SPECTRUM
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U.S. ARMY CORPS OF ENGINEERS, SOUTH ATLANTIC DIVISION 2008

A Regional Look at Dry Times

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On the Cover:
Southwestern Shore of Lake Okeechobee

The southwestern shore of Florida's Lake Okeechobee, near Observation Island, is usually underwater; however, this rare view appeared when the lake elevation hit a record low of 8.87 feet. Opportunistic grasses and sedges quickly sprouted and followed behind the receding shoreline, covering the exposed lake bed and revealing a treasure trove of sunken vessels and cultural resources.

Cover photo and inside cover photo by
Natalie S. Garrett
Jacksonville District

Southeast Drought Response Web Site
The Place to Go for the Information You Need

The southeastern U.S. remains in a long-term drought. This lack of rain impacts everyone – agriculture, recreation, wildlife, state and local governments and individuals. The U.S. Army Corps of Engineers, which manages federal reservoirs in the region, is responding to the drought through a comprehensive plan to balance the water needs of users throughout all affected river basins.

The Corps cannot end the drought, but our professionals work closely with local governments and other federal agencies to ensure fair treatment to all users of the reservoirs and dams along the rivers. Water managers and other specialists must balance the many, often competing, needs of the users of these lakes and rivers. During any drought, this balance is critical and difficult.

You can learn more about the effects this drought has on the region on the Southeast Drought Response web site: **http://www.sad.usace.army.mil/drought/index.htm**

The Army Corps of Engineers welcomes your participation as we work to balance the needs of all users.

Brig. Gen. Joe Schroedel
The South Atlantic Division Commander

Message from Brig. Gen. Schroedel

For the last two years, the southeastern region of the United States has been in the grips of a drought unprecedented in modern times. The dry conditions, categorized by the National Weather Service as "exceptional," the most extreme condition, are truly regional in scope. They extend from North Carolina all the way to Mississippi and Florida. The drought has inflicted great hardship on the people who depend upon the region's water resources for a wide variety of needs, from drinking water to power production, from water quality to maintenance of a vital seafood industry. Virtually no one has been untouched.

The U.S. Army Corps of Engineers, as the manager of federal reservoirs throughout the region, has played a pivotal role in the management and mitigation of drought impacts. Attempting to balance the diverse needs of the population, Corps water managers have faced tough choices in determining how best to conserve water while meeting critical needs in the river basins that support us all. Many of the stories in this issue of Spectrum are their stories, not only of the difficulties of good stewardship, but the challenges in communication and compromise when vital needs come into conflict.

The drought has also been a time of opportunity, as some of these stories show. Low water conditions provide a chance to improve lakeside facilities and explore archaeological riches. The drought also provides unprecedented opportunity to galvanize public opinion and resolve to deal forthrightly with the causes and solutions to the current crisis. With this forceful reminder of the finiteness of resources, the people of the region are rising to the occasion by seeking long-term solutions. We in the Corps are assisting by lending our considerable water resources expertise to this effort. Even as we all hope for relief from the unrelenting drought, we can also take comfort in the fact that this period of hardship will lead to a better future for the region.

DEEDS, NOT WORDS!

Best wishes always,
Joe Schroedel

SPECTRUM

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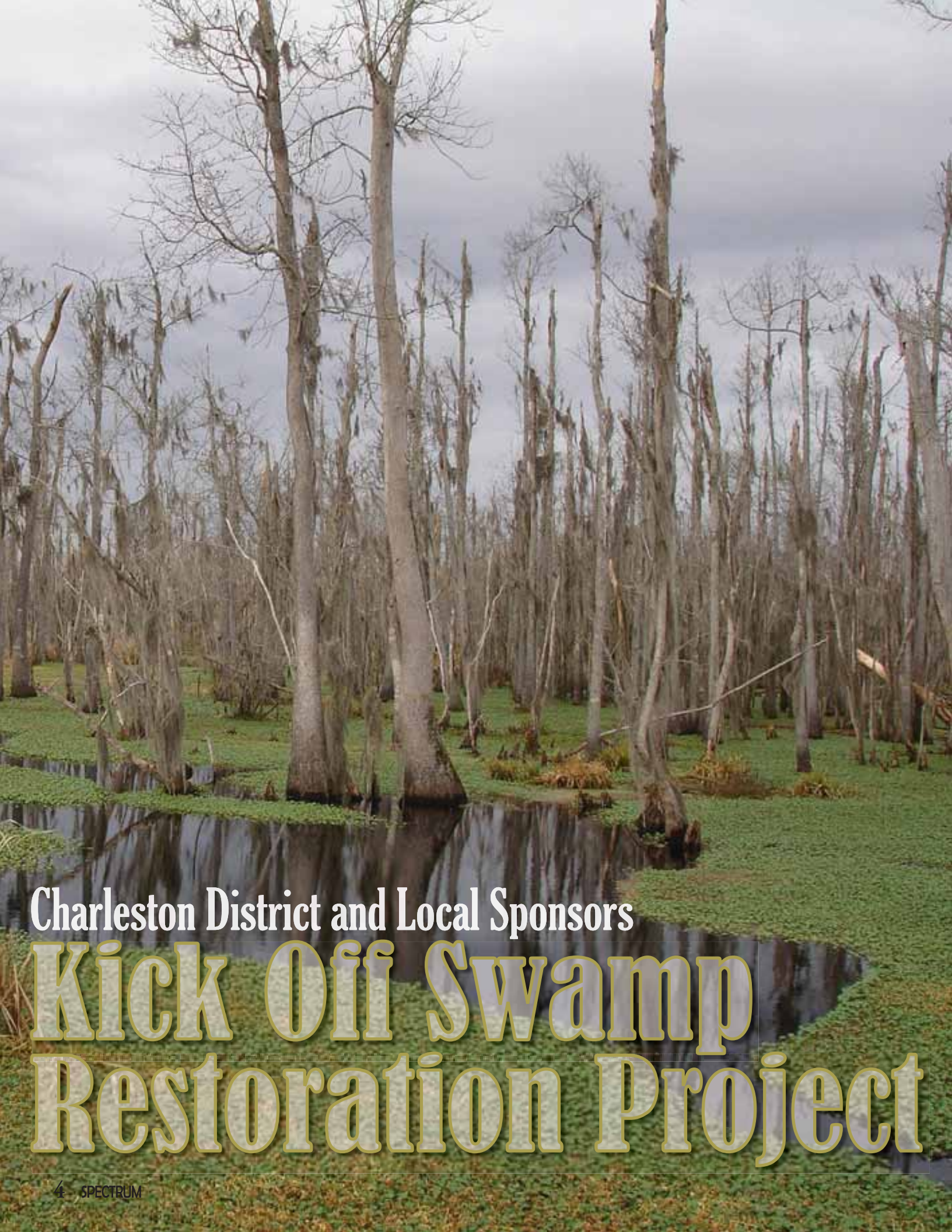


Charleston District and Local Sponsors

Kick Off Swamp Restoration Project

As the lack of water plagues the Southeast during a severe drought, there is an area in Sumter, South Carolina that would actually welcome less water. In the Pocotaligo Swamp, too much water is stifling the once-flourishing swamp, leaving behind a ghostly image of what it once was.

The U.S. Army Corps of Engineers, Charleston District and local sponsors are restoring the Pocotaligo Swamp to its pre-1950 conditions when the river was characterized by a river swamp system with as many as 13 flowing streams and was dominated by a swamp forest community of water tupelo and bald cypress.

The project will lower the artificially high water levels and allow approximately 5,800 acres of swamp to return to a forested swamp that normally dries up for part of the year. The project consists of clearing two channels—approximately 20 feet wide x 2 feet deep—to allow flow to resume and the water level to decrease seasonally.

"We are very excited and proud to be a part of this project," said Lt. Col. Trey Jordan, district commander. "The people involved in this effort have been determined to see it to completion and we want to see this swamp restored."

On January 30, Charleston District and the Clarendon and Sumter Counties Soil and Water Conservation Districts kicked off the Pocotaligo Swamp Restoration Project with a ribbon-cutting ceremony. "Leaving the earth a better place" seemed to be the common theme during remarks.

The ceremony featured speeches from Jordan and from Vicky Howell, chairwoman of the Pocotaligo Swamp Reclamation Committee, South Carolina State Senator Phil P. Leventis, Sumter Mayor Joseph McElveen, Jr., Sumter County Councilman Charles Edens and the chairman of Clarendon County Council, Dwight Stewart, Jr.

"We all feel good about leaving this place a little better than we found it and this project is a big step in that direction," said Howell.

Nearly 60 people gathered for the event and most agreed the event was a long time coming but also added that they were very happy to be a part of this effort.

The project is located in the Pocotaligo Swamp in Clarendon and Sumter Counties. It will start at the confluence of Turkey Creek and the Pocotaligo River near the City of Sumter and extend to the Highway 301 bridge near the City of Manning.

This aquatic ecosystem restoration project is authorized under Section 206 of the Water Resources Development Act. The Secretary of the Army, and ultimately the Corps of Engineers, has to determine that the project will improve the quality of the environment, is in the public interest and is cost-effective.

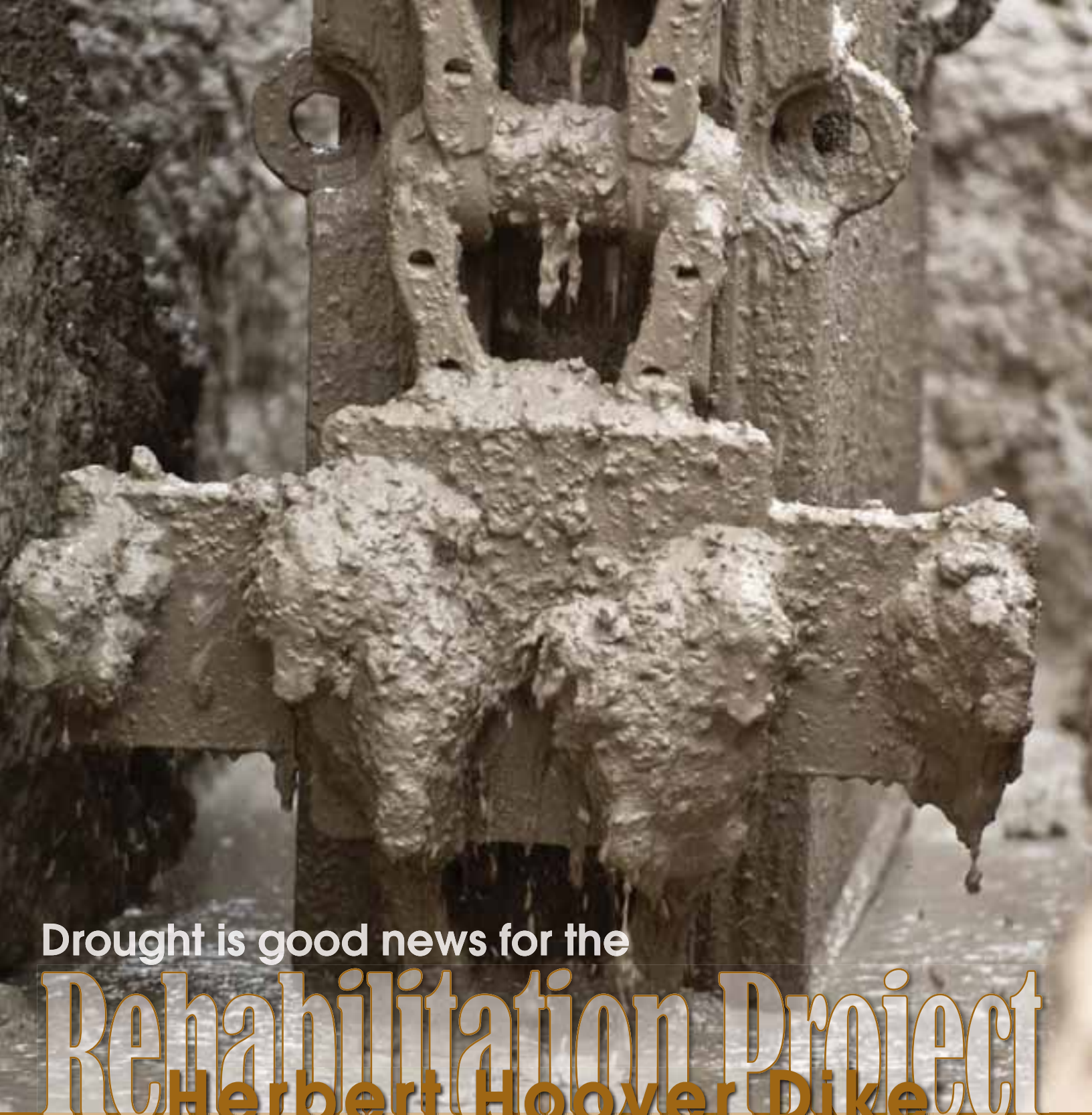
According to project manager Jimmy Hadden, this is the first Sec. 206 project the Corps has ever taken to construction in the state of South Carolina.

"It's really rewarding to be a part of this project," said Hadden. "I'm glad to help restore this riverine swamp forest to its former state, and preserve our natural environment for future generations."

The project is expected to be complete in June 2008. ▪

by Connie Gillette
Charleston District

(To the Left) A ghostly image of the Pocotaligo Swamp, where too much water is stifling the once-flourishing swamp.
(Below) Lt. Col. Jordan and local sponsors participate in a ribbon-cutting ceremony announcing the Pocotaligo Swamp Restoration Project.



Drought is good news for the

Herbert Hoover Dike Rehabilitation Project

Herbert Hoover Dike (HHD) surrounds Lake Okeechobee, the second largest freshwater lake in the nation and the heart of the Everglades. In the 1920s, after two major floods killed more than 2,500 Floridians, the Corps built northern and southern levees to prevent overtopping. Following another major storm in 1947, the Corps extended the levees to completely encircle the lake. For over 75 years, the dike's presence has prevented loss of life due to flooding, and the waters contained within its walls have served as south Florida's backup water supply. In the late 1990s, however, the Corps identified a need to repair the aging dike and, in 2007, HHD was prioritized on the Corps' Dam Safety Program's top six dams in the nation in "urgent and compelling" need of repair. Jacksonville District has begun a massive rehabilitation project to prevent erosion of the HHD by prolonged high lake levels. The first phases of rehabilitation are under way and focus on the oldest areas of the dike, where the lake once flowed naturally into a "river of grass" for thousands of years.

After devastating storm seasons in 2004 and 2005, two consecutive years void of hurricanes and tropical storms provided many benefits for the Herbert Hoover Dike Rehabilitation Project. Work has continued uninterrupted as engineers, operations staff and contractors have made unprecedented progress on inspecting structures and fixing areas most in need of repair.

With both calm weather and record low Lake Okeechobee water levels, Jacksonville District engineers identified and prioritized dike focus areas and expedited repairs ahead of schedule. Low lake levels minimized impacts during dewatering and filling the toe ditch, which the Corps identified as one of the most important interim risk reduction measures. Drought conditions also allowed inspectors to visually assess the conditions of structures along the 143-mile dike. Average lake levels require some inspections to be conducted by specially trained SCUBA divers, remote operated vehicles with underwater cameras or by closing off and dewatering the site, which can take up to a week to accomplish. Instead, Jacksonville District engineers were able to navigate boats through the culvert structures, resulting in major reductions in time, effort and costs.

"Previously, we could only schedule three or four culvert inspections a year, but now there's been – and will be in the near-term – more opportunity to conduct inspections," said Brent Trauger, dam safety program manager for the Jacksonville District. A geotechnical specialist was also able to inspect the entire dike, focusing on the crest and the lakeside slope, including the riprap and shoreline of areas that are usually under water. "These are areas that normally can't be inspected, but we're taking advantage of the rare opportunity allowed by the lower water elevations," Trauger said.

The Herbert Hoover Dike rehabilitation maintains a high profile during times of extreme wet weather and drought, requiring numerous parallel and simultaneous activities and the expertise of the Corps' top cadre.

"We have a vast team of engineers, locally and from across the nation, who are experts in the rehabilitation of dams, levees and structures. Team members are applying lessons learned, addressing a wide variety of priorities and making solid progress," said project manager Michael Rogalski. "Each member contributes to the success of the team and the overall project."

Corps personnel have filled in miles of toe ditch, which will help prevent piping, or internal erosion, in which water that naturally seeps through the earthen structure increases and carries along sediment and other materials through pipe-like holes. This creates cavities that, if undetected, may cause breaches and flooding.

Seepage berm construction atop the toe of the dike is ahead of schedule too, as Corps contractors construct in one of the most critical reaches, Port Mayaca to Belle Glade. Filling in the toe ditch, along with seepage berm construction, counters internal pressure from rising waters by balancing pressure on the landside of the dike. The fill material also prevents seepage by catching and holding foundation materials.

Construction of a cutoff wall will provide the internal fix, by cutting off existing piping and preventing new piping through the dike, foundation and limestone layers. The wall will not interrupt seepage through the deep sand layer, so there is very little ground water impact outside the dike's footprint.

Lead engineer Dave Dollar said the district sought worldwide cutoff wall expertise and has contracted with the very best available sources. Based on lessons learned, the HHD team awarded a construction contract for the first area of cutoff wall construction.

"We awarded three contractors performance-based contracts that do not dictate the cutoff wall technique. The first task order for construction of a 4,000-

(Left) A close up of the arm's chainsaw-like features shows the thickness of the grout mixture in the trench. Cement-bentonite is pumped underground through the arm. (Right) Corps contractors remove an extension of the arm from the dike. The arm can extend up to 80 feet deep through the center of the dike and into the foundation.

foot cutoff wall is under way and, potentially, all three contractors could work simultaneously. Using Multiple Award Task Order Contracts provides us with the flexibility we need to achieve our timeline and objectives," Dollar explained.

The contractors' construction methods will vary, but the most obvious difference between prior construction and today's methods is that contractors will grind rock within the dike and foundation, versus removing rock and embankment fill as done in 2006. In January, contractors began constructing a test panel for a cutoff wall, using a new technology developed in Japan.

Hayward Baker Inc., based in Odenton, Md., is a nationally-recognized leader in geotechnical construction and cutoff wall technique. The new method involves a hydraulic-driven cutting and mixing arm that mixes cement with foundation soil in a continuous trench, as the trench is being dug.

The Corps has also implemented a plan that ensures dedicated resources to maintain momentum on the dike rehabilitation. The Independent Technical Review Team includes senior engineers from across the Corps who will be on call to address any issues that may arise during the construction.

"All of the team members bring specialized design and construction backgrounds in addition to their professional experiences," said Jay Davis, lead geotechnical engineer. "The team has been together for over a year-and-a-half, and has reviewed every significant project design change, engineering or design report and contract documentation along the way."

Along with this team, the district can draw on international expertise at a moment's notice via expert consultants. They will provide technical review and other related engineering activities during the dike rehabilitation.

Jacksonville District has also enhanced its in-house geotechnical design team by seeking assistance from other Corps' districts. Currently, designers and geotechnical engineers from Chicago, Detroit, Huntington, Mobile and Savannah Districts are lending their design and analytical skills to the project. "By expanding our resource pool, we have broadened the overall team's experience and knowledge base," Davis said.

"Each of these measures will help ensure the Herbert Hoover Dike Rehabilitation Project continues to move forward as rapidly, safely and effectively as possible," said Col. Paul Grosskruger, Jacksonville District commander.

To see and learn more about the newest technology in cutoff wall construction, visit Jacksonville District's web site at: www.saj.usace.army.mil. ▪

by Susan Jackson
Jacksonville District

Trench cutting and Remixing Deep (TRD) wall machinery spews soil and cement-bentonite grout on top of the Herbert Hoover Dike as contractors construct a 500-foot long test panel.

Bonanza of Archeological Finds on Lake Okeechobee

The odds are now 50/50 that Lake Okeechobee will break its all-time record low of 8.96 feet set last spring. If so, a bonanza of archeological finds may be uncovered by the receding water for the second consecutive year. "That's what statistics and forecasts are telling us right now," said Andrew Geller, senior hydraulic engineer in the water management section of the U.S. Army Corps of Engineers, Jacksonville District.

Two Corps archeologists and one from Palm Beach County said they would share Geller's dismay if another record is set, but for different reasons. "For preservation purposes, we do not want to see the lake go any lower than it did last year," said Natalie Garrett, an archeologist in the Jacksonville District. "Grasses have already moved into the sites uncovered last spring. And those sites are also drying out and decaying."

"Keeping the lakebed covered [by water] would be the best thing," agreed Jacksonville District archeologist Grady Caulk. "But if that doesn't happen, a great amount of historical research could be done."

Palm Beach County archeologist Christian Davenport agreed. He said that if the lake goes down to 6 or 7 feet, which is possible, according to Geller, relics of civilizations may be found from two time periods: one from 12,000 to 8,000 years ago and another from 8,000 to 3,000 years ago. "We could also learn about more recent history," said Davenport. "There are a ton of shipwrecks on the lake and we would hope that certain specific wrecks could be found."

The stage for a possible archeological gold strike this spring was set in 2006, with the discovery of the remains of ancient settlements on the bottom of the lake. While it fascinated many, perhaps no single person was more intrigued than Garrett.

Archeologist Natalie Garrett found personal meaning in artifacts found at Lake Okeechobee.

Biologist Yvonne Haberer holds treasuers found on the dry lake bed of Lake Okeechobee.

Spearhead found when drought caused receding waters in Lake Okeechobee.

"I am half Creek Indian," said Garrett, an Oklahoman who came to the district in 2005 from the Bureau of Indian Affairs. "My people are related to the Seminoles, so these discoveries have a personal meaning that is very difficult for me to put into words, as an archeologist and as a Native American."

Last spring, Garrett visited a number of the sites and personally found shards of pottery and other remnants of the past. Last year's conditions exposed 21 archaeological sites on the lake. Thousands of artifacts were unearthed, including pottery, shell pendants, candle holders, arrowheads and fishing weights.

The state of Florida is tasked with safeguarding, documenting and informing local tribal officials of the discovery of human remains and graves. Palm Beach County is the lead governmental agency in the archaeological mission.

"Finding and holding in your hands any artifacts of this nature is something special to a person in my profession," said Garrett. "And for a person of my heritage, it is something I'll never forget, and that I hope to repeat in my lifetime."

Garrett and Corps biologist Yvonne Haberer located pottery dating to 2000 BC and other artifacts, including mound earth works, dating to 500 BC. Most of these pieces were found in the lake near Pahokee and Clewiston.

Not all of the discovered pieces were prehistoric. Garrett and Haberer were shown the remains of a steam dredge, circa 1928. The vessel was powered by a giant and somewhat still intact boiler. An old catfish boat was also exposed by the low water levels. Garrett said both are eligible for registration with the National Historic Registry.

"That day on the lakebed was one of those days in my life that I will never forget," Haberer said. "I am not an archeologist but just watching Natalie in her element as a scientist was gratifying and enlightening."

Another feature of the low lake levels that Garrett and Haberer marveled at was the original riverbed at the southern end of Lake Okeechobee.

"Seeing the riverbed and everything else is a once-in-a-lifetime experience," Garrett said. "Anyone who goes there does not want to leave."

Davenport said that numerous additional sites from several time periods would be uncovered if record low lake levels are set this spring. They include old Fort McCray, thought to be located in Martin County. It existed in the 1830s and 1840s as a military installation. Archeologists and historians also hope to locate unique boats used on Lake Okeechobee which have never been previously recovered.

"This rare weather event has created a real happening for archeologists," Davenport said. "We are reveling in it right now because we may never see the likes of this again." ▪

by Barry Vorse
Jacksonville District

Strong Water Management Sustains Drought-Plagued Savannah River Basin

A strong drought management plan and early implementation of more restrictive water release levels by Corps of Engineers water managers have allowed for continued use of the Savannah River, despite months of severe drought in Georgia and South Carolina.

"We have seen some record low in flows into our reservoir system during this drought," said Stan Simpson, water resource manager. "At times, these inflows have been less than 10 percent of what we and environmental officials in Georgia and South Carolina agree is needed to sustain the river," Simpson said. "Without the reserves of water stored in the three Savannah District lakes, users along the Savannah River corridor would be in dire straits."
Rains in late December 2007 and January 2008 brought some relief to the three Savannah District reservoirs. Enough rain fell that officials revised the outlook for the levels of Lakes Hartwell, Russell, and Thurmond.

The three reservoirs, currently at Drought Contingency Level 2 (of four levels), had been predicted to enter Level 3 as early as mid-December 2007. Under current conditions that date has been extended into April 2008 or beyond. Subsequent rains may extend that date further, according to Jason Ward, a hydrologist with the Corps of Engineers.

"The majority of the annual precipitation in the upper Savannah River basin occurs during the winter and early spring," Ward explained. "While we expect a somewhat drier than normal winter, we still anticipate an upturn in lake levels over the first several months of 2008."

Designated swimming areas at Savannah District reservoirs, such as this on at Lake J. Strom Thurmond, now sit far from water. (Photo by Jennifer Small)

La Niña conditions contributed to the drier than normal conditions in the region, according to experts with the National Oceanic and Atmospheric Administration. La Niña conditions are characterized by colder water temperatures in the eastern equatorial Pacific Ocean.

Lake Hartwell, the most upstream of the three Savannah District reservoirs, reached its lowest level of 646.64 feet above mean sea level (ft. msl) – barely a half foot above Level 3 – on Dec. 20, 2007. Lake Thurmond, the most downstream of the three lakes, reached its 2007 low point on Christmas Day at 316.2 ft. msl, only two inches above Level 3. Drought Level 3 is triggered when either Lake Hartwell drops to 646 ft. msl or Lake Thurmond drops to 316 ft msl.

Lake Russell, due to its smaller size and the design of the Russell Dam, has little fluctuation and typically remains within five feet of its target level of 475 ft. msl.

Col. Ed Kertis, Savannah District commander, held a series of public meetings in November and December 2007 to discuss the district's management of water resources during the current drought. About 250 people attended the meetings held in Augusta, Ga., Anderson, S.C., and Savannah. Experts from the National Oceanic and Atmospheric Administration and The Nature Conservancy joined hydrologists, park rangers, and hydropower producers to answer questions from the pubic on how the Savannah District responds to drought. Rangers presented water safety information, especially related to the additional hazards posed by receding lake levels.

"We manage the water in Corps reservoirs very carefully," said Simpson. "We balance the needs of the upstream and downstream lake users. We can't keep every user happy, but we try to be fair to all."

Communities from northeastern Georgia and northwestern South Carolina to the mouth of the Savannah River depend on the river for water supply, recreation, energy production and navigation. The drought has impacted hundreds of thousands of people throughout the Savannah River watershed and millions throughout the Southeast.

For more than 50 years, the Savannah District has managed dams and reservoirs on the Savannah River between Georgia and South Carolina. These multi-purpose dam and lake projects provide flood damage reduction, hydropower production, recreation, water supply, navigation and environmental benefits. The non-polluting hydropower generated through the dams provides power to thousands of residential and commercial customers. Lakes Hartwell and Thurmond are consistently among the most visited Corps lakes, providing fishing, swimming, boating, camping and picnicking opportunities to millions of visitors annually. ▪

by Billy Birdwell
Savannah District

Frequently Asked Questions
Drought Management

1. How much lower will the levels of the Savannah River and reservoirs go?
That all depends on how much water remains in the reservoirs at the peak of the drought and how much longer the drought persists. Even using the best available technology, we can't predict when the drought will break so we manage the river system based on our drought contingency plan.

2. How much water is discharged from the reservoirs? How much more will be discharged?
Effective October 23, 2007, the Corps lowered the daily average discharge from the Thurmond Dam (where we measure the outflow for the three reservoirs) to about 3,600 cubic feet per second. State resource agencies in Georgia and South Carolina believe this to be the minimum discharge needed to meet downstream community and resource needs. However, in conjunction with the state and federal resource agencies, we are investigating to determine if this rate can be lowered further.

3. How many days of water do we have left in the Savannah River basin?
This is very dependent on rainfall. The winter typically brings rain to the upper Savannah basin. We expect some relief but we can't predict how much.

4. Why do you lower the levels of Lakes Hartwell and Thurmond during drought? Shouldn't you conserve the water rather than let it flow downstream?
The Savannah District manages the Savannah River basin watershed as one system – from its headwaters to the Atlantic Ocean. Any action taken at one point on the system impacts other points, too. Cities, counties, manufacturers, and utilities all draw from the Savannah River below Thurmond Dam. During severe drought, we minimize releases from the projects to only what is necessary to support downstream community and resource needs. Further, there are environmental concerns at the estuary and the Savannah National Wildlife Refuge on the lower reaches of the river.

5. Why not just allow the same amount of water out of the reservoir system that flows into it?
We have experienced some record low inflows into the reservoir system during this drought. At times, those inflows have been less than 10 percent of what we and the states of Georgia and South Carolina consider adequate outflows. We established a drought management plan in coordination with state and federal agencies, with input from local governments and other stakeholders on the Savannah River. This plan allows us to maintain water resources for as many people and uses as possible.

6. The government makes money generating electricity through the dams. Isn't that why you lower the lake levels?
When we enter the first drought level, we reduce outflows, which in turn automatically reduce hydropower production. As we move into more severe drought levels we reduce hydropower production further. Contrary to popular belief, generating electricity is not our primary purpose with the reservoirs. Instead, Congress authorized the reservoirs as multi-purpose projects. Hydropower is just one purpose; others include flood risk management, recreation, water supply, water quality, navigation and environmental stewardship.

7. Why can you keep Lake Russell full while the levels of the other lakes constantly drop?
The topography and the design of Lake Russell and Russell Dam only allow it to fluctuate five feet above or below guide curve. It is a much smaller reservoir with a much shallower conservation pool – the water used for managing the reservoirs during drought. In addition, Russell Dam has a pump-back capability which allows us to use lake water during the day to generate electricity then pump it back into Russell at night.

8. What kind of endangered species do we have on the Savannah River basin?
The short-nosed sturgeon and the shoals spider lily are threatened species.

9. What is the Corps' role in water conservation restrictions?
The Corps manages the storage of water in the federal reservoirs. The States define and permit the use of water resources. State and local governments control set water restrictions.

10. Some people are starting to suggest moving water from the Savannah basin to another basin in Georgia. How will that affect our water supplies?
This is an interbasin transfer, currently not allowed by Georgia state regulations. Any such proposal would require extensive research, planning and public input.

Docks that once floated on several feet of water now sit high-and-dry as the Southeast continues suffering through one of the worst droughts since the construction of dams on the upper Savannah River. With water levels at Savannah District reservoirs such as Lake J. Strom Thurmond (pictured) and Lake Hartwell up to 14 feet below average, many recreation opportunities, as well as hydropower production suffer. (U.S. Army photo by Jennifer Small)

Wilmington District Stands with Neuse River Basin Communities as Reservoirs Dry Up

The threat is real. After a hot, dry summer and a long winter with little meaningful rainfall, reservoirs in the central Piedmont area of North Carolina remain perilously low. Warmer, dryer spring and summer months are just around the corner.

The Wilmington District manages one crucial resource: Falls Lake, which serves as the primary water supply source for the city of Raleigh, N.C. and surrounding communities. Falls Lake has stayed persistently at about eight feet below guide curve since late last fall. Two generous rainfalls at the end of October and just before the new year pulled the lake away from record low levels, but each time the dry weather came right back.

While continuing a highly successful communication strategy that has helped all stakeholders cooperate to make best use of water resources, the Wilmington District is also stepping out into uncharted territory to handle the unprecedented drought.

It became clear by November 2007 that the water supply pool in Falls Lake could be exhausted by early summer of 2008. Instead of adopting a 'wait and see' attitude, the Corps, the State of North Carolina, City of Raleigh and other Neuse River Basin stakeholders began to aggressively explore water-saving strategies and last-resort efforts to extend supplies.

To address the worst-case scenario, a complete depletion of the water supply pool, the Wilmington District fielded a special project delivery team. The team included hydrologists, the office of counsel, resource managers and others. Their job was to create a workable plan whereby the State of North Carolina could make use of the bottom layer, or sedimentation pool, of Falls Lake. This last-ditch alternative has literally never yet been undertaken by Corps water resource managers. Although the final details are still being worked out, the plan remains on schedule to be implemented on or before the date when water supply might possibly be depleted. The effort has included:

- Water quality assessment that determined the water in the sedimentation pool, with treatment, could be used for water supply
- Quantitative analysis to determine the amount of water in the sedimentation pool, and creation of a plan to use it in four increments
- Intensive research by counsel and resources managers to determine the legal and fiscal requirements for making this water available to the State of North Carolina.

Meanwhile, the Wilmington District, the City of Raleigh and other communities have continued to find creative ways to squeeze the most out of every drop of water in Falls Lake.

With help from Corps regulators and state and federal resource agencies, the City of Raleigh implemented a plan to keep more water in Falls Lake. Instead of putting a new sewage treatment on line at the proposed date, the city instead used the facility to pump water from two currently out-of-use reservoirs into the Neuse River below Falls Dam. This enabled the Corps to keep more water in Falls Lake, since required flows downstream were met by the temporary pumping operation.

The Corps has worked with downstream communities to find the minimum amount of flow needed to maintain good water quality conditions in the Neuse River and adequate flows to meet the needs of downstream habitats and community water intakes.

The City of Goldsboro, with a permit from Corps regulators, moved forward to make a temporary repair in a weir to ensure that adequate flows continued to pass over its water intake.

And of course, municipalities throughout the river basin have imposed water use restrictions to minimize pressure on this stressed resource.

The only real solution to the drought problem, of course, is a return to regular and more generous rainfalls. Constant communication through all forms of media remains an important component of keeping this key fact uppermost in the public's mind, as worried citizens look for the reason why water resources are scarce, and imagine solutions to the problem—some practicable, but only over the very long term, some not.

North Carolina, like other drought-stressed parts of the Southeastern United States, waits on rain. Day in and day out, the Corps stays on the job, crunching numbers, imagining solutions and communicating with stakeholders and the public. ▪

by Penny Schmitt
Wilmington District

Background image, taken in early December at Falls Lake Dam and Reservoir, show a dramatic decrease in available water caused by the ongoing drought in the Raleigh-Durham area. According to Wilmington District officials, the reservoir could run dry by July if there's no rainfall. (Photo by Hank Heusinkveld)

Engineer Uses Compromise to Manage Water

Brown likes Openness, Getting Many People Involved in Discussion

As water managers met recently, Terry Brown calmly refereed as Raleigh's utilities director and a federal wildlife officer sparred over their responses to the region's withering drought.

Raleigh wanted to divert water from two of its Swift Creek lakes to the Neuse River, so more water could be held back upstream at Falls Lake, the city's water source. Wildlife officials were taking their time reviewing the proposal, even as Falls Lake hit an all-time low with little rain in sight.

The bickering lasted several minutes before the exasperated utilities chief left for another meeting. Brown's immediate summation of the heated confrontation: "A good, healthy discussion."

Faced with a crisis, many managers would hole up, close ranks and issue unilateral orders.

Not Terry Brown, the U.S. Army Corps of Engineers' water control manager for much of the state, including depleted Falls Lake north of Raleigh.

Even during what's shaping up to be the region's worst recorded drought, Brown, 54, of Wilmington prefers an open discussion among the dozens of stakeholders with an interest in the five lakes, six rivers and 1,500 miles of navigable water he manages in North Carolina and Virginia.

Brown listens to their concerns, entertains their ideas, gets them to acknowledge one another's needs and goads them into compromises when necessary. His twin focuses: truth and trust.

"I've learned over the years that to have a good level of trust, you have to have an open process where ideas are valued and openly discussed," he says. "Many times, we come up with a common-sense course of action. And everybody understands how we got there.

"It's a good sanity check. It's more fun, too."

If fun can be had during a persistent drought, Brown is having it. The North Carolina native and N.C. State University-trained engineer seems at his best combining his technical skill with understated diplomatic savvy. ▪

Used with permission. By Matthew Eisley
Staff Writer, Raleigh News & Observer

Partnerships Enhance Corps

Partnerships are the cornerstone for successful community relations during drought conditions. As the southeastern United States suffers from drought conditions, Mobile District's natural resource managers and rangers have actively sought partnerships with homeowner associations, youth groups, sports and water enthusiasts and government agencies to enhance projects and benefit local communities and fish and wildlife habitat.

The ongoing drought has reduced the natural habitat of fish and other wildlife species at Lake Allatoona. Through partnering with Georgia Department of Natural Resources, National Wild Turkey Federation, National Fish and Wildlife Foundation and Southern Company, 350 acres of longleaf ecosystem was restored by planting more than 125,000 longleaf pine seedlings.

The Fish Habitat Improvement Program and the Christmas Tree Recycling Program partnered with Georgia Department of Natural Resources, Georgia Power Plant Bowen, Keep Paulding Beautiful, Keep Bartow Beautiful, Wildlife Action, Trees Bartow, Wal-Mart, Acworth, local fisherman and volunteers.

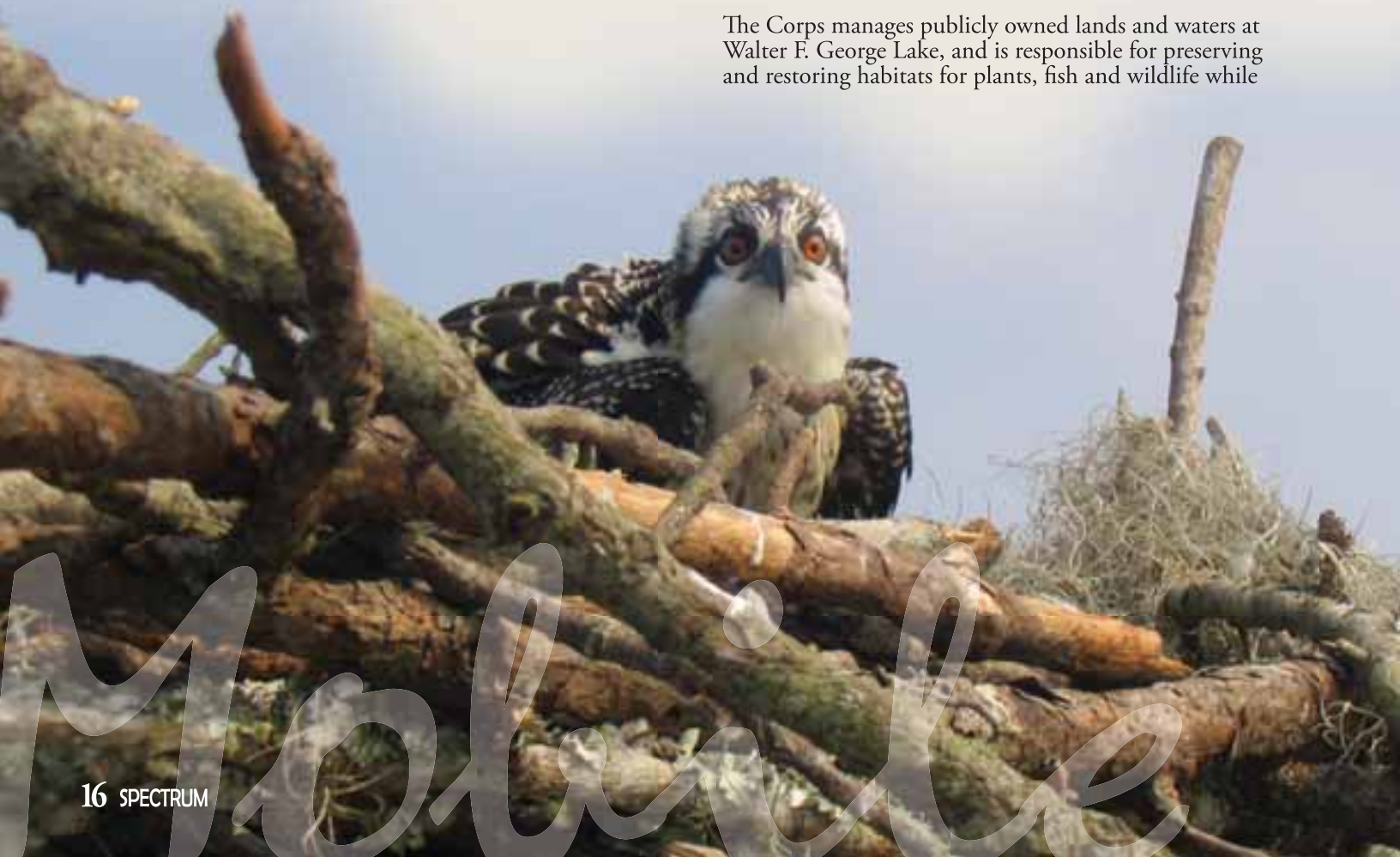
Unhealthy trees were cut down along the shoreline and dropped into the lake bed, to provide fish structures when the lake levels rise in the spring. Recycled Christmas trees were placed alongside permanent concrete fishing jetties to provide further fish habitat.

The Corps and the Cherokee County Historic Society worked together to save a historic mill gear that became exposed on the Etowah River shoreline due to drought conditions. The two partners joined resources and relocated the gear to the Cherokee County Historic Society Rock Barn located in Canton, Ga.

Local wildlife is benefiting from the Corps' partnership with the U.S. Coast Guard, Timberland Harvesters and Georgia Power. In March 2007, a tornado destroyed osprey nests at Walter F. George Lake in Georgia and Alabama. The Pataula Creek Park area was devastated and many osprey nesting platforms were needed to ensure continual use of the area.

"Under an agreement with the Coast Guard Auxiliary, we provided materials and they built osprey platforms," said Sara Jernigan, natural resource manager, Walter F. George Lake. The logging company provided two poles, Georgia Power drilled holes and placed the poles, and the Coast Guard mounted the platforms to the poles. "Through this multi-partner handshake agreement, two new platforms benefited the osprey of the area for years to come," said Jernigan.

The Corps manages publicly owned lands and waters at Walter F. George Lake, and is responsible for preserving and restoring habitats for plants, fish and wildlife while



Projects in Spite of Drought

protecting endangered and threatened species. The Bonaparte Fishing Club and the Corps have partnered to keep the Rood Creek Park open for campers and anglers during the off season. The partnership will continue their efforts to promote, preserve and restore Rook Creek Park.

The Alabama River Lakes Site Office partnered with the Alabama Wildbird Conservation Association in placing American kestrel boxes at Robert F. Henry Dam. The office is also in the beginning stages of a partnership with the Alabama Wood Duck Nesting Association to maintain waterfowl nesting structures on the three reservoirs in Alabama: Woodruff, Dannelly and Claiborne.

"Partnership agreements, such as the one between the Alabama Wood Duck Nesting Association and Alabama River Lakes are a necessity in the days of budget constraints. Partnership agreements allow nonprofit organizations to perform work normally accomplished with government and/or contract personnel," said Frank McIntosh, park manager, Alabama River Lakes. "Our natural resource management budget has not increased in the past few years, but with the help of this organization, the wood duck habitat in the Alabama River Lakes Project Area will be greatly enhanced."

Many fishing associations and boating enthusiasts have contacted various project offices to enhance partnerships. The drought has reduced recreational activities for the public and has adversely affected boat ramps at public access points.

Lake Lanier, Ga., has partnered with LanierSpots Pro Guide to provide materials to extend the boat ramps. It is mutually beneficial for the Corps and its partner to work cooperatively to extend the ramps so that they can reopen sooner and remain open longer during current drought conditions.

"Partnerships are a handshake, not a handout," said Michael Lapina, chief park ranger, Lake Lanier. "The boat ramp extension projects at Lanier have been a perfect example of this philosophy. The Corps, counties and the community all worked together to make things happen. The completed projects will benefit everyone."

The Corps is routinely contacted by local businesses, youth groups and homeowners associations to beautify the local lakes, trails and beaches.

The Black Water and Tombigbee Site Office (BW&T) in Alabama have formed many local partnerships. The annual National Public Lands Day event included 20 local businesses in the Demopolis, Ala. area, and more than 200 volunteers worked to clean up trash and debris removal from the trails. The BW&T Site Office also formed a partnership with the National Wild Turkey Federation and received a grant to work to provide and improve wild turkey habitat.

National trails and river trails have benefited local water enthusiasts and wildlife management. The Bigbee Bottom Trail, located on the Alabama Black Belt Nature and Heritage Trail, opened in 2007. The four partners were: University of West Alabama, Alabama Power, Hexion Chemicals and the Corps' BW&T Site Office.

At more than 631 miles, the Alabama Scenic River Trail (ASRT) is the longest river trail in one state. It has become a paddle and boating enthusiasts dream. The four main partners are the Corps, Alabama Bureau of Tourism and Travel, Alabama Power and the National Park Service. Among the many groups involved with the ASRT are the U.S. Fish and Wildlife, Southern Trail Outfitters, Alabama Mile by Mile, Coosa River Adventures, Boy Scouts USA, Bama Backpaddlers and many others.

During times of limited resources and personnel, working cooperatively with our partners effectively enhances Corps projects, builds mutual trust and respect, and benefits the community. ▪

by Lisa Coghlan
Mobile District

East Bank Ramp on Lake Lanier is extended further out to provide fishing and boating opportunities. The Corps partnership with LanierSpots Pro Guide worked together to enhance this project.(USACE Photo)

Southeastern Drought

The dramatic drop in water levels at the Falls Lake reservoir in Raleigh has exposed once-submerged objects, making boating hazardous. With sinkholes and waist deep muck, the shoreline is also hazardous. (Wilmington District - Photo by Hank Heusinkveld)

Exposed, dried out fish nests at Okeechobee Jaycee Park. (Photo courtesy of SFWMD)

Near Ritta Island evidence of an old structure was revealed when Lake Okeechobee hit record lows in 2007. (Jacksonville District)

The drought has put public and private docks on dry land at Lake J. Strom Thurmond. (Savannah District – photo by Jennifer Small)

When engineers specialize in hydraulics and hydrology, they probably don't anticipate a career fraught with conflict, or even high drama. But if they are water managers working for the U.S. Army Corps of Engineers, they may find that their job is less about complex calculations than it is about managing scarce natural resources in a highly contentious, emotionally charged environment.

Such is the case with the drought that has been gripping the southeastern United States since early 2006. Corps water managers throughout the region have found themselves faced with dry weather conditions unprecedented in recorded weather history. "Here in the southeast, we are accustomed to plentiful rainfall," said Brig. Gen. Joseph Schroedel, commander of the Corps' South Atlantic Division in Atlanta. "But population growth in the region, coupled with this record-breaking drought, is now straining our water resources almost to the breaking point."

The current drought, deemed "exceptional" by the National Weather Service, is truly regional, ranging from North Carolina well into Alabama and Florida. The Corps' role in the region is to manage the flows of its major rivers through 15 reservoirs the agency operates in the southeast. These reservoirs were built for multiple purposes, which include flood control, hydroelectric power production, navigation, recreation, water supply, water quality and fish and wildlife enhancement. While the federal government owns and operates these lakes, it does not own the water resources. "Under water law, the water in the streams, rivers and lakes belongs to the states," Schroedel said. "This shared responsibility for water management makes it especially important that we work closely not only with state governments, but with local communities and other stakeholders as we determine how best to manage available water. We have established regular communication with stakeholders in the affected basins through periodic teleconferences and other means of communication," Schroedel said.

The effects of the 2006-07 drought have been widespread, affecting virtually every aspect of life in the region. Navigation on the region's rivers has been curtailed severely, hydroelectric power production has been minimized, outdoor watering has been banned and communities and industries have been asked to reduce their consumption. Many communities in the region have for the first time had to realistically contemplate exhaustion of what have previously been adequate and reliable water sources. Raleigh-Durham, N.C. is among the hardest hit, faced with the prospect of running out of water in about 100 days if more rainfall is not forthcoming. Likewise, the heavily populated Atlanta area, which depends on Corps lakes Lanier and Allatoona, as well as the Chattahoochee River, is experiencing record low lake levels. "Flows in the affected river basins have at times been as low as the 2nd percentile of normal historic flows," said Christopher Smith, regional hydrologist for the Corps. "What we have seen in the last few months is unprecedented, and we are finding ourselves as water managers in uncharted territory."

The severe shortages created by the drought have predictably exacerbated tensions which already existed in these basins over the allocation of water. In Alabama, Georgia, and Florida the sharing of water among the three states has been in litigation or mediation for nearly 20 years. Conflicts became so severe in late 2007 that the governors of these three states came together under the auspices of the federal government to attempt to resolve the basic issues underlying the disagreement. "We're hopeful the governors can make some progress on this," said Schroedel, "and we are doing everything we can to facilitate their success." The governors have agreed to craft an agreement by early spring of 2008.

Tests Water Managers

In the meantime, Corps water managers continue to struggle with tough decisions. "Rainfall in the southeast is seasonal, and we depend heavily on the winter and spring rainy seasons to refill our reservoirs and recharge the hydrology," Smith said. "But the weather prediction for this year is for La Nina conditions, a drier and warmer than normal wet season. If we go into the summer without some significant refill, we will be that much farther behind in 2008." Additionally, the region normally gets some tropical storm activity during the summer months, but these events have been notably lacking during the last year. If this combination of factors continues, it will mean that cutbacks in usage may have to be more severe. "We risk exhausting our storage in these reservoirs," Smith said, "which will significantly reduce our flexibility in managing for all the varied users in the basins."

Among the many considerations in the water management equation are the requirements of the Endangered Species Act. "The law requires that we manage in such a way as not to jeopardize species listed as endangered or threatened," said Schroedel. "Certain minimum required flows are established through a consultation process with the U.S. Fish and Wildlife Service, and these minimums must be met. We have been working closely with the FWS during these extreme low flows to evaluate and implement small reductions in these flow requirements that will not jeopardize the species."

Endangered Species requirements are not the only environmental considerations in a drought. "Estuaries throughout the region are being affected by the reduction in freshwater flows," said Smith. Coastal ecologies are peculiarly adapted to the mix of fresh and salt water in the estuaries, and any disruption of the balance causes problems. "The impacts are not just environmental, but economic as well. For example the oyster industry in Apalachicola Bay, Fla. has been significantly hurt by these continued low flows," said Smith.

Lakeside recreation, though it may be considered a luxury by some, is also a major economic force in the region. Low water levels in Corps reservoirs have created vast mudflats where water used to sparkle, and stranded thousands of floating docks on dry land. Hundreds of boat ramps are also high and dry, severely limiting boating access to the water remaining in the lakes. These problems have real impacts on lakeside businesses and the communities around the lakes.

Aside from these immediate impacts,
what are the implications of this drought for the region? "This drought, which now surpasses in severity the drought of 1839, has permanently changed the way we think about the water resources of the region," said Smith. "Modern society has not seen these low flows, which change our historic record and give us new insight into the extremes that can affect our water supplies." If the perspective of Corps water managers is changing, so is that of the social and political leadership in the region. "We are seeing a greater emphasis on conservation," Schroedel said, "and a deeper appreciation of the need to cooperate on water resource issues in the future. Planning for the growth and future well-being of this region is now tempered by a much better understanding of the limitations of our resources."

Whatever the long-term impacts, Smith and other Corps water managers are facing a difficult period over the next year. "It's not likely that our reservoirs will refill this winter, and we don't know where we will be next June when the dry season begins again," said Smith. "If we have another year or more of drought, our job will become more challenging than ever. But we have a very professional and experienced team, and I have confidence in our ability to manage through these very severe conditions." ▪

by Rob Holland
South Atlantic Division

Dry, cracked earth at S-306 structure on Lake Okeechobee. (Photo courtesy of SFWMD)

Designated swimming areas at Savannah District reservoirs, such as this on at Lake J. Strom Thurmond, now sit far from water. (Savannah District – photo by Jennifer Small)

Wading birds by the thousands descended upon Lake Okeechobee when it dipped to record low levels in 2007 taking advantage of the rich food source which would have normally been covered by several feet of water. (Jacksonville District)

Exposed bank along C-44 canal due to low water levels caused by the drought. (Photo courtesy of SFWMD)