

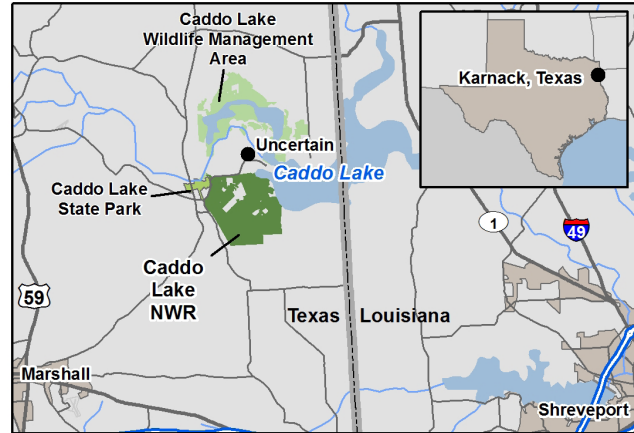
Introduction

Established in December 1941 to produce TNT for World War II, the Longhorn Army Ammunition Plant facility was a major employer in East Texas. Over time, the facility produced a variety of munitions, including incendiary devices and Pershing rocket motors. As unused buffer land surrounding the facility reverted from its former agricultural use to forest, it provided habitat for hundreds of species of wildlife. Today, the site has been transformed into a valuable wildlife refuge. This case study tells the remarkable story of the continuing cleanup and reuse of the Longhorn Army Ammunition Plant Superfund site.

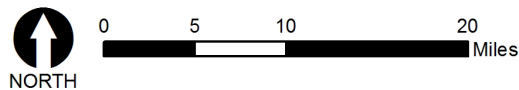
Following the discovery of contamination at the site and the facility's closure, the community set to work planning for the site's reuse. Tenacious and enterprising organizations including the Caddo Lake Institute (CLI) and Greater Caddo Lake Association of Texas worked tirelessly to engage federal agencies and the community to conserve habitat areas at the site. Thanks to their work and collaboration with the U.S. Army, the U.S. Fish and Wildlife Service (FWS), EPA, the Texas Commission on Environmental Quality (TCEQ), and other organizations, the site has become a unique part of the country's National Wildlife Refuge System.

Today, refuge visitors enjoy hiking and birdwatching. Forest, wetland and aquatic habitats support hundreds of species of wildlife, including alligators, wood ducks and paddlefish. Internationally recognized wetlands include pristine mature flooded bald cypress forest, one of the best-preserved such ecosystems in the United States. "This extraordinary example of ecological reuse illustrates the opportunities that Superfund site cleanup and revitalization present for communities," said EPA Region 6 Superfund Redevelopment Coordinator Casey Luckett Snyder.

This case study explores the tools and partnerships that have led to successful cleanup and transformation at the Longhorn Army Ammunition Plant site. The following pages trace the evolution of cleanup and reuse efforts, highlighting community leadership, project partnerships, and coordination of remedy and reuse considerations. The case study provides information and lessons learned for parties interested in Superfund site reuse, habitat conservation, and the adaptation of former federal facility and military sites for public use.



Sources: US Fish and Wildlife Service, Texas Parks and Wildlife, Esri, DeLorme, AND, Tele Atlas, First American, UNEP-WCMC and USGS.



The site is located on the shore of Caddo Lake in East Texas, near the Louisiana border.



The refuge includes some of the country's most pristine old-growth hardwood forest.

Site History, Contamination and Remediation

At the outset of World War II, the Army moved quickly to expand the production of munitions to support the war effort. As part of these efforts, the Army acquired the site property and established the Longhorn Army Ammunition Plant (LHAAP) in December 1941. Less than a year later, the manufacturing facility was in place and had made its first batch of trinitrotoluene (TNT). The facility operated for almost six decades, manufacturing munitions ranging from incendiary devices to rocket motors. At its peak, the facility included 451 buildings, operated its own power and water treatment plants, and moved raw materials and finished product around on site using an extensive rail network.

Facility operations and chemical releases resulted in the contamination of soil and groundwater with volatile organic compounds, perchlorate, metals and explosives. EPA listed the site on the Superfund program's National Priorities List (NPL) in August 1990. The Army, EPA and the Texas Water Commission (now TCEQ) entered into a Federal Facility Agreement (FFA) to guide site investigations and cleanup in December 1991. The FFA became effective in December 1991. In 1997, the U.S. Army Armament, Munitions and Chemical Command placed LHAAP on inactive status and classified it as excess property.

The project team developed cleanup plans for 15 separate site areas. The bullets below highlight several of these areas, illustrating the range of site remedies.

- *LHAAP-001-R (South Test Area/Bomb Test Area) and LHAAP-003-R (Ground Signal Test Area)*: land use controls and groundwater monitoring.
- *LHAAP-12 (Landfill)*: capping and groundwater monitoring.
- *LHAAP-16 (Landfill)*: landfill cap maintenance, in-situ bioremediation, monitored natural attenuation and land use controls.
- *LHAAP-17 (Burning Ground No. 2/Flashing Area, Group 2)*: soil removal, groundwater extraction and treatment, monitored natural attenuation, and land use controls.

As cleanups finish, the Army transfers ownership of the areas to FWS. The most recent transfer – of the Landfill 12 Area Parcel – took place in March 2014. To date, about 7,000 acres of the 8,416-acre installation have been transferred to FWS for management as the Caddo Lake National Wildlife Refuge.

The Army is currently conducting soil and groundwater cleanup activities for several remaining areas. All operations, including the restoration program, are carried out by the Army's Base Alignment and Closure Division. The Army Environmental Command funds environmental restoration activities at the site.



In 1988, plant employees destroyed Pershing missiles in the presence of Soviet inspectors in accordance with the Intermediate-Range Nuclear Forces Treaty.

Project History

1980s – 1995

Setting the Stage

Long before the Army moved to close LHAAP, the site’s unique setting and natural resources as well as the community’s developing environmental stewardship ethic had set the stage for future use. Located on the western shore of the stunning and biodiverse 40-square-mile Caddo Lake and within the Central Flyway, a vital bird migration corridor, LHAAP provides important wildlife management opportunities. Undeveloped buffer areas surrounding the facility include some of the most pristine old-growth bottomland hardwood forest in the United States. Large forested upland areas of the facility, while managed for timber production by the Army, had historically supported a biodiverse Piney Woods ecosystem, consisting of shortleaf pine and hardwoods, including oaks, hickory and other fire-tolerant species. As early as the 1980s, FWS staff were aware of the property’s unique value and potential. “I had my eye on the site very early, in case there might be an opportunity to secure it in the future,” said Jim Neal, former FWS staff member and CLI consultant. “It was a great opportunity for land preservation.”

Building Local Capacities

Community efforts to preserve the natural heritage around Caddo Lake began early, and local advocacy organizations built their capacities over time. In 1978, the Greater Caddo Lake Association formed to work on water flow and water quality issues at the lake. In 1992, Eagles musician Don Henley formed CLI to oppose development of the “Daingerfield Reach,” a barge canal proposed for Caddo Lake. Both organizations worked to preserve the Caddo Lake ecosystem,



Caddo Lake’s wetlands provide high-quality habitat for many species of wildlife.

CERCLA

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is the law passed by Congress on December 11, 1980, that is commonly known as Superfund.

including an effort in the 1990s to oppose changes to the water permit held by the nearby city of Marshall. These early efforts built capacity within the organizations and also energized and inspired community members to build on those successes.

Since its inception, CLI has been a driving force in land preservation at LHAAP. When it learned that the potential existed for the property to be sold for use as a prison or industrial facility, CLI got to work. Recognizing the facility’s unique ecological value and international significance, cofounders Don Henley and Dwight Shellman took an entrepreneurial approach to preserving the land. They hired an engineer and scientist to study and map the contamination and determined that much of the land on the facility was relatively clean and suitable for use. Henley, a well-known musician, worked hard to open doors at the state and federal levels, building the political capital needed for the work to come.

Starting the Reuse Dialogue

In the early 1990s, the Army put the facility on a list of installations slated for closure. Many people in Marshall were concerned that whatever came next at the site should provide jobs, and many community meetings were held to consider potential future uses. “After a major employer like an Army base closes down, things won’t continue to be the way they were before,” said Mark Williams, former FWS staff member and Friends of the Caddo Lake National Wildlife Refuge member. Ecotourism emerged as an opportunity for the next stage of economic development in the area.

The Army began looking for partners to accept the property, and approached FWS about the site’s potential as a conservation area. The site’s pristine bottomland hardwoods and upland habitats fit well with surrounding conservation areas. The Texas Parks and Wildlife Department had purchased all of the land

“By facilitating conversations about reuse early in the cleanup process, EPA can support the design of cleanups that support future community needs”

– Richard Mayer, EPA Project Manager

for establishment of the Caddo Lake Wildlife Management Area to the north of the site by 1992. Nearby Caddo Lake State Park dates back to the 1930s.

FWS was initially reluctant to take on the site due to concerns about the Superfund cleanup. The site is also part of an FWS region that includes primarily arid western landscapes. Building awareness of the habitat's value took time. A cleanup for ecological reuse also caused concerns for the Army, as cleanup for industrial reuse might be less expensive. Dwight Shellman and CLI persistently advocated for the project, traveling to Washington, D.C. and meeting with various federal agencies to build support.

To raise the profile of the area and build support for conservation, CLI pushed to have Caddo Lake's wetlands designated under the *Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat*. Since 1971, over 150 countries have signed the treaty and 2,226 sites have been designated worldwide. In 1993, the 20,000 acres of Caddo Lake wetlands, including part of the Caddo Lake Wildlife Management Area and part of LHAAP became the 13th site in the United States to receive the designation. CLI could use the designation to build the community and political support necessary to preserve more of Caddo Lake's resources.

Dwight Shellman, Caddo Lake Conservationist

CLI co-founder Dwight Shellman is remembered by many in the community as a key contributor to the establishment of the Caddo Lake National Wildlife Refuge. After founding CLI with Don Henley in 1992, he was the organization's president for many years. Robust community engagement and education was a key component of the efforts he led to preserve the land at LHAAP. "Dwight was a great believer in citizen science and teaching people," said Greater Caddo Lake Association member Jack Canson. "We had so many community meetings that you'd think people would get sick of it, but they didn't – he was so democratic and such a good teacher." Mr. Shellman passed away in 2012.

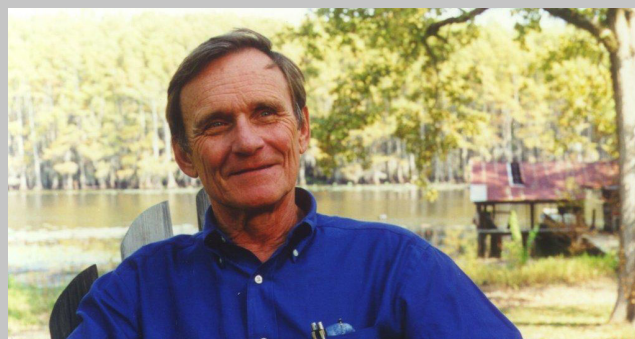
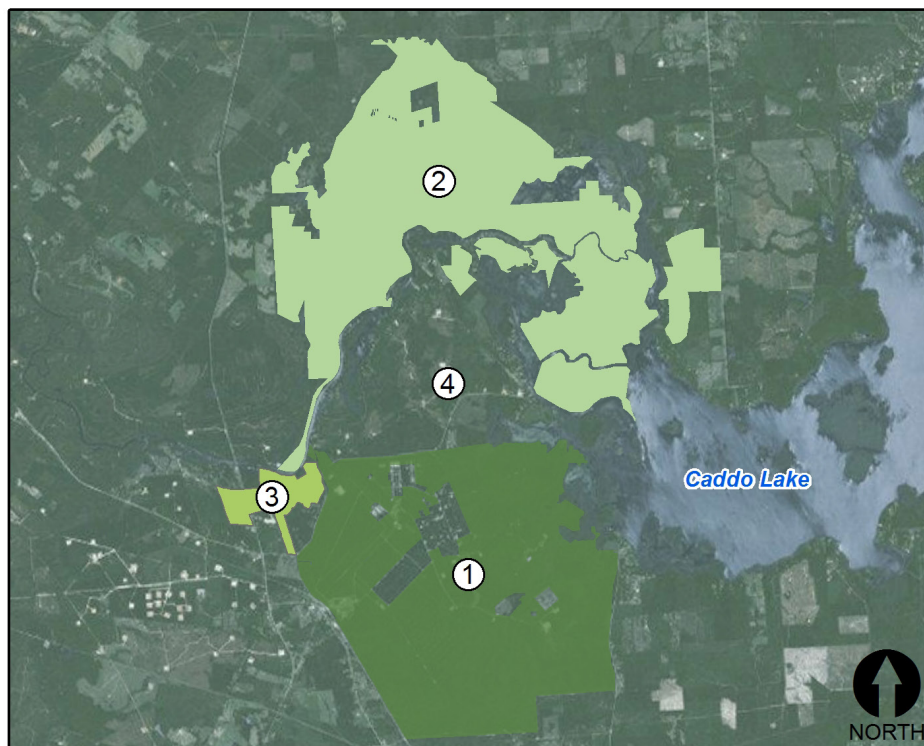


Image used with permission of CLI.



- ① Caddo Lake National Wildlife Refuge
- ② Caddo Lake Wildlife Management Area
- ③ Caddo Lake State Park
- ④ Uncertain

Sources: US Fish and Wildlife Service, Texas Parks and Wildlife, Esri, DeLorme, AND, Tele Atlas, First American, UNEP-WCMC and USGS.

The Caddo Lake National Wildlife Refuge includes 7,000 acres of hardwood bottomland and lakefront.

Federal Facilities: A Closer Look

In addition to military installations, federal facilities include former nuclear production plants, abandoned mines and landfills. Common types of contamination include radioactive waste, munitions and unexploded ordnance, mining waste, fuels and solvents. There are 174 federal facilities on the NPL. EPA is responsible for overseeing their cleanup under the Superfund law (CERCLA Section 120).

At Department of Defense sites such as LHAAP, EPA's responsibilities include efforts to support community involvement, facilitate property transfer, implement remedies as soon as practicable, and maintain remedies that protect human health and the environment.

Timeline of Events

1942	LHAAP established to produce munitions for World War II
1984	Army identified contamination at the site
1988	Pershing missile destruction
1990	LHAAP added to the NPL
1991	Federal Facility Agreement (FFA) between State of Texas, EPA and the Army LHAAP manufacturing facility closed
1992	CLI formed
1993	Area wetlands designated Ramsar Wetlands of International Importance
1996	CLI leases 1,300 acres from the Army
1997	Army declares LHAAP in excess of needs
1998	FWS expresses interest in receiving lands to establish the Caddo Lake National Wildlife Refuge
1999	Additional land and buildings leased by CLI
1999-2000	Tri-party memorandums of agreement (MOAs) between CLI, FWS and the Army
2000	First technical assistance grant
2000	MOA between Army and FWS establishes Caddo Lake National Wildlife Refuge
2003	Administrative control of LHAPP transferred to BRAAC
2004	MOA between Army and USFWS establishes the transfer process for LHAAP lands
2009	Caddo Lake National Wildlife Refuge opens to the public
2014	Transfer of Landfill 12 Area Parcel
2017	Visitors continue to enjoy nature and recreation areas at Caddo Lake National Wildlife Refuge

1996 – 2009

Putting the Pieces in Place

As political and community interest in conservation increased, CLI, FWS and the Army started work on the legal framework necessary to preserve the land. In 1996, CLI leased over 1,300 acres of bottomland hardwoods at the site from the Army. The lease, which allowed CLI to engage in a variety of education, research and conservation activities, would give the Institute the opportunity to explore the site's potential as a national wildlife refuge. The pilot effort was a success. In 1998, FWS expressed interest in receiving the lands for the establishment of a refuge.

Over the next several years, CLI, FWS and the Army worked on a series of agreements to establish the refuge and define roles. Throughout the negotiations, EPA supported and facilitated discussions, working with all parties involved and gathering community input. Under three-party agreements in 1999 and 2000, the Army, FWS and CLI established interim roles and responsibilities. "Our role has shifted over time from trying to spur interest in reuse to working with federal agencies to make it happen," said CLI legal counsel Rick Lowerre.

A 2000 Memorandum of Agreement between the Army and FWS designated an area of over 7,000 acres for the establishment of an overlay refuge. Under the agreement, the Army retained ownership and control of the land, while FWS undertook wildlife and habitat management activities. In 2002, the Army transferred LHAAP to its Base Realignment and Closure Office for management as an excess property. An Integrated Natural Resource Management Plan published that year outlined custodial and forest stewardship for the site during the transition process.

A 2004 MOA between the Army and FWS laid out the process for transfer of the land. With EPA approval, the Army would complete discrete areas of cleanup and then turn them over to FWS control. Cleaning up parts of the site piece by piece addressed contamination concerns and enabled the areas to be returned to use while cleanup continued in other areas. The process began with the transfer of about 5,000 acres immediately as part of the 2004 agreement; to date, about 7,000 acres in total have been transferred. These land transfers include a portion of the water rights associated with the land, which is important for preserving the lake ecosystem. The

"Having community voices in discussions about site reuse is vital, particularly when the site will be put in the public trust."

– April Palmie, TCEQ Project Manager

same year, CLI subleased the 1,300 acres and buildings it had leased from the Army to FWS. In exchange, CLI retained rights to use half an office building, which they have provided free of charge to other partner nonprofits. Co-locating these organizations strengthened their collective efforts.

Resisting Development Pressures

The 2004 MOA left some uncertainty about the transfer of all installation lands to the FWS. The agreement included a provision that lands unsuitable for the refuge could be transferred to a third party. In 2005, several business interests initiated an effort to secure the remaining 2,600 acres for industrial development. As millions of gallons of water rights were tied to the acreage, interest in acquiring the land was high despite feasibility issues and concern over potential industrial impacts on the refuge.

Community organizations remained focused on ensuring the refuge's long-term sustainability. Outreach by CLI, the Greater Caddo Lake Association of Texas and other groups included community meetings, a letter-writing campaign and contacting elected officials. Organizations worked to educate the public on the limitations of the site's infrastructure, constraints of the Superfund cleanup, and the availability of vacant industrial park space nearby. Community members showed up in droves at public meetings. Given the scale of the community response, industrial development proposals did not move forward.

Developing a Community Resource

Following the establishment of the refuge, FWS focused on infrastructure, visitor amenities and habitat restoration. The Army had managed upland forest portions of the site for industrial timber production for many years, and the area had been primarily planted with a single variety of pine tree. "When the land was transferred, the forest was in pretty good shape," said Mark Williams. To restore the historical Piney Woods ecosystem, which includes shortleaf pine and fire-tolerant hardwood species such as oak and hickory, FWS has employed forest management strategies such as selective cutting and prescribed fires. This management approach helps



As ecological reuse proceeded at the refuge, the Army continued to clean up other site areas still under its control.



Volunteers and paid staff have improved infrastructure, habitat and visitor amenities at the refuge. Image courtesy of FWS.

Superfund and National Wildlife Refuge Reuse

Ecological reuse at Superfund sites restores contaminated lands to productive use in areas where industrial, commercial or residential redevelopment may not be suitable or feasible. These lands provide valuable wildlife and pollinator habitat and recreational resources. EPA, the U.S. Department of Defense and FWS have worked together on national wildlife refuge establishment at military site Superfund cleanups across the country, including the Rocky Mountain Arsenal and Rocky Flats national wildlife refuges in Colorado, the Crab Orchard National Wildlife Refuge in Illinois, the Assebet River National Wildlife Refuge in Massachusetts, and the Great Bay National Wildlife Refuge in New Hampshire.



Bison graze at the Rocky Mountain Arsenal National Wildlife Refuge near Denver.



Most buildings at LHAAP have been demolished. A guardhouse (left, prior to restoration), now part of the refuge visitors center, and the ruins of an old production facility (right) remain. Images from Jack Canson.



create a forest with diverse tree and plant species and a range of age classes, which is vital to forest health.

FWS' work on visitor resources included building trails and creating a visitor center. The Friends of Caddo Lake National Wildlife Refuge, a volunteer organization formed to assist FWS with its mission at the refuge, undertook projects to build kiosks, birding blinds and other amenities. "Our goal is to create a place for the public with activities and assets that build stewardship and an appreciation for the natural system that's there – an understanding of its uniqueness and sensitivity," said organization President Gary Endsley. "Volunteers are key to that work – what we want is an army of stewards, and then we can get on to making the world a better place."

Community groups collaborated to preserve a guardhouse dating to 1942 that the Army was preparing to abandon. CLI, FWS, the city of Marshall, the Marshall Convention and Visitors Bureau, the city of Uncertain, and private individuals contributed funds to move the structure to the visitors center complex and preserve it. Using old photos of the guardhouse kept by the son of a former Army staff member, they restored the building to its original condition, with energy-efficiency improvements. "Our collaboration to make this happen was a great gesture to show that we have all moved past the conflicts we had in the early days," said Greater Caddo Lake Association member Jack Canson. "We worked together to create a valuable tourism asset." The guardhouse has been transformed into the Dwight K. Shellman Jr. Ramsar Wetlands Visitor Center, which features educational displays about the Caddo Lake wetlands and the history of the site.

In September 2009, hundreds of people celebrated the opening of the Caddo Lake National Wildlife Refuge. The ceremony included elected representatives, members of the Caddo Nation of Oklahoma, the tribe that originally inhabited the area, representatives from local, state and federal agencies, and members of the local advocacy organizations that had worked so hard to make it all happen. The event was a celebration of the community's remarkable conservation efforts and marked an important milestone on the way to move forward to the next chapter at the site.

"The impetus for this refuge was a local movement that garnered the attention of agencies involved. Thanks to the community, this is a great story of preservation."

– Stephen Tzhone, EPA Project Manager



At the 2009 opening ceremony, CLI co-founder Don Henley (top) spoke to a crowd of hundreds (middle), including a local boy scout troop (bottom). Images from Jack Canson (top) and Dawn Orsak (middle and bottom) used with permission of CLI.

2010 – Present

Building for the Future

Since the refuge opened to the public, stakeholders have focused on ensuring its long-term sustainability by nurturing partnerships, developing refuge resources, and undertaking long-range planning. Since 2004, the Army has transferred a total of about 7,000 acres of the former LHAAP facility to FWS; the most recent transfer took place in 2014. As new areas are added to the refuge, FWS folds them into its management strategy, which involves select harvest of timber and prescribed fires to cultivate a diverse forest ecosystem.

Working Across Lines on Ecosystem Restoration

Land preservation at LHAAP has been an important advancement in establishment of a landscape-scale conservation area on Caddo Lake. The refuge lands complement thousands of acres managed by the Texas Parks and Wildlife Department at the Caddo Lake Wildlife Management Area and Caddo Lake State Park. Together, these conservation areas provide a variety of complimentary habitats, including upland hardwood forest, flooded cypress swamp, wetlands, shoreline and biodiverse aquatic habitats. As wildlife are not constrained by administrative boundaries and flow freely across the land, landscape-scale conservation management is key to successful wildlife preservation.

With this broader context in mind, FWS is currently developing a Comprehensive Conservation Plan that will guide the long-term management of the refuge. The plan will outline the habitat management goals and strategies, plans for

building partnerships, and other management strategies that FWS will undertake to advance the mission of the refuge. The plan development process includes extensive public outreach efforts, including focus groups, public meetings and comment periods to educate and inform the community and gather information and ideas and address concerns. FWS will develop a series of alternative management approaches and gather feedback on the preferred alternative before preparing a final environmental document and plan.

Cultivating Partnerships

Many different local organizations work together and independently to promote natural resource conservation in the Caddo Lake area and at the refuge. Education and community outreach have been a primary focus, with the goal of increasing support for conservation and sharing the area's remarkable natural resources with the community. The Cypress Basin Chapter of the Texas Master Naturalists is active at the refuge, with volunteers building bird blinds, maintaining walking trails, teaching community members about prescribed fires, and fighting invasive species. Volunteers with the Friends of Caddo Lake National Wildlife Refuge also continue their mission to support FWS operations. Collins Academy provides environmental education opportunities related to the refuge. Community members can be part of volunteer efforts at the refuge by participating in bird counts, trail work and other projects. CLI also works with FWS, TCEQ and other agencies and nonprofits to coordinate Caddo Lake conservation efforts across state lines. "Volunteer groups and education organizations have been very active here," said refuge manager Erik Duerkop. "They've made important contributions to developing resources and improving visitor experiences."

Today, visitors can participate in hiking, biking, horseback riding, bird watching and some hunting activities at the refuge. The refuge boasts one of the most pristine examples of Piney Woods ecosystem in the country, featuring bayous and forests with diverse aquatic species and plant life nourished by the area's heavy rainfall. Birders visiting the area can find over 200 species of birds, including wood duck, herons, warblers

"It's important to consider landscape-scale management. The refuge includes wetland like the old growth bottomlands along Harrison Bayou, the Caddo Lake shoreline and upland sites that integrate well with the state park and wildlife management area."

– Jim Neal, CLI consultant



At the Dwight K. Shellman Jr. Ramsar Wetlands Visitor Center, people can learn about the refuge ecosystems. Image from Jack Canson.

Giant Salvinia: A Threat to Caddo Lake

The spread of Giant Salvinia, a floating aquatic fern, threatens the health of the Caddo Lake ecosystem. The invasive plant outcompetes and replaces native plants and blocks sunlight and decreases oxygen concentrations in the water, which damages fish and other aquatic species. CLI, Friends of Caddo Lake National Wildlife Refuge, the Greater Caddo Association of Texas and other organizations are working hard to halt the plant's spread in Caddo Lake. A type of weevil that feeds on Giant Salvinia, damaging its buds and leaves, is being cultivated and used as a biocontrol agent.

and white-eyed vireos. Rafinesque's big-eared bats are among nearly 50 species of mammals at the refuge, which also supports 90 species of reptiles and amphibians, including alligators and snapping turtles. The lake supports nearly 90 species of fish, including 18 species of game fish enjoyed by fishing enthusiasts.

“This seems like the best possible use of the land. It’s available for a lot of people to use and has wonderful habitat benefits.”

– April Palmie, TCEQ

A total of 1,400 acres of Army land and accompanying 3.2 million gallons in water rights remain to be transferred to FWS control. As groundwater cleanup proceeds, EPA continues its oversight role, including engaging the community, helping with development of land use controls and participating in Restoration Advisory Board meetings. The Army and FWS continue to negotiate over the terms of the final transfer, which is complicated by remaining cleanup work. Under the 2004 MOA, the Army retains the right to transfer the land to a third party should FWS refuse to accept the land. Project partners remain deeply engaged in this conversation and are committed to seeing the last part of site acreage finally transferred to FWS management.

Harrison Bayou

A 400-acre virgin hardwood forest in this bayou, which is part of Caddo Lake National Wildlife Refuge, has stood untouched for over a century due to its inaccessibility. “Harrison Bayou is some of the last of virgin forest in this part of the world,” said Gary Endsley. “It is pristine and looks prehistoric.”



Image from Laura-Ashley Overdyke used with permission of CLI.

“If there is a resource worth preserving, conservationists should do everything they can to protect the site, whatever it takes.”

– Jim Neal, CLI consultant



Community members continue to meet to learn about and discuss remaining cleanup activities at LHAAP. Image from Jack Canson used with permission of CLI.

Community Engagement in Cleanup and Reuse

Technical issues at Superfund sites are often hard for people to understand. EPA and federal partners provide a variety of tools to engage community stakeholders during cleanup and reuse planning efforts.

EPA's Technical Assistance Grant (TAG) program provides money to community groups so they can procure technical advisors to interpret and explain technical reports, site conditions, and EPA's proposed cleanup proposals and decisions. EPA's cleanup decisions depend on several different things, including what studies say about site conditions, the kinds of wastes found, and the cleanup methods that would work at a particular site. A technical advisor can help community members participate in decision making by helping them better understand what is going on at a site.

At LHAAP, EPA technical assistance grants provided the community with expertise to review and explain the cleanup work underway. These technical assistance services enabled community members to engage more fully in the process. “Cleanup issues can be hard for communities to understand,” said EPA Remedial Project Manager Stephen Tzhone. “Technical advisors help communities more effectively participate in decision-making by reviewing, commenting on, and translating technical reports.”

The site's Restoration Advisory Board is another vital community engagement mechanism. The Department of Defense establishes Restoration Advisory Boards to gather community input and increase community understanding of and support for cleanups. The advisory boards are designed to be forums where citizens, the military, EPA and state representatives can share information and partner on effective cleanups.

Lessons Learned

Project participants identified several significant factors that contributed to its successful outcomes.

- LHAAP's location along an important bird migration route, within the unique Caddo Lake landscape, and nearby other large conservation lands made it a unique opportunity for habitat preservation.
- Harrison Bayou's pristine virgin flooded cypress forest, one of the best examples of its kind in the country, drew regional and national attention and support from FWS.
- EPA works with communities and stakeholders to support reuse outcomes that are compatible with site cleanups. At Department of Defense sites, EPA's work includes supporting community involvement, facilitating property transfers and providing cleanup oversight. As part of its ongoing support for cleanup and reuse at LHAAP, EPA provided technical assistance grant funding to support the community's effective engagement, supported parties involved in MOA negotiations and gathered community input.
- CLI provided leadership and vision, bringing financial and political resources as well as an ability to work with a range of federal, state, local and nonprofit partners to advance the establishment of the refuge.
- Nonprofit and volunteer organizations dedicated to public education and outreach built community capacities to participate in the reuse and cleanup discussions and have yielded a robust volunteer network that supports ongoing refuge operations.

Bigger Picture

While these factors created an ideal climate for the successful reuse of the LHAAP site, a range of broader lessons learned can also help guide similar projects at contaminated lands across the country:

Educate and involve communities.

Robust community engagement and education ensures transparency and allows information to flow in both directions. Providing detailed information helps clarify decision-making, addresses concerns and establishes trust. The public can provide valuable information and ideas throughout the planning process, making remedy and reuse planning efforts more successful. "Getting the community involved in decision-making ensures that they are invested and are part of the process," said TCEQ project manager April Palmie. In turn, community engagement builds a sense of ownership, which has resulted in high levels of volunteerism and support for the refuge.

Bring in technical expertise.

Superfund cleanups and habitat restoration are both complex endeavors. Bringing in outside expertise helps communities learn about key issues and participate effectively in decision making. At LHAAP, an EPA technical assistance grant funded expert assistance to translate technical reports and studies and provide the community with a deeper understanding of cleanup issues. CLI and other advocacy organizations also contributed resources and environmental education opportunities to help community members understand and contribute to the natural resource preservation effort.

EPA and Reuse: Lessons Learned

Since the inception of the Superfund program, EPA has been building on its expertise in conducting site characterization and remediation to ensure that contamination is not a barrier to the reuse of property. Today, consideration of future use is an integral part of EPA's cleanup programs from initial site investigations and remedy selection through to the design, implementation, and operation and maintenance of a site's remedy.

Interest in the remarkable natural resources located at LHAAP pointed to wildlife habitat as a reasonably anticipated future use fairly early in the cleanup process. The reuse planning process identified valuable natural resources, gathered community feedback, prioritized efforts, and informed the site remedy. Robust education and engagement efforts, led by local organizations with support from federal partners, built capacity within the community to engage more fully in the planning process.

EPA also works with site stakeholders to consider how future land use considerations can inform the implementation and long-term stewardship of site remedies as well as cleanup planning. At some sites, for example, reuse considerations can inform the future location of groundwater monitoring wells and other operation and maintenance equipment that might inadvertently hinder redevelopment efforts. At other sites, detailed site reuse plans have provided additional benefits that save time and reduce redevelopment costs. For example, future infrastructure corridors or building footers can be installed in coordination with site cleanup activities. Considering future use during cleanup design and construction ensures that cleanup outcomes align with community priorities.

Think long term.

It can take many years to remediate contamination that has accumulated over decades. These activities provide a time window for stakeholders to build partnerships and identify resources, coordinate with EPA and state and other federal agencies, and develop a strategy for returning a site to use while protecting future users. Community engagement and capacity building around environmental issues began in the area over 40 years ago, and cleanup and redevelopment efforts remain ongoing today. “It’s a matter of staying focused, persistent and not giving up,” said Gary Endsley. “In the end, all that effort has been worth it.”

Think beyond site boundaries.

Superfund sites are not islands; they are deeply embedded in local and regional contexts. For decades, LHAAP was an important employer in East Texas, and a key landmark for residents in the nearby communities of Marshall and Uncertain. The ecosystem at the site is tied to other conservation lands nearby and to the larger Caddo Lake landscape, which crosses the state border into Louisiana. Site reuse discussions took this regional context into account, and involved a range of federal, state, local and nonprofit organizations working across boundaries.

Looking Forward

In the years to come, FWS, CLI, Friends of Caddo Lake National Wildlife Refuge and other stakeholders will continue their work to improve the habitat, resources and visitor experiences at the refuge. EPA will oversee the ongoing cleanup effort, and will find opportunities to support community engagement processes and provide technical expertise to support reuse at the site. FWS will focus on building new trails, expanding its hunting program, removing additional old buildings, and implementing the upcoming Comprehensive Conservation Plan. CLI is focused on adding to the area’s conservation lands, increasing riverine flows into Caddo Lake to improve habitat quality, and reintroducing paddlefish to the ecosystem. The Friends of Caddo Lake National Wildlife Refuge will continue to support FWS efforts at the refuge and focus on building partnerships, improving visitor experiences, and renovating Starr Ranch. These and other local advocacy organizations and state and federal partners have worked together for decades, resulting in the creation and long-term vitality of the Caddo Lake National Wildlife Refuge. “EPA has been working at the site with the community for nearly three decades,” said EPA Project Manager Richard Mayer. “It’s incredibly rewarding to see these remarkable outcomes.”

“The community’s role is very important in keeping people’s eyes on the ball and putting pressure to move things forward.”

– Rick Lowerre, CLI

Preserving Starr Ranch

Dating back to 1915, the Starr Ranch Hunting and Fishing Lodge is now a crumbling ruin on the shore of Caddo Lake. Many local community members recall visiting the lodge for picnics back in its heyday. Friends of the Caddo Lake National Wildlife Refuge is hard at work on restoring the property for use by refuge visitors. While the facility is too damaged for full restoration and reuse, volunteers are working to create a pavilion for day use, add a boat launch, and provide historical interpretation services.



The site’s groundwater treatment plant will continue to operate for the foreseeable future.



CLI and other advocacy organizations are working to reintroduce paddlefish to the area. Image from FWS.

“This was a tremendous effort that required financial commitment, community organization, and comprehensive educational approach.”

– Jack Canson, Greater Caddo Lake Association

Ancient Landscapes, Community History: Restoring and Celebrating a National Treasure

THE LONGHORN ARMY AMMUNITION PLANT SUPERFUND SITE IN KARNACK, TEXAS

Sources and Resources

Sources

Images and maps for this case study are provided courtesy of EPA Region 6, CLI, FWS and Jack Canson.

Resources

EPA site profile page:

<https://cumulis.epa.gov/supercpad/cursites/csinfo.cfm?id=0603606&msspp=med>

EPA Superfund Redevelopment Initiative:

<https://www.epa.gov/superfund-redevelopment-initiative>

EPA Technical Assistance Grant (TAG) Program:

<https://www.epa.gov/superfund/technical-assistance-grant-tag-program>

U.S. Army Longhorn Army Ammunition Plant

Environmental Restoration Program:

<http://www.longhornaap.com>

Caddo Lake National Wildlife Refuge:

https://www.fws.gov/refuge/Caddo_Lake/about.html

Texas Commission on Environmental Quality:

<https://www.tceq.texas.gov/remediation/superfund>

Caddo Lake Institute:

<http://www.caddolakeinstitute.us>

Greater Caddo Lake Association of Texas:

<http://gclaoftx.com>

Friends of Caddo Lake National Wildlife Refuge:

<http://www.caddofriends.com>



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