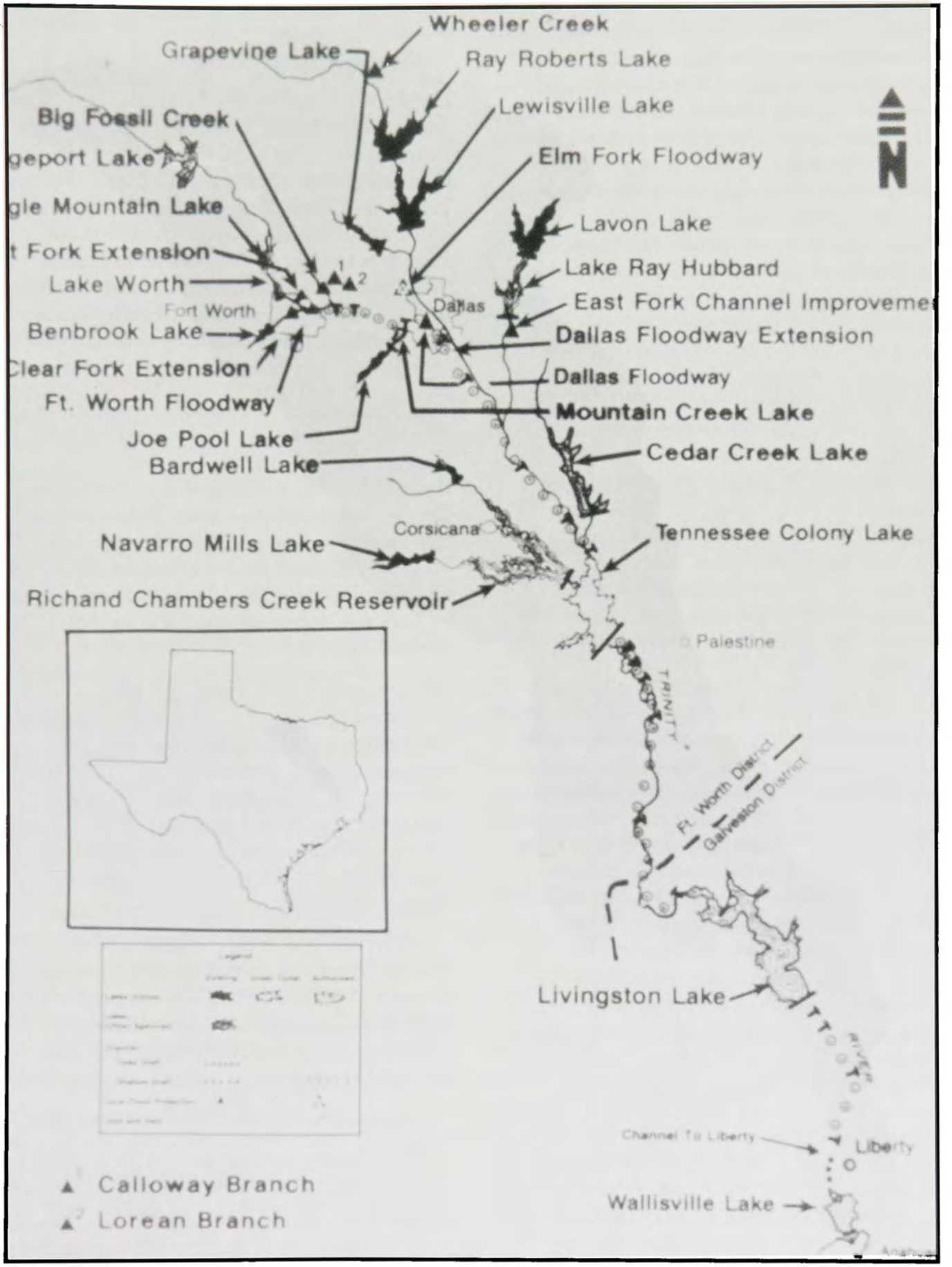
– Chief of Engineers Lt. Gen. Henry Hatch, 1990



Transforming the Trinity

The Trinity is a river of controversy. Flowing from the north Texas prairie to the Gulf of Mexico, this waterway lies in the eastern half of the state, and passes through the populous Dallas-Fort Worth area, which places heavy demands on it. Texans have dreamed of transforming the river for irrigation and navigation since the 19th century. In 1852, Lieutenant William H. C. Whiting of the Corps of Engineers surveyed the Trinity, pronouncing it "the deepest and least obstructed river in the State of Texas."[29] Even so, the Corps reported that steamboats could travel the river only in spring, during high water levels.[30] From that point, the prospect of improving and controlling the Trinity River endured for more than a century. During the 1960s and 1970s — which marked the beginning of the environmental era — this dream met with considerable opposition, which has continued through the 1990s.

The Trinity River flows in three principal branches: the East Fork, the Elm Fork, and the West Fork. The main stem forms at Dallas, at the confluence of the Elm and West Forks. From here, the Trinity meanders more than 400 miles to the coast, making it the longest river with its entire course in Texas. The Trinity River Basin encompasses all or part of 37 counties in the eastern section of the state, including Dallas and Tarrant. Its climate varies extensively. Average annual precipitation ranges from 52 inches near the mouth of the waterway to less than 36 inches in the northwest section.[31]


Wheeler Creek
Grapevine Lake
Ray Roberts Lake
Lewisville Lake
Big Fossil Creek
geport Lake
Elm Fork Floodway
gle Mountain Lake
Lavon Lake
t Fork Extension
Lake Ray Hubbard
Lake Worth
East Fork Channel Improveme
Fort Worth
Dallas
Benbrook Lake
Dallas Floodway Extension
Clear Fork Extension
Dallas Floodway
Ft. Worth Floodway
Mountain Creek Lake
Joe Pool Lake
Cedar Creek Lake
Bardwell Lake
Corsicana
Navarro Mills Lake
Tennessee Colony Lake
Richand Chambers Creek Reservoir
Palestine
TRINITY
Ft. Worth District
Galveston District
Livingston Lake
RIVER
Channel To Liberty
Liberty
Wallisville Lake
Calloway Branch
Lorean Branch

Due to rapid changes in weather in the basin, the Trinity gained a reputation as an unpredictable, capricious river. While sometimes reduced to a trickle, it could become a raging torrent after a cloudburst. The Spanish explorer General Alonzo de Leon named the waterway in 1690, in honor of the feast day of the Most Holy Trinity (*La Santisima de la Trinidad*). According to one observer, he remained "blissfully unaware of the basin's 'split personality.'" Early Euroamerican settlers were attracted to the verdant landscape that now encompasses Dallas, Rockwall, and Collin counties. So rich was the land drained by the East Fork of the Trinity that in the 1860s, the *Dallas Herald* called it "the finest soil in the Union." Here, the basin supported lush stands of pecan, oak, elm, hackberry, cottonwood, and bois d'arc. It also offered settlers numerous springs and creeks. Early residents, however, quickly learned of the river's volatile character, as they watched crops wither in dry periods, only to see their labors washed away after sudden storms.[32]

The unpredictable nature of the Trinity increased the challenge of developing the river for flood control, navigation, energy production, water supply, and recreation. Throughout the 20th century, management of the river was further complicated by a variety of land uses. Agriculture was a long-standing use, as the basin proved well suited for production of cotton, corn, peanut, sorghum, soybeans, rice, and wheat. Additional activities included development of oil and gas deposits, extensive livestock operations, and urban expansion. These uses severely polluted the river with human and industrial waste.[33] As early as 1925, the State Health Department reported that the "flow below Dallas for many miles does not impress one as being that of a river," owing to the "filth" and "the stench from its inky surface." So contaminated was the water that the Trinity was dubbed the "mythological river of death."[34]

After World War II, pesticides and herbicides added to the deterioration. "The damn river's black," observed one rancher near Forney. "I'd have to go down there to fix a fence, and it'd burn your eyes." By the 1980s, the Texas Water Resources Institute had ranked the East Fork and the main stem running from Fort Worth to near Trinidad among the most polluted streams in the state.[35] Locals described the Trinity as a drainage ditch "slinking through Fort Worth."

Cleanup efforts, including a pollution-monitoring program, improved the river's water quality — and its reputation — in the mid-1980s. Naturalist Jean Craighead George, author of *Julie of the Wolves,* praised the Trinity during a visit to Texas in 1984. "The area around the river is incredible," she commented. "I really don't think people in Fort Worth realize what a wonderful thing they have here."[36]

Demands on the river, however, continued to increase. As the population of the basin grew throughout the late 20th century, many residents looked to the river as a resource to be developed. The Trinity remained vital to the economy of Texas, they argued, because the river links Dallas, Fort Worth, and Houston — the state's largest metropolitan complexes.[37]

Congress had long recognized the Trinity River's potential for development. In 1962, it directed the Corps to produce a basinwide plan for the Trinity River. Called the Trinity River project, the plan included the following related components:

- Tennessee Colony Lake near Corsicana.
- Multipurpose channel — or barge canal — from the Houston Ship Channel to Fort Worth for navigation, flood control, river

bank stabilization, fish and wildlife conservation, and other purposes.

- Dallas Floodway Extension in southeast Dallas.
- West Fork Floodway between Dallas and Fort Worth.[38]

The Trinity River Authority (TRA), established by the Texas Legislature in 1955, served as the local sponsor of the project. The TRA had prepared a master plan for the orderly development of the basin's soil and water resources in 1958 — and the Trinity River project complemented that plan.[39] The Rivers and Harbors Act of 1965 authorized the Trinity River project, and five years later, Congress directed the FWD to conduct engineering and design studies.[40]

Although Texans had advocated developing the river for years, the Trinity River project proved to be one of the most controversial in the FWD's history. In 1973, voters rejected a tax proposal that would have funded portions of the Trinity River project, including the barge canal. This 360-mile navigation project, which would have connected Dallas and Fort Worth to the Gulf of Mexico, represented the culmination of a long-standing dream — and the Fort Worth and Galveston Districts had worked on it for more than 10 years. The 1973 vote concerned a very specific issue: funding for the TRA, the project's local sponsor. Even so, its defeat signalled a change in public perception of water projects in general and in navigation projects specifically. Voters in the Metroplex rejected the measure by a margin of two to one.[41]

Opposition stemmed from concerns about expense as well as differing views on rail versus water transportation. Citizen's Organization for a Sound Trinity — or COST — argued that the Trinity River project was not economically sound.[42] Alan Steelman, a Republican congressional candidate, denounced it as a "billion dollar ditch" that would increase pollution and crime — and he won his seat by a large margin.[43] Environmentalists proved to be especially influential in defeating the proposed canal. They feared that channelizing the 550-mile river into a 360-mile waterway would destroy wildlife and fisheries habitat. The Sierra Club, Audubon Society, and other organizations had filed suit in the early 1970s to stop construction of the Wallisville Reservoir, a component of the navigation project located south of Liberty.[44]

Debate over navigation on the Trinity River did not end with the 1973 vote. Texas legislators kept the issue alive in Congress. "It's that time of year again," noted one Washington, D.C. observer in 1976, "when the Trinity River project, complete with barge canal proposal, gets kicked around."[45] According to one observer, however, "the project was on a death spiral."[46] COST continued to voice its disapproval. "The construction of the barge canal would cost as much as it would take to build five new railroads from Fort Worth-Dallas to Houston, any one of which could carry as much cargo as a barge canal," one publication read. To COST, the Trinity River project was flawed as flood control as well. A spokesman for the organization noted, "The modern method is to keep man's buildings away from the river, not the river away from buildings." Tennessee Colony Lake was further derided as a "classic boondoggle" and a "preposterous project."[47]

Friends of the Earth echoed these sentiments, calling the Trinity River project "unworthy of endorsement by rational engineers or economists." This leading environmental organization included the proposed canal on its "hit" list of projects in 1975.[48] As one Sierra Club official summarized, "the subject of navigation and

for that matter the entire Trinity River project is one of controversy and very strong feelings."[49]

The public had a number of forums to vocalize concerns. In the mid-1970s, the TRA held a series of public hearings throughout Texas to obtain recommendations for its master plan. At the same time, the Corps launched a Public Involvement Program as part of its evaluating and updating of the Trinity River project. In addition to general public meetings, this program included a Citizens Assistance Group, consisting of a "cross section" of the public, which met throughout the study. The Department of Urban and Regional Planning at Texas A&M University assisted the Corps in this public outreach, offering its expertise in workshop planning. This effort represented a "significant departure" for the FWD, according to Charles J. Tracy, acting district engineer.[50] Corps personnel would remember the public meetings and hearings decades later. "Public involvement was a big factor in the project," Marty Hathorn recalled. "It was exciting."[51]

In the late 1970s — the era of the Carter Administration's questioning of big water resources development projects — the FWD determined that navigation from Fort Worth to the Gulf of Mexico was not economically feasible. The design memorandum and EIS for the project issued in 1979 recommended three elements: the Dallas Floodway Extension, Tennessee Colony Reservoir, and a navigation channel from the Houston Ship Channel to the Port of Liberty, at the upper end of Galveston Bay. The FWD also recommended mitigation for wildlife and fisheries habitat. Among these, Congress authorized only the mitigation features. For Hathorn and others in the FWD, "this was the first indication that the public would have a say and that the environmental impact would have a weight in whether a project [was constructed] or not."[52] Although the environmental community remained strongly opposed to structural solutions to flooding, such as the proposed Dallas Floodway Extension, organizations like the Texas Committee on Natural Resources supported non-structural alternatives.[53]

The Dallas metropolitan area's continued growth kept attention focused on the need for protection from flooding by the Trinity River and its tributaries. Originally, private interests had constructed levees and floodway improvements between 1928 and 1932 at a cost of $20 million. The Dallas Levee Improvement District maintained this flood protection until the 1950s, when the Corps expanded and upgraded the existing levees and floodway system to a higher level of protection. The area protected within the Dallas Floodway levee system totaled approximately 10,500 acres in the heart of Dallas near the confluence of the Elm Fork and West Fork of the Trinity River. In total, the improved flood protection system received drainage from a 377-square-mile area through 1,150 miles of underground culverts and pipes, 49 miles of concrete channels, and 340 miles of natural creeks and streams.[54]

Rapid urban development after 1975 exceeded growth projections and, coupled with poor floodplain maintenance, greatly increased the potential for heavy flood damage. From 1970 to 1993, Dallas' population grew 20 percent, and the pressure during the economic boom of the 1980s to build on floodplain areas near the Trinity River became irresistible. As new office buildings, shopping centers, subdivisions, and parking lots sprang up in or near the floodplain, storm water runoff into the floodway increased significantly.

The levee and floodway system deteriorated as silt accumulated in channels, thereby increasing the potential for severe flooding in Dallas. Pleading insufficient funding, the city acknowledged spending only half of what was needed to meet current maintenance requirements.[55]

In the mid-1980s, the Corps joined the North Central Texas Council of Governments and local sponsors in initiating several studies of the flooding problems on the Trinity River. Most of the developments built along the Trinity River in the Dallas-Fort Worth metropolitan area required modifications to the river or floodplain. Such activity frequently called for a permit from the Corps. Because these projects had the potential to compromise existing flood protection and because of conflicting public demands for other uses of the river channel and floodplain, the Corps developed a regional perspective to evaluate the impacts of individual permits issued under its regulatory program. The pressures for development, however, continued unabated. Many development projects did not require a permit from the Corps, but did result in adverse impacts on the floodway. The Corps, North Central Texas Council of Governments, and local sponsors developed a Corridor Development Certificate process, which became a volunteer program implemented by city ordinances. The Corps also examined the flooding problems in the Upper Trinity River Basin to determine what, if any, changes should be made in the interest of flood control and other water resources uses such as recreation and water quality.[56]

Floods in the early 1990s increased the urgency of the issue. In 1991, the FWD undertook a thorough reevaluation of the Dallas Floodway Extension. This was a major effort that involved the city of Dallas, U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department, and the Texas Department of Transportation. "It was a cooperative effort," Hathorn recalled—one that produced an innovative solution. "We knew the channels were environmentally unacceptable," he explained. At the same time, "we knew that levees, in themselves, wouldn't reduce flood damages."[57] What the FWD devised was a plan for a large, open area along the stream. It avoided channelization, leaving much of the bottomland vegetation intact. In areas where removal of trees and brush proved unavoidable, the Corps would buy adjacent lands for mitigation, creating a chain of wetlands nearly 6 miles in length that provided 123 acres for waterfowl and other wildlife. The recommended plan included approximately 5 miles of levee extensions and a diversion channel to protect a highway bridge. The plan also included a recreation component, consisting of 18 miles of bike/hiking trails, 8.5 miles of equestrian trails, 5 miles of natural surface nature trails, and picnic and rest areas. The Dallas City Council adopted the Corps' new plan in March 1997. Completion of the recommended plan for the Dallas Floodway Extension project depends on federal funding levels in the future, and will extend into the next century.[58]

Similarly, FWD personnel viewed the Upper Trinity Feasibility Study as an opportunity to propose non-structural solutions to flooding problems. In a mere decade, then, the FWD moved from the controversial Trinity River project to a non-structural approach that "avoids, minimizes, and then mitigates." As Hathorn summarized, the district "recognizes that that's where we as a community want to go. And ... it's exciting."[59]

Ray Roberts Lake

As one of the last reservoirs to be constructed in the FWD, the Ray Roberts project was especially significant. Authorized by the Rivers and Harbors Act of 1965, this facility was located on the Elm Fork of the Trinity River approximately 40 miles north of the Metroplex. In 1980, Congress changed the name from Aubrey Lake to Ray Roberts, to honor the Denton representative who proved instrumental in obtaining funding for the project. "It isn't oil that will ultimately affect our economy 100 years from now," explained Jim Collins, a congressman from Dallas. "It's water! Roberts had the foresight to do something about it." Completed in 1987, the project became the district's 24th operating reservoir — and its primary purpose was water supply. "I'm humbled to know my name is worth a dam — and a reservoir," Roberts noted. "It is one of the greatest thrills of my life."[60]

The FWD completed most of the construction within four years, which was record time for a district reservoir. As resident engineer Web Boland explained, "we made a commitment" to Dallas and Denton, the two sponsors of the project. A unique contracting arrangement allowed a single firm — Phillips and Jordan Company — to build the dam, outlet works, and spillway, eliminating the need to coordinate multiple contractors. The Contracting Division awarded a $48 million contract to this company — the largest civil contract signed by the FWD.[61]

The project presented a number of challenges, many of which affected the Real Estate Division. Although the district completed construction ahead of schedule, the Corps was unable to close the gates and impound water until all the land was purchased. Federal regulations required that private appraisers assess the land value, and the company hired to complete this work defaulted. The Real Estate Division purchased 48,500 acres, and assisted with the relocation of railroad track and seven cemeteries. On June 30, 1987, the gates closed and the reservoir began to fill — a process expected to take two years. Due to unusually heavy rainfall, however, the reservoir filled in just three months, reminding Corps staff and north Texas residents of the volatile nature of the area's weather.

Ray Roberts Lake was also noteworthy for its incorporation of environmental values. While providing water for growing Texas communities, the project's master plan also called for construction of six wetlands for waterfowl and other wildlife. This system was located along Ranger Creek, a tributary of the Elm Fork. It consisted of approximately 170 acres of marsh divided by low earthen levees. These were equipped with control structures that allowed water to flow from one cell — or weir — to the next. The Corps turned operation of the wetlands over to the Texas Parks and Wildlife Department. This agency coordinated with the Waterways Experiment Station in Vicksburg, Mississippi, and the U.S. Geological Survey in conducting research on sedimentation and water quality. According to Mary Flores, an environmental resources specialist with the FWD, "the construction of wetlands at Ray Roberts Lake has provided a unique situation for the Corps" and other agencies "to take advantage of new and exciting research opportunities."[62]

Cooper Lake

The construction of the Cooper Lake project in the Sulphur River Basin was a momentous event in the FWD. Thousands of spectators attended the dedication ceremony of the 79-foot-high earthen dam in September of 1991. "What's behind us here is not a pile of dirt," announced U.S. Representative Jim Chapman of Sulphur Springs. "It's a mountain of dreams that have been fulfilled." For many Texans, however, the realization of this dream proved to be bittersweet. The 25th multipurpose reservoir built in the FWD, it was the last major dam to be constructed. The project's development had spanned 40 years — and its "on-again, off-again history" had tempered the enthusiasm of proponents. Even so, communities in the northeast corner of the state heralded the project in 1991 as "the greatest thing ever to happen to our country," owing to the water supply, flood control, and recreation that it provided.[63]

Residents of this region had a long-standing familiarity with water shortages.

Cooper Lake Project dedication, 1991. Colonel John A. Mills greets Senator Lloyd Bentsen (above) and Colonel Mills addresses the crowd at the dedication (right).

Early settlers in Delta County had discovered the difficulty of drawing water from wells, and many residents depended on underground cisterns to hold rain water, until the appearance of rural water systems in the 1950s. Recurring flooding on the Sulphur and South Sulphur rivers was another problem that plagued the area.[64] Accordingly, in 1955, Congress authorized construction of the Cooper Lake and Channels, in accordance with plans recommended in a report of the Chief of Engineers. Three years later, the New Orleans District initiated construction of the channel and levee improvement portion of the project.[65]

Spending limitations and lack of funding slowed the work during the 1960s. In 1971, the Corps awarded a contract for constructing approximately 23 miles of levee and 33 miles of channel improvement and realignment of the Sulphur River. By that time, however, NEPA had required the preparation of an EIS evaluating impacts of the project. Consequently, the Texas Committee on Natural Resources filed suit in 1971 and won an injunction against the Corps and the project's sponsors, which included the City of Irving, the North Texas Municipal Water District, and the Sulphur River Municipal Water District. A U.S. District judge halted construction pending

The White Oak Creek Wildlife Management Area provides habitat for waterfowl, wild turkey, deer, and non-game species.

the filing of an EIS, in compliance with NEPA regulations.[66]

When the New Orleans District filed the EIS in 1977, however, the court found the document to be inadequate. By 1979, the Corps had realigned district boundaries — and the Cooper Lake project was transferred to the FWD, along with Lake O' the Pines, Wright Patman Dam, and the Red River Waterway between Daingerfield and Shreveport, Louisiana. In 1982, the FWD filed a supplemental EIS for the Cooper Lake project. The court again found the document to be inadequate, upholding the injunction against construction.[67]

This decision stemmed from concerns of the Texas Committee on Natural Resources and other environmentalists that the project would damage bottomland hardwood forests — a vanishing ecosystem in the state. The oaks and nutmeg hickories found in the Sulphur River Basin supported a variety of wildlife species. According to the U.S. Fish and Wildlife Service, the Sulphur hardwoods comprised "the best wildlife habitat in northeast Texas," harboring "one of the last huntable squirrel populations." The agency feared that clearing these trees could reduce squirrel, deer, and raccoon populations in the area by as much as 25 percent. Moreover, the project would curtail periodic flooding in the Sulphur River Basin, which enhanced spring spawning grounds and rearing ponds for fish. Environmentalists were also worried about the effect of habitat loss on wolves and bobcats. Attorney Edward "Ned" Fritz of Dallas, who had gained considerable experience in

opposing the Trinity River project, represented their interests.[68]

These concerns frustrated some proponents of the Cooper Lake project. U.S. Representative Sam Hall of Marshall, for example, was particularly outspoken. "Shall we tell the people to continue to limp along," he asked, "because we must protect our snakes, alligators, insects and 69 varieties of flies? I think not." Confronted with the lengthy delays in the project's construction, he remained determined to keep the project alive. Walter Helm, a spokesman for the Sulphur River Municipal Water District, reported that Hall "was going to see that we got Cooper Lake or he was going to 'hair-lip every dog in Texas.'"[69]

Partly due to the persistence of proponents such as Hall, attorneys representing water users initiated an appeal to the New Orleans Fifth Circuit Court of Appeals in 1983. The next year, this court overturned the earlier ruling, dissolving the injunction against construction. The FWD resumed work on the project throughout the remainder of the decade, making it a priority. "Col. Stroup and all of his staff stressed that the reservoir is their No. 1 project," Helm noted in 1984. "Things are going to start moving fast around here."[70] By 1988, construction work on the project had "lifted spirits and created a can-do attitude" in the northeastern Texas counties of Delta and Hopkins — "an area that once suffered from pessimism while the dam's plans were lodged in government bureaucracy for more than 30 years."[71]

When it was completed in 1991, the Cooper Lake project included an earthen dam measuring 79 feet above the valley floor, stretching for a distance of more than 5 miles. The project provided 131,400 acre-feet of flood storage, protecting more than 12,000 acres of farmland and urban development downstream. Filling very rapidly, it yielded 244 million gallons of water per day, serving approximately one million people.[72]

In one respect, completion of the Cooper Lake project signaled the end of an era. It was the last major reservoir project that the FWD built, and it marked the decline in engineering and construction of large-scale water projects in Texas. At the same time, the Cooper Lake project also reflected new developments in the district.

One of the most significant features of the project was the White Oak Creek Mitigation Area (now called the White Oak Creek Wildlife Management Area), consisting of approximately 25,000 acres in the Sulphur River Basin. The Corps selected this area, in coordination with the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department, to mitigate — or offset — losses to wildlife and fisheries habitat. The objective was to offset the lost habitat that was flooded by the Cooper Reservoir. Much of this area had consisted of bottomland hardwood forest. It was a place where land and water overlapped, characterized by a yearly cycle of flooding and drying — a habitat that supported waterfowl, wild turkey, deer, and non-game species. In addition to assisting the other agencies in identifying the location for the White Oak Creek Mitigation Area, the FWD constructed the moist soil area, commonly called the duck marsh. It consisted of three units fed by channels and controlled by gates. These units could be flooded during dry years or drained during floods, as needed. The duck marsh became a key tool in managing the habitat.[73]

Mitigation efforts at the Cooper Lake project also included preserving 10,000 acres of land around the lake, bringing the mitigation area to a total of 35,000 acres. According to Marty Hathorn, chief of the Environmental Resources Branch, this

development represented a "major milestone" in the FWD's civil works projects. Construction on the Cooper Lake project had been slowed not only by lack of funding but also by environmental concerns. The battle for this reservoir revealed that if large-scale construction of water projects were to proceed at all, it would require strong consideration of environmental values as well as coordination with agencies devoted to wildlife and fisheries protection.[74]

The Cooper Lake project represented another significant milestone: the appointment of the FWD's first female lake manager. Throughout her childhood in Oklahoma, Marilyn Jones had worked on a number of farms, developing a lifelong interest in the outdoors and the conservation of natural resources. She had participated in the Youth Conservation Corps, completing conservation projects at an Indian Academy. After college, she became a park ranger at the Oklahoma Department of Parks and Tourism. Jones began her career with the Corps as a park technician in the Tulsa District.[75]

Jones came to Lavon Lake in the FWD in 1982, and eight years later she was hired as the construction park ranger at Cooper Lake. During the early 1990s, she became lake manager after the completed facility transferred from the Construction Division to the Operations Division of the district. "Seeing the progress that has been made here at Cooper from beginning to end has been the most rewarding part of my job," she noted. "And we have a tremendous amount of beautiful wildlife and resources here." As the first woman to manage a dam in the FWD, Jones hoped to "pave the way" not only for "career-oriented women," but also for those interested in working in the natural resources field in the Corps. Her position at Cooper Lake reflects a number of developments in the FWD during the last 25 years, including an increasingly diverse workforce and a staff trained not just in engineering, but in fields such as wildlife and fisheries biology, archaeology, and recreation planning.[76]

San Antonio River Tunnels

The San Antonio Riverwalk is one of the jewels of Texas. Among the most popular tourist attractions in the state, it follows the waterway through a park-like setting, linking San Antonio's downtown and adjacent neighborhoods through appealing landscaping and architecture. The riverwalk, which has proven to be an asset to the city as well as to the state, was enhanced by an innovative flood control project constructed by the FWD and the San Antonio River Authority (SARA).

Flooding had been a long-standing problem for residents of the San Antonio area. A deluge in 1921 resulted in the city's adoption of a flood control plan that included constructing the Olmos Dam at the headwaters of the San Antonio River. Another flood in 1946 prompted the Corps to recommend the San Antonio Channel Improvement Project. Congress authorized it in 1954, designating the SARA as the local sponsor. While the Corps remained responsible for design and construction, the SARA took care of right-of-way acquisition, utility relocation, and construction of bridges.[77]

For 30 years, these agencies focused on conventional flood-improvement measures — widening and deepening approximately 35 miles of riverbed and channel. When work advanced upstream into the downtown area, however, the FWD concluded that traditional methods would prove disruptive and costly. In 1985, district officials decided to build two diversion tunnels — one under the San Antonio River, and one under San Pedro

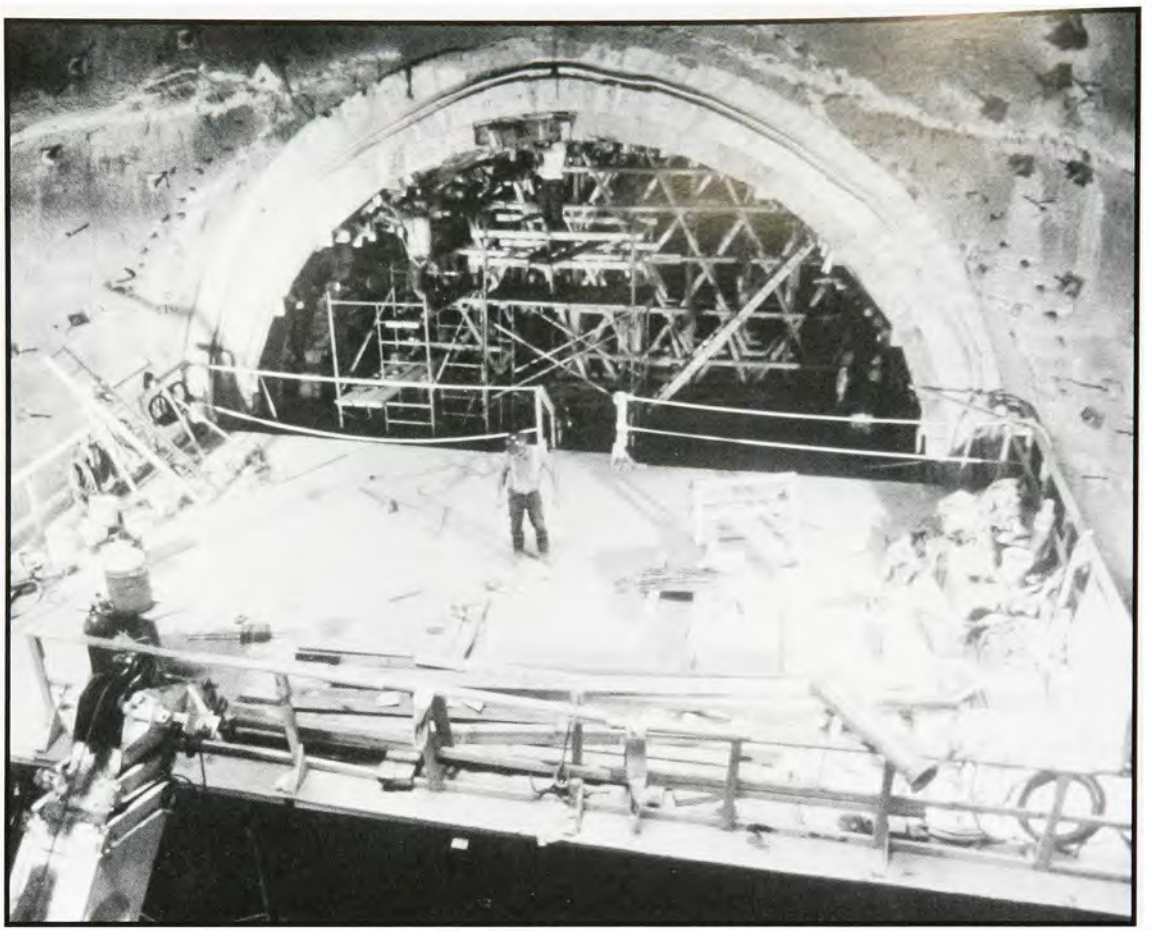
The San Antonio Riverwalk is one of the jewels of Texas.

Creek.[78] The idea was that when the San Antonio River or San Pedro Creek reached flood stage, the overflow would travel down the tunnels under the city, as opposed to through the city streets.[79]

These structures proved to be engineering marvels. They were massive in size, measuring more than 24 feet in diameter. The San Pedro Creek Tunnel was 5,985 feet long, while the San Antonio River Tunnel measured 16,225 feet in length. Buried 140 feet underground, they employed the principle of an inverted siphon, reducing the estimated height of a 100-year flood by 6 feet in the downtown area. The San Antonio Tunnel collected water at the inlet facility north of downtown, funneling it more than 3 miles underground. An outlet south of downtown released the water back into the San Antonio River.[80]

"It was a very interesting job," recalled John Schaufelberger, who served as District Commander of the FWD during the late 1980s. "Most of the people who worked on the project were brought in because there was virtually no one in the San Antonio area that experienced a tunnel construction." Unique features of the project included the concrete lining elements, which were pre-cast and steam-cured, and then brought in and set in place. Workers brought materials down an elevator to a locomotive in the tunnel, which was also used to haul away debris.[81]

The project took more than 10 years to complete, costing approximately $111 million. "When [it] started off, it was just a flood control project," observed Fred Pfeiffer, the SARA's general manager. "We had no idea how complex it would become."[82] Excavating the San Antonio River Tunnel proved challenging. The Obayashi Corporation, the contractor responsible for construction, first attempted to use the tunnel-boring machine employed in the San Pedro Creek Tunnel. Operations began in October of 1989, but after advancing approximately 30 feet, the rock collapsed. Obayashi personnel then placed a bulkhead at the front of the tunnel and filled the cavity with concrete. Even so, the project continued to be plagued by recurring fallouts. In the winter of 1990, the company decided to use a smaller bore, and engineers constructed a temporary shaft. During the summer, however, the shaft collapsed. Resident Engineer Keith Allen noticed falling pieces of debris, and alerted the crew to withdraw. As a result of his quick thinking, no workers were injured. Obayashi reinforced the failed section, and the tunnel was completed in the early 1990s.[83]



The San Antonio Tunnels proved to be engineering marvels.

The project attracted widespread interest among designers and contractors throughout the world, owing to the resolution of these mining problems and the magnitude of the construction. Engineers from other districts and divisions also frequently visited the site. In 1991, the project was named an honor winner in the Chief of Engineers Design and Environmental Awards Program.[84]

While protecting the city from flooding, the project also enhanced tourism. The city extended the promenade through downtown, creating a linear park along the waterway. The channel meandered through the mission district, and an adjacent pedestrian corridor linked downtown and the Espada Mission. Carefully placed native plants created a low canopy of vegetation around the project, increasing its appeal. "I'd call it one of the most important things to happen to the city since the original development of the river itself," commented Mayor Henry Cisneros.[85] Martha McNeel, the SARA board chairman, agreed. Assessing the significance of the project, she explained that "San Antonians have a love affair with their city and their river." The project proved important for the FWD as well. Tom Vogt, project manager, commented, "We've brought the federal flood control interests, the local water quality issues and the contributions to tourism all together and have come up with a multi-purpose project which meets everybody's needs and desires."[86]

Sam Rayburn Spillway

The FWD's innovative approach to the traditional area of engineering design was exemplified by the new spillway at Sam Rayburn Dam. This project, completed in 1965, provided flood control, hydroelectric power, and water for municipal uses and recreation.[87] Located in southeastern Texas, it was subject to dramatic fluctuations in water level. Although the largest lake contained within the state boundaries, the reservoir drained a small watershed, making it prone to low water. A drought in the spring of 1996 reduced the normally 114,000 acres of lake down to 80,000 acres. Low water was perilous to the area's wildlife, while exposed stumps presented a hazard to boaters. Just four years earlier, however, record rainfall had driven the water to its highest elevation ever, threatening the dam's spillway. As part of its responsibility to ensure the safety of the dams under its control, the FWD determined that the earthen spillway at Sam Rayburn Dam was inadequate to pass floods, based on new hydrologic criteria developed by the National Weather Service.[88]

The FWD engineers determined that the existing spillway could be dangerously eroded with a flood much smaller than the original design flood. Engineering design studies indicated that a labyrinth control weir could be built at potential savings of $7.5 million over an earlier design employing a traditional ogee weir. The labyrinth spillway used a folded wall weir to allow more water to pass over the weir in the same lateral distance. This design element allowed the Sam Rayburn weir and spillway width to be reduced from 2,200 feet to 640 feet. According to Ronald Turner, chief of the Hydraulics Design Section, the labyrinth consisted of 16 folded weirs, 40 feet wide and 105 feet long. The weir, which had walls 20 feet high, was able to pass the flood with the same pool elevations predicated for the existing 2,200-foot weir. In addition, a parapet wall was added to the top of the dam to accommodate the higher pool elevation predicated by the new hydrology. Since the Corps had no expertise in the labyrinth type of design, the FWD received assistance from the Bureau of Reclamation, which had designed and constructed such a weir at

The labyrinth spillway at Sam Rayburn Dam, seen here under construction, reflected an innovative design.

Ute Dam in New Mexico. Work on the Sam Rayburn spillway modifications began in January 1994 and reached completion in August 1996. [89]

Labyrinth spillway, aerial view.

Summary

During the post-1975 period, the FWD has been in the forefront of the Corps' shift toward planning, engineering, and constructing water resources projects that were environmentally compatible. As the most economically and environmentally acceptable projects were authorized and completed, the FWD gradually turned its attention to operating and maintaining existing projects and enhancing their environmental aspects. New responsibilities, such as cultural resources and regulatory work (discussed in the next chapter), also commanded the district's attention. These activities had to be accomplished in an era of declining federal budgets and shrinking personnel resources. The FWD, like the Corps at large, responded to a rapidly changing political, economic, and social environment with innovation and determination.■

The Highs and Lows of Sam Rayburn Reservoir

Throughout the modern era, Sam Rayburn Reservoir, located in eastern Texas, was subject to dramatic fluctuations in water level. Although the largest lake contained within the state boundaries, this reservoir drained a small watershed, making it prone to low water. A drought in the spring of 1996 reduced the normally 114,000 acres of lake down to 80,000 acres. These conditions were perilous to the area's wildlife, while exposed stumps presented a hazard to boaters.

Just four years earlier, however, record rainfall had driven the water to its highest elevation ever, rendering the dam's spillway unstable. In response to the flood, FWD staff temporarily raised the spillway approximately 2.2 feet to prevent water from flowing over the structure. In the mid-1990s, the district constructed a new spillway, unlike any other among the Corps' projects. The innovative spillway featured a labyrinth weir design, measuring only 640 feet long, in contrast to the original 2,200-foot structure. "This is a significant departure from the way the Corps usually builds spillways," commented Ron Turner, chief of the Hydraulics Design Section.

Sources: Ron Ruffennach, "Sam Rayburn Gets Corps' First," *Dispatch* 12 (January/February 1994), p. 18; Ray Sasser, "Depths of a Drought," *Dallas Morning News*, May 5, 1996.

II. Cultural Resources and Regulatory Work

"One of the most interesting problems facing the district is the treatment and preservation of cultural resources at its lakes."

– Robert F. "Skipper" Scott, 1994

A Non-Traditional Function

The cultural resources management and regulatory programs of the FWD represent non-traditional functions of the Corps, stemming in part from the environmental movement of the 1960s and 1970s. In particular, the requirements of the National Environmental Policy Act (1969), the National Historic Preservation Act (1966), and the Federal Water Pollution Control Act (1972) moved the Corps to consider closely the environmental consequences of its water resources development projects. By the 1980s, federal budgetary cutbacks and congressionally mandated cost-sharing requirements had combined with the environmental concerns to force the Corps to rethink how it accomplished its traditional missions such as flood control, navigation improvements, and hydroelectric development. As a consequence, the Corps adopted a variety of non-structural and environmentally friendly approaches to water resources development. Moreover, these new initiatives usually involved the Corps in a broad spectrum of cultural resources actions. Finally, the administrative responsibilities of its regulatory program moved the Corps deeper into preventing or mitigating necessary wetlands losses. The FWD has played a key role in implementing the cultural resources management and regulatory programs that have become essential components of the new, more environmentally responsible, Corps.

Human activity has always been intimately connected with waterways. Water was essential to life-sustaining agriculture, and it facilitated migration and transportation of goods and services over vast distances. The desire to exploit and control water's potential to benefit humans stimulated the development of increasingly sophisticated social and technological methods to achieve such benefits. As humans used water courses for various purposes over time, they left behind, embedded in adjacent lands, the physical remains of their activities. These deposited cultural artifacts, if scientifically recovered, were capable of revealing the story of human change through time — the rise and fall of civilizations and the successes and failures of people's continuing attempts to adapt to or modify their physical environment. Archaeology is the science devoted to studying this record of the human past through recovering and analyzing its material culture.

The Corps' water resources development activities slowly but steadily brought it into the field of archaeological work. Beginning in the 1930s, the Corps' large-scale dam building and flood control

The Fort Worth District's water resources development brought it into the field of archaeology. The Corps' dam building and flood control projects along major waterways in Texas exposed the buried cultural remains along riverbanks and in areas cleared for reservoir pools. Pictured here are excavations of cultural resources at Fort Worth District projects.

projects along the nation's major waterways exposed the buried cultural remains along river banks and in areas cleared for reservoir pools. At the time, the recovery and scientific analysis of such remains was largely the responsibility of the National Park Service (NPS). Although the Corps cooperated with this agency when its water development activities exposed human and cultural remains, such coordination usually occurred on an ad hoc and crisis basis. That is, archaeologists undertook quick excavations at a site to salvage what they could before it was destroyed by construction or flooded by the rising waters of a reservoir. Before the 1970s, federal agencies sponsored relatively little pre-project research or inventory work to survey and record significant historical or archaeological remains in the path of new water resources projects.

Legislation

The Historical Sites Act of 1935 gave the Secretary of the Interior, through the National Park Service, the responsibility to establish a national historic preservation program, which, among other activities, required the regulation of the removal of archaeological resources from federally owned land. Unfortunately, Congress appropriated little money for such work. The situation improved only slightly with the passage of the Reservoir Salvage Act of 1960. This measure gave the Department of the Interior, through the Park Service, major responsibility for the preservation of archaeological data that might be lost through dam construction. Federal agencies, including the Corps, had to notify the Park Service of impending projects that could endanger archaeological sites. Still, limited funding prevented the Park Service from providing more than emergency archaeological assistance to federal construction agencies. A growing recognition that the nation was losing large numbers of significant historical and archaeological resources led to the passage of the National Historic Preservation Act of 1966 (NHPA).[1]

The NHPA became the basic federal law governing preservation of historical and archaeological resources. It required the federal government to provide leadership in preserving, restoring, and maintaining the nation's historic and cultural environment. The new law created a federal-state partnership to identify and list on the National Register of Historic Places all districts, sites, objects, buildings, and structures significant in American history, archaeology, and culture. It also established the Advisory Council on Historic Preservation and required federal agencies having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking to take into account the effect of the project on listed resources or those eligible for inclusion in the National Register. To satisfy this legal requirement, federal agencies must afford the Advisory Council a reasonable opportunity to comment on the proposed undertaking. Subsequent executive orders and amendments to the NHPA have expanded federal agency responsibility for identification and nomination to the National Register, and for preserving significant historic property owned or controlled by federal agencies. Still, lack of funding continued to hamper the preservation program within individual federal agencies during the 1970s. The funding situation improved somewhat when Congress amended the Reservoir Salvage Act through the Archaeological and Historic Preservation Act of 1974. This new law gave federal agencies the authority to expend up to one percent of a project's total construction cost on archaeology. It also expanded coverage beyond reservoir projects to include all federal or federally assisted or licensed undertakings.

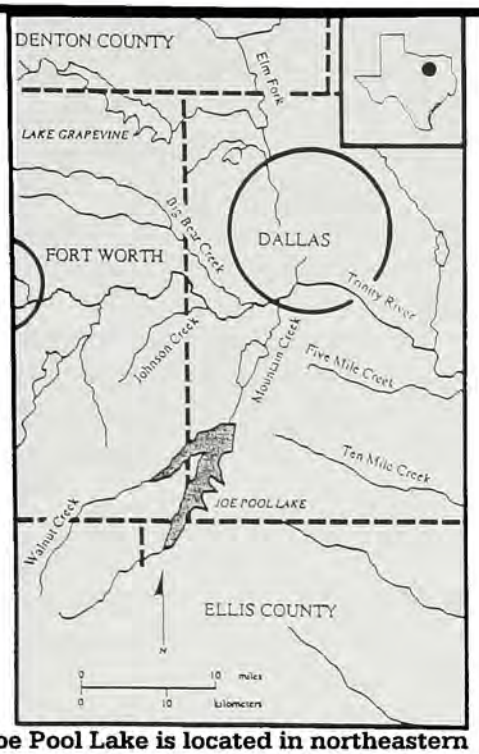
After the passage of the Archaeological and Historic Preservation Act, the Corps began hiring its first archaeologists. The Southwestern Division of the Corps led the way in this process. The Tulsa District selected Larry Banks, a geologist with an archaeological background, as the agency's first full-time archaeologist in 1970. Four years later, several other Corps districts began employing staff archaeologists. By 1978, FWD had its own archaeologist and in subsequent years added others to the staff along with other disciplines, such as architects and architectural historians. In the 1990s, five archaeologists and two historic architects worked in the Environmental Division in a cultural resources management section and one in the district Regulatory Branch.

To bring further order to the federal archaeology program and to better protect the large quantity of cultural resources being recovered on public and Indian lands, Congress passed new legislation in 1979, entitled the Archaeological Resources Protection Act. This measure established a permit procedure for investigations of archaeological resources on public land under a federal agency's control and prohibited the removal, sale, receipt, and interstate transportation of such resources obtained illegally (i.e., without a permit) from public or Indian lands. The new law designed the permit process to ensure that individuals and organizations wishing to investigate or excavate and remove archaeological resources from federal lands have the necessary professional qualifications and that federal standards and guidelines for research and curation are followed. The law also established both civil and criminal penalties for violation of its provisions.

Finally, in response to Native American concerns about the loss of human remains and certain cultural items, Congress enacted the Native American Graves Protection and Repatriation Act (NAGPRA) in 1990. This law directed federal agencies to inventory their collections of human remains and associated funerary objects and to identify the lineal or cultural descendants who might be entitled to claim them. It established procedures for transferring human remains and associated funerary objects to the appropriate lineal descendants or tribes that so request. The law further directed federal agencies to prepare summaries (i.e., descriptive narratives) of all collections containing unassociated funerary, sacred objects, and items of cultural patrimony and make them available for repatriation to appropriate tribes.

The FWD's Program: Joe Pool and Cooper Lakes

Within the parameters of the federal historic and archaeological preservation program, the FWD developed a robust program of its own. Archaeological investigations at Joe Pool Lake, a storage dam for flood control, water supply, and recreation, offer an excellent case study of cultural resources activity in the FWD, as mandated by federal historic preservation laws and regulations. Initial archaeological investigations, conducted between 1977 and 1979, identified 42 prehistoric and historic sites in the vicinity of the proposed Joe Pool Lake. Archaeological properties ranged from temporary prehistoric hunter/gather camps to 19th and early 20th century farmsteads. The second phase of archaeological research involved test excavations at 15 sites to determine which held the best promise for yielding significant information about prehistoric peoples and early Euroamerican settlers. To establish a full understanding of the historical development of the area, investigators conducted archival research



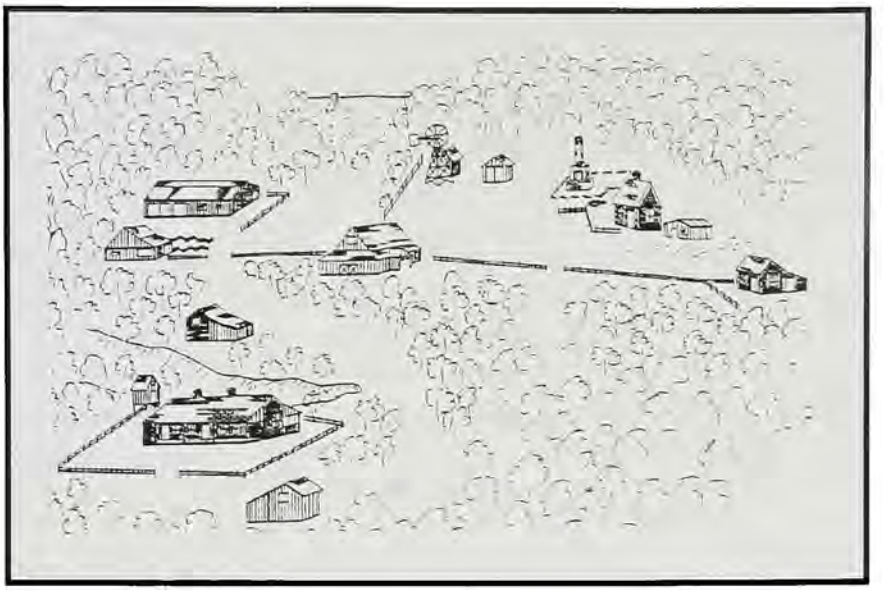
Joe Pool Lake is located in northeastern Texas, just south of Dallas and Fort Worth.

and oral history interviews in conjunction with the archaeological field work. These studies revealed important new understandings about rural lifeways in north central Texas in the late 19th century, reinforcing the value of preserving and interpreting the relatively intact John Wesley Penn Farmstead in the Joe Pool Lake area.[2]

The Penn Farm, which the FWD purchased in 1976, presented a variety of historic preservation and interpretation challenges. Originally encompassing over 1,000 acres, it consisted of 14 structures built between 1859 and the early 20th century. The subsequent cultural resources evaluation of the Joe Pool Lake project determined that the Penn Farm was eligible for the National Register of Historic Places. Since construction of Joe Pool Lake would have an adverse effect on the historic property, the FWD had to develop a mitigation plan for the farm structures and associated landscape and artifacts. The FWD, in conjunction with the Texas Parks and Wildlife Department, developed the concept of restoring the farm and making it an agricultural history center for the public.[3]

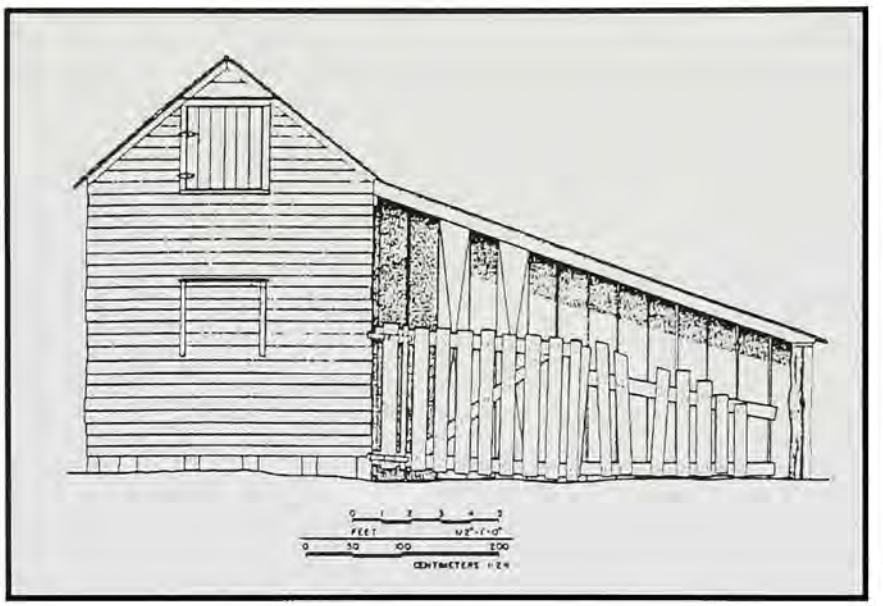
Vandalism, funding shortages, and bureaucratic delays held up work on the project until the early 1990s. In addition to a fire that heavily damaged the interior

The Penn Farmstead includes structures and outbuildings dating from the late 1850s through the 1920s. Because the construction of Joe Pool Lake would have an adverse effect on this historic property, the Fort Worth District developed a mitigation plan for the farm structures and associated landscape and artifacts. The Penn Farmstead (above) offers visitors a glimpse of rural life during the late 19th and early 20th centuries. The family farmhouse (left) was built in 1859.



Schematic of Penn Farmstead, showing major structures and outbuildings.

Source: Archaeological Research Program, Institute for the Study of Earth and Man, Southern Methodist University.



Historic American Building Survey (HABS) drawings were completed as part of the Fort Worth District's mitigation effort for the Penn Farmstead. This drawing details a granary at the site.

Source: Archaeological Research Program, Institute for the Study of Earth and Man, Southern Methodist University.

of the main farm house, the natural environment also presented a safety challenge. So many rattlesnakes lived under the floor boards of the buildings that, as one archaeologist noted, "it sounded like a mariachi band lived there."[4] One of the key problems encountered in the restoration effort involved finding authentic replacement materials for deteriorated wood on the historic structures. The FWD and Texas Parks and Wildlife Department solved this difficulty by recycling salvage materials from period farmsteads and other properties removed or demolished to make way for construction of the Texas National Research Laboratory Commission's Super Conducting Super Collider project in nearby Waxahachie.

The Penn Farm Agricultural History Center, situated on 47 acres on a bluff overlooking Joe Pool Lake, opened to the public in April 1996. It offers a fascinating view of rural lifeways fast disappearing under the relentless assault of

suburbanization sweeping across the north central Texas landscape. The Penn Farm Agricultural History Center is operated by the Texas Parks and Wildlife Department and costs the Corps approximately $350,000. In recognition for its innovative cultural resources work on the Penn Farm Agricultural History Center, the district won a national merit award in the Chief of Engineers Design and Environmental Awards Program.[5]

On a similar project, the FWD carried out an extensive cultural resources investigation at Ray Roberts Lake, again discovering valuable information about our prehistoric and historic pasts. Ray Roberts Lake, constructed by the FWD for water supply, flood control and recreation, is located near the upper end of the Elm Fork of the Trinity River. Extensive field surveys and testing, laboratory analysis, archival research, and oral history interviews by cultural resources experts once again yielded important information about the prehistoric and historic past usage of the project area. The Aubrey Clovis site at Ray Roberts Lake contained one of the best records of Paleoindian activity in North America. Archaeologists recovered over 10,000 stone artifacts and thousands of animal bones at the Aubrey site. In addition, archaeologists discovered that the Late Archaic period (1,500 B.C. to 700 A.D.) and the Late Prehistoric period (700 A. D. to 1700) were well represented at Ray Roberts Lake. They excavated 15 sites containing an array of artifacts and features representative of the lifeways of peoples from these past eras.[6]

Archaeological and historical studies of the late 19th century historic sites at Ray Roberts Lake documented a number of agricultural-related small industries in the area, including blacksmith shops, grist and grain mills, and portable sawmills. Farmsteads, however, accounted for 90 percent of all historic sites at the lake. In particular, the Jones Farm in the north central portion of Ray Roberts Lake contained a number of standing structures and agricultural implements, representative of late 19th century agricultural lifeways of the region. Extensive research and evaluation by cultural resource investigators determined the Jones Farm ensemble eligible for the National Register of Historic Places. Accordingly, as mitigation for the adverse impacts of the Ray Roberts Lake project on this property, the FWD conducted extensive data recovery excavations on the property and then stabilized and preserved the remaining structures for public interpretation. The Jones Farm is managed and interpreted as a public historic farm by the Texas Parks and Wildlife Department as a part of the Johnson Branch Park at the edge of Ray Roberts Lake.[7] Plans for interpretation of the Jones Farm, like the Penn Farm at Joe Pool Lake, were developed by an interdisciplinary team of archaeologists, historic architects, and recreational planners.

Cultural resources investigations at Cooper Lake in northeastern Texas provided FWD yet another opportunity to contribute to the better understanding of the prehistoric and early historic lifeways of the region. In preparation for dam construction and filling of the lake, Corps-sponsored archaeological studies located 240 prehistoric sites and intensively analyzed 15 of them. Recovered artifacts and features buried 5 to 7 feet below the surface indicated that the Cooper Lake area had been inhabited by Archaic peoples dating from approximately 3250 to 4450 B.C. Other sites revealed that the Cooper Lake area supported human use during the Woodland period (200 B.C. to 800 A. D.), and one location contained a cemetery with 13 cremated human burials. These

cremations and carefully arranged burials represent the oldest known examples of the religious and ceremonial activities practiced by the ancient people who lived in the region. By far the largest amount of archaeological remains found at Cooper Lake came from the Caddoan period (800 A.D. to 1500). These people were related directly to a present-day Native American group known as the Caddo Indians, who now live in western Oklahoma. In terms of interpretive value, some of the most noteworthy artifacts discovered at the Caddo sites were pieces of clay pottery. Decorations on this pottery provided much information on food preservation techniques and trading patterns of the far-flung Caddo people and helped to distinguish between early and late Caddo groups. In recognition of the importance of Cooper Lake to Caddo peoples, the Corps has worked with the Caddo to establish a small Tribal Cemetery at the lake.[8]

Early white settlement of the Cooper Lake area began in the 1850s. These pioneers were small farmers growing cotton and a variety of subsistence food crops. Archaeologists excavated and studied several 19th century farm sites, documenting the shift over time from small subsistence farms to more commercialized cotton production by tenant farmers. Researchers combined field work with extensive examination of documentary sources and oral history to round out their investigations. Archaeological and historical research at the Cooper Lake sites helped preserve important knowledge that will be useful to future scholars as they continue to study past lifeways.[9]

According to Robert "Skipper" Scott, regulatory archaeologist for the FWD, "one of the most interesting problems facing the district is the treatment and preservation of cultural resources at its lakes." This issue is pervasive, as all of its 25 lakes have indications of prehistoric and/or historic use. Providing appropriate protection and care for the cultural resources at over 3,005 known sites scattered over 305,000 acres is a challenging responsibility. The management of cultural resources is particularly difficult because of the finite nature of the resource. Once lost, sites can never be replaced. A variety of factors, some associated with routine project operations of a lake, constantly threaten cultural resources sites. Wind and wave erosion is a pervasive destructive force, especially at older East Texas lakes, where sandy soils readily wash or blow away. Recreational activities also can impact sites through pedestrian and vehicle traffic. The management response to these problems have included stabilization of eroded sites, restrictive fencing, monitoring, and data recovery through excavation of heavily impacted sites possessing historic significance. For example, at Bear Creek Rock Shelter, an important archaeological site on the district's Lake Whitney, wave action and vandalism were destroying the site. In 1984, after considering and rejecting capping the location with cement or riprap, the Corps found an acceptable preservation alternative through installing a three-inch-thick gunite cover. It proved both a more affordable, as well as more permanent, solution compared to the other alternatives considered.[10]

The most severe impacts, though, have stemmed from vandalism and pot hunting. "In extreme cases," Scott stated, these activities "can represent total destruction of sites for arrowheads, pots, or bottles, to be sold to collectors. Many people add to site destruction by collecting artifacts as a hobby, failing to understand their role in the theft and degradation of government property." Arbitrarily stripping artifacts from sites destroys their context and thus prevents learning about the past from the disturbed sites. Several laws impose stiff

penalties and fines for committing artifact vandalism and looting on federal property. These include the Archaeological Resources Protection Act and the NAGPRA. But such laws have been hard to enforce with the limited budgets and personnel available at the Corps projects where there are so many different natural and human resources and recreation programs to administer. For these reasons, education and training of the FWD lake personnel to help in the identification, protection and interpretation of cultural resources has become an ongoing part of the district cultural resources program. Project personnel have also attempted to protect sensitive sites through surveillance, motion detectors, protective covering, as well as by limiting access. Just as important to the long-term protection of project cultural resources, has been a public outreach and education program that teaches lake visitors to respect and preserve endangered cultural resources for the enjoyment and edification of present and future generations.[11]

Curation and Collection Management

The cultural resources work of the FWD has created approximately 3,000 cubic feet of artifacts and 160 linear feet of associated records that must, by federal law and regulation (36 CFR Part 79), be properly catalogued, stabilized, and maintained for future reference and study. The curation and management of archaeological collections has become a major concern for all federal land managing agencies. For example, a study published in 1991 by the St. Louis District of the Corps reported the following:

> Over the past 15 years, the Corps of Engineers has spent approximately $165 million on the recovery of archaeological resources, but we have rarely addressed curation and conservation needs for these collections. The result is that many of our collections cannot be accounted for, and most show considerable evidence of neglect and deterioration. In point of fact, we appear to be walking a tightrope of compliance that may unravel on us.[12]

The Corps has been in the forefront of all other federal agencies in its struggle to handle properly the nationwide curation problem. The Corps revised its curation regulation (ER 1130-2-433) in 1991 to comply with new federal curation rules published in 1990. When it became apparent that some Corps districts lacked the resources to adequately deal with their curation responsibilities, it designated in 1994 the St. Louis District as the Corps' Mandatory Center of Expertise (MCX) for the Curation and Management of Archaeological Collections to centralize and efficiently push the agency's compliance effort. In addition, the Corps established a separate line item in its operations and maintenance budget to support the MCX's collections-management strategy, based on standardized archaeological curation data-gathering procedures. The systematic collection of baseline data on the status of the Corps' archaeological collections has also provided the information necessary to comply with the NAGPRA and has facilitated the development and implementation of the long-term solutions to proper archaeological collections management and Native American consultation.[13]

Some Corps districts were further along in complying with the federal curation mandates than others. These districts continued conducting their own curation and NAGPRA responsibilities with the oversight and support of the MCX, while those districts that had been unable to effectively meet their obligations turned over much of their curation and NAGPRA work to the MCX and its contractors to perform. The FWD was one of the districts

in better control of its archaeological collections and continued to carry out curation and NAGPRA responsibilities on its own. By 1997, the FWD had catalogued 99 percent of its collections and had initiated or completed work to curate the collections to appropriate standards at three curatorial facilities in Texas at a cost of $1.5 million. Much of the FWD cultural resources unit's efforts has focused on complying with the requirements of NAGPRA. The district has completed its NAGPRA collections summaries and inventories and sent letters to notify Tribes of Corps collections that might contain objects subject to repatriation to culturally affiliated Indian Tribes. As of 1999, 224 sets of human remains and associated and unassociated funerary objects under the Corps' control at the Texas Archaeological Research Laboratory were awaiting appropriate repatriation.[14]

In addition to carrying out the cultural resources management program for FWD civil works projects, the district cultural resources unit also provided such assistance to a number of other federal agencies and the military. Under various memorandums of agreement, mainly through the Army and Air Force Materiel Commands, the FWD gave support to 140 military installations nationwide, including assistance in meeting their cultural resources requirements. The FWD cultural resources unit also assisted the Air Force Air Combat Command with cultural resources issues. The unit has further supported a number of civilian federal agencies with their cultural resources management needs. These include the International Boundary Water Commission along the Rio Grande River, the General Services Administration facilities in Region Nine, the Federal Aviation Administration, the Immigration and Naturalization Service, and the Drug Enforcement Administration. The cultural resources work is accomplished by in-house staff, consisting of archaeologists, historical architects and archaeologists, historic architects, and GIS specialists, and through indefinite delivery order contracts with private cultural resources firms.[15]

Fossil Remains on FWD Projects

A resource that has received special management attention is the fossil remains on Corps' lands. FWD lakes contain valuable fossil remnants of such prehistoric creatures as mosasaurs (a giant swimming lizard), hadrosaurs (duck-billed dinosaurs), and complete dinosaur skeletons. Fossil clams, oysters, and snails have been found in the limestone at a number of the district lakes. Duck-billed dinosaur bones and tracks discovered at Grapevine Lake date back 70 to 141 million years ago and are the oldest tracks found in North America. FWD park rangers have taken special care to protect tracks from eroding and to provide interpretive programs to the public on this special resource.[16]

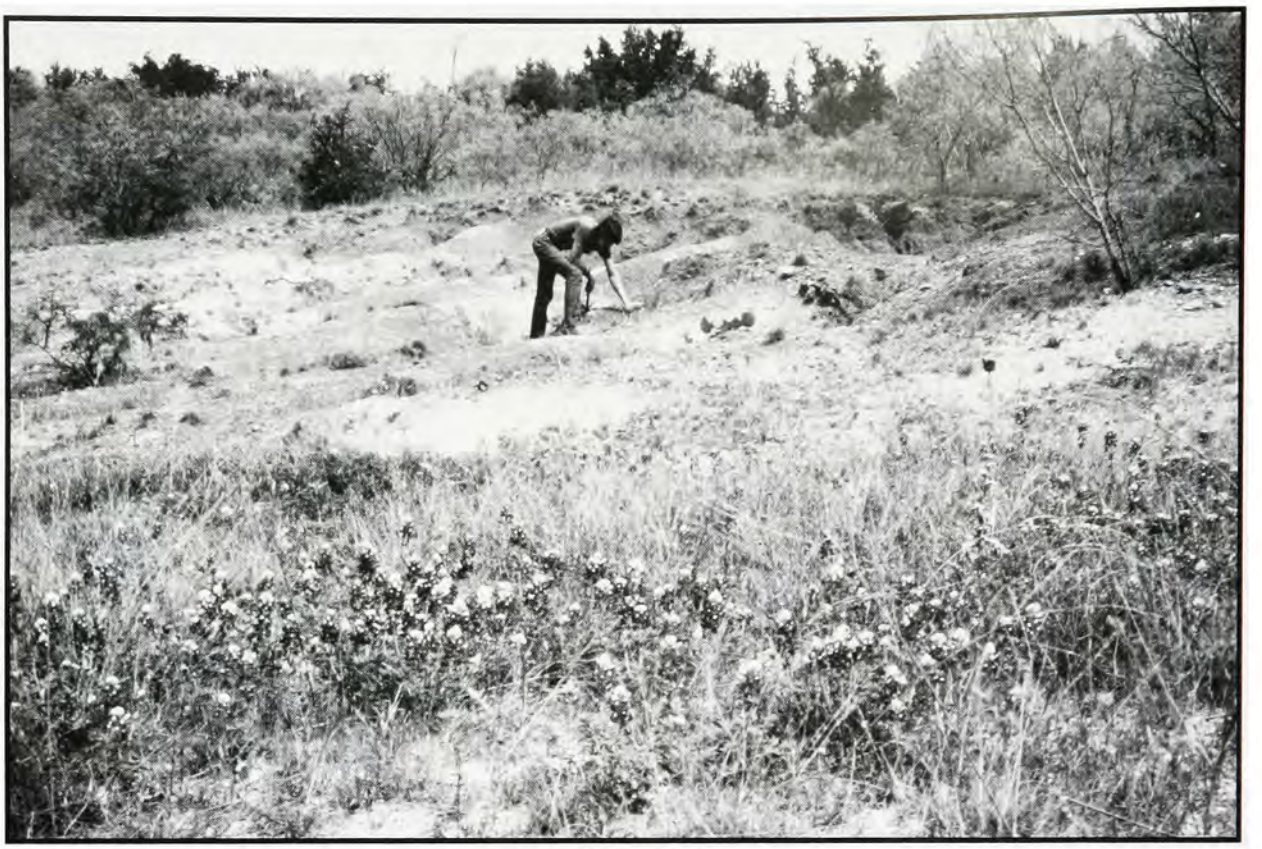
Some of the most scientifically significant fossilized dinosaur remains were discovered at FWD's Proctor Lake near Comanche in 1985. Paleontologists uncovered large numbers of complete dinosaur skeletons of creatures that lived over 100 millions years ago (Early Cretaceous Period), a time from which few large fossils had previously been recovered. These dinosaurs found at Proctor Lake were small (about 10 feet in length) and herbivores (plant eaters). The large concentration of both adult and juvenile fossils indicated that the area served as a nesting ground for the dinosaurs. The Corps has encouraged continued paleontological research at Proctor Lake and constructed an exhibit incorporating a prepared dinosaur specimen and related educational and interpretative material at the Proctor Lake project office.[17]

The Regulatory Program

The Corps' regulatory program is one of the oldest in the federal government. The Rivers and Harbors Acts of 1890 and 1899 established a permit program administered by the Secretary of the Army, acting through the chief of engineers, controlling most construction activity in or over the navigable waters of the United States. Section 10 of the Rivers and Harbors Act of 1899 prohibited the construction, excavation, or deposition of materials in, over, or under navigable waters without a permit from the Corps. Section 13 of the same act also gave the Corps regulatory responsibility over the discharge of refuse into navigable waters of the United States. Navigable waters are those waters subject to the ebb and flow of the tide shoreward to the mean high water mark and/or are used, or have been used in the past or may be susceptible to use, in interstate or foreign commerce. Without a permit from the Corps, discharges of refuse have been prohibited. Until the 1960s, the Corps based its permitting decisions solely on a proposed activity's effects on navigation.[18]

In the 1960s, as broader environmental concerns began to sweep the nation, the Corps expanded the public interest factors it used to evaluate permit requests. It began to include fish and wildlife, recreation, and water quality issues as well as the traditional consideration of effects on navigability in reaching permit decisions. The courts upheld the Corps' broadened interpretation of its permitting responsibilities, and passage of the Federal Water Pollution Control Act (FWPCA) of 1972 further expanded the Corps' regulatory program. Section 404 of the 1972 Act prohibited the discharge of any dredged or fill material into *all* waters (not just navigable ones) of the United States without a permit from the Corps. This later came to include the addition or redeposit of materials resulting from dredging operations, as well as from mechanized land clearing, ditching, channelization, and other ground disturbing activities. Subsequent court decisions defined "waters of the United States" in the broadest possible sense, including virtually all wetlands and isolated waters where the use, degradation, or destruction of such waters could affect interstate or foreign commerce.

The Clean Water Act (CWA) of 1977 amended the FWPC Act to strengthen and clarify the federal commitment to restore and maintain the chemical, physical and biological integrity of the nation's water. Congress continued the Environmental Protection Agency's (EPA) policy-making and oversight role in the program, while assigning the Corps the primary administrative responsibility for carrying out the program. Although not a comprehensive wetlands protection program, it provided the major authority for the federal efforts to stem the loss of valuable wetlands. The CWA exempted certain activities from Section 404 regulations, including normal agriculture, forestry, or ranching activities. The act also exempted work related to maintaining dikes, dams, breakwaters, causeways, or bridge abutments; construction and maintenance of farm or stock ponds, irrigation, or drainage ditches; construction of farm or forest roads; and congressionally approved projects with completed environmental impact statements. Many of the activities, however, would require a permit if their purpose was to convert an area of water to a new use, and the flow of such water was restricted or reduced thereby. Prior converted croplands are not waters of the United States, but the discharges associated with excavation activities do fall under the definition of dredged material discharges.[19]



Dinosaur remains, discovered at Proctor Lake during the mid-1980s. Paleontologists uncovered large numbers of complete dinosaur skeletons of creatures that lived over 100 million years ago (Early Cretaceous Period), a time from which few large fossils have been recovered.

Several federal resource agencies also played roles in implementing the Section 404 program. The most influential of these was the EPA, which had responsibility for defining the reach of the "waters of the United States" and for interpreting the extent of exemptions [Section 404(f)] under the Section 404 program. EPA also had veto authority [Section 404(c)] over all Corps-approved permits. Other federal resource agencies had agreements [Section 404(q)] with the Corps that allowed them to request review of district engineer permit decisions by higher authority within the Department of the Army. The Assistant Secretary of the Army for Civil Works, however, could refuse the request for an evaluation of a district engineers' decision. Finally, Section 401 of the CWA required state water quality certification prior to issuance of a Section 404 permit.

The Secretary of the Army delegated his permit authority under Section 404 to the chief of engineers and his authorized representatives. In practice, because of the decentralized nature of the Corps, district engineers made the decisions on permit applications. The processing of individual permits followed a three-step process: pre-application consultation, formal project review after a completed application has been received, and decision making by the district engineer. The decision whether to approve a permit was based on balancing input from a variety of sources, such as resource agencies, the concerned public, and the states, among others. The Corps called this process the public interest review, and it was conducted simultaneously with the Section 404(b)(1) guidelines evaluation. The purpose of the permit process was to reduce the potential impact of projects on the aquatic environment.

The Corps considered many factors in its public interest review. These included conservation, economics, aesthetics, wetlands, cultural values, navigation, fish, and wildlife values, water supply, water quality, and, in general, the needs and welfare of the public. A permit is usually granted unless the district engineer has determined that it would be contrary to the public interest. In some cases the district engineer will take into account any practicable alternatives to proposed activities and the possible beneficial effects of proposed mitigative measures to lessen the adverse environmental effects of proposed projects. In addition to the Section 404(b)(1) guidelines, the Corps considered three general criteria in evaluating permit applications:

- the extent of public and private need for the proposed activity;
- the practicability of using reasonable alternative locations and methods to carry out the proposed work;
- the extent and permanence of the effects of the proposed project on public and private uses to which an area is suited.

Most projects were modified to protect the aquatic environment or other aspect of the public interest. However, only about 600 activities nationally, or less than one percent of all actions, were denied per year. A memorandum of agreement between the Corps and EPA prescribed the type and level of mitigation necessary to demonstrate compliance with the Section 404(b)(1) guidelines and established the sequence of steps for evaluating proposed projects requiring permits.

Under the CWA, district and division engineers have had the authority to issue other types of permits. For example, letters of permission were used when a district engineer concluded that a proposed activity would not have significant individual or cumulative impact on the aquatic environment. The Corps issued general permits to cover activities substantially

similar in nature and causing only minimal individual or cumulative impacts. These permits applied to activities in a limited geographic area, a particular region, or the nation. Geographical or regional permits were handled by the Corps element whose boundaries encompassed such permits, while nationwide general permits were issued by the chief of engineers through the *Federal Register* rulemaking procedure. All permits, whether individual or general, initially involved public notice and opportunity for comment.

The Corps and EPA have had joint responsibility for monitoring and enforcement of Section 404 permit requirements. While criminal or civil action may be taken when violators are discovered, the Corps has generally preferred administrative remedies to correct adverse impacts. These remedial actions could entail some form of restoration or mitigation work by the violator. The Corps sought penalties and fines only in cases of flagrant or repeat violations. Each year, its districts processed about 5,000 violations nationwide. Eighty percent of the reported violations involved unpermitted discharges; the others were for noncompliance with permit conditions.

Nationwide, the Corps' regulatory program annually processed about 70,000 permits of all types, involving both Section 10 and Section 404 approval. The Corps attempted to process permit applications in a timely manner, with a goal of having 85 to 95 percent of all permit actions completed in less than 60 days. During Fiscal Year 1994, the average time for all forms of Section 404 permit authorization was 25 days. The average time for processing individual permits, however, averaged 115 days during FY 1994. To carry out this regulatory program required a budget of $106 million (FY 1998) and approximately 1,100 employees. Despite its heavy regulatory workload, the Corps' goal in administering the Section 404 program has remained focused on protecting the aquatic environment while providing fair and efficient decision-making for applicants.[20]

In implementing the Corps' Section 404 program, the FWD Regulatory Branch grew from 2 people in the early 1970s to 13 in the 1990s. Since 1992, the regulatory branch has been divided into two sections: processing and enforcement. Data collected by the FWD reflect the following workload trends:

FWD Regulatory Program Statistics*

Fiscal Year	1977	1982	1987	1992	1997	1998
Ind. Permit Application	47	86	58	19	108	53
Withdrawals	2	11	19	4	12	26
Ind. Permits Issued	38	71	26	16	18	17
Gen. Permit Decisions	0	420	12,184	246	1,057	1,116
Letters of Permission	0	12	22	2	61	26
Denials	0	1	1	0	0	0
Violations	0	63	39	42	121	153

*All Authorities (Section 10, 10/404, and 404).
Source: FWD, Regulatory Branch, Annual Regulatory Report, FY 1977-1997; Wayne Lea, personal communication with the authors, April 22, 1998.

The FWD regulatory program jurisdiction covered a large portion of Texas, encompassing 80,000 miles of streams and large sections of nine navigable rivers. Many types of development projects required Section 404 permits. The most common projects were stream channelization and reservoir activities. If the in-stream work was greater than 500 feet in length, an individual Section 404 permit was required. Development

activities causing the loss of natural stream channels in urban areas have been a big issue for the FWD regulators. Concerns over endangered species habitat in regulated waters also have become involved in permitting decisions. Finally, the aquatic effects of large-scale oil, gas and surface coal mining in eastern Texas has required consideration under the Section 404 program. Some of these activities were covered under four regional general permits, so that individual permits were not required if the applicant met certain conditions.[21]

The FWD strived to make balanced permit decisions within the Corps' goal of completing 85 to 95 percent of all permit decisions in less than 60 days and 70 to 80 percent of all individual permit decisions in less than 120 days. Between 1993 and 1997, FWD performed well within these goals, completing 93 percent of all decisions in less than 60 days and making 75 percent of all individual permit decisions in less than 120 days. Permit denials remained well under one percent of all permit decisions. The district resolved most enforcement actions through after-the-fact permits, voluntary restoration, or some other form of mitigation. Very few cases resulted in litigation or administrative penalties.[22]

Most Section 404 permits required some form of compensatory mitigation to replace those aquatic ecosystem functions lost or impaired by an authorized activity. Mitigation has included restoration, enhancement, creation, or preservation of wetlands and other aquatic resources. On-site or adjacent, as opposed to off-site, compensation usually was preferred to minimize losses to the affected aquatic environment. Under certain conditions, mitigation banking served as an acceptable form of mitigation. This approach has provided consolidated off-site compensation for numerous authorized activities in advance of adverse project impacts. Typically, a third party accepted the responsibility of designing, implementing, and assuring the success of compensatory mitigation for the permittee.[23]

By the end of 1997, the FWD had one mitigation bank in operation, two nearing approval, and two proposed and under evaluation. The first mitigation bank went into operation in 1995 to provide off-site compensatory mitigation for projects of the Texas Department of Transportation. This 2,500-acre tract enhanced and preserved high quality forested wetlands of the Sabine River floodplain. The chief issues involved in establishing mitigation banks have included the role of preservation, valuation of mitigation credits, inclusion of uplands in wetlands mitigation banks, consideration of in-kind mitigation and sequencing before using mitigation banks, as well as the burden of the approval process for the banks. The FWD recognized that mitigation banks would likely play an increasingly important role in the Section 404 program. The district worked with other federal and state agencies to improve the mitigation banking approval process, as well as the quality of the mitigation provided by the banks.[24]

The FWD also engaged directly in wetlands mitigation. When Congress cancelled the Superconducting Super Collider in 1994, the construction site remained as a wasteland. In a joint effort between the Corps and the Department of Energy, a 16-acre complex of grasslands, woodlands, riparian corridors, and wetlands was established behind Bardwell Lake. This undertaking mitigated for the losses created by the Super Collider construction. Named the Buffalo Creek Wetland, it was designed as an outdoor learning center to give school children and the general public the opportunity to view

the natural environment as it existed 150 years ago. The Buffalo Creek Wetland area helped preserve the diverse flora and fauna of the area around Ennis and Waxahachie, Texas. At the dedication of the wetland in April 1998, Alton Hurley, a Bardwell Lake park ranger, remarked that "no where else can you see such a variety in vegetation and landscape — everything from the wetlands to prairie grasses to hardwoods can be seen in this small area."[25]

As noted in Chapter One, the FWD, in an attempt to improve the science of constructed wetlands for mitigation purposes, initiated intensive research efforts at Ray Roberts Lake. Working with various state and federal resource agencies and a university, the FWD conducted a series of environmental studies between 1989 and 1999. The studies involved constructing wetland cells to monitor vegetation and wildlife utilization over time with the goal of achieving an improved understanding of how to create and restore viable, functioning wetland systems.[26]

The Section 404 regulatory and cultural resources management programs of the FWD have kept it in the forefront of the Corps' engagement with the nation's environmental and cultural concerns. Both programs commit the district to protecting the nation's aquatic ecosystem and cultural heritage. From efforts to ensure the federal wetlands goal of no overall net loss of the nation's remaining wetlands to the task of properly curating its sizeable archaeological collections, the FWD has sought to carry out its new environmental responsibilities efficiently and fairly.■

Paleontology laboratory.

TRINITY TRAILS

- Completed & Designated
- Programmed
- Sponsored

III. Recreation

"We're no longer in the business of supplying only flood control and water. Now we try to determine the best use for the entire reservoir system."
– Charles W. Screeton, Lavon Reservoir Manager, 1976

The Lakemakers

The FWD's 25 reservoirs have provided more than flood control and water supply. During the late 20th century, recreation became an increasingly important component of water projects. Among federal agencies, the Corps led the nation in providing water recreation, and devoted more funding to recreational programs than even the National Park Service.[1] This trend became particularly significant in Texas, which has relatively few national parks and forests to serve its large land area and population. The Corps' increasing involvement in recreation paralleled larger developments in the FWD. Initially, the agency focused on providing structures, such as boat ramps, marinas, picnic tables, and campsites, used in traditional recreation. By the 1980s, however, the FWD had turned to a non-structural approach to recreation — one that incorporated the environmental values described in previous chapters.

Recreation and the Corps' Changing Image

"To most of the public, the old Corps appeared more concerned with flood control and cool, military bearing than anything else. Few men became resident lake engineers before they were 40. The only time the Corps became vocal or visible was while catching an environmental hearing blast or chasing a fisherman from behind a dam.

Now, 'reservoir managers' are sometimes as young as 30 or so. The Corps appears to express more concern for public contact and acceptance.... The hat and the badge behind the "dam" were "replaced at Lavon with smiling faces, paved parking lots, restrooms and signs inviting the unfamiliar to 'fishing area[s].'"

– Dan Watson, *The Dallas Morning News*, May 8, 1976

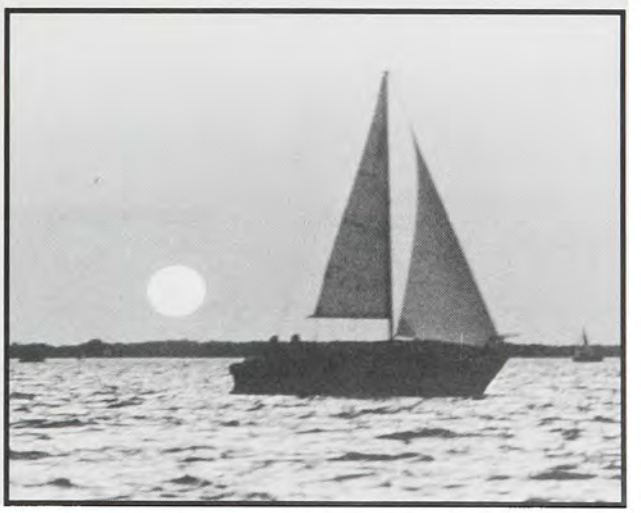
The Flood Control Act of 1944, as amended, provided authority for the Corps to construct, maintain, and operate recreational facilities for the public. It was not until the mid-1960s, however, that the agency became closely associated with this activity.[2] The "recreation business" developed during the last three decades, bringing considerable public visibility to the Corps, helping to broaden the agency's image. Lavon Lake in northeastern Texas, for example, became a "recreational showplace" during the mid-1970s, when the Corps added $7 million of amenities to its shoreline. These included boat ramps, picnic tables, and campsites. Of the 15,000 acres of public use area around Lavon Lake, 10 square miles became wildlife management areas that were open to hunters. As one observer noted, "To most of the public, the old Corps appeared more concerned with flood control and cool, military bearing than anything else.... The only time the Corps became vocal or visible was while catching an environmental hearing blast or chasing a fisherman from behind a dam." By the mid-1970s, however, the Corps had expressed "more concern for public contact and acceptance," and the

"hat and the badge behind the dam" were "replaced at Lavon with smiling faces, paved parking lots, rest rooms and signs inviting the unfamiliar to 'fishing area[s].'" As Charles W. Screeton, Lavon Reservoir manager explained, "We're no longer in the business of supplying only flood control and water. Now we try to determine the best use for the entire reservoir system."[3] Throughout the last 25 years, the Corps has increasingly applied the concept of multiple use to its reservoirs — and recreation has become a major activity.

Hords Creek, located in central Texas, further exemplified the growing importance of recreation to the Corps. When this reservoir was completed in 1948, little attention was devoted to recreational facilities. By the mid-1980s, the FWD had added picnic tables and boat ramps, enhancing wildlife areas with brush shelters and bluebird boxes along the dam. Project staff considered the aesthetic appeal of their improvements. Rather than using unattractive cables to barricade cars from park grounds, Manager Tommy Halfmann placed one-ton rocks, quarried during reservoir construction, in areas that were off-limits — giving the shoreline a more natural appearance. "I believe if you give visitors a quality product, they'll take care of it and will come to the lake again and again," he explained. So successful were his efforts that Hords Creek, the FWD's smallest reservoir, attracted 400,000 visitors per year. In 1987, the Southwestern Division, which oversaw 140 lakes in an eight-state area, named Hords Creek "Project of the Year."[4]

Cooper Lake similarly became known for its opportunities for recreation. The FWD funded the development of Cooper Lake State Park, a scenic area of rolling hills surrounding the water, in coordination with the Texas Parks and Wildlife Department. This $17-million facility, which opened in the mid-1990s, included 28 screened shelters and more than 100 campsites. According to Lake Manager Marilyn Jones, "this reservoir and its recreation facilities will prove to be a tremendous boost to the local economy."[5]

Fort Worth District reservoirs provide a variety of opportunities for recreation.

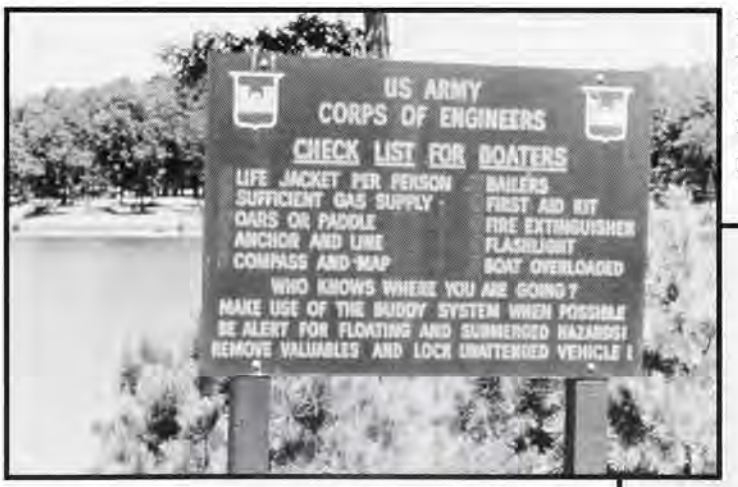


Promoting Water Safety

As visitation to the Corps' water projects increased, water safety became an especially significant, visible issue. The FWD's worst year for drownings was 1971, when 72 people died in the district's lakes. During the early 1970s, the agency's lake managers and rangers joined state and federal partners in a sustained program of public education on water safety. The Corps trained its rangers, sending them to National Water Safety Congress workshops.[6] FWD personnel also maintained a high level of interaction with the public outside the lakes. Rangers attended public events, including boat shows, to offer demonstrations on how to get into a life jacket during a storm, and other safety tips. Staff emphasized the importance of supervising children, and advised that boaters refrain from drinking alcohol while on the water. To increase their appeal to young visitors, the FWD's rangers dressed in Smokey Bear outfits, and the Lake Whitney staff used a robotic boat to teach kids about water safety.[7] Additional efforts to promote water safety included patrolling lakes in agency boats, and inspecting recreational facilities, such as boat ramps, docks, and marinas.[8]

By the early 1990s, the number of drownings had dropped to an average of 30 per year — a reduction of approximately 45 percent during a 20-year period. The number of visitors, however, continued to increase, requiring the FWD to remain vigilant on the issue of water safety.[9]

Lavon Ranger Darrell Johnson exemplified the new responsibilities that came with the expanded role of recreation in the FWD. Working at the lake since the 1970s, Johnson managed the water quality program, which involved testing and sampling at swimming areas, and monitoring 10 waste treatment plants. Due to the numbers of swimmers and boaters, water safety was a major component of this job. He supervised other park rangers in conducting boat patrols and teaching water safety to boaters and swimmers at FWD reservoirs. Johnson and other park rangers manned booths at boat fairs and special events to educate the public about water safety. In recognition of these efforts, the FWD named him Natural Resources Employee of the Year in 1994 — an award that indicated the growing importance of environmental and recreational values to the Corps.[10]



The Fort Worth District sponsors signs and billboards promoting water safety at its reservoirs.

Promoting Education

In addition to promoting water safety, the district participated in educational programs. Many of the Corps' reservoirs featured a visitor center that offered information on the area's flora and fauna as well as recreational opportunities. Wright Patman Lake in northeastern Texas, for example, maintained a dry aquarium that included a stuffed alligator. North of the Metroplex, the district entered a cooperative agreement with six area universities and the Lewisville Independent School District to create a facility for aquatic habitat research and outdoor education. Established in the early 1990s, this facility, called the Lewisville Lake Environmental Learning Area (LLELA), was connected to a wing of the Corps' Waterways Experiment Station in Vicksburg. The FWD served on the LLELA's board as a non-voting member. Located on approximately 2,000 acres downstream of the Lewisville project, the LLELA was close to the Metroplex, encouraging the participation of thousands of students enrolled in the area schools and universities. As one observer summarized, "the LLELA has the potential to become the hub of environmental education activities in North Texas."[11]

Fort Worth District personnel participate in outdoor education programs.

FWD personnel promoted additional educational programs. Ricky Raymond, a park ranger at Sam Rayburn Reservoir in eastern Texas, for example, visited schools and shopping malls during the mid-1990s to talk to children about the natural world and human impacts on plants and animals. He and other rangers initiated a program called "Project Wild" for elementary students, which involved a computer game called "How Many Bears Live in the Woods?" Raymond reflected the changing background of FWD personnel. With a degree in Fisheries and Wildlife Management, he helped coordinate a wildlife maintenance program at Sam Rayburn Reservoir. In 1996, the Corps named Raymond the Natural Resources Employee of the Year, for exemplifying the increasing professionalism of FWD rangers.[12]

Balancing Diverse Interests

These activities have helped to make recreation one of the most visible components of the Operations Division. The only direct contact that much of the general public had with the FWD involved recreation at Corps lakes. "That's what the public sees and that's what they use," Jim Hair, a former Executive Assistant, explained in 1998. Kenneth Howell, assistant to the Chief of Operations, similarly observed the high level of visibility that recreation brought to the FWD, along with the additional responsibilities. "If we don't have a clean restroom or we don't have the grass cut, people complain," he noted. "They come [to the Corps' reservoirs] to get rid of stress, not to take on some more."[13]

From 1975 through 1999, the need to interact with the public and seek input from local communities has increased — and this point was especially significant for recreational facilities. According to Howell, before the 1970s, "we pretty well just went out and told people how we were going to do things. We can't do that anymore. People have their congressman on their speed-dial." For that reason, staff at FWD lakes held "information exchange meetings" with community leaders to discuss plans for the projects and to share their expectations and concerns. "They're our customers and we need to listen to them," Howell concluded. This consultation with the public represents a significant trend in the district during the last 25 years.[14]

Recreation at reservoirs encourages interaction between Fort Worth District staff and the general public.

Flooding sometimes results in the closure of lake parks in the Fort Worth District.

Competing interests among customers complicated the operation of FWD lakes, affecting recreational activities. On the Guadalupe River, for instance, a variety of businesses associated with canoeing, rafting, and tubing requested a slow, steady release of water at the Corps' Canyon Dam in south central Texas.[15] During floods, however, interests located upstream favored releasing the water quickly to protect lands above the project. Moreover, flooding often resulted in closure of lake parks throughout the FWD, prompting an outcry from visitors. "There's a balance of

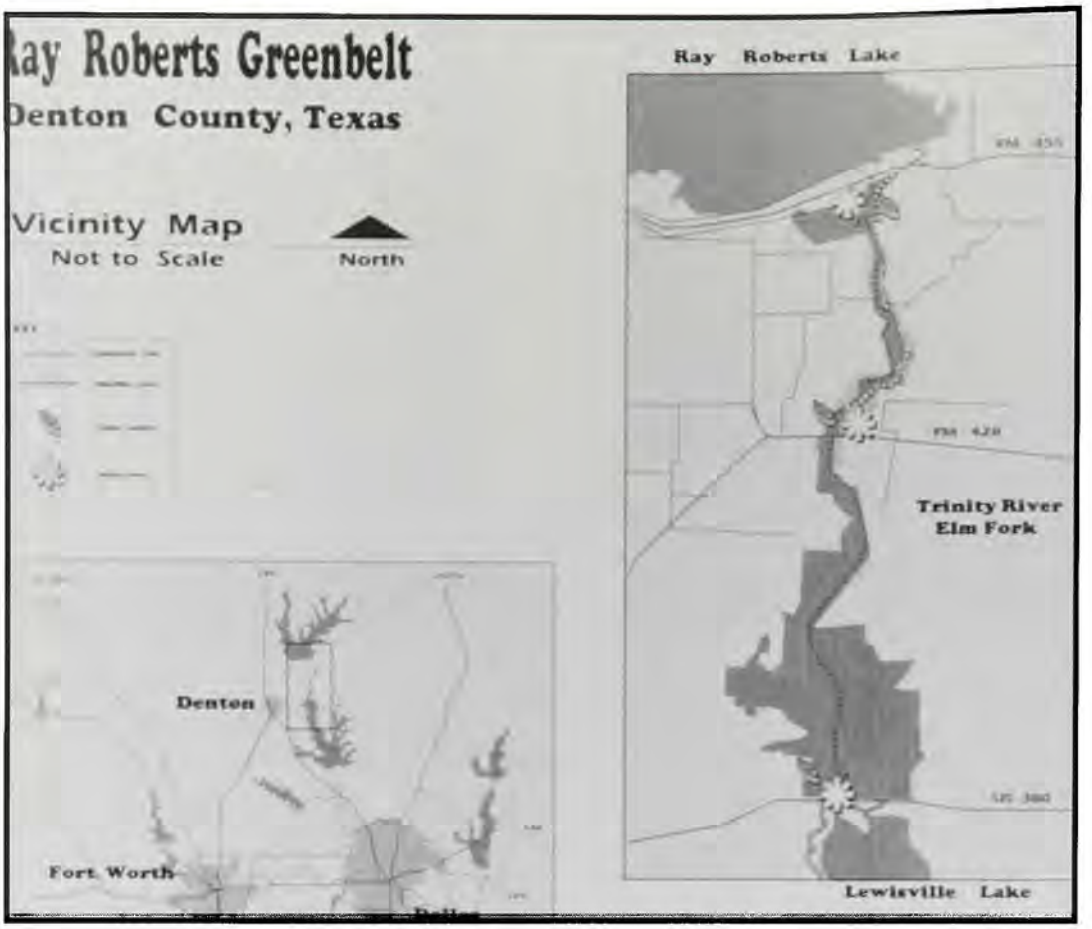
interests that has to take place," Howell explained, "because the lakes [have] a large economic impact on the community and we have to realize that."[16] Sally Werst, a former Public Affairs Officer, agreed, noting that the FWD increasingly has had to satisfy the needs of "many publics," in recreation as well as in other areas.[17]

Balancing these diverse interests sometimes created public-relations problems for the agency. As Werst observed, "it used to be that... the great majority of people felt that the Corps of Engineers were the bulldozers of the world" with "absolutely no concern for the environment."[18] This perception extended beyond the agency's dams to its recreational facilities. During the 1970s, environmentalists criticized the Corps for its emphasis on meeting "flat-water recreation demands" instead of adopting passive, non-structural approaches that would leave land and water areas in a more natural state.[19] A number of projects in the FWD, however, demonstrated the Corps' responsiveness to changing values, which forged a "new public perception" of the agency, improving its image during the last two decades.[20]

A Non-Structural Approach to Recreation

A greenbelt corridor linking Ray Roberts Dam and Lewisville Lake north of the Metroplex exemplified this shift away from traditional development of recreational facilities, marking a new direction for the FWD. The corridor, located along the Elm Fork of the Trinity, encompassed approximately 8 river miles between the two projects, totaling around 1,600 acres. It included croplands and pastures, as well as bottomland woods of elm, hackberry, and oak trees. This strip of land — much of which remained in a natural state — was a remnant of an earlier era in Texas, and it was vulnerable to future development as the City of Denton expanded northward.[21]

The initial suggestion for the greenbelt corridor appeared in 1974 in a general design memorandum for Ray Roberts Lake. The U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department endorsed the proposal, requesting that the Corps investigate further. By the early 1980s, the cities of Dallas and Denton had requested that the Corps study the



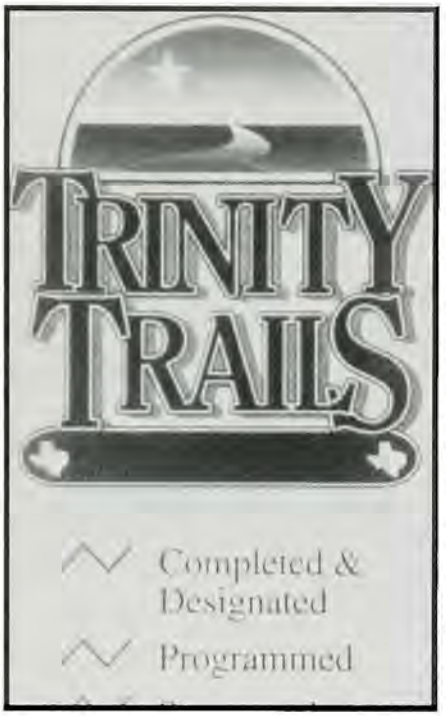
feasibility of creating the greenbelt corridor in lieu of building a lakeshore park for recreation. In 1983, the FWD issued a public notice recommending that a greenbelt be implemented instead of constructing traditional lake facilities. The reasons for this recommendation included monetary savings to the federal government and local sponsors; lower operation and maintenance costs; and the opportunity to provide a unique form of recreation.[22]

In 1983, Dallas and Denton expressed their desire to participate in the project, and agreed jointly to pay 50 percent of the cost of its development. The Federal Reservoir Recreation Act of 1965 had required that a sponsor assume half of the cost for recreational development and that another agency assume responsibility for operation and maintenance. Accordingly, the Texas Parks and Wildlife Department was to assume operation and maintenance responsibilities for the greenbelt corridor. Initial costs, amounting to approximately $3 million, were shared among this agency, the cities of Dallas and Denton, and the FWD. Plans called for recreation trails, primitive campsites, and access points.[23]

For the most part, public response to the idea proved to be favorable. Environmentalists expressed "overwhelming support" for the greenbelt corridor. The Lone Star chapter of the Sierra Club and the FWD became "unusual allies" in recommending the project. Landowners in the area, however, opposed it, not wanting to sell their property.[24] At a public meeting in Aubrey, Mary Lynn Beaty, for instance, argued that the Trinity is a muddy, murky, and essentially unappealing river. "It's not going to be the Guadalupe," she warned. "It's not going to

be the clear blue... water you want to inner tube on. If you do, you'll get snake bit."[25]

Boaters who had floated down the project's stretch of river disagreed, and once again the Corps was faced with balancing opposing interests. As Marty Hathorn, an environmental resource specialist with the FWD, pointed out, "I wouldn't anticipate that 100 percent of the landowners would agree to anything.... Our goal is to satisfy as many people as possible."[26] Hathorn further viewed this project as on the cutting edge of recreational planning. According to him, "for the greenbelt concept to be implemented by the Corps in the state of Texas would be unique."[27]



Due to the landowners' objections, the Southwestern Division initially was reluctant to approve the project without review from Washington — and for much of the 1980s the project remained in limbo. In 1990, the Water Resources Development Act authorized it, and the FWD assisted the Texas Parks and Wildlife Department in selecting and purchasing the land. Completed in 1998, the greenbelt corridor operated as an extension of Isle du Bois Park, located on the southwest side of Ray Roberts Lake. Dallas and Denton continued to serve as co-sponsors, with the Texas State Parks and Wildlife Department acting as their agent.[28]

This greenbelt included equestrian trails — an especially appealing feature in a region with many horse owners. It also included hiking and bicycling routes, along with canoe launches. The long-term objective was to link this project with "The Trinity Trails Project," which included a system of trails from South Dallas County to the Oklahoma border. The greenbelt corridor provided much-needed recreation for a heavily populated area in North Texas, encouraging passive, linear activities that left a minimal impact on the environment. It became a showpiece by meeting recreational needs in a manner that also protected natural resources, wildlife habitat, and water quality.[29]

The White Oak Creek Wildlife Management Area (described in Chapter One) also combined environmental protection and recreation. Located approximately 60 miles downstream from the Cooper Lake project, it included 25,000 acres set aside as mitigation for the loss of bottomland hardwoods inundated by the reservoir. While providing habitat for waterfowl, wild turkeys, deer, and non-game species, it provided

opportunities for hunters, anglers, birdwatchers, hikers, and picnickers.[30]

Canyon Lake, located between Austin and San Antonio, similarly featured a Wetlands Enhancement Project that offered habitat for waterfowl as well as trails, observation platforms, and interpretive signs for hikers and birdwatchers. The FWD constructed this area in 1995, in partnership with Ducks Unlimited and the Soil Conservation Service. It quickly became a focal point for the local communities, bringing volunteers together from the Boy Scouts and local environmental groups, who assisted in repairs and maintenance.[31]

A small, non-traditional project at Wright Patman Lake also brought the FWD and community groups together. This reservoir's scheduled low-water period coincided with the winter migrations of numerous species of waterfowl, making it a favored spot for birders. As a result, the Sulphur River Chapter of Waterfowl U.S.A. requested that a special observation deck be placed over mud flats near the reservoir, allowing visitors the opportunity to watch the variety of shore birds that used this habitat. Completed in 1997, the deck and stone trail leading to it resulted from a joint project for the FWD and the Sulphur River Chapter, which contributed more than $14,000 for its construction. Corps officials met with chapter members to dedicate the new deck, which the FWD owned and maintained. "We wanted this deck because the general public has expressed an increasing interest in bird-watching activities here," explained Park Ranger Mike Bransford. "We now have a quality facility for the public without the expenditure of tax money. It's a win-win situation — a highly visible project, a wide range of users and a guarantee for future maintenance and repairs."[32]

Recreational activities at other FWD projects similarly brought communities together. As Sally Werst recalled, the Corps organized lakeshore cleanups, starting in the mid-1980s. At these events, volunteers collected trash for a morning, receiving prizes for the most unusual garbage. Noteworthy items discovered along the lakeshore at the Grapevine project included a love letter, a toilet, and a man's suit on a hanger — all of which had been discarded. "You couldn't make this up if you tried," Werst commented. The Corps also participated in community picnics and plantings of wildflowers at the lakes.[33]

The FWD's lakeshore cleanups continued through the 1990s. An Earth Day celebration at O.C. Fisher Lake near San Angelo, for instance, attracted more than 1,200 volunteers who picked up litter and helped clear horse trails in 1992. "You could tell it was a great success because the kids still had smiles on their faces and were very energetic after working all morning," observed Reservoir Manager Doug Cox. "Let's hope it will instill in the kids environmental respect for the Earth which will last the rest of their lives." A variety of organizations joined the FWD in this effort, including the Sierra Club, Girl Scouts, San Angelo Friends of the Environment, and the Texas Parks and Wildlife Department.[34]

Increasing Visitation and Decreasing Funding

Involvement in recreation had its drawbacks. Lack of funding for recreational facilities at Corps projects became a serious concern, particularly given the growing number of visitors. By 1983, Texas residents had registered more than 580,000 boats. "And that doesn't count canoes and rowboats," explained Texas Parks and Wildlife Department official Larry Williford. "Anyone going to a lake ... had better be prepared for company."[35]

During the 1990s, lakes near large metropolitan areas — such as Lewisville — received more than two million visitors per year. With this large number of people, the average of 2-to-5 rangers assigned to each project did not stretch very far. Canyon Lake, for example, received 1.5 million visitors annually, with as many as 50,000 to 75,000 people at the lake on spring and summer weekends. That project employed four rangers to cover three shifts per day, seven days per week. Overcrowding and lack of staff added an element of tension. "The problems of the city show up in the parks," noted one ranger from Canyon Lake, who described his reservoir on busy weekends as an "outdoor bar." With so many visitors, the setting hardly appeared natural — or even pastoral. The large numbers of people rafting and tubing on the Guadalupe River outside the project further "changed the complexion" of the area.[36] This congestion added to concerns about water safety. As one long-time visitor to Grapevine Lake commented, "it's crowded. I don't go there on the weekends anymore, at least not in the summer. If you see one Jet Ski out there you see 6,000."[37]

The Corps began addressing these problems as early as 1979. That year, the agency, faced with projected budget reductions, initiated a nationwide effort to increase the efficiency and quality of park management, and to reduce recreation costs. One-quarter of the lakes affected were located in Texas.[38] By 1982, the Corps had closed approximately 13 parks in Texas, including more than 50 boat launch areas. In December of that year, Perry Robinson, recreational resource management chief for the FWD, pointed out that "We're expecting a 15 percent (budget) cut this year and had a 10 percent cut last year." Keeping boat launches open without maintenance was not an option, he explained.[39]

This action prompted widespread concern among boaters and other visitors. The Sierra Club issued a statement opposing the closings of the parks "because Texas is very short on park land in terms of the state population." As a result, the State Attorney General filed suit against the Corps, noting that the agency should have first filed an environmental impact assessment that incorporated public comments. [40] State and federal legislators followed the suit with interest, expressing disapproval of the Corps' action. The closure of facilities at heavily used lakes

such as Lewisville was especially troubling. As Lake Manager Gary McKean noted in 1983, however, "You have to be practical about this.... If they want to force the issue they'd better give us the funding to do what needs to be done."[41]

Budget-deficit legislation in 1993 provided some resolution to these problems. It allowed the Corps to collect day-use fees of up to $3 per vehicle at its reservoirs. The resulting fee program generated more than $800,000 annually in new revenue for FWD lakes, for operation and maintenance of recreational facilities.[42] This development sparked protests from visitors who had become accustomed to using boat ramps and swimming beaches for no charge.[43] The Corps, however, was not the only agency

facing a budget problem. The Texas Parks and Wildlife Department also proposed raising fees at its facilities. "Times are tough in the park business," the *Dallas Morning News* reported in 1995.[44]

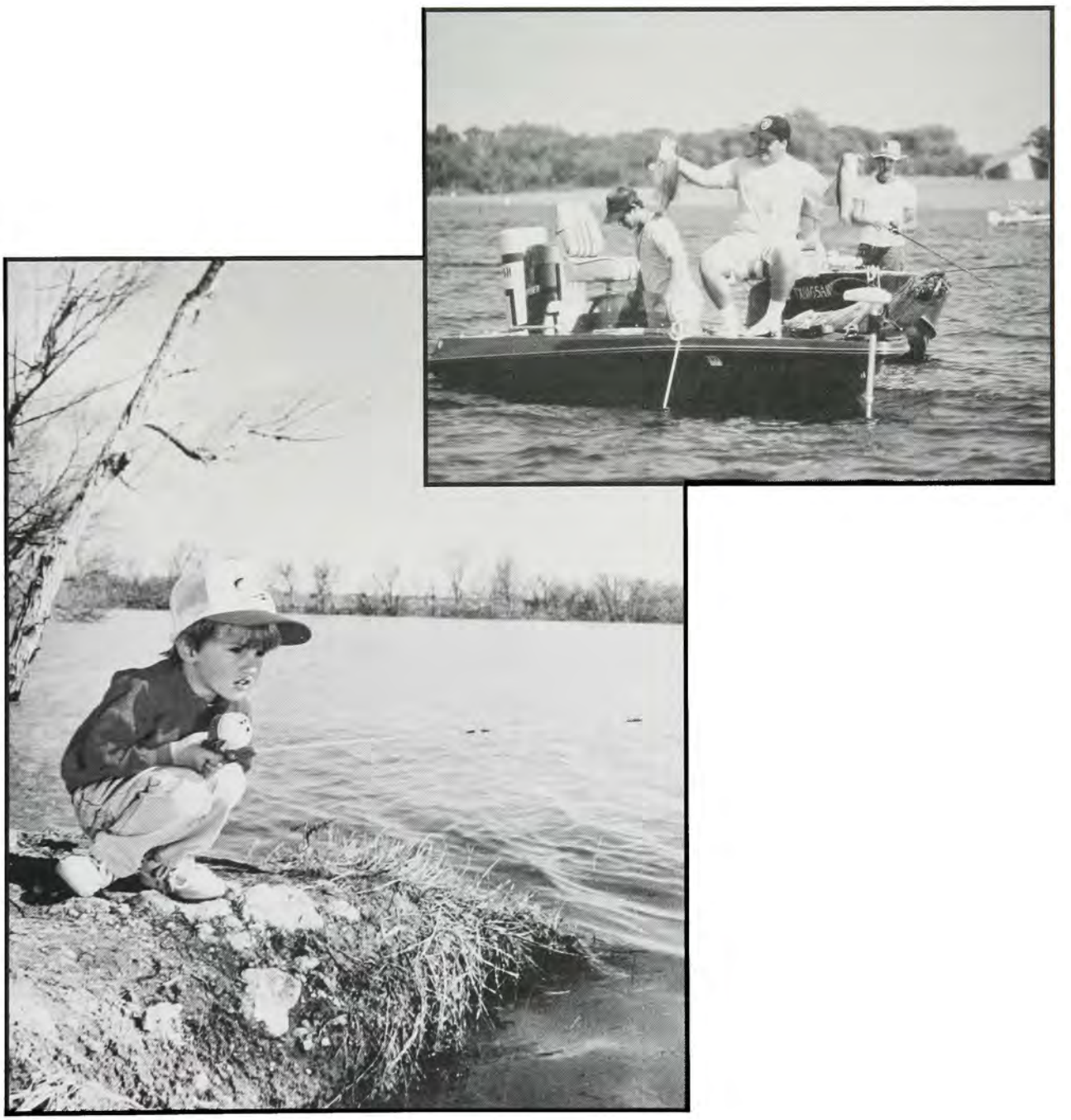
By that time, the Corps had turned over recreational authority to other agencies at Joe Pool, Ray Roberts, and Cooper lakes, as required by the Federal Reservoir Recreation Act. When the agency released a Recreational Partnership Initiative inviting private developers to lease several parks in the FWD, some residents of the Metroplex protested. One spokesman for Texas Black Bass Unlimited conceded that FWD facilities "are not paying for themselves," but urged the Corps to consider the large numbers of visitors "drawn to fishing and hiking because they are inexpensive hobbies." In a state with relatively few federal parks and forests, the public in Texas had come to depend upon Corps projects for recreation.[45]

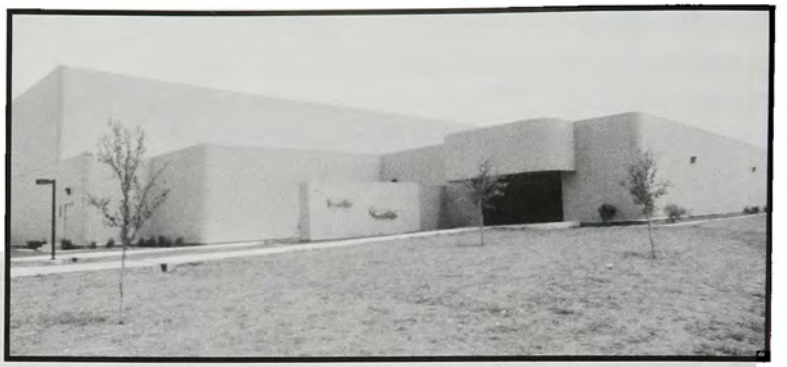
Recreation and the Future of the FWD

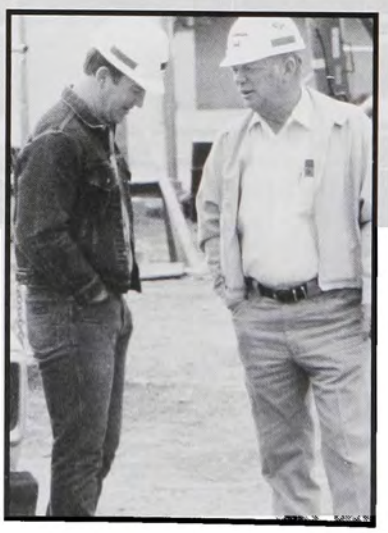
Ambivalence within the Corps further complicated these issues. "We are in the recreation business but we act like we're not," observed one ranger in 1998.[46] Jim Hair offered a similar assessment. "The Corps has no interest in recreation," he asserted. The "recreation business ... is as low as you can get on our list of priorities."[47] *The Dallas Morning News*, too, reported that the Corps "would just as soon be out of the recreation business."[48] By law, navigation, flood control, and generation of hydropower had remained higher priorities for the Corps.[49] The agency had viewed itself as a builder of dams for so long that it was difficult for some staff to take recreation seriously as a mission. Even so, the involvement of biologists and landscape architects in projects such as the greenbelt corridor and the White Oak Creek Wildlife Management Area demonstrated that attitudes within the Corps were changing. The FWD's role in providing non-structural recreation indicated an increasing environmental awareness as well as a growing recognition of the need to please customers.

For some employees, recreation exemplified the range of services and skills that the FWD could offer residents of Texas. Bill Cotten, a recreation planner and landscape architect in the Evaluations

Branch, believed that the FWD occupied a unique position, able to bring a regional or statewide perspective to projects such as the greenbelt corridor. The Corps also functioned as coordinator in recreation projects that involved smaller agencies and municipalities. "We have prided ourselves on being a great engineering institution," he noted in 1998, "but that's not enough anymore. There is an engineering consultant on every corner." Cotten predicted that the FWD's ability to view projects "holistically," in terms of "multipurpose usability," would help sell projects in the future — and recreation would continue to be a major part of that trend.[50] ■







IV. Military Projects

"Within the Corps of Engineers, those districts that have only civil functions tend to have a totally different character than those that have both civil and military .... The sense of urgency and listening to what the customer has to say — I think you're going to find it more in the military side. And of course that character spills over into the Fort Worth District."

— Former District Commander John Schaufelberger, 1998

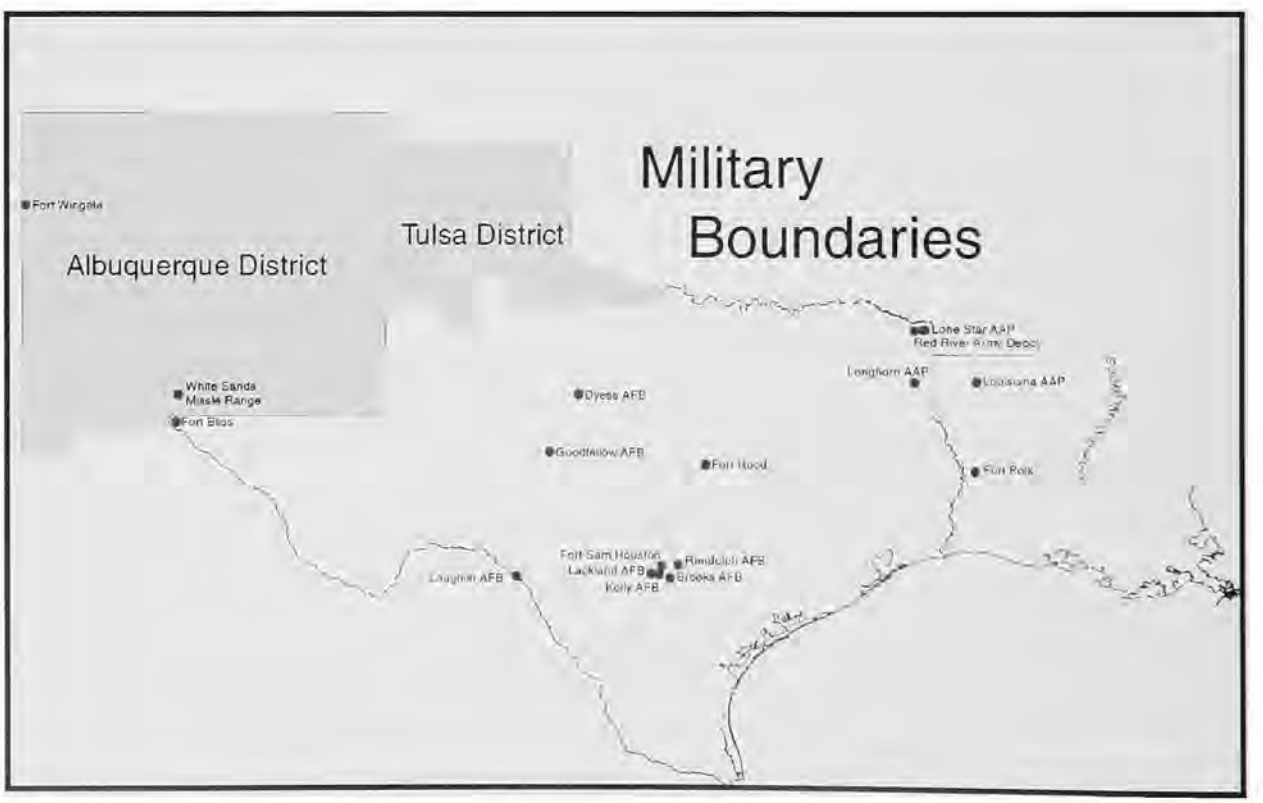
A Military Character

The FWD would have a very different character without its military work, which accounts for the district's status as one of the largest in the Corps in terms of staff and workload. While the district's initial mission in 1950 focused on flood control, by the 1980s, military projects had accounted for approximately 80 percent of the workload. During the 1980s, the Corps' work on military projects — particularly its construction of military facilities — helped offset the decline in large-scale water projects. Despite a decrease in military work after the end of the Cold War in 1989, this sector continued to comprise a significant amount of the district's workload. In the 1990s, the military workload averaged around $500 million per year, while the civil side averaged around one-fifth of that amount. "It's our bread and butter," explained Larry Rogers, Chief of the Military Branch in the Programs and Project Management Division (PPMD).[1]

The FWD's military work dated to the Korean conflict in the early 1950s — and throughout the 1950s and 1960s, the Cold War ensured a continuing interest in expanding military facilities. Fort Hood, once the nation's largest military installation, exemplified the defense buildup during this period — and it became the focus for much of the FWD's construction work. During the Carter Administration in the late 1970s, the district's military work extended to environmental projects, including cleanups of hazardous waste sites — a significant trend that continued throughout the next three decades. The Reagan Administration in the 1980s encouraged expansion of military facilities, securing the FWD's prominence within the Southwestern Division as well as within the Corps in general. At that time, the district handled all the military work for the division, in an area encompassing five states. In the late 1990s, the FWD's military responsibilities included 17 military installations located in Texas, Louisiana, and New Mexico. Between 1975 and 1999, military projects ranged from the routine — such as construction of barracks — to the highly specialized — such as building the high energy laser test facility at White Sands Missile Range in New Mexico. In addition, the FWD served as headquarters for the Reinvention Center for District Installation Support, and it assisted Army and Air Force Reserve Center customers in Texas and Louisiana.[2]

This work has distinguished Fort Worth from other districts. According to John Schaufelberger, who served as District Commander in the late 1980s, "within the Corps of Engineers, those districts that have only civil functions tend to have a totally different character than those that have both civil and military." Districts that have large military programs include "a lot of civilians who volunteer to go to overseas assignments." Many FWD personnel traveled to Saudi Arabia, for instance, to support Corps projects. Working abroad, these civilians acquired a diversity of skills, along with a cosmopolitan outlook. "They have experienced other settings and environments," Schaufelberger observed — a trait that perhaps made them more responsive to the needs of the military. In his opinion, customers on the civil side were easier to please. "They're not near as demanding as the military, whether it be the Army or Air Force," he explained, "so the sense of urgency and listening to what the customer has to say — I think you're going to find it more on the military side. And of course that character spills over into the Fort Worth District." In Schaufelberger's estimation, the receptivity to customers and the business sense that characterized the district since the 1980s have resulted from its military work.[3]

Rogers similarly observed considerable variation between civil and military work. "They're just two very different beasts," he commented in 1998. The process for getting civil projects underway is a lengthy one: "You're usually talking about a cost-shared situation now with local sponsors and you've got to go through all these hoops to identify the most economic project and get everybody bought into sharing the cost." The customers for military projects, on the other hand, "already identified and scoped the project and submitted it up through their [command] channels to where it



The Fort Worth District constructed this tactical vehicle wash facility at Fort Hood.

eventually winds up in Congress," thereby speeding up the process for approval. "Almost without exception, military [work] happens faster," he noted.[4]

Once approved, military construction often proceeded on a quick timetable, presenting further challenges for the FWD. During the military buildup of the mid-1980s, Fort Hood needed airfields and associated buildings to support Apache helicopters. The Central Texas Area Office (CTAO) had only 600 days to build one large hangar — a deadline that it met.[5]

Also, military projects typically affected a smaller area — often within existing installations — than did large-scale civil projects. Reservoirs, for example, inundated enormous sections of land, sometimes requiring extensive acquisition of real estate. Large-scale civil projects also prompted environmental concerns, further complicating interaction with the public. As noted, Cooper Dam had a long history, due in part to environmental issues that slowed the process for approval and construction. Like Schaufelberger, Rogers suggested that the relatively quick approval process for military work — and the rapid turnaround for completion — helped encourage FWD personnel to become more responsive to customers.[6]

Most FWD staff who worked on the military side agreed that their customers, who included the Army and the Air Force, were especially

challenging. The technological requirements of military customers, for example, increased the difficulty of their projects. John Riddle, area engineer at the CTAO, recalled that the medical equipment for a hospital rehabilitation project at Fort Hood changed so rapidly that engineers "had to keep modifying the design to accommodate it." Hospitals, he pointed out, "like to have the best technology" — which frequently meant the latest technology.[7]

Schaufelberger, too, mentioned the difficulties of hospital rehabilitations. The FWD, for example, renovated a large medical facility at Carswell Air Force Base while it was still in use. "We were able to work around," he recalled, "moving emergency from one area to another." Physicians at military facilities also could be demanding. "Doctors are very good at doctoring," Schaufelberger explained, "but they don't know a lot about construction and they want things that may not be realistic or cost effective." Yet "meeting their requirements was very important."[8]

Both Riddle and Schaufelberger stressed the importance of listening to military customers and building a rapport with them — characteristics that became increasingly significant to the success of the FWD. "The key to keeping good relations [with customers] is integrity," Riddle suggested. "If you tell them you're going to do something, you do it."[9] To ensure effective communication, the Military Branch in the PPMD distributed surveys to their customers each spring. Military personnel at all levels filled out these evaluations — from the Directors of Public Works at Army posts and Base Civil Engineers at Air Force bases to real estate representatives and environmental officers. According to Rogers, in 1998 "we received our highest scores on questions related to making the customer a part of the team and involving them in our work for them." These scores reflected "the results of good customer care." Even so, Rogers was careful to urge the Military Branch not to rest on its laurels. "There is room for additional improvement," he cautioned, especially regarding the price of the Corps' services. "We must continue to focus on the cost of doing business."[10]

The end of the Cold War and the reductions in military spending in the 1990s heightened the need for this concern about costs and customer satisfaction. Another trend during the 1980s and 1990s was the need for military work to incorporate environmental values. What follows is a description of how the FWD's military projects reflected these developments.

Construction at military installations accounts for the district's status as one of the largest in the Corps in terms of staff and workload.

Fort Hood

No military installation has been more influential in Texas than Fort Hood — the FWD's biggest customer. Named for John Bell Hood, a Confederate general who led the Texas Brigade during the Civil War, this installation was established in 1942 in central Texas, west of Temple and Killeen. Fort Hood operates under the command of the United States Army Forces Command (FORSCOM). Its primary mission is the training, housing, and support of III Corps with its two divisions, the 1st Cavalry and the 2nd Armored Division.[11]

During the last 25 years, III Corps forces were involved in operations throughout the world, including Grenada, Panama, Honduras, Saudi Arabia, Kuwait, and Iraq. III Corps forces also supported Operation Joint Endeavor in Bosnia and Herzegovina as well as Operation Restore Hope in Somalia. For many years, III Corps' primary objective was the reinforcement of NATO, maintaining a state of readiness for combat missions.[12]

Fort Hood proved to be an ideal training ground for the III Corps' activities. Encompassing more than 200,000 acres, it featured a varied terrain of wooded and open areas that enabled military forces to gain experience in diverse conditions. The heavily forested area near Lake Belton, for example, provided effective training for maneuvers in jungles. "This closely wooded area does not have the same vegetation as in the jungle," observed General Robert M. Shoemaker, "but it presents the same problem militarily." Moreover, Fort Hood's remoteness from major population centers allowed for maneuvers and live-fire exercises involving cannons, bombs, airplanes, and helicopters — with relatively few complaints from civilian neighbors.[13]

With approximately 40,000 troops stationed at Fort Hood, this post has functioned much like a city. Retirees and military dependents brought the population of the area to around 150,000.[14] "It's an incredibly large installation with vast needs," Larry Rogers explained. "You start thinking about taking care of all the water systems and the sewer systems and the gas distribution systems and the powerhouses and then all of the buildings. They've got 26 million square feet of buildings." These include troop housing, family housing, administrative facilities, medical facilities, commissaries, gymnasiums, hangars, and tactical vehicle maintenance shops. The FWD constructed, maintained, and rehabilitated these facilities. "Fort Hood in round numbers is at least a third of our military workload in any given year," Rogers commented. "It's a very important installation."[15]

So important was Fort Hood to Texas that by 1990 it had become an "economic colossus." At that time, it provided the largest single payroll in the state, bringing $1 billion a year to the local economy. Some residents viewed Fort Hood as a stabilizing force in a region subject to the fluctuations in oil and agriculture prices.[16] The towns in the vicinity were oriented around the base, with 70 percent of the adults working there. As Rick Murphy, president of the Killeen Chamber of Commerce, pointed out in 1990, "This community is the U.S. Army." The prominence of Fort Hood increased the prestige of the district's work there.[17]

Many large construction projects at Fort Hood involved housing. The move to an all-volunteer Army in 1972 made it necessary to improve conditions for soldiers, and that included providing more appealing living quarters. Accordingly, the FWD designed and constructed new barracks at several bases. These were large construction projects that included multiple components. Each complex included a laundry facility,

dining area, gymnasium, chapel, and a headquarters and supply building.[18]

The design of an enormous barracks complex in the late 1990s exemplified this development. This project, which replaced an old barracks complex, included rooms for 408 soldiers, a community building, dining facility, three administrative buildings, and a central energy plant. A sign outside the barracks read, "III Corps and Fort Hood: Keeping Our Promise to Soldiers," reflecting the commitment to provide them with high-quality living facilities.[19]

Many large construction projects at military installations involved housing. The move to an all-volunteer Army made it necessary to improve conditions for soldiers, and that included providing more appealing living quarters. Additional facilities for families, including child development centers, further boosted morale and encouraged re-enlistment.

This was a highly visible project that quickly attracted a number of visitors. Colonel Richard Craig, the installation's director of Public Works, praised the complex as "the most modern set of facilities" in the U.S. Army. "As a soldier who's got 30 years in and started out as a private living in the open barracks," he mused, "it's absolutely amazing to me the progress we've made in providing a real lifestyle for the soldiers living in the barracks."[20]

Private Joshua Zinn of the 504th Military Intelligence Brigade agreed. He moved from the old barracks on

West Fort Hood into the new complex in 1998. In his former quarters, Zinn shared a bathroom with 27 soldiers and had to walk to the day room to use the microwave. The new barracks provided him a private room within a suite with a bathroom and kitchen that he shares with only one other soldier. "They're a lot better than the last ones we lived in — *a lot* better," he observed. "We have a lot more privacy." Harold Molnes, the CTAO's on-site representative, similarly noted that the new barracks were well received. According to him, "the soldiers and the commanders are happy." Colonel Craig pronounced the barracks project a success: "We're covering the whole gamut of what a soldier's life is all about at West Fort Hood. It's all being improved, and a great deal of it is with the Corps of Engineers."[21]

Another significant development at Fort Hood involved privatizing family housing. During the 1980s, the military implemented the 801 program, authorized by Section 801 of the Military Construction Authorization for Fiscal Year 1984. This was a build-to-lease program for family housing that enabled the military to enter into long-term contracts with private entities, who in turn financed, constructed, and maintained the buildings. The program's objective was to provide family housing quickly and to extend the federal government's payment schedule, thereby avoiding immediate, significant increases in the defense budget.[22] This program became important at Fort Hood — an installation with a large number of housing units. As John Riddle pointed out, "maintenance is always an issue." He believed that the 801

program resulted in "better quality" housing, because the contractor had to maintain it. "There is a big difference between the 801 housing and the government housing," he observed. At Fort Hood, the 801 buildings included brick construction and were more attractive. Moreover, "in the long run it was cheaper" for the government to turn over these projects to private contractors.[23]

By the 1990s, much of the Fort Hood's family housing had turned 30 years old. Many units were badly in need of rehabilitation, while some were beyond repair — and an additional 1,000 new four-bedroom units were needed for enlisted soldiers and their families. To meet these needs, the Army was prepared to turn over 12 village-sized housing areas that included more than 5,000 homes, to a private entity. This contractor maintained existing structures, demolished selected buildings, and constructed new ones.[24]

The FWD assisted in the process by serving as the contracting officer for a Capital Venture Initiative involving prospective lenders, builders, and property managers. Other installations, including Fort Carson and Lackland Air Force Base, had employed a similar process. What distinguished the effort at Fort Hood was the size of the project. "This is twice as big as the Fort Carson project," noted Colonel Craig, "and three times the size of Lackland Air Force Base." Robert Erwin, the installation's team leader, explained the sense of urgency and the rationale for privatizing the homes. "We need them soon," he pointed out, "not in the 60 or more years it would take under the normal appropriation process."[25]

In addition to speed and efficiency, the goal of housing privatization was to improve the quality of life for military personnel, which included providing family-oriented housing that was comfortable and appealing. As Army Chief of Staff General John A. Wickham, Jr. pointed out in the mid-1980s, "unit readiness is inextricably tied to soldiers' morale" and "to sustaining their families' strength."[26]

The Reagan Administration encouraged expansion of military facilities during the 1980s – and family housing benefitted from increased spending. The 801 program brought private enterprise into these improvements, allowing private developers to provide and maintain family housing at military installations. Pictured here is a kitchen in an 801 home at Fort Hood.

Another project that reflected the new soldier-conscious Army was the III Corps and Fort Hood Headquarters facility, completed in 1989. This sleek, upscale complex featured elements not often found in military construction, including chrome columns and elevators as well as marble and stone floors. An atrium staircase and skylights provided open space and light. "You think you've strayed into the headquarters complex of a Fortune 500 company," marveled one observer. "But don't worry ... you still *are* at Fort Hood."[27]

This building, constructed at a cost of $33 million, was a site-adapted copy of the FORSCOM Headquarters facility at Fort MacPherson in Georgia. Although the design of the building at Fort Hood resembled its counterpart in Georgia, the use of natural Texas products made it distinctive. The exterior of the building was covered with two inches of banded lime and shell stone, which the interior stone floors complemented.[28]

This project was especially noteworthy for the FWD because the CTAO supervised not only constructing the building but also furnishing it. The district thus carried the work from its inception to the end — the point at which the building was ready to be occupied. Harold Molnes explained that the CTAO liked this concept. "It is certainly different to start from scratch," he noted, "and then be able to hand [the customer] the keys to the building." He believed that the district was able to install the furnishings more efficiently because of its familiarity with the design of the building. Typically, the Corps would turn the unfurnished facility over to the user, who would then have to become acquainted with its features to get it ready for occupancy. This "one-stop shopping" service was an advantage that the FWD could offer its Fort Hood customers, making the Corps more competitive during an era that especially valued efficiency.

Additional Installations

Like Fort Hood, Fort Polk has provided much of the district's military construction work during the last quarter of the 20th century. Located in Louisiana, this installation served as a training base during World War II, the Korean conflict, and the Berlin crisis. In 1974, the 5th Infantry Division (Mechanized) became its major tenant. Soldiers from Fort Polk served in Panama during the seizure of Noriega's headquarters and in Operation Desert Storm. They also assisted victims of Hurricane Andrew in Louisiana and Florida.[29]

The FWD did much to improve the installation. In the early 1970s, Fort Polk, as one recruit recalled, "was 200,000 acres of mosquito-infested pines and swampland in the heart of Louisiana's Kisatchie National Forest."[30] Much of its infrastructure, which included World War II-vintage buildings, had become out-of-date. As Rogers explained, from the mid-1970s through the 1980s, the district completed an extensive rehabilitation of this installation: "We substantially reconstructed the whole base with new facilities, new barracks, new equipment shops, new headquarters buildings, a new hospital. I mean just everything. We just rebuilt the base and it's a very nice installation now."[31]

For all the improvements that military construction brought to Fort Polk, it sometimes prompted environmental concerns. As noted, work on military installations typically affected a smaller area than the large-scale water projects that created reservoirs. Even so, it impacted fish and wildlife habitat — and the ESA required that critical habitat of listed species be protected from development. The piney woods at Fort Polk supported populations of the red-cockaded woodpecker, one of the first species to be listed under the ESA. This bird, named for the crimson feathers behind the male's ear, depended on aged pine forests, which were rapidly disappearing in the Southeast.[32]

During the 1980s, construction of a new multipurpose range complex at Fort Polk threatened the habitat of these birds. The purpose of the project was to provide gunnery training for individuals as well as for units, and the weapons to be fired included rifles, machine guns, and rockets.

Family housing at Fort Polk.

Rogers described the range as a place to "fire tanks and simulate battles." As weaponry increased in complexity, installations such as Fort Polk needed modernized facilities for training soldiers.[33] Facilities such as the multipurpose range, however, tended to be located on the periphery of the installation, which disrupted the area's wildlife. Owing to the presence of the red-cockaded woodpeckers, FWD personnel had to adjust the design of the project to avoid damaging their habitat.[34] The need to consider the environmental impacts of military projects was a reflection of modern values, which, as noted, affected projects on the civil side as well.

Between 1975 and 1999, the impact of military projects on cultural resources was also a concern. These include objects, structures, and sites associated with prehistoric, ethnohistoric, and historic occupation. In the mid-1970s, Fort Hood and Fort Bliss, located near El Paso, established staff archaeological positions as well as cultural resource management programs. So effective were these programs that they became national models for military installations.[35] [See Chapter Two.]

In an attempt to enhance the overall visual image of Fort Bliss, the FWD project managers gave careful attention to the historic architecture and associated landscaping of the post. This concern took into account such regional influences as climate, culture, and geography. In the case of military installations in Texas, this often included traditional, Spanish-influenced architecture of solid masonry materials and forms, such as low-pitched tiled roofs, verandas, and courtyards. These elements reflected the Hispanic cultural influences as well as the desert environment of the Southwest. Attention to maintaining the historic integrity of existing buildings and landscapes helped ensure that the historic character and mission of the military installation was not lost as inevitable changes occurred over time.[36]

Constructing for Sophisticated Technology

During the last 25 years, the FWD constructed a number of projects that required considerable technological sophistication. One of the most noteworthy of these involved the White Sands Missile Range in southern New Mexico. Established in 1945, this facility supported missile development and test programs for the Army, Navy, Air Force, and National Aeronautics and Space Administration (NASA). It is an especially large military reservation, 100 miles in length and 40 miles wide. The range has also had economic significance to local communities, employing approximately 8,000 people. It includes more than 3,000 accurately surveyed sites for permanent and temporary instrumentation, and approximately 1,100 optional and electronic instruments for support of range users. In short, it has played a major role in the nation's missile and space program.[37]

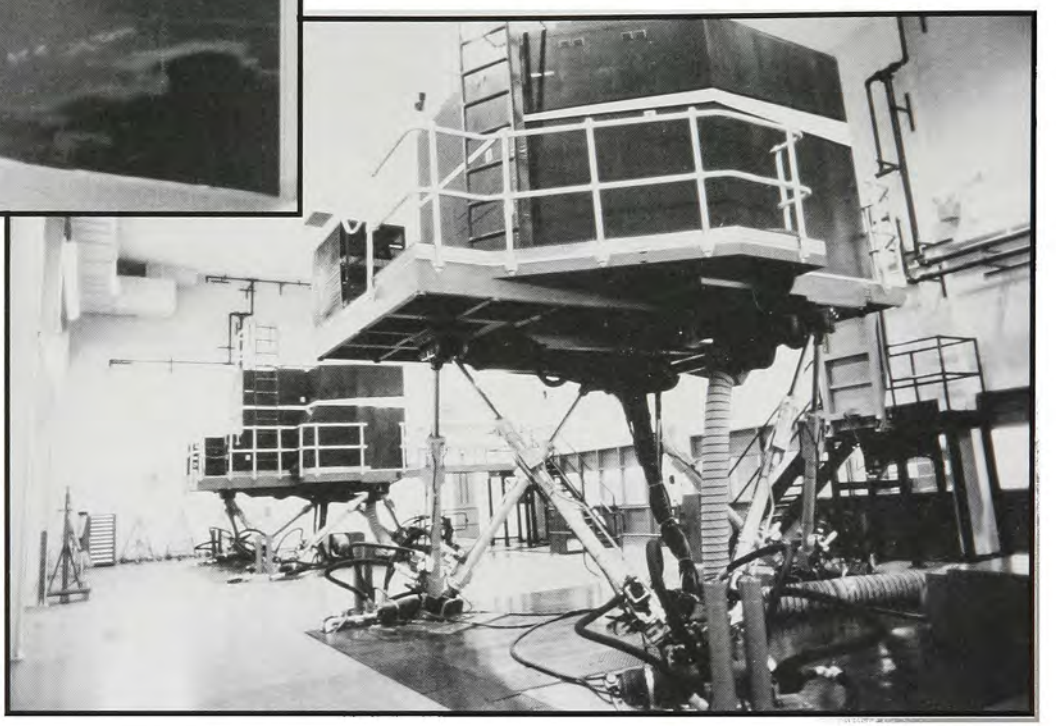
The Corps has had a long association with White Sands, providing design and construction of testing facilities. During the 1960s, for example, the agency built research facilities at the site for NASA, including a project for an Apollo Command Module engine test. The Corps also constructed a solar observatory for Air Force scientists who needed a special telescope for space research. The FWD, which assumed responsibility for the Southwestern Division's military work in the late 1970s, managed design and construction of the High Energy Laser Systems Test Facility in 1983. It allowed Army and Navy personnel to test high-energy lasers and their effects on materials within the complex as well as on additional targets located downrange. This project provided a basis for the Reagan Administration's Strategic Defense Initiative, known as "Star Wars."[38]

Another "very exotic and high tech" project at White Sands was the Large Blast Thermal Simulator. The FWD also managed design and construction of this facility, completing it in the early 1990s. Rogers was especially enthusiastic about this complex project, describing it as follows:

> you can simulate the blast and the heat of an explosion, ... any kind of an explosion ranging up to an atomic weapon. And then we can say, well, we want to know what happens to an M1 tank if an atomic bomb goes off two miles away or something, and ... you can calculate what the blast and the heat effect would be, and then [military personnel] simulate that in there to just see what happens. I mean, it's got to be wild to watch.[39]

Fuel cell maintenance hangar, Dyess Air Force Base, Texas.

The FWD's design and construction of highly specialized facilities were not limited to weapons testing. Medical facilities also included technologically sophisticated components that the FWD had to accommodate. The expansion of Wilford Hall Medical Center, for example, became one of the largest



The Fort Worth District constructed the building that houses the Apache AH-64 Flight Simulator at Fort Hood.

Brooke Army Medical Center, Fort Sam Houston, San Antonio.

of the FWD's hospital projects. Located on Lackland Air Force Base in San Antonio, Wilford Hall dated from 1942. The FWD began construction on the new complex in the 1970s, adding a nine-story hospital tower, three-story clinic, helicopter pad, food service facilities, and physical therapy units — additions that more than doubled the amount of floor space. This medical facility included highly specialized features: an automated materiel handling system; an energy monitoring and control system; a pneumatic tube system; an automated medical record system; an automated laboratory for rapid evaluation of diagnostic tests; and an automated pharmacy. The FWD completed Wilford Hall Medical Center in 1981, having spent $100 million on the expansion.[40]

The FWD also completed hospital expansion projects for the Army. These included Darnall Army Hospital at Fort Hood, Bayne-Jones Hospital at Fort Polk, and the Bradley Annex of the William Beaumont Hospital at Fort Bliss. One project that generated considerable pride in FWD personnel was the $300 million Brooke Army Medical Center, located at Fort Sam Houston in San Antonio. This monumental project represented a decade of planning, designing, and constructing. The new complex replaced the original hospital, which dated from 1936, and included an eight-story teaching hospital. "Brooke is big in every sense of the word," marveled Calvin Conger, project manager, in 1995, "from its 1.5 million square feet to its 38 tons of drawings sent out to prospective contractors ... to the distinction of having the largest architect-engineering

contract of $42 million awarded by the Fort Worth District."[41]

Early design began in 1983 — and was innovative from the outset. Although computer-aided design was a new concept at that time, the architect-engineers — HKS of Dallas and Wingler Sharp of Wichita Falls — designed the entire project on the computer. The complexity of the project was apparent from the beginning. So extensive was the documentation that the FWD stored the mountain of paper in an Air Force Reserve warehouse. "We were Lilliputians next to the towers of plans," Conger quipped. These included more than 10,000 drawings and 2,500 pages of specifications. Due to the project's complexity, the FWD and the contractors employed full-time liaison personnel on site to handle revisions and questions about the design.[42]

The Brooke Army Medical Center featured an integrated building systems space (IBS), zoned both vertically and horizontally to facilitate construction and maintenance needs. The first foot of space off the floor in the IBS, for instance, was devoted to electrical wiring, while the first foot down from the ceiling was dedicated to plumbing. This zoning also enabled construction crews and maintenance personnel to work simultaneously in the IBS area. Crews completed floor space below, while electricians and plumbers worked in the IBS above, increasing the efficiency of the construction process.[43]

The FWD turned over the facility to the Army on July 18, 1995 — 10 months ahead of schedule. "Partnering is a factor that contributed to the hospital's early completion," explained a resident engineer for the new medical center. "I've become a strong supporter of the partnering concept. It works."[44] Former District Commander Schaufelberger then described the project as being especially significant. "It was a beautiful facility," he recalled. "The designer did a wonderful job on the project."[45]

Remediating Hazardous Waste Sites

During the 1970s, the Carter Administration encouraged environmental projects on military installations, emphasizing the need for cleanup of hazardous waste sites, which included debris, ordnance, and toxic materials. Many contaminated sites dated back to World War II, when the dangers of substances such as DDT and lead were not understood. Growing awareness of the hazards that they presented prompted the push for environmental cleanup.[46]

To that end, Congress established the Defense Environmental Restoration Program (DERP) in 1984, providing for the cleanup of Department of Defense (DOD) hazardous waste sites. Congressional appropriations funded the program for the Army, Navy, and Air Force — and each branch of the service was responsible for its own active installations. The Army's program had two components: the Army Installation Restoration Program (IRP) for current installations and Formerly Used Defense Sites (FUDS) for closed installations. Its objectives were to protect the health and safety of installation personnel and the public, and to restore the quality of the environment. The FWD provided project management for remedial actions for the IRP at active military installations as well as former DOD sites.[47]

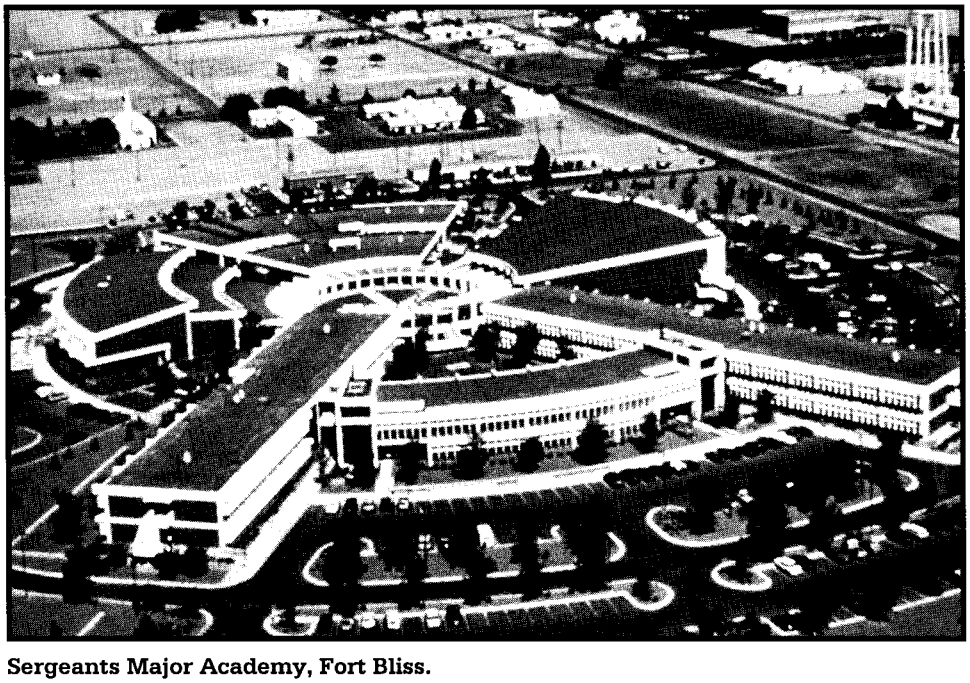
These programs affected a number of installations in the FWD — and Kelly Air Force Base provides a good example. In 1995, the Base Realignment and Closure (BRAC) Commission recommended that Kelly Air Force Base be realigned. Environmental investigations identified

more than 50 sites at the installation, including landfills, former fire training areas, radioactive waste disposal areas, underground storage tanks, sludge lagoons and sludge drying beds. Moreover, Kelly Air Force Base had been involved for decades in maintenance and overhauling of military aircraft. As Larry Rogers explained in 1998, this process "used all kinds of different nasty solvents and paint strippers and chemicals. There is a lot of contamination that's going to have to be dealt with at Kelly, and we are just getting started." Additional hazardous waste sites included ammunition plants in eastern Texas. "Anyplace where you manufacture explosives you're bound to have everything from TNT to heavy metals in different settling ponds," Rogers noted.[48]

Fort Hood, too, included numerous abandoned landfills as well as battery neutralization shops that had contaminated the surrounding soil with lead.[49] Rogers explained that the cleanup process did not always involve removal: "you can cap it and leave it there as long as you've made the proper provisions so the stuff doesn't leach out and contaminate anything else." The FWD employed two project managers in PPMD to oversee this work.[50] It represented a new development in the FWD, reflecting the influence of environmental concerns.

The district's military work remained an essential component not only in terms of revenue but also in terms of its character. In the mid-1980s, Division Engineer Major General Robert Dacey described the FWD's military construction program for the Army and Air Force as "extremely complex."[51] Responding to this complexity helped the district gain a reputation for responsiveness to customers, contributing to its vitality.

"It's exciting work. It's always different," Rogers summarized. "The program happens so rapidly and you see results so quickly that it's very rewarding work to be involved in. I think people who work in design or managing projects on the military side really enjoy it because of that. You don't have to spend a whole career to get one project done. You've got dozens."[52] ■



Sergeants Major Academy, Fort Bliss.

V. Responding to Emergencies

"We had a situation while I was there at Kelly Air Force Base, where a tornado struck... . I went to San Antonio on Sunday, met with the Air Force; they gave us the money and on Monday we had the contractors repairing the roofs. The Air Force couldn't believe it, because they knew they couldn't respond that fast. It was a function of the emergency contracting authority ... and the dedication of the people of the Fort Worth District."

— Former District Commander John Schaufelberger, 1998

Disaster Relief and the Emergency Management Branch

One distinguishing feature of the period between 1975 and 1999 has been the unusually large number of natural disasters that have hit Texas and the Southeast. FWD personnel responded to numerous floods, tornadoes, and hurricanes under the direction of the Emergency Management Branch, demonstrating a high level of preparedness. This activity, like the work on military projects, enhanced the district's reputation for responsiveness and the ability to move at a fast pace.

The Corps' civil works responsibilities have included disaster relief since the 19th century. Public Law 84-99 authorized the agency to provide flood assistance, and Public Law 93-288 authorized its assistance to the Federal Emergency Management Agency (FEMA) for other disasters. Corps districts prepared emergency management plans that outlined how the agency would serve stricken communities by removing debris, rebuilding structures, and surveying damage. In 1983, the duties of the Corps' Emergency Management Branch expanded to include coordination with the FEMA for flood hazard mitigation and participation in Regional Response Committees. The following year, Executive Order 11490 further expanded the branch's responsibilities to include emergency water preparedness.[1]

The FWD's Emergency Management Branch employed five people under the direction of Jesus Rangel. In addition to responding to disasters in Texas, this branch assisted other districts and divisions around the nation. Rangel's staff coordinated employees throughout the FWD who responded to calls for volunteers. In the early 1990s, for example, the district assisted the recovery effort after the earthquake in Northridge, California. "They needed 300 engineers right away that could do analysis and inspection of buildings," Rangel explained. Within three days, the FWD dispatched 18 employees, who joined more than 200 other Corps staff from around the nation. This quick response took some emergency officials by surprise. "They didn't think they could get that many people in that short of a time," noted Rangel. In the case of a hurricane, the Emergency Management Branch is aware of the situation in advance, and can compile a list of district volunteers before the disaster occurs.[2]

Planning was in fact one of the components of Rangel's job that he enjoyed the most. He coordinated training exercises to prepare FWD to respond to emergencies. "It's basically writing a play," he explained, "a disaster script" based on experience in previous crises. Once given the script, participants take action as though it were a real emergency. These exercises made FWD staff aware of what goes into responding to disasters. Awarding contracts, for example, can take months in civil work — but in an emergency this process must occur in a few hours to facilitate activities such as debris removal and installation of housing.[3]

Floods

Floods were the most common natural disasters in Texas during the last 25 years. Although periodic droughts created serious problems — particularly for agricultural and recreational interests — nothing was more damaging than flooding. The FWD was established primarily for flood control in 1950, and during the 1980s and 1990s, Texas received record rainfalls that produced floods reminiscent of the devastating deluge of the mid-20th century.[4]

Flooding is a natural occurrence that can replenish soil and recharge ground water supplies. Floodplains also provide habitat for fish and wildlife throughout Texas. The problem is that humans have settled in increasing numbers in floodplains across the state, where they were vulnerable to the damage. While the Corps' flood control projects — structural and nonstructural — reduced the devastation, engineers could not completely prevent it. One study in the 1970s noted the persistence of development in floodplains, despite evidence of the hazards: "In the very best pioneering spirit, flood victims everywhere appear determined to restore every lost bridge, every damaged house and trailer, every waterlogged business, to its 'rightful' place on the floodplain. Their faith in themselves and nature appears limitless." Much of the Corps' disaster-relief work was devoted to assisting those who occupied areas along waterways.[5]

In the FWD, agricultural lands were especially likely to suffer damage from flooding. Much of the district personnel's relief work for inundated farmlands occurred after the deluge, in repairing levees and channels. For non-federal control works, the federal government contributed 80 percent of the funding for repairs, while the local sponsor, which included cities, counties, and levee districts, covered 20 percent of the cost. The FWD also provided the manpower.[6]

These markers indicate the frequency and severity of flooding in Texas.

Texas is especially prone to flash floods, which occur rapidly after a downpour and subside quickly. Rangel, who has served as chief of the Emergency Management Branch since 1982, understood that the distinctive character and geography of Texas produced emergency conditions that were unique. A native Texan, he contrasted the flooding in his state to that along the Mississippi River. "The flooding [there] is long-range," he explained in 1998.

> People know a week in advance that they're going to have flooding because of what happens way upstream and they anticipate. And then finally as the day comes in, the water rises, and the people get prepared for it. They're able to predict ... how high [the water is] going to rise when it does get there. And then with that information they can decide whether they need to raise the levees or evacuate people and do certain things. Well, here in Texas, if it rains, the creeks and rivers rise rapidly and by tomorrow it's gone.[7]

This lack of warning made preparing for flooding crucial in the FWD.

Accordingly, the district included flooding in its Disaster Response Plan, which served as a guide for deployment of personnel, contracting, construction, and information management.[8] The district also assisted local municipalities in preparing for floods. In 1986, for instance, it joined the City of Waco in "Operation Rainspout," to get ready for a hypothetical 500-year flood. After the "alert" appeared, the FWD dispatched a seven-member first reaction team, led by U.S. Army Captain Sam Burkett. His description of the team's activities provides an idea of the extent of its responsibilities: "We arrived in an unfamiliar city, had to arrange for transportation, find working space, assess damages, write specifications and get a contractor to do the work all in a matter of hours." Had there been actual flooding in Waco, the Corps could have offered supplies, pumps, and sand and clay for

The FWD was established primarily for flood control in 1950.

diking operations, in addition to providing manpower. If the president declared the area a federal disaster, the FWD could then assist in cleanup operations. "The exercise gave us some valuable experience in working closely with city emergency officials," Burkett concluded. "It made us all think and think fast."[9]

In 1989, the FWD received a real test of its ability to coordinate disaster relief and mobilize quickly. A series of storms in May and June of that year resulted in the second largest rainfall on record in North Texas, totaling more than 20 inches. The storm system lingered for weeks, saturating the ground and creating runoff water that spilled over the banks of rivers and streams. Corps reservoirs filled to the brim, with water going over their spillways. "You don't see this very often," noted Doug Perrin, chief of the Upper River Basins Unit of the Reservoir Control Section. "One weather service official said he hadn't seen anything like it in 30 years."[10]

In 1990, Second Lady Marilyn Quayle inspected flood damage in Dallas.

The flooding killed 25 people and caused millions of dollars in damages, prompting President George Bush to declare 75 counties major disaster areas. With federal funds available, the Emergency Management Branch assisted the FEMA with damage assessments and survey reports. The FWD also assisted with levee repairs, using emergency procedures to award contracts quickly. Jesus Rangel was pleased with his branch's performance during the emergency. "People in the Fort Worth District have really been responsive," he commented. "That's important because it makes the district look good in the eyes of the Corps, FEMA, and most importantly, the publics we serve."[11]

In 1990, North Texas once again was hit with a storm system that dumped 27 inches of rain, killing 13 people. The Upper Trinity Basin received the worst of the downpour, and five lakes in the Metroplex rose to record levels. Water went over the spillways at Benbrook, Lewisville, and Grapevine lakes. Proctor Lake in the Brazos River Basin rose more than 23 feet in a single day. The City of Brownwood, located southeast of Proctor Lake, experienced the worst flooding in its history, with water measuring several feet deep in the downtown area. Not since the floods of 1908 and 1942 had Texans seen flow rates at Dallas exceeding the 81,000 cubic-feet-per-second (cfs) witnessed in 1990.[12]

Without the Corps' flood-control projects in North Texas and the Dallas and Fort Worth floodways, the flow rate might have reached 260,000 cfs — a new record. Estimates indicated the projects prevented approximately $2 billion in damages.[13] Even so, the severity of flooding in the late 1980s and early 1990s served as reminders of the unpredictable nature of Texas rainfall, and the need for emergency preparedness.

Tornadoes

Like Texas floods, tornadoes strike with little warning. Although these destructive forces of nature occur in many parts of the world, they most frequently hit the United States east of the Rocky Mountains, during the spring and summer months. A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most intense twisters produce wind speeds of 250 miles per hour and higher, with damage paths up to 50 miles in length.[14] The FWD is affected by tornadoes spawned by storms moving through the Central Plains and by hurricanes from the Gulf of Mexico.

One tornado in 1988 exemplified the district's responsiveness. In September of that year, Hurricane Gilbert, downgraded to a tropical depression, hit southern Texas. A tornado touched down at Kelly Air Force Base in San Antonio, tearing off the roofs of the Air Force's Logistic Command's warehouses. These buildings held 40 percent of the Air Force's "spare parts" — everything from notebooks to fighter helmets and jet aircraft parts. The damages to the structures totaled around $19 million. John Schaufelberger, then District Commander, recalled the speed at which personnel responded. The Air Force manager provided money for repairs on a Sunday, he recounted, "and on Monday we had the contractor [Guyco Engineering Company] repairing the roofs. The Air Force couldn't believe it, because they knew they couldn't respond that fast. It was a function of the emergency contracting authority ... and the dedication of the people of the FWD." As he concluded, "they really did a wonderful job."[15]

A tornado at Fort Hood produced similar results. That twister tore the roofs off family housing and barracks. Within several days, Lieutenant Colonel John Rigby and other staff arranged for contractors to repair the damage. In Schaufelberger's estimation, this responsiveness reflected the influence of the district's military work, which required Corps personnel to mobilize quickly.[16] [See Chapter Four.]

In May of 1999, 51 tornadoes ripped though Oklahoma, devastating a number of communities. Faced with the grim task of cleaning up the debris, the Tulsa District requested quality assurance inspectors to oversee the job — and FWD personnel were among those who responded to the call.

"We drove as fast as we could to get there and were anxious about what to expect," recalled Grady Clay, a FWD outdoor recreation planner who volunteered to assist the recovery effort. He described the scene as follows: "People's possessions were strewn everywhere.... I wondered what kind of tornado could suck roofs off of houses, linoleum off floors and the blacktop off the roads. Even after a month, we were still looking for a [lost] truck and a combine." According to Clay, those assisting the clean up had to act quickly. "We had heavy equipment moving around," and "volunteers pouring in to help," he noted, "and I was dealing with city officials, the fire department, the Red Cross and other federal agencies, three television stations, and four subcontractors and their crews all at one time."

"We were amazed at the damage," observed Ott Boswell, a FWD volunteer, "and even more amazed that people survived it."

Text source for pages 87 and 89: Judy Marsicano, "Fort Worth Helps Oklahoma City Clean Up," *Dispatch* 17 (October 1999), pp. 4-6.

Hurricanes

For all their destructive power, tornadoes rarely affect a wide area. Hurricanes and tropical storms, on the other hand, produce damage of staggering proportions — and the FWD Emergency Management Branch devoted considerable energy to assisting stricken communities in their aftermath.

Hurricane Andrew, for example, was the worst natural disaster in U.S. history. This storm hit Florida on August 22, 1993, focusing on the area 25 miles south of Miami. It packed sustained winds of 145 miles per hour, with gusts exceeding 200 miles per hour, resulting in storm surges and inland flooding as well as wind damage.[17]

Gruesome statistics revealed the magnitude of the destruction. Approximately 125,000 people were left homeless, while more than one million residents lost electricity — some for a month or longer. Of the estimated 2,100 small businesses that operated in Dade County in southern Florida, 90 percent were destroyed. Homestead Air Force Base was demolished. In all, Hurricane Andrew resulted in $20 billion in damage.[18]

Once the storm subsided, the Corps was ready for action. On August 29, the agency established an office at Miami's International Airport to manage the anticipated increase in missions from the FEMA. Personnel from every Corps division, district, and office around the

Terms for Storms

Tropical Depression: Counterclockwise rotation of air at speeds of 38 mph or less. A low-pressure area is emerging.

Tropical Storm: A low pressure system with wind speeds of 39 to 73 mph. The storm receives a name.

Hurricane: Intense low pressure with winds rotating about the center in a counterclockwise direction at speeds of 74 mph or more.

Source: Jacksonville District, U.S. Army Corps of Engineers, "After Andrew: A Corps Recap," August 1993., p. 23.

world responded to the emergency, coming to the aid of the Jacksonville District. More than 1,400 Corps employees served in a variety of technical and support positions as members of the response team. These included around 25 people from the FWD.[19]

One of the first tasks was to issue contracts for installation of plastic roofing material, to protect residents from continuing rains. Corps personnel offered 55 million square feet of temporary roofing material to contractors and private citizens, in addition to providing labor. To facilitate repairs, the Corps developed emergency roofing kits, which included roofing material, nails, furring strips, and a step-by-step booklet with instructions in English and Spanish.[20]

An especially significant responsibility was the removal of the extensive amount of debris left by the hurricane. The Corps cleared the public rights-of-way, identifying and providing temporary disposal sites. As part of this mission, the agency also rehabilitated street signs. "Entire neighborhoods were leveled," Rangel explained. "People couldn't tell what address they were at."[21] During the later stages of recovery, the Corps demolished and removed the wreckage of homes and marinas.[22]

The Corps' contractors collected more than 12 million cubic yards of debris throughout Dade County. This activity accounted for approximately 70 percent of the funds expended in the recovery effort. A constant stream of trucks removed the debris to landfills and transfer sites. If these vehicles had been placed bumper-to-bumper, they would have stretched from Miami to Seattle and back — a compelling indication of the extent of the wreckage.[23]

The Corps' additional services included delivery of bottled water and ice to communities without basic utilities and refrigeration. Engineers also submitted more than 4,000 damage survey reports after Hurricane Andrew, which addressed emergency protective measures. The agency studied Dade County's disaster evacuation procedures, offering recommendations for improving and updating the plan based on changed demographics and limitations on transportation. In all, the number of Corps contracts to fulfill the 14 missions assigned by the FEMA totaled more than $450 million. Colonel Terrence Salt, Jacksonville district engineer, praised these efforts, noting that "the Corps is ready to respond again whenever the need may arise."[24]

The agency's emergency management resources were tapped extensively during 1998 — an El Nino year of warm, wet weather. On August 23, Tropical Storm Charley dumped 18 inches of rain in 24 hours on Del Rio, a small town in southern Texas. The resulting flood contaminated the city's water system and left 700

families without shelter. Many people lost all of their possessions. By August 25, the FWD had activated the Emergency Operation Center (EOC) and Corps personnel were among the first to provide drinking water under the district's authority. FWD personnel worked 13-hour shifts in the 100-degree heat, coordinating delivery of thousands of cases of water.[25]

Once the water mission was underway, the district addressed the issue of housing. In Fort Worth, the EOC finalized the design of an existing 62-unit mobile-home park, preparing it in less than a day. The Corps developed two additional sites for mobile-home parks, installing 116 new units. "It was extremely important for us to get the homes ready as soon as we could so we could get these people back into some kind of normal life," explained Jerry Thomas, of the Piney Woods Project Office, who led the emergency housing effort. [26]

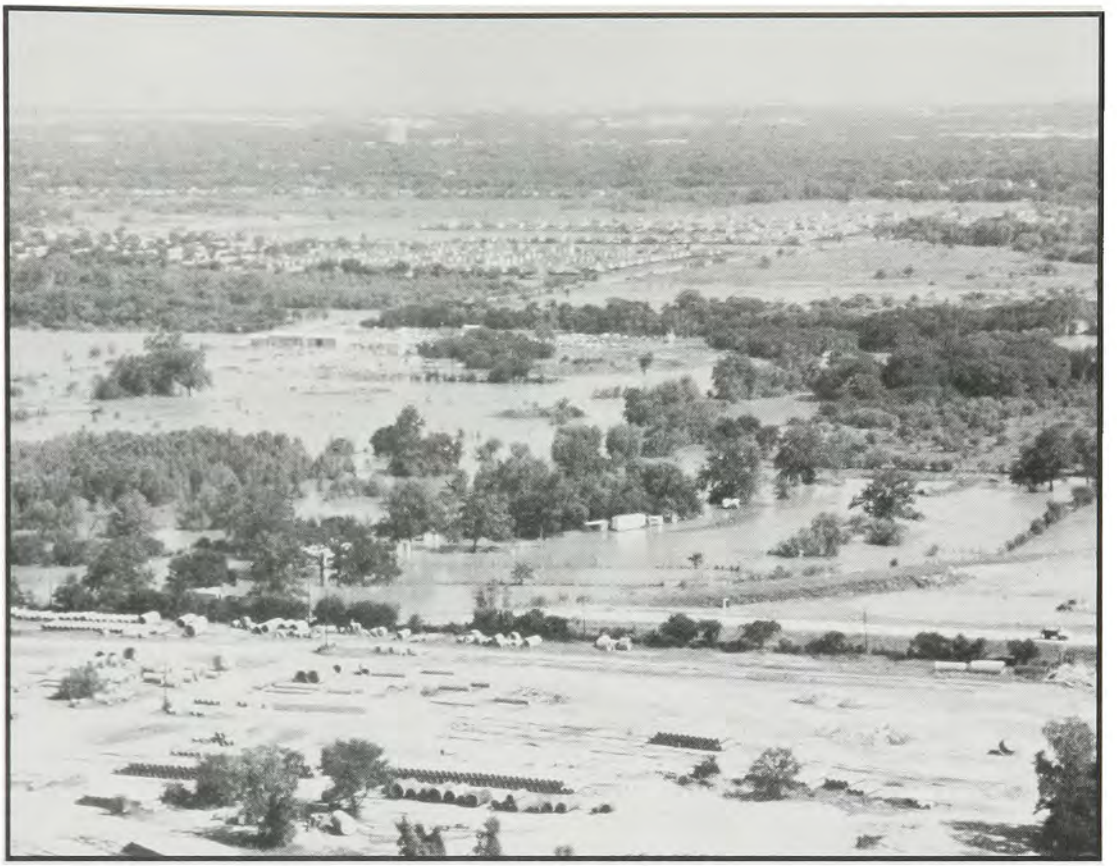
In September of 1998, while FWD personnel were still working in Del Rio, Hurricane Georges, one of the worst storms of the century, hit Puerto Rico. The statistics were staggering: The storm damaged more than 60,000 structures — and the devastation included five million tons of debris. Approximately one million people were without power, while 700,000 lost water. Accordingly, the district EOC issued another call for volunteers.[27]

More than 30 FWD employees helped the Jacksonville District's Georges Emergency Recovery Response Office with its missions for delivering water and ice, installing roofs, and removing debris. Some FWD employees flew directly from Del Rio to Puerto Rico to assist in the recovery effort. Lisa Eskew of the Civil Planning and Engineering Design Branch, for example, had volunteered to work in Del Rio and understood the demands of the recovery efforts in Puerto Rico. For 45 days, she assisted on the temporary roofing mission. "I volunteered for Puerto Rico after seeing the news footage of Hurricane Georges and its unbelievable destruction," she explained.

This work required physical stamina as well as dedication. Greg Sipes from the Military Design Branch, Engineering and Construction Division, reported that Corps employees working on this mission logged 12-hour days, 7 days a week. As he pointed out, "the fact that many people had been going 2-3 weeks without roofs on their homes was the incentive to keep moving." Similarly, Carlos Lora from the Reservoir Control Branch noted that the victims of the hurricane were forced to live in "heart-breaking" conditions. "That's what kept us going," he noted.[28]

FWD personnel involved in disaster relief found the work to be rewarding. "The culture and the language barrier made communications difficult," Sipes noted, "but many of the residents, who were often very poor, would offer drinks and fruit." When one roofing team completed the final house in one of their neighborhoods, residents lined the streets and applauded as they left.[29] As this example demonstrates, nowhere in the Corps' work is the importance of teamwork and responsiveness more evident than in disaster relief. ■

In August of 1998, Tropical Storm Charley dumped 18 inches of rain in 24 hours on Del Rio, a small community bordering Mexico. The resulting floods left nine people dead and hundreds homeless. To assist in recovery efforts, the FWD activated its Emergency Operations Center, sending teams of personnel to survey the damage and to help coordinate delivery of bottled water. While the disaster occurred within the FWD's jurisdiction, the Savannah and Galveston districts also assisted in the recovery efforts.

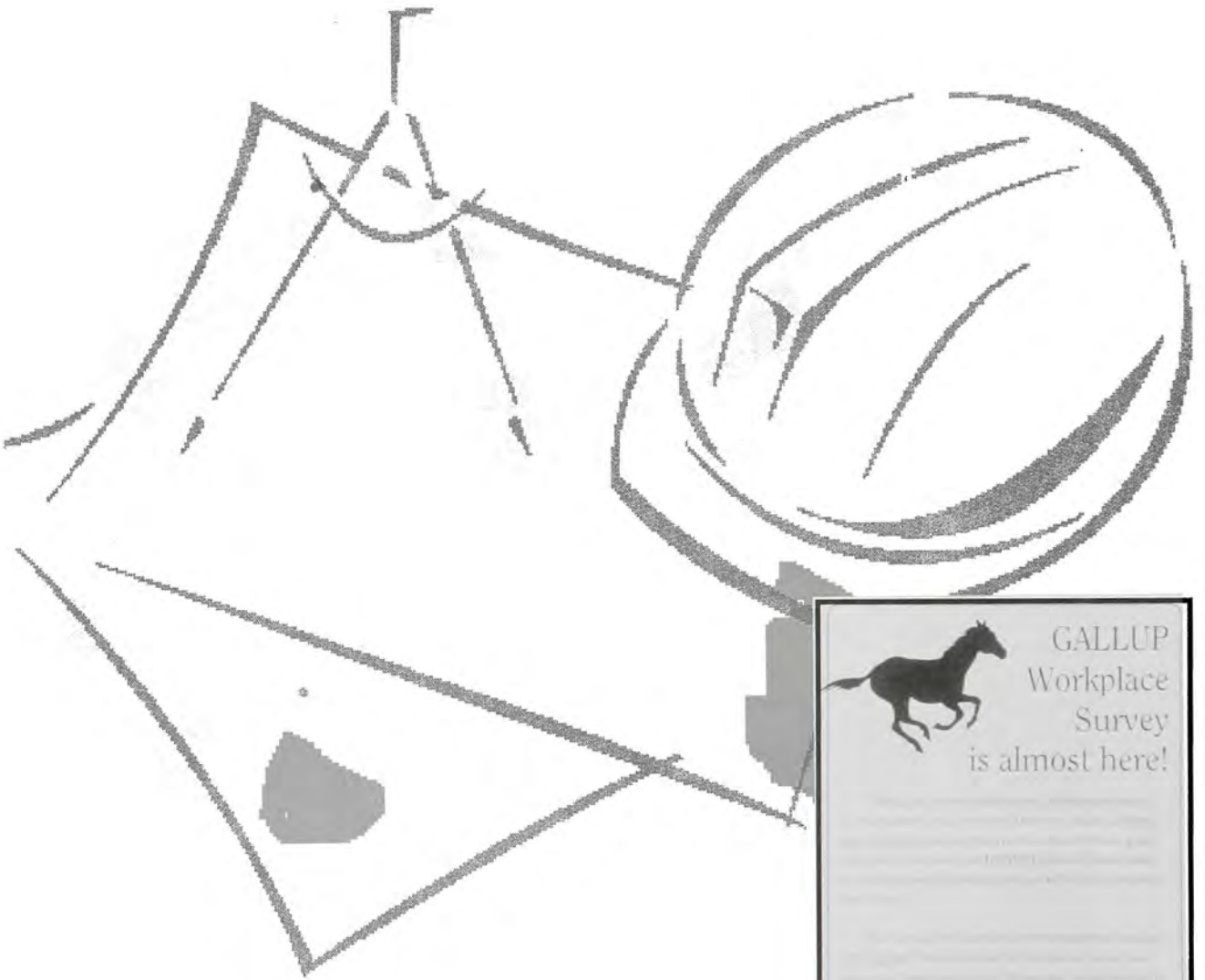



STOP

FWD personnel assisted National Guardsmen in supplying drinking water to Del Rio. Severe flooding often contaminates drinking water with bacteria, parasites, and other organisms. "We put our water mission in Del Rio first on our high priority list," explained Col. James Weller, District Engineer. "We had to act quickly to help the flood victims recover from this tragedy, and taking care of drinking water was one of their most urgent needs."

The Emergency Operations Center assembled a team of FWD employees to design a 62-unit mobile home park for temporary housing. Within three weeks of the storm, the team had the homes ready for occupancy. "It was extremely important for us to get the homes ready as soon as we could so we could get these people back into some kind of normal life," explained Jerry Thomas, who headed the team. The FWD coordinated with other agencies, including the Federal Emergency Management Agency, in this recovery effort.

Source: Judy Marsicano, *Dispatch.*



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VI. Reorganizing the Corps

"We're changing the way we traditionally do business."
– Lieutenant General Joe Ballard, Chief of Engineers, 1997

A Changing Work Environment

The past 25 years has been a period of great change and adjustment for the Corps. Although the civil and military workload has fluctuated widely during this period, the long-term trend for both missions has been downward. In each case, the reasons differed but the outcome was similar: a reduced workload. In response, the Corps implemented a major reorganization that had far-reaching implications for the FWD.

By the early 1980s, the era of large-scale water resources development projects had passed, the victim of environmental and budgetary concerns. By Fiscal Year 1984 — for the first time in the Corps' history — the organization's civil operations and maintenance expenditures exceeded construction outlays. The future of civil works appeared uncertain until the passage of the Water Resources Development Act of 1986 (WRDA-86) made possible a steady flow of small-scale water projects, funded in part through cost-sharing provisions.

The Corps' military work experienced similar fluctuations during the 1980s and 1990s. The military buildup under the Reagan Administration in the early 1980s caused a major expansion of work for the Corps, while the end of the Cold War after 1989 led to an equally sharp contraction. New types of military programs, such as the BRAC projects, produced some work, and innovative efforts embraced in the concept of "support for others" helped to smooth transition from high to lower levels of military construction contracts.

Adjusting to the workload swings of the past two decades put enormous strains on the Corps, and on dual mission districts like the FWD. Having both a large civil and military responsibility placed the FWD at the center of the wrenching changes that the entire organization experienced. The FWD provides an excellent case study of how the Corps struggled with an ever-changing work environment and developed the institutional and administrative responses to ensure organizational survival. The impact of WRDA-86, implementation of Programs and Project Management (PPM), downsizing through agency-wide reorganization, and adoption of new information and financial systems were all part of the process. The FWD played a key role in implementing each initiative.

WRDA-86, the first new civil works projects authorization in ten years, caused major changes in the way the Corps operated. This legislation directed the Corps to implement greater cost sharing with non-federal sponsors and to expedite the planning process for civil works projects. WRDA-86 contained new requirements for intergovernmental cooperation, local sponsorship, and financing inland navigation and harbor

maintenance and construction. For the first time, cost-sharing was imposed on all flood control projects. Local sponsors had to pay at least 25 percent of all project costs. The legislation also established two trust funds based on user's fees to support inland waterway construction and rehabilitation and for harbor maintenance. Recognizing that the Corps would have to change its project planning and management procedures to implement WRDA-86, the chief of engineers and his senior leaders in 1987 initiated a major review of Corps business functions.[1]

Adopting Project Management

Traditionally, a district worked a civil works project by passing it from one functional area — planning, engineering, construction, and operations — to the next as it progressed from concept through completion. Each functional area assigned a different manager to the project, with no single person responsible for delivery time or cost control. The Corps approach proved time-consuming and costly. In contrast to the Corps' method, the private sector employed one person — the project manager — to oversee all project costs and schedules throughout the life of the undertaking. The system emphasized teamwork above loyalty to a functional specialty and stressed cost controls and timeliness throughout the life of the project.[2]

In July 1988, the Corps adopted the project management concept and issued an engineering circular to guide implementation. Each district was to designate a civilian as a deputy district engineer for project management [DDE (PM)] and to assign a project manager for each large civil works project. An Office of Project Management was to provide technical advice to the DDE (PM). The chiefs of functional areas retained responsibility for providing functional products, including schedules, budgets, and manpower requirements necessary to accomplish their assigned work. The new project managers had responsibility for the overall project schedule, cost, and coordination and reported directly to the DDE (PM). The Corps' headquarters ordered that no additional personnel positions be created to achieve the new structure.[3]

Over the next four years, senior leaders at headquarters labored mightily to implement the new project management system. The process did not go smoothly. The functional elements (stovepipes) and their chiefs did not want to give up their authority or personnel to a project manager or civilian DDE. Each district tended to interpret and implement guidance differently. Although frustrated, Chief of Engineers Lieutenant General Henry Hatch pushed ahead with determination, clarifying that the DDE (PM) had equal rank with the chiefs of engineering and construction. He also restructured the Corps headquarters to emphasize commitment at the top to the project management system. The key change at headquarters involved the establishment of two program directorates — Civil Works and Military Programs — in July 1989. While each directorate had its own engineering and construction division, Civil Works contained divisions of project management, programs, and policy and planning. Military programs, on the other hand, had a project management and an environmental restoration division. In the field, each district and division combined programs and project management. By 1990, project managers existed at every level of the Corps. In effect, this new organization had its own stovepipe.[4]

Between 1990 and the end of his term as chief of engineers in 1992, General

Hatch continued to fine-tune the implementation of project and program management and to attempt to overcome residual resistance to the new way of doing business. In March 1991, the Corps issued a regulation for project management. It established a project team, led by the project manager, which included the technical personnel from the functional elements. Field surveys conducted by headquarters continued to reveal resistance to the new approach to project management. Field personnel complained about conflicting guidance, complicated reporting requirements, and micro-management. Nevertheless, the new system gradually took hold as new leaders emerged in the district and division offices that embraced project management as the way to do business in the Corps.[5]

The FWD implemented project management in July 1988. Initially, the district placed six civil works projects under the new system. Five of the projects employed a team approach while one project was managed by a single project manager. The following year, in July 1989, the district commander appointed the first DDE for Project Management. At first, only one project manager worked in the new office. During 1989, however, the existing Programs Management Office joined with Project Management to become the Programs and Project Management Division (PPMD). By 1990, the new division had nine employees. Quickly embracing the philosophy of WRDA-86, the FWD led the Corps in the number of cost-shared planning studies (6 out of 14 nationwide) and also had the lowest average planning study cost of any district.[6]

In 1990, the PPMD established separate civil and military project management branches with a total staff of 13. The PPMD also initiated a major "support for others" effort during 1990 to bring non-Corps engineering, design, environmental services, and real estate acquisition work to the district. That effort bore fruit the following year when contracts for a variety of services were signed with the General Services Administration, Department of Energy, Environmental Protection Agency, Immigration and Naturalization Service, and Drug Enforcement Agency. By the end of 1991, the FWD was performing 74 tasks in the "support for others" mission. During 1992, the PPMD established Project Review Boards for both military and civil projects, involving broad input by all elements of the district to ensure that projects were on time and within budget. The PPMD grew three-fold during 1992, increasing to 37 personnel. This was significant, since overall district employment remained unchanged.

This trend continued into 1993: the number of project managers, program analysts, and support staff in PPMD increased to 40, while total district employment remained flat. The PPMD workforce peaked at 42 in 1994 and then declined to 36 in 1996. The implementation of project management was only one of the major organizational changes the district experienced in the late 1980s and early 1990s.[7]

Restructuring the FWD

By the late 1980s, the Corps' leadership recognized that reorganization, as well as changes in business practices, would be necessary in order to survive. The expected decline in military work as the Cold War drew to a close reinforced the message sent by the cost-sharing features of WRDA-86. The Corps needed to reevaluate its mission, goals, and structure, as well as its management procedures. In addition to a shrinking workload, the Corps also struggled with high overhead costs and a loss of technical expertise. Spurred on by a congressional directive in the Energy and Water Development Appropriations Act for Fiscal Year 1990-91, the Corps formed a study group to identify the most effective means for reorganizing the agency. Made up of division and district personnel, the Bayley Task Force identified several criteria for reorganization plan development, including cost effectiveness, flexibility, competence enhancement, and management efficiency. Using these objectives, the Bayley Task Force defined six alternative structures for the future organization: No change (base case), realignment, regionalization, decentralization, elimination of divisions, or a combination of all structures.[8]

As the Bayley Task Force completed its report, the Bush Administration tried to insulate the Corps reorganization from politics by including the plan in the larger BRAC process. Begun in 1990, the BRAC tried to identify and recommend military installations to be closed or realigned free from congressional interference. Congress, however, did not feel that the BRAC process was appropriate for evaluating the civil works aspect of the Corps and passed, in November 1991, the "Nunn Amendment," withdrawing the Corps from BRAC and ordering the Defense Department not to spend funds to close any district or division office.

The Corps responded to this congressional directive by creating two more study groups: a headquarters Reorganization Office assisted by a Field Advisory Committee (FAC) and a task force under Brigadier General Albert Genetti, former district engineer. The FAC was charged with developing site-selection criteria for the various types of organizations that comprised the proposed plan. These included divisions, districts, and technical and administrative centers. The Genetti Task Force had drawn up the proposed organizational structure. In July 1992, Genetti's group suggested reducing the number of divisions from 11 to 5 and basing district management on the concept of 15 technical centers and 10 military construction centers. The technical centers were designed to provide greater concentrations of planning, design, and review expertise, while two districts per division would have responsibility for all military work. Finally, five administrative centers would provide regional human resources, audio-visual, library, and audit functions. The decision on which districts and divisions to close or realign would depend upon the application of the site-selection criteria to the existing structure of the Corps. The site-selection criteria included such items as current office site; cost of living; educational; transportation hub; labor; and office space availability; number

of current personnel; and geographic distribution.

While the Genetti Task Force recommended a major reorganization of the Corps, it did not name the divisions or districts targeted either for realignment or closure. That element of the reorganization process caused high anxiety among Corps employees throughout the organization. Congress further complicated the process when, on September 24, 1992, it funded Corps reorganization planning while specifically ordering the agency not to close any district offices. Finally, on November 19, 1992, Chief of Engineers Lieutenant General Arthur E. Williams and Assistant Secretary of the Army for Civil Works Nancy Dorn held a joint news conference that announced the final reorganization strategy.

The 1992 reorganization plan proposed closing five divisions and severely altered the responsibilities and workload of all 38 districts. The Corps would close divisions in Chicago, New York, San Francisco, Dallas, and Omaha. With the elimination of the Southwestern Division, its districts were to be divided between the new Western and South Central Divisions located in Portland, Oregon, and Vicksburg, Mississippi, respectively. The Albuquerque District would move to the Western Division, while Fort Worth, along with Galveston, Tulsa, and Little Rock Districts, would join the South Central Division. In addition to reducing the number of divisions, the plan also altered their responsibilities. The remaining divisions lost their technical and policy review functions that were now assumed by a Washington Level Review Center at headquarters. The overall plan would result in eliminating 2,600 full-time positions and result in projected annual savings of $115 million. The Corps estimated implementation costs at $215 million with a 1.7 years payback time.

The FWD came out a winner in this reorganization plan. The district would become both a technical and administrative center and retain an expanded military mission. It would actually add 168 positions to its 1992-authorized force of 1,178. To deal with the inevitable crush of questions and rumor about the impact on individuals of the announced reorganization of the Corps, the SWD Human Resources Office set up a Reorganization Information Center. It also established a hotline and published special newsletters to provide district employees with accurate and timely information about reorganization and individual options. Other districts, however, were in a state of shock and disbelief. As the first major restructuring of the Corps since 1942, the organization was ill prepared for such a major change. Personnel in the losing districts and divisions bombarded the headquarters with complaints and queries, turning quickly to their local congressmen for help in halting the reorganization plan. The protest received a sympathetic response in both Congress and the new Clinton Administration.

In January 1993, President Clinton instructed the Secretary of Defense to review the 1992 reorganization process and ordered Vice President Al Gore to examine the Corps as part of a sweeping review of federal government management practices, called the "National Performance Review." The 1992 plan for reorganization was dead for all intents and purposes. For the next several years, the Corps' reorganization became part of the "Reinventing Government" initiative and was heavily influenced by the congressional budget cutting pushed by the Republican-controlled House of Representatives elected in November 1994. This incremental

approach to reorganization — "salami slicing" as some called it — resulted in a reduction between Fiscal Years 1990 and 1995 of approximately 1,770 full-time equivalent (FTE) employees, or about 6 percent. The struggle to consolidate functions and downsize (or rightsize) its workforce proved a painful process for the Corps. Reorganization remained a hot topic of conversation throughout the Corps during the 1990s.

In May 1994, the Corps initiated a new effort to reorganize, or restructure, as it has preferred to call the process, involving the entire agency. As a first step, in June 1994, the Corps leadership convened a restructuring workshop to seek ideas on how the Corps could function more efficiently. Participants included representatives from the headquarters and the field, as well as Corps project sponsors and partners. Congressional staffers came as observers. Dr. John Zirschky, Acting Assistant Secretary of the Army for Civil Works, urged the attendees to "focus on what the organization does, not where it is done" in coming up with a new approach to restructuring the Corps. In delivering his keynote address to the workshop, Joe R. Reeder, Undersecretary of the Army, urged that the participants "focus on getting better, on becoming the premier modern engineering business entity in the world." In his remarks, Chief of Engineers Lieutenant General Arthur E. Williams candidly stated that "we have been through a period of frustration and uncertainty because of projected reorganizations, hiring freezes, high grade ceilings, changes in workloads and personnel reductions . . . . We have 40,000 civilians in the Corps who have been on a bungee cord. We now have an opportunity to move forward."[9]

The workshop addressed such tough issues as the future roles and missions of the Corps, the definitions of technical and policy review and the level at which they should occur, and the implementation of the new Civil Works Standard Organization Structure. After intensive debate, the workshop produced a draft statement of revised roles and missions for comment throughout the Corps. The agency had no choice but to proceed with restructuring because it faced a mandated 12 percent staff reduction by Fiscal Year 1999 — a total of 4,500 positions. By June 6, 1994, the Corps had eliminated only 747 positions; and those had been achieved on a voluntary basis.[10]

The process of restructuring the Corps advanced on a piecemeal basis, without a grand, overarching plan. Initially, the effort to improve organizational effectiveness and efficiency concentrated at the headquarters and division levels. During 1994, for example, the new technical review procedures removed divisions from the process and instead focused reviews at the district level. A new division structure evolved during Fiscal Year 1994-95 for implementation in Fiscal Year 1996. The Corps also revised many of its business processes, including the continuing authorities program, the feasibility study process, and the Operations and Maintenance performance measurement system. The overall objective continued to be delivering quality products at less cost. Still, restructuring proved painful because of the continuing pressure to downsize. By August 1995, the Corps had taken roughly 1,800 of the 4,500 reductions required by 1999. Maintaining a viable engineering and technical expertise in a retrenching organization was challenging, to say the least.[11]

The focus of the next phase of restructuring was at the district level. The approach required developing Corps-wide guidelines and then allowing division commanders to ensure that all specific

district restructuring actions were in compliance with the guidelines. No district would close and all districts would continue to maintain core engineering, planning, operations, and construction capability. The level of competency, however, in each category would not necessarily be uniform across districts. The guidance encouraged consolidation of non-engineering support functions. All changes were to be consistent with better business processes and customer services. The goal, according to the guidelines, was not to "do more with less," but "to identify how to accomplish the realistically projected workload in an era of declining resources."[12]

After gathering comments from the field, customers, and congressional elements, the Corps issued guidance so that district restructuring could begin in the spring of 1996. While the district reorganization moved slowly ahead, the Corps implemented a revised division-restructuring plan in 1997. The final plan reduced the number of divisions from 11 to 8 and reassigned some districts to new divisions. The Southwestern Division was one of the divisions realigned, losing the Albuquerque District to the South Pacific Division, located in Los Angeles.[13]

Changing Workloads

By the mid-1990s, the FWD had recognized the need to restructure and improve business practices in order to survive as a viable organization. Workload trends and manpower levels over the previous 15 years foretold what the future held for the district. The 1980s witnessed a steady rise in the district workload, with expenditures of $311.3 million in 1980 increasing to $621.6 million in 1989. This rise had been fueled by a dramatic increase in military construction. Between 1980 and 1989, the military portion of the district workload more than doubled, rising from $232.3 to $506 million. At the same time, the civil works effort rose more modestly, moving up from $79 to $115.6 million. The military side of expenditures peaked in 1986 at $711 million. Throughout the decade, the civil works workload averaged 18 percent of the total budget; its highest point came in 1980 (25 percent) and its lowest, in 1986 (12 percent). In the 1990s, on the other hand, the total district workload declined from $747.9 million in 1990 to $579.3 million in 1998. A slow but steady decrease in the district military construction activity accounted for most of the workload decline. The military effort dropped from $584 million in 1990 to $496 million in 1998, a decline of 15 percent. While the civil works expenditures fell even more dramatically on a percentage basis, sinking from $163.9 million in 1990 to $83.3 million in 1998 (49 percent), the effect of the steep decline in civil works activity had a lesser impact because it represented an increasingly smaller portion of the district's total workload. During the 1990s, the district's civil works effort averaged only 15 percent of the total budget; its highest point came in 1990 (22 percent) and its lowest, in 1993 (11 percent).[14]

The growth in the operations and maintenance portion of the civil works budget served as yet another measure of the decline in new projects in FWD over the past quarter of a century. During the 1980s, the district operations and maintenance expenditures averaged 30 percent of the civil works budget; in the 1990s, they climbed to an average of 45 percent. It is interesting to note that FWD's operations and maintenance outlays as a percentage of the civil works portion of the budget did not pass the 50 percent level until 1994 — a full decade after this occurred for the entire Corps. By 1998, FWD's operations and maintenance workload stood at 57 percent of the civil

works expenditures. During the 1980s, the operations and maintenance employees averaged 44 percent of the district's full-time civilian personnel. In the decade of the 1990s, the average percentage of operations and maintenance employees steadily increased, passing the 50 percent mark in 1993, remaining at or slightly above that level thereafter.[15]

In recognition of the impact of the Operations Division on the district's program, top management realized that it needed to perform as efficiently as possible. Accordingly, a major reorganization of field project offices took place on October 1, 1992, known as the district-clustering concept. Under this plan, individual and dual lake offices were consolidated into clusters of two or more lake offices. For example, Wright Patman Lake and Lake O' the Pines were combined into the Piney Woods Project Office to centralize and streamline the administrative support functions at the lakes. This enhanced the role of the support staff at the field offices in the management of natural resources and the recreation mission of the district. The cluster concept served as a model for the Corps' nationwide effort to standardize the organization and administration of its lake project offices.[16]

In addition to expenditures, workforce levels or FTEs provide a good measure of the FWD's changing workload since 1975. As shown in the table, the district reached peak manpower levels during the 1980s. The district attained the highest workforce levels between 1983 and 1987, when FTEs averaged 1548 and the split between military and civilian positions was 51 percent (783) and 49 percent (764), respectively. The late 1970s and early 1990s had the largest imbalance between the numbers of military and civilian employees; at other times, the split was almost even.[17]

As early as 1988, the FWD realized that its workload would be declining in the future and that personnel reductions would have to occur. In that year, management abolished 150 positions, with most reductions coming from the engineering and construction divisions. Although a reduction-in-force was announced, actual separations were few. The district was able to achieve most of the personnel cuts through retirements, and outplacement with other agencies, and by filling existing vacancies with surplus employees. In 1989, the district commander announced that another round of cuts would be necessary. This reduction-in-force came not because of a declining workload, but because the district had determined that private contractors could perform certain functions less expensively than could in-house personnel. Studies conducted over a two-year period showed that private contractors could do recreation maintenance at the projects less expensively than could Corps' workers. Similarly, a separate analysis found that district mail and messenger service could be handled more cost-effectively by contracting out the work than by using in-house workers. As a result, the district abolished 90 positions.

FWD Workforce Strength Averaged by 5-year Increments.

	1975-1979	1980-1984	1985-1989	1990-1994	1995-1998
Average Total FTE	1,249	1,400	1,484	1,190	1,108
Military FTE	710 (57%)	716 (51%)	757 (51%)	547 (46%)	537 (49%)
Civil FTE	539 (43%)	684 (49%)	727 (49%)	643 (54%)	571 (51%)

Again, numbers of actual separations were low as such options as outplacement and filling vacancies with surplus employees took care of most terminated incumbents.[18]

In the mid-1990s, the internal and external push on the FWD to restructure and improve business practices stretched the district's personnel and resources to the limit. While the Corps at the national level set the general terms for reorganization and mandated the search for better ways of doing its work, the FWD conducted in 1994 a self-assessment of areas for improvement. The study focused on the concepts of streamlining/flattening the organization, consolidating functions, reducing high-grade positions, and empowering employees. As a result of the self-assessment, the district restructured its engineering, planning, and real estate divisions. In the process, it abolished 9 deputy chief positions to improve the supervisory ratio, eliminated 84 positions through voluntary programs, reduced 10 high-graded positions, and continued the reorganization of lake project offices into geographic clusters to achieve resource efficiencies and better customer service. The FWD also implemented a leadership development program designed to enhance the skills of employees.[19]

During the last half of the 1990s, the drive to improve business practices and adjust manpower levels in response to reduced workloads continued unabated. In 1996-97, the FWD adopted yet another restructuring plan, this time to realign the technical support functions to more efficiently serve the field offices and customers. Specifically, to improve engineering support and better address environmental work, the plan combined the engineering and construction divisions and created an environmental division (the first in the Corps). The environmental division was an outgrowth of the district's heavy involvement in the environmental cleanup of military bases slated for realignment or closure and in "support for others" projects requiring environmental mitigation or restoration and cultural resources compliance work. Finally, the study management function of the planning division was moved into PPMD. This major reorganization of functions was the first at a district level in the Corps and served as a benchmark for other districts as they planned to undertake reorganization in the future.[20]

The FWD had been successful in securing work outside its geographical area since 1989. At that time, it developed nationwide memorandums of agreements with the Air Combat Command and Army Materiel Commands to provide environmental support for non-HTRW (Hazardous, Toxic, and Radioactive Waste) work. Subsequently, the FWD developed similar agreements with the Air Force Materiel Command, Army Environmental Center, General Services Administration, and the Federal Aviation Administration. The types of environmental services provided by the FWD included a variety of environmental assessments or impact statements, endangered species surveys, biological assessments, natural resources management plans, and the full range of cultural resources and Native American consultation compliance requirements. The FWD on a reimbursable basis supplied all of these environmental services, often involving small actions at multiple installations or sites crossing several Corps district boundaries. The FWD captured this type of "support for others" work because it achieved a reputation for having the appropriate expertise and doing a job in a timely, cost-effective, and customer-responsive manner. As the entire federal workforce downsized, the FWD realized that more opportunity for work in support of other federal agencies could develop.[21]

In 1997, the aggressive search for work through "support for others" proved particularly successful. The INS selected the Corps to become its facility and infrastructure manager, with responsibility for design, construction, and maintenance nationwide. To support this new mission, the Corps established a dedicated INS Resource Center in the FWD to focus on customer needs in developing design and construction projects. The Center would oversee the programs for the INS, while other Corps districts would perform specific projects within their geographic boundaries on a priority basis. Impressed with FWD's success in putting together an innovative proposal for doing work for others, Chief of Engineers Lieutenant General Joe Ballard stated that "I think it is a model that we can now hold up . . . to the other districts (and say) 'This is the way we're going to do business in the future.' It will gain us an untold amount of support from other potential customers because we're changing the way we traditionally do business."[22]

Building INS Facilities

The Immigration and Naturalization Service (INS) provided an exciting new development in the Fort Worth District under the Corps' Support for Others Program. The district coordinates with the INS headquarters in Washington, D.C. and the Support for Others Program to construct border patrol stations and to provide petroleum cleanup for these facilities throughout the Southwest. The Fort Worth District also assisted in a nationwide design guide for border patrol stations at locations in Florida, Puerto Rico, Virgin Islands, Hawaii, Guam, and along the West Coast.

Source: "Immigration and Naturalization Service," *Dispatch* 14 (January/February 1996), p. 12.

In spite of such successes as the INS agreement, the projected workload shortfall for Fiscal Year 1998, and the need to reduce overhead expenses required a new round of personnel cuts. At a town hall meeting in January 1998, the new district commander, Colonel James Weller, announced that 117 positions — from both the district office and the field — had to be abolished by the end of the fiscal year. "We just have to make some hard business decisions," Colonel Weller explained. "We're targeting positions and not people."[23] As a reason for the new reductions, he pointed out that between Fiscal Years 1993 and 1999, the FWD saw a 50 percent cut in design placement, from about $400 to $200 million. He further noted that downsizing was needed to bring the district within the Corps' guidelines for the supervisor/employee ratio. The FWD was at 1 to 8.3 while the Corps target aimed for a 1 to 10 supervisor/employee ratio. Once again, through use of outplacement, early retirements, and voluntary separation packages, managers had to abolish only 11 positions through reduction-in-force actions.[24]

Gallup Surveys

In an effort to sustain employee morale through the constant stress of reinvention and restructuring, top management sought to listen to employee concerns and respond where appropriate. The FWD contracted with the Gallup organization to survey employees about their attitudes and concerns. The first Gallup Workplace Audit, conducted in the fall of 1995, had a high response total — more than 90 percent — and revealed the strong performance of the district in support of its mission and customers. On a scale of 1 (extremely dissatisfied) to 5 (extremely satisfied),

respondents rated the FWD at 3.66 as a good place to work and gave a score of 3.51 to the statement, "The mission of the Fort Worth District makes me feel my job is important." The lowest rating, 2.60, came in response to a question about whether the employee had recently received recognition or praise for good work. The district senior leaders planned to use the survey to help them develop strategies to improve organizational effectiveness and customer care.[25]

A follow-up Gallup survey in July 1997 demonstrated significant improvement in most areas and marginal declines in a few. Overall, individual satisfaction with the district as a workplace and with the district's mission remained constant. Trust and relationships between co-workers and first-line supervisors, however, improved significantly. New questions were asked concerning the district's recent restructuring efforts and elicited a generally undecided response. Queried if "the restructuring of our district was a positive step," respondents gave a score of 2.90. As District Commander Colonel Madsen noted, in evaluating the Gallup survey, the district's leadership had the challenge of seriously responding to the findings:

> Our most important resource is the people who make up the District. Working to make each of us more effective in the workplace as individuals or as members of a team, makes the District more effective. Understanding our individual concerns, perceptions and needs is why we conducted the Gallup Workplace Survey.... The survey results are valuable. If we want to improve where we work, we must participate in the development of action plans aimed at the results.[26]

Reprogramming the Corps

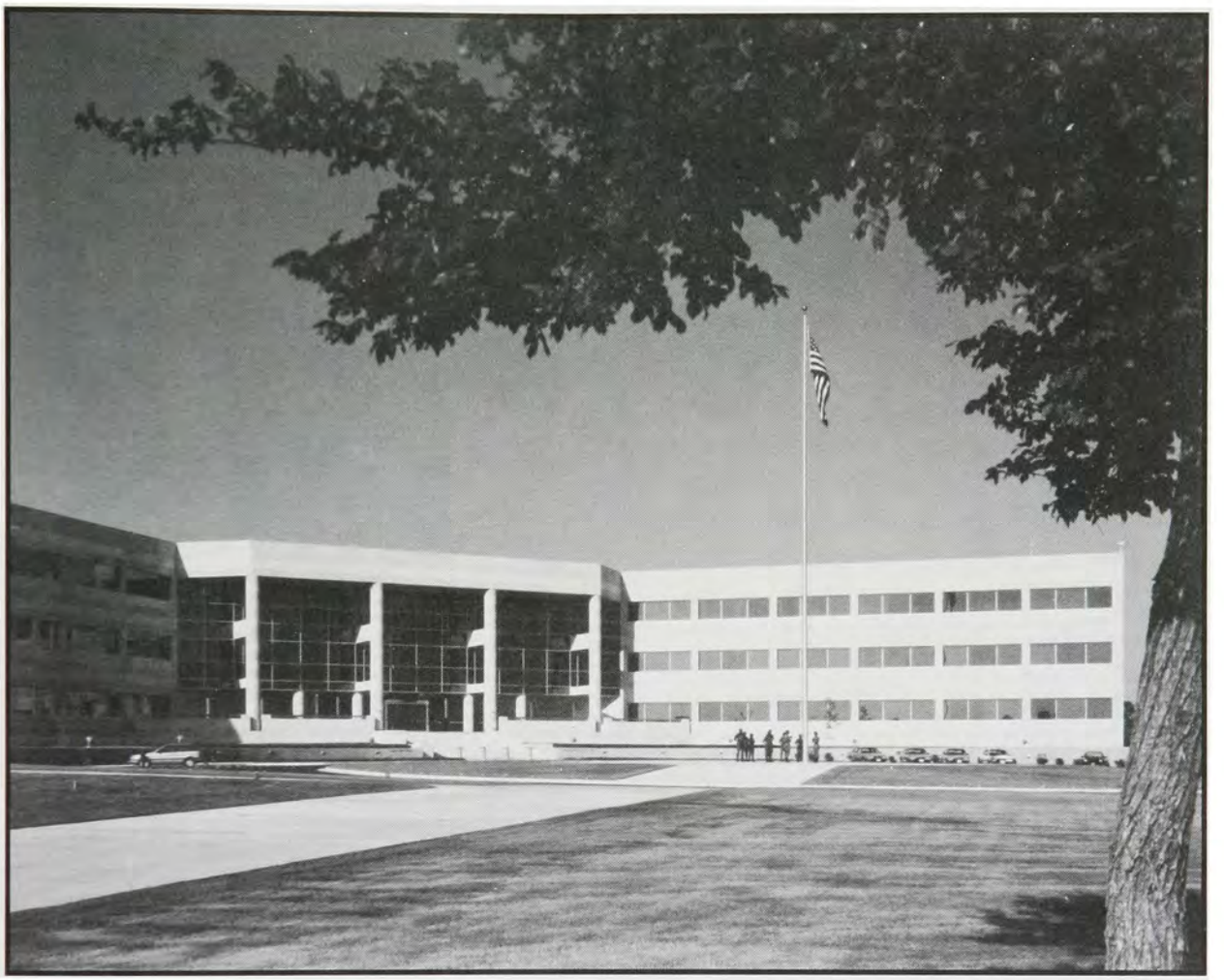
The Corps' headquarters confidence in the FWD's ability to perform appeared in another important initiative that the district undertook during the 1990s. The district served as the beta test site for the new Corps of Engineers Financial Management System (CEFMS). This system was a product of the Army's desire to standardize its financial and accounting methods and reduce costs. It chose the Corps of Engineers to begin the process. The Corps designed the new financial system to allow employees to conduct all their financial business through the computer. CEFMS maintained virtually every financial transaction, including travel orders, payments to contractors, labor time and attendance, and civilian pay. It also provided the capacity to access real-time data. Another unique aspect of the CEFMS was its electronic signature capability to authorize transactions on a computer. A

major benefit of the CEFMS was to give project managers the ability to better control access to their projects while monitoring financial status. It also served to integrate information from other automated systems in a district. Ultimately, the Corps hoped that the new financial accounting system would save time and money by streamlining business processes. The Corps projected savings of $270 million over a period of ten years.[27]

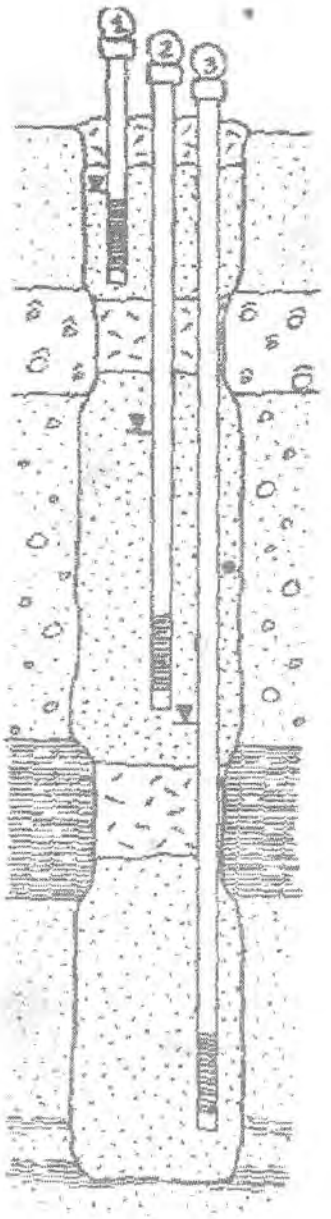
After initial development at the Corps' Huntsville Division, it was critical to test the program thoroughly before proceeding with full-scale implementation. The FWD was chosen for the beta test because of the size and complexity of its program and its highly capable workforce. With both a large and diverse civil and military program, FWD could provide testing for such applications as military uniform supervision and administration accounting, contributed funds, base realignment and closure, homeowners assistance program, GSA rent/standard level user charges, and the budget module. In addition, the district's extensive field office component would allow testing of the system's effectiveness in handling small purchases, multiple users on-line at one time, and new procedures for simplifying financial disbursements for multi-locations.[28]

The experience with the CEFMS proved more than a test of a new financial management system. It also tried the patience, flexibility, and temperament of the district's employees. Deployed in June of 1995, the new system initially proved to be complicated and not very user-friendly. "At first, it was a total disaster," recalled John Riddle, area engineer at Fort Hood.[29] Produced for civilian needs, it did not incorporate forms, such as purchase orders, required for military projects. Over the course of a year, the district gradually made the adjustment and helped the development team make essential improvements to the new system. The district also trained other districts as they prepared to implement the CEFMS. Besides the human issues, problems the district had to overcome in adapting the CEFMS to district business centered on fine-tuning the interactions with other project systems involving contracting, personnel, logistics, and real estate.[30]

The FWD experienced a great deal of change between 1975 and 1999. Large societal forces such as the environmental movement and the end of the Cold War — as well as federal budget constraints — led to changes in mission and workload for the district. In response to declining work and the need to provide better customer service, the FWD sought to become more efficient and innovative. As both traditional civil and military projects disappeared, it sought new work by providing support to other agencies. Internally, operations and maintenance requirements took ever-larger portions of the district budget. The entire Corps faced similar challenges and restructuring and reinvention became the response at all levels. Downsizing of the workforce became a necessity at all levels of the Corps. The FWD accepted the challenges and helped the Corps test and implement such organizational responses as the CEFMS and the realignment of functional divisions. Through it all, the FWD never lost confidence in itself and approached each problem with a solid team effort. That spirit is best exemplified in the words of Jimmy Baggett, an engineer with over 40 years of service in the FWD: "Oh, it's the best. Fort Worth District, I think, has been the leader in so many different areas. I would say that Fort Worth District is the premier district within the Corps of Engineers.... Whenever a new program comes along,... Fort Worth District has provided the expertise to be able to step in and do it."[31] ■



III Corps Headquarters at Fort Hood.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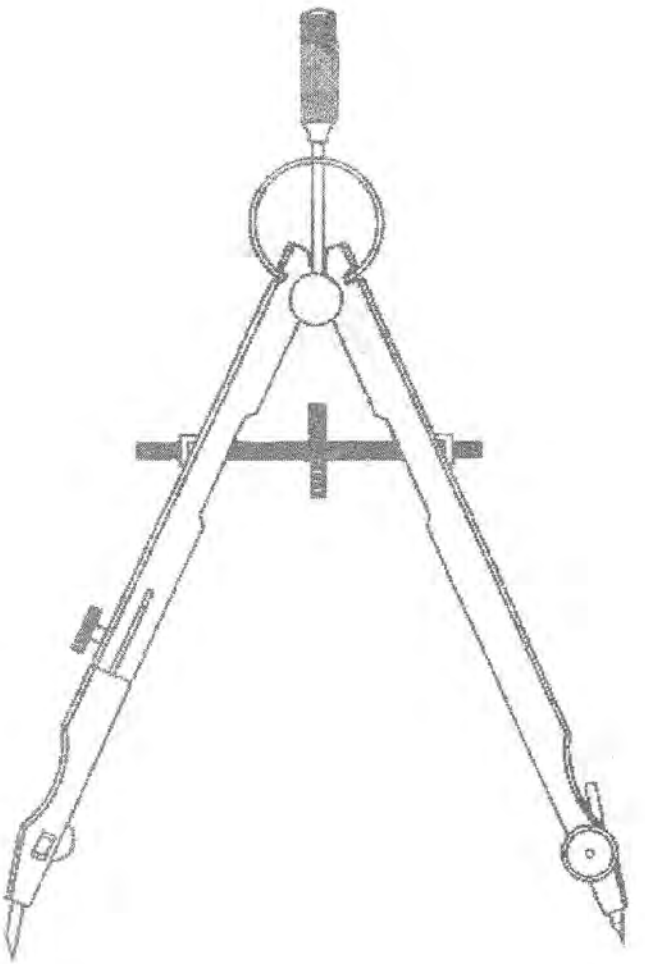


Conclusion

"Our charter is to get creative about how we do business, network and share good ideas that are currently working well, break down barriers that get in the way of doing smart things, and see how, as a team, we can provide the best possible services to our customers."

– Colonel Peter T. Madsen, District Commander, 1996

The FWD experienced major changes between the years 1975 and 1999, reflecting the development of the Corps in microcosm. Established for flood control, the district was characterized by construction of large water resource projects during its early years. As both environmental concerns and budget constraints emerged, the era of large-scale water resources projects came to a close — and increasingly, both the Corps as a whole and the FWD in particular turned to non-structural and environmentally friendly solutions to water problems. In addition, Congress, in 1986, imposed cost sharing with local project sponsors as a basic requirement for most future water resources development. Other national political and economic trends since 1980, such as a greater reliance on the market place, a smaller role for the federal government, and the end of the Cold War, forced the Corps to downsize and restructure as both its civil and military programs shrank.

The need to achieve greater efficiency and competitiveness in engineering, construction, and operations, as well as project management, required a trim but aggressive workforce with the appropriate skills. To achieve these capabilities, the FWD responded with determination, convinced that its actions were on the leading edge of creating a new Corps of Engineers. It epitomized the Corps' motto, *Essayons*. The FWD sought results on two fronts: internal reinvention and external search for new customers.

Reinvention came through restructuring and downsizing the organization in the face of shrinking civil and military programs. And it came through finding better ways of doing traditional missions. The FWD even set examples for the rest of the Corps in the reinvention process. It pioneered the implementation of the CEFMS for the entire Corps and developed a new organization for managing project offices at the Corps' lakes. In the search for new missions, the FWD developed the capability to provide environmental and cultural resources support for non-HTRW work for various military organizations. Due to its project management skills, it became responsible for providing facility and infrastructure management for the INS.

A focus on providing efficient and effective customer service helped the FWD stay on track. With this goal in mind, the district worked its way through the reinvention process. It explored new ways of utilizing existing district resources and embraced new technologies. For example, the FWD became a proponent of sharing indefinite delivery architect-engineer contracts between districts, proposing that the practice be expanded Corps-wide.

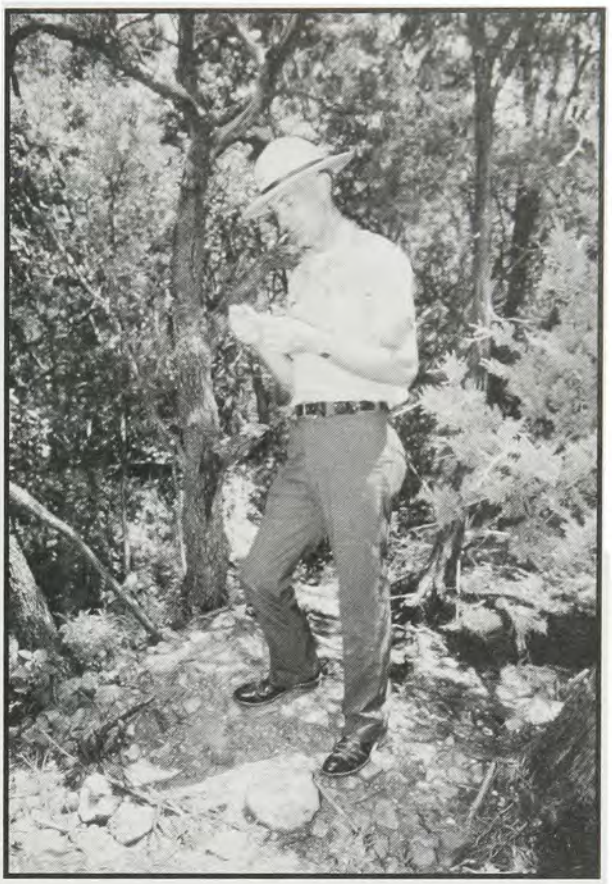
Thus, each district would have the contract capacity and strength of every other district, at a great saving in time and cost in the architect-engineering selection process. The FWD also urged other Corps districts to join it in partnering a broad range of expertise, resources, and funds to meet customer needs. It argued that in an era of shrinking resources and manpower, individual districts could not afford to maintain duplicate technical skills. Partnering with other districts across organizational boundaries promised better customer service at reduced costs. The FWD and Savannah District began such partnering on a limited basis in 1993. The FWD formed another partnership to pool technical resources with the Tulsa District in 1996.[1]

Another customer service initiative pushed by the FWD involved conducting the first CD ROM/Internet contract solicitation in the Corps. The chief of engineers created a headquarters-district level task force to establish the technical specifications and ordered the FWD to place the first job on both CD ROM and the Internet. On April 26, 1996, the FWD placed three volumes of plans and specifications containing 225 drawings for a project at Edwards Air Force Base on the new media; no hard copy was given out. This new approach to the bid solicitation process cut costs almost in half, even with start-up expenses added in. The goal eventually is to move all contract solicitations to the Internet.[2]

As the FWD worked to improve its internal operations and seek new outside customers for its services, the district also shared its expertise with other Corps elements. From 1995 to 1998, the FWD served as the Corps' Reinvention Center for District Installation Support. It had responsibility for exploring innovative solutions to military installation problems, stemming from the need to provide a high quality of life for personnel and dependents while meeting mission and readiness requirements. As Colonel Madsen suggested, "our charter is to get creative about how we do business, network and share good ideas that are currently working well, break down barriers that get in the way of doing smart things, and see how, as a team, we can provide the best possible services to our customers."[3]

In working to redefine existing policies and develop new techniques and processes for installations, the Reinvention Center sought to identify or develop standards and specialized services for use throughout the Corps. Results ranged from innovative contracting procedures to applying new technology, such as Geographic Information Systems and Geospatial Data and Systems, to customer needs. Expanding the access to environmental planning support services also played a role in the management options coming out of the Reinvention Center. Not surprisingly, the biggest challenge the Reinvention Center faced was getting the installations and various district elements to accept the cultural changes necessary to implement new ways of doing things. For Scott Bearden, chief of the Reinvention Center, the solution to the needed cultural change involved creating a "forward-thinking engineer team, integrally linked to the nation's defense, providing innovative solutions, not simply traditional services or products."[4]

Whether it was providing better ways of servicing military installations or developing new methods of mitigating for environmental impacts when services and facilities were improved for the recreating public, the FWD has demonstrated over the past 25 years that it was on the cutting edge. Its willingness to innovate and partner with others would serve the district well as it entered the next 25 years of service to the state of Texas and to the nation.■



Appendix

List of Commanders, 1974 – 1999
U.S. Army Engineer District – Fort Worth

Name	Dates of Command
Col. Joe H. Sheard	April 1974 – July 1976
Col. John F. Wall	July 1976 – April 1979
Col. Donald J. Palladino	May 1979 – June 1982
Col. Theodore G. Stroup	June 1982 – January 1985
Col. Albert J. Genetti, Jr.	March 1985 – July 1987
Col. John E. Schaufelberger	July 1987 – August 1989
Col. William D. Brown	August 1989 – August 1991
Col. John A. Mills	August 1991 – August 1993
Col. Joseph G. Graf	August 1993 – August 1995
Col. Peter T. Madsen	August 1995 – November 1997
Col. James S. Weller	November 1998 –

Glossary

Acronyms

BRAC	Base Realignment and Closure
CEFMS	Corps of Engineers Financial Management System
COST	Citizen's Organization for a Sound Trinity
CTAO	Central Texas Area Office
CWA	Clean Water Act
DDE (PM)	Deputy District Engineer for Project Management
DERP	Defense Environmental Restoration Program
DOD	Department of Defense
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAC	Field Advisory Committee
FEMA	Federal Emergency Management Agency
FORSCOM	United States Army Forces Command
FWPCA	Federal Water Pollution Control Act
FWD	Fort Worth District
FTE	Full Time Equivalent
HELSTF	High Energy Laser Systems Test Facility
HTRW	Hazardous, Toxic, and Radioactive Waste
IBS	Integrated Building Systems
INS	Immigration and Naturalization Service
IRP	Installation Restoration Program
LLELA	Lewisville Lake Environmental Learning Area
MCX	Mandatory Center of Expertise
NAGPRA	Native American Graves Protection and Repatriation Act
NHPA	National Historic Preservation Act
NEPA	National Environmental Policy Act
NPS	National Park Service
PPM	Programs and Project Management
PPMD	Programs and Project Management Division
SARA	San Antonio River Authority
TRA	Trinity River Authority
WRDA-86	Water Resources Development Act of 1986
WSMR	White Sands Missile Range

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