

WATER RESOURCES

WATER RESOURCES



US Army Corps of Engineers®

# Water Resources

*Value to the Nation*

## Managing the Nation's Water Resources for:

- Economic Growth
- Environmental Health
- Social Well-Being



*Making a Difference for You*



US Army Corps of Engineers®

Visit our Value to the Nation website: [www.CorpsResults.us](http://www.CorpsResults.us)  
 ©2010 Produced by the U.S. Army Engineer Institute for Water Resources.  
 To inquire about this brochure, please contact the IWR publications office at  
[CEIWR.Publications@usace.army.mil](mailto:CEIWR.Publications@usace.army.mil).  
 For the sources of information used in this brochure, visit [www.CorpsResults.us](http://www.CorpsResults.us).



# Water: Our Most Precious Resource



**W**ATER. It's everywhere. It's always there when we need it. In fact it is so common that it's easy to forget just how important our nation's water resources—our rivers, lakes, wetlands and coasts—are to our daily lives.

Where would we be, for instance, without our many rivers and coastal ports, which allow petroleum, grain and other products to be moved into, out of, and across the country less expensively, reducing the prices of food, fuel and other goods? Or our lakes, which provide recreation, electrical power, protection against floods and, in many cases, the water for our daily needs? Or our wetlands, nature's nurseries, which offer shelter and food to a wide variety of plants, fish and wildlife?

The employees of the U.S. Army Corps of Engineers Civil Works Directorate have the challenging and rewarding job of managing our nation's water resources to ensure that they continue to provide these, and many other, benefits and to protect and restore these resources for future generations.



Our duties cover a wide spectrum including:

- keeping channels open for navigation;
- protecting against floods;
- safeguarding the environment;
- generating clean, reliable hydropower;
- providing water to communities;
- managing recreation areas; and
- responding to disasters.

Water

One of our most important jobs, though, is finding the right balance between society's needs for economic growth, protection from floods, and affordable power, with environmental concerns such as water quality, the preservation of wetlands and the protection of threatened or endangered species.

In recent years, the Corps also has begun to implement a more holistic approach to managing our nation's aquatic resources by focusing on watersheds. This approach recognizes that our rivers, lakes, wetlands and coasts are complex systems that interact with one another in numerous ways. Through the watershed approach the Corps is working to better understand these interactions and to take actions that benefit the whole system rather than just one part of it.



In carrying out its responsibilities, the Corps works in close partnership with a broad array of other federal, state and local agencies, environmental groups, businesses, and nonprofit organizations.

The following pages tell the story of our nation's water resources and the Corps role in managing and protecting them. So take a moment and travel with us as we journey to the nation's rivers, lakes, wetlands and coasts.

*Corps Environmental Operating Principles*

- **Strive to achieve environmental sustainability.** An environment maintained in a healthy, diverse and sustainable condition is necessary to support life.
- **Recognize the interdependence of life and the physical environment.** Proactively consider environmental consequences of Corps programs and act accordingly in all appropriate circumstances.
- **Seek balance and synergy among human development activities and natural systems** by designing economic and environmental solutions that support and reinforce one another.
- **Continue to accept corporate responsibility and accountability** under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.
- **Seek ways and means to assess and mitigate cumulative impacts to the environment;** bring systems approaches to the full life cycle of our processes and work.
- **Build and share an integrated scientific, economic, and social knowledge base** that supports a greater understanding of the environment and impacts of our work.
- **Respect the views of individuals and groups interested in Corps activities,** listen to them actively, and learn from their perspective in the search to find innovative win-win solutions to the nation's problems that also protect and enhance the environment.

*Rivers of Life*

**W**hether you live on the banks of a river or hundreds of miles from one, your life is impacted upon every day by what happens on our nation's waterways.



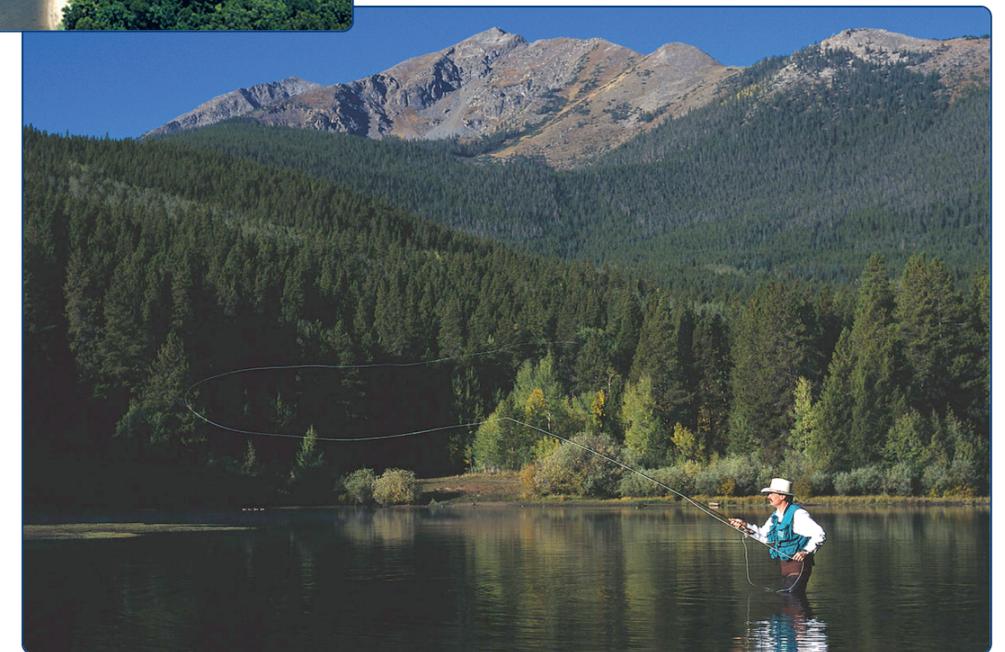
And of course our rivers and their adjoining lands provide habitats for many types of plants, fish and wildlife, including a number of endangered species.

Along with their many benefits, though, rivers also can pose threats. If water levels rise too high from rain or snowmelt they can overflow banks and sweep into floodplains causing untold damage. If water levels sink too low barges won't be able to move along them, plants and animals will die, and communities will be faced with droughts.

Clearly, rivers play many, and often conflicting, roles in our lives. The U.S. Army Corps of Engineers has the challenging and rewarding job of balancing these many roles to maximize the benefits provided by our nation's rivers, minimize the threats and protect these wonderful natural resources and the plants and animals that call them home.

For example, in 2007, more than \$380 billion in raw materials, manufactured products, and consumer goods were shipped to, from and through 40 states via rivers and intracoastal waterways. Despite the growth in high-tech communication and high-speed transportation, the nation's waterways remain a crucial backbone of our economy.

But that is only the beginning. Hundreds of cities depend upon rivers as a source of water for homes, businesses, and community use. Thousands of farmers rely on rivers to help irrigate their lands and maintain America's reputation as the "bread basket" of the world. And millions of Americans head for the nation's rivers every year to fish, boat, and swim.



**Keeping the Economy Moving**

Since America's earliest days, rivers have played an important role in our national economy allowing us to efficiently and cost-effectively move grain, oil,



manufactured goods and other valuable commodities across the country.

The cost per unit to transport commodities over inland waterways is two to three times lower than other forms of transportation. The ability to ship goods safely and reliably via inland waterways translates into almost \$7 billion a year in transportation savings for American businesses and consumers. Nearly 800,000 Americans depend on the inland waterway system for their livelihood, constituting a total payroll of nearly \$2 billion annually.



The Corps plays a vital role in keeping goods moving along our rivers by ensuring that water depths are sufficient for tows and barges to travel safely. The amount of water flowing through a river, and consequently its depth, can vary greatly depending on the time of year, location, weather, etc. Through the construction, operation and maintenance of a series of strategically placed locks and dams the Corps is able to smooth out waterflow and control water levels on the nation's major rivers, ensuring a consistently safe depth.

For example, on the Mississippi River, a series of 29 locks and dams maintain a minimum nine-foot deep navigation channel between St Louis, MO, and St Paul,

MN, allowing millions of tons of cargo to move up and down the river. From these two major ports the goods can be easily transshipped by rail or truck to distant overland markets, reducing the cost of products for consumers living far from the river's edge. Cargo also is barged further south to New Orleans for export to international markets at a lower cost, allowing farmers and manufacturers in the nation's heartland to compete in markets throughout the world.

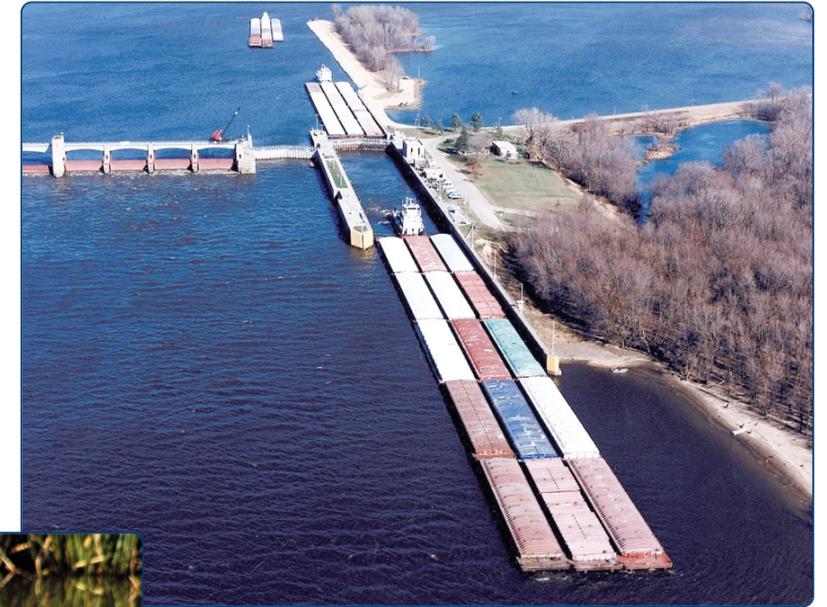
Dredging is the other major component of the Corps efforts to protect navigation channels. Over time, the buildup of sediment and other material resulting from weather conditions and the natural flow of a river can reduce water depth to unsafe levels. The Corps regularly undertakes dredging projects designed to remove this material and ensure that rivers and inland ports remain navigable.

The Corps operates and maintains nearly 12,000 miles of inland and intracoastal navigable channels and 191 commercial lock and dam sites. The Corps dredges nearly 300 million cubic yards of material each year to keep the nation's waterways and coastal harbors navigable.



The amount of goods moved on the nation's rivers is expected to increase by 65 percent over the next 20 years. The Corps is in the midst of a very active lock modernization program that will address these future navigation needs, while also taking into consideration environmental concerns.

Over half the locks on our waterways have exceeded their 50-year design lives. In addition, many locks are approaching their physical capacity, making replacement projects increasingly urgent. Modern river tows often consist of 15 or more barges lashed together.



Each year the Corps undertakes numerous projects to control erosion, restore aquatic ecosystems and protect endangered species along the nation's rivers. For instance, over the past several years we have completed 34 rehabilitation and enhancement projects on the Upper Mississippi River that have protected, restored or enhanced more than 35,000 acres of aquatic, wetland and floodplain ecosystems. We also are collaborating with The Nature Conservancy to modify dam operations to better protect nearby habitats. In addition, the Corps is working with the U.S. Environmental Protection Agency to clean up urban rivers degraded by contaminated sediment.

The Corps carefully evaluates the environmental impact of every project it undertakes on the nation's rivers. For instance, we typically perform computer modeling of planned changes to river and estuary systems to fully assess, and limit, the adverse environmental effects before any work begins. Dredging projects are usually carried out during "environmental windows" when they will have the least impact on sensitive species. In addition, the Corps makes every effort to find beneficial uses for dredged material resulting from these projects, including using it to augment and restore wetland habitats.

The Corps has projects underway to modernize and increase capacity at more than a dozen locks and dams and many other projects are in the planning stages. We also are constructing new, larger locks in several states. Together these projects represent a \$3.5 billion investment in modernizing the nation's inland waterways.

### Protecting and Restoring

The Corps is dedicated to protecting and restoring the nation's rivers for the enjoyment and use of current and future generations.



## Too Much Water or Too Little

Over the past several years, significant sections of the country have experienced either too much water or too little with droughts regularly plaguing large parts of the East and West Coasts and floods ravaging the South and Midwest.

While it is impossible to entirely prevent floods or droughts, the Corps does play a key role in lessening their impact by controlling the flow of water in the nation's rivers.

This is done through the construction and operation of dams, which hold water back during periods of heavy rain or snowmelt and release it during hot, dry periods.

Central to every dam is a reservoir—a manmade lake which helps control water flow, while also serving a wide variety of purposes, including providing recreation, hydropower, flood control and water supply.



### BALANCING THE BENEFITS:

## *The Red River*

For much of its history the 200+ mile stretch of the Red River between Shreveport, LA, and the Mississippi River was a source of frustration to many residents who lived and worked near it. Commercial tows had a difficult time navigating the river. As a result, the tremendous economic benefits that it could have brought to the area were lost. During heavy rains the river was prone to overflowing its banks,



flooding low-lying farmland and towns. And, finally there were serious erosion problems on long stretches of the river's banks.

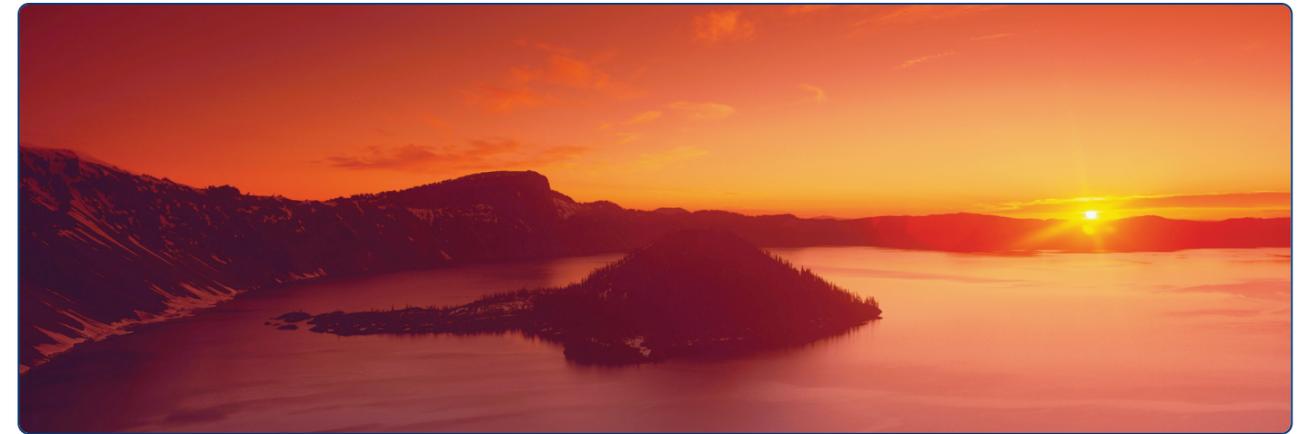
All of that gradually began to change when the U.S. Congress authorized what has become the J. Bennett Johnston Waterway Project. Beginning in 1968, the Corps constructed five locks and dams and dredged a 9-foot deep, 200-foot wide navigation channel. The Corps also has stabilized the banks along the 236-mile stretch of river, limiting erosion and preventing loss of valuable lands.

The project has stimulated local economies and helped generate nearly 7,000 jobs, according to a recent economic impact report by the Red River Waterway Commission. The changes also have greatly reduced the impact of flooding. During one period of heavy rain, nearly 1 million acres of land were saved from flood damage because of the waterway.

The waterway, which began largely as an effort to improve navigation, has gradually evolved to meet numerous other needs. For example, the lakes created as part of the project provide recreational opportunities for more than 2 million people per year.

Throughout the project, the Corps has worked diligently to protect the plants, fish and wildlife that live in and near the river. Studies indicate that the project has improved the quality and quantity of fish and waterfowl populations. The river also has become a major route for migratory birds.

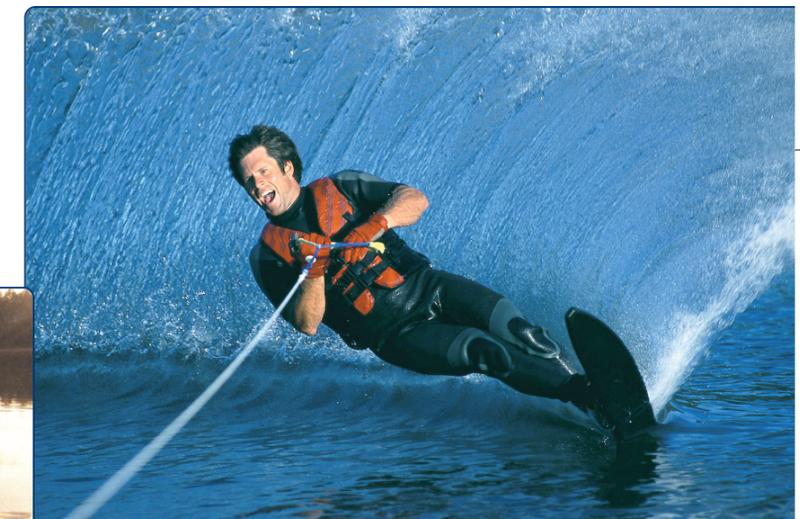
# *A Day in the Life of a Corps Lake*



Imagine it is sunrise. You're standing on the shoreline of a Corps lake. The sun glints off the boats of fishermen angling for an early catch. Behind you a squirrel darts across the hiking path that winds back into the woods. In a few hours families will begin arriving with swimming suits and picnic baskets. But for now the lake is quiet. Calm.



Behind the scenes, though, this calm, quiet lake is a flurry of activity as Corps personnel work diligently to focus the lake's resources to serve a wide variety of purposes including generating power for homes and businesses, supplying water for nearby communities and farms, and preventing or lessening the impact of downstream floods. And of course the lake will soon begin fulfilling its "day job" of offering a wonderful get-away to enjoy boating, fishing, hiking, etc.



## Getting Away From It All

The recreation component of our lakes is the face most familiar to the public. The Corps of Engineers is the largest federal provider of outdoor recreation in the nation, hosting nearly 360 million visitors a year at 4,300 recreation areas in 43 states. Our lakes and parks have something for everyone including:

**Fishing and boating.** We host 33 percent of all freshwater lake fishing in the United States and 15 percent of freshwater boating. We also host 200,000 fishing tournaments every year.



**Camping.** Over 90,000 campsites are available at Corps-managed properties and more than 70 percent of our lakes are located within 50 miles of a large U.S. city.

**Hiking.** Corps parks include 4,300 miles of trails.

In addition, we offer a wide array of non-traditional recreational opportunities including snorkeling, windsurfing, white-water rafting and more. Corps parks are home to many special events including sailing regattas, arts and crafts festivals and scouting activities.

As part of our ongoing effort to raise awareness about environmental issues, our park managers and rangers provide hundreds of environmental education programs every year that reach more than 3 million people.

Corps recreation areas are much more, though, than just a great place to have fun and enjoy nature. They also provide hundreds of thousands of jobs and billions of dollars in revenue for local communities. More than 500 private concessionaires, with \$1 billion in assets,

provide support services and facilities, such as marinas, bait shops and grocery stores, at Corps lakes. Visitors to our lakes spend an estimated \$18 billion a year on trip-related expenses such as gas, food and lodging within and outside the local communities surrounding Corps lakes. These dollars support 350,000 jobs nationwide.



### More Than Just Fun... Clean, Reliable, Efficient Power

But recreation is just one of the many activities underway at a Corps lake on the average day. For example, many of our lakes also play a key role in providing a clean, reliable, efficient source of energy through hydropower.

The Corps of Engineers is the largest operator of hydroelectric power plants in the United States and one of the largest in the world. Our 75 hydropower projects provide 100 billion kilowatt-hours of energy annually. That is enough energy to serve more than 10 million households.

Hydropower plants contribute to cleaner air, because they do not burn fossil fuels, like coal and oil, and they are good for the economy because they provide an inexpensive source of power, which helps keep energy prices down. The Corps hydropower plants have low operating costs and are immune to rising fossil fuel prices making them one of the least costly sources of electric power available today.

One disadvantage of hydropower projects and the dams associated with them is that they do change the natural river environment. The Corps has been working closely with a wide variety of groups and individuals to minimize the impact of these projects on the environment. For instance, in the southeastern

states, dissolved oxygen levels below dams often get so low that aquatic life is severely affected. The Corps is working to improve dissolved oxygen levels at these facilities by using aerating turbines and injecting oxygen directly into the streamflow. As with all of the projects it undertakes, the Corps consistently works to find the right balance between society's needs and environmental concerns related to its hydropower facilities.



### Meeting Community Water Needs

Do you ever stop to wonder how that water coming out of your faucet got there? Truthfully, most of us probably never do. However, if one day the water suddenly stopped coming, you'd start wondering in a hurry.

Over the last few years, as droughts have plagued large parts of the country, more and more people have begun thinking about where their water comes from and what happens when there isn't enough of it.

One critical role that many Corps lakes play is to provide water for local communities, particularly in times of drought. For example, during a recent drought in the Washington, DC area the Corps released 3 billion

gallons of water from the Jennings-Randolph reservoir to relieve water shortages for about 25 days. Had the drought escalated the reservoir could have provided up to another 3 billion gallons of water.

Many communities also rely on Corps reservoirs to help meet their everyday water needs. The Corps has 134 water supply projects in 24 states and Puerto Rico, which provide more than 3 billion gallons of water for use by local communities and businesses. That is enough water to supply the average household needs of about 55 million Americans for a year. Corps reservoirs supply water to some of the nation's largest metropolitan areas including Atlanta, Dallas-Fort Worth and Washington, DC.

The Corps provides water to help farmers irrigate crops, particularly in hot, dry western states. These farmers care for 10 million acres of land, producing 60 percent of the nation's vegetables and 25 percent of its fruits and nuts. The Corps has nearly 56 million acre-feet of water available at 48 sites for irrigation and other uses.

Overall, it is estimated that the water supplied by the Corps contributes nearly \$800 million to the economy each year.



### Preventing and Lessening the Impact of Floods

We have all seen the devastating impact of floods as they sweep through communities across the United States taking lives, destroying property, shutting down businesses, harming the environment and causing millions of dollars in damages.



Nearly 94 million acres of land in the United States are in areas at risk for flooding. A key function of Corps dams and lakes is to control water flow on rivers to reduce the impact of these floods and in some cases to prevent them entirely. Reservoirs have proven to be one of the most effective methods to reduce or eliminate flooding.

Corps reservoirs involved in flood control typically have a large area set aside where no water is stored. During times of heavy rainfall or snowmelt water can be drained off the river into this area and stored.

This process helps keep water levels from rising too fast downstream. Heavy periods of rain and snowmelt often pass in a relatively short period of time. By keeping water flow down, the dams can keep rivers in their banks until the

influx of water stops. Then the stored water can be released at much lower, non-damaging rates of flow when downstream high water has receded.

A good example of the effectiveness of reservoirs for flood damage reduction is the 1993 flood in the upper Mississippi and lower Missouri River Basins. The Corps has estimated that the 76 existing reservoirs in the basins stored enough water to reduce the peak elevation of the flood at St. Louis by about six feet. The flood crested within three feet of the top of the floodwall protecting St. Louis. The disaster that would have occurred had the floodwall overtopped and flooded the city was averted by the storage of floodwater in the upstream reservoirs.

Over the years, the Corps also has built thousands of miles of protective levees and dikes to give communities additional shelter against flooding. In addition, the Corps works closely with states and local communities on projects to help prepare for and reduce



#### BALANCING THE BENEFITS:

### *Lake Sidney Lanier*

This beautiful 38,000-acre lake at the headwaters of the Chattahoochee River touches five counties in Georgia. It was created by the Corps in the 1950s as part of the development of Buford Dam. The lake and dam meet many needs for the people living in the area.

For example, each year, more than 7.5 million people visit the recreational areas surrounding Lake Lanier, which include 46 park areas operated directly by the Corps. Lake Lanier also provides a home for numerous species of fish, wildlife and plants, many of which are threatened or endangered, including the southern bald eagle. Corps rangers regularly present water safety and environmental awareness programs to thousands of school children at the lake.

Three hydroelectric power generators at the lake produce 86,000 kilowatts of clean, non-polluting energy, which is enough electricity to supply 25,000 homes. This power is primarily used during peak times when energy demands are high. Lake Lanier also is the main source of water for drinking, industrial and commercial uses in metropolitan Atlanta.

The dam at the lake helps control downstream water-flow on the Chattahoochee River, which enables large boats and commercial barges to safely move goods up and down the river. During times of heavy rainfall, the dam also holds back water, preventing millions of dollars worth of flood damage and saving lives downstream. Over the years, Lake Lanier has adapted to changing needs and developed into a wonderful resource that provides a wide variety of benefits for the people of Georgia. The lake won awards as the best-operated lake in 1990, 1997 and 2002.



the impact of potential flooding. Overall, the Corps flood control efforts prevent an estimated \$18 billion in damages annually.

The Corps has recently begun to emphasize non-structural flood control solutions rather than structural ones such as dams, levees, etc. Non-structural solutions involve modifying how floodplains are used or accommodating current uses to potential flood hazards. A non-structural approach helps avoid changes to the floodplains that might have a negative effect on the environment. Floodplains are complex natural systems that provide habitat for plants, fish and wildlife, and contribute to the overall health of the environment. Significant changes can upset the delicate balance.

### Responding To Floods and Other Disasters

Despite our best efforts, it is still impossible to entirely prevent floods. When a flood or other disaster does strike, the Corps stands ready to help.

Each year Corps personnel respond to presidential disaster declarations and numerous state and local emergencies, including floods, tornadoes, hurricanes and earthquakes. Our teams move rapidly into an affected area to provide a wide range of vital services including:

- supplying drinkable water and emergency power;
- helping in search and rescue operations;
- clearing debris and blockages of critical water intakes, sewer outflows and drainage channels;
- offering engineering services;
- making emergency repairs to levees and other flood control projects;
- restoring public services and facilities, like electrical power or water supply systems;
- providing technical assistance, including structural evaluations of buildings, and damage assessments;
- building temporary shelters; and
- assisting with long-term recovery and reconstruction.



The Corps maintains 43 Planning and Response Teams, stationed around the country to facilitate a rapid response to any disaster, no matter where it occurs. To prepare these teams, the Corps continually conducts disaster training simulations and participates in regional training exercises with other agencies.

In the case of a flood, our emergency teams can be on site within hours helping to shore up levees, protecting vital facilities and conducting search and rescue operations. In the wake of a flood, our teams can help communities and businesses get “back on their feet” quickly by clearing away debris, restoring power and helping to repair damage.

### Part of the Community

No matter where you live there is probably a Corps lake nearby. The Corps manages nearly 600 dams and lakes nationwide. These lakes have become integral parts of their community, serving as focal points for recreation and employment, protecting against damaging floods, nurturing the environment and providing invaluable water supplies. Together these precious water resources are helping to improve the lives of millions of Americans in a wide variety of ways.

# Wetlands: The Nurseries of Life

**B**lue crabs, shrimp, Canada geese, ducks, insects, plants, and bacteria. This is just a small sampling of what you might find in the average wetlands.

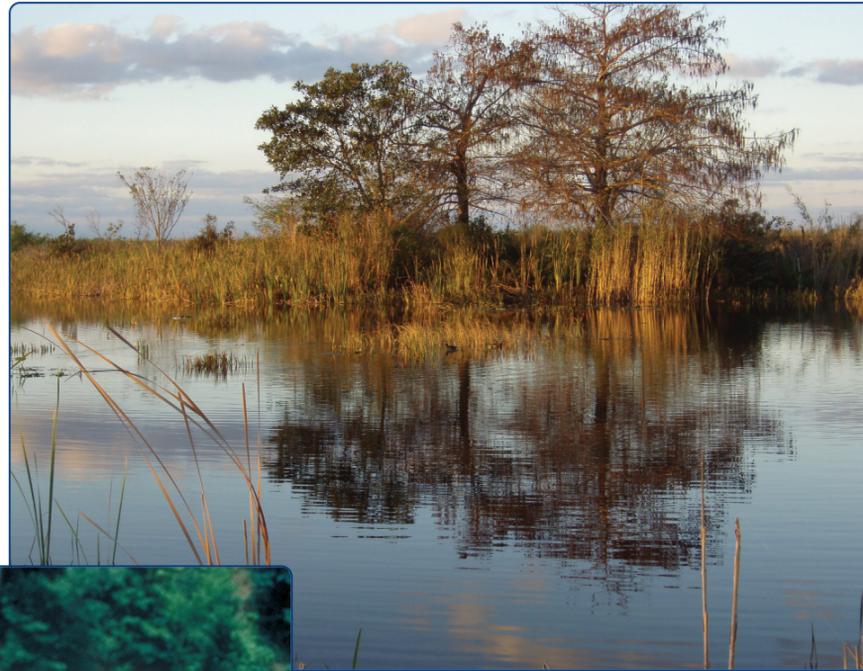
Lying on the border between water and land, wetlands have a rich mix of nutrients, plants and insects that make them the perfect nursery for a wide variety of fish and wildlife during the vulnerable early stages of their lives. Most commercial and game fish breed and raise their young in wetlands such as coastal marshes and estuaries. Approximately 35 percent of all federally-listed rare and endangered animal species either live or depend upon wetlands.

But that is just the first of many critical jobs performed by wetlands. Others include:

**Rest stop.** With their rich abundance of plant and insect life wetlands serve as the perfect rest stop for migratory birds on their trip north or south;

**Flood prevention.** In many areas wetlands act as a sponge soaking up excess water flowing from higher ground and keeping it from overflowing rivers, lakes and streams. Wetlands within and downstream of urban areas are particularly valuable, counteracting the greatly increased rate and volume of surface water runoff from pavement and buildings.

**Erosion control.** Wetlands can play an invaluable role in reducing erosion, particularly on coastal shorelines. The rooted plants in wetlands help to



hold soil in place, provide a buffer against the pounding of waves and break up the flow of currents.

**Water filter.** Pollution and sediments that are washed into wetlands are typically trapped by rooted plants, which means that the water comes out the other side much cleaner. For example, one study found that a wetland in South Carolina was so effective at filtering water that without it the area would have had to install a \$5 million wastewater treatment plant.

Wetlands can range in size and scope from small marshes to an area as large as the Everglades. Most experts consider wetlands to be second only to rain forests in terms of environmental importance. Unfortunately, America has lost more than half of its native wetlands since 1600. These losses were due in part to natural conditions, but are primarily related to human growth, development and expansion.

In recent years, the nation has adopted a national policy of “no net loss” of wetlands and with a goal of a net gain. The U.S. Army Corps of Engineers is playing a key role in this effort by working in partnership with others to protect, preserve, restore and enhance wetlands in the nearly 12 million acres under its care and elsewhere. In addition, through its regulatory program the Corps works to strike a balance between the nation’s need for growth and development and the protection of valuable wetlands.

## Protect and Preserve

Each year the Corps undertakes a number of wetlands-related projects, often in coordination with other organizations.

For instance, the Corps is a key partner in the restoration of wetlands at the Vic Fazio Yolo Wildlife Area in California. It is estimated that 90 percent of coastal wetlands in southern California have been lost. At Yolo, the Corps has helped develop 16,000 acres of wetlands from a flood control channel. It is the largest wetland restoration project of its kind in the west, involving the addition of ponds, a riparian forest and other features that provide shelter and breeding grounds for waterfowl and helping with flood control.

The Corps also heads the interagency task force responsible for identifying, prioritizing and implementing projects to restore wetlands and to provide for the long-term preservation of wetlands and dependent fish and wildlife populations in coastal Louisiana. The loss of wetlands in this area has reached catastrophic proportions with current losses of 25 to 35 square miles a year. The Corps is the lead



agency on 14 current projects that will restore over 15,000 acres of wetlands.

These are just two examples of the many Corps efforts nationwide aimed at ensuring the survival of our wetlands. The Corps also is careful to keep environmental considerations at the forefront of its thinking and planning on projects it undertakes related to navigation, flood control, etc. In many cases these projects also will have environmental benefits. For example, the Corps frequently uses the dredged material in wetland restoration projects.

## Finding the Balance

Each year more than 90,000 construction projects are undertaken in the United States that have the potential to affect wetlands and other aquatic resources. Through its regulatory program the Corps strives to protect these resources, while allowing reasonable and necessary development projects, such as construction of new homes and businesses, installation of utility lines, etc., to go forward.

Organizations undertaking projects that will have an unavoidable impact on aquatic resources must obtain a permit from the Corps. A detailed public interest review process enables the Corps to solicit and consider the views of the public, government agencies, and project proponents regarding proposed permits. Once



**BALANCING THE BENEFITS:**

*Charles River Wetlands*

The scenic Charles River is one of the natural landmarks of Boston. Because of its close proximity to the city, though, the river also poses a potential flood risk to residents. In the late 1960s, the Corps undertook a study of the Charles and found that thousands of acres of wetlands along the river's middle and upper reaches were playing a key role in protecting the residents of Boston and 15 other communities from flooding. These wetlands drew off millions of gallons of excess water during periods of heavy rain and snowmelt, substantially reducing downstream flow.



At the time, though, many of these wetlands were being threatened by a boom in construction and development. Working in partnership with a number of other organizations and agencies, the Corps began acquiring 17 of these wetlands. Over the subsequent decades, the Corps has successfully protected or restored thousands of acres of wetlands along the Charles, preventing millions of dollars in flood damage.

This award-winning project was one of the first Corps efforts to implement a "non-structural" approach to flood control. It is estimated that building flood control structures to provide the same level of protection would have cost more than \$100 million and would not have provided the same environmental advantages.

Today, the Corps focuses increasingly on such non-structural approaches to flood control, which help protect individuals, communities and businesses while also enhancing the environment.

The Charles River wetlands also help prevent erosion, provide a source for recreation and serve as a wonderful habitat for many plants, fish and wildlife.

all sides have been heard from, the Corps carefully evaluates the positives and negatives of each project to determine what will best serve the public interest. For permitted activities that result in unavoidable losses of wetlands, the Corps usually requires replacement wetlands to offset those losses.

One measure of the success of our efforts is that many developers are working with the Corps during the planning stage of projects to make changes to the projects that will protect the aquatic environment and avoid the need for a permit.

The permit program is backed up by a strong enforcement effort. The Corps is committed to enforcing compliance with the terms of all of the permits it issues. The enforcement program also ensures that companies which harm aquatic resources fix the damage. The Corps acts on approximately 6,000 reported violations each year.

Every year, the Corps issues permits that affect 22,000 acres of wetlands. By contrast more than 50,000 acres are restored, created, enhanced or preserved. In many cases, several small, separate, low-value wetlands were replaced with more environmentally beneficial large wetland complexes.



# From Sea to Shining Sea

From the bustling ports and harbors to the smooth, sand beaches, our nation's coasts are a testament to the economic vitality and natural beauty of America. The Corps is proud to play an important role in keeping our ports and harbors running smoothly and in protecting our coastlines from the effects of erosion, hurricanes and other natural and manmade forces.



is rapidly becoming a vessel requiring up to 55 feet of channel depth. Few U.S. ports currently have this depth but a number of nearby ports in Canada and the Bahamas do, meaning we run the risk of losing trade to these ports.

With this in mind, one of the Corps major focuses is to modernize and upgrade the nation's ports and harbors to keep pace with the growing traffic as well as the increasing size of vessels in the world merchant fleet.

## Protecting the Coastlines

Many coastal areas in the United States are in peril from development, erosion and pollution. Along the East and Gulf coasts more than \$3 trillion in



## Gateway to America

Our coastal ports and harbors are the launching point for America's participation in the global economy. Over 95 percent of all overseas imports and exports are shipped by sea, including 12 million barrels of oil per day. In fact, virtually all of our jobs depend in one form or another on the free flow of goods through U.S. ports and harbors.

The Corps is responsible for ensuring that ships can move safely and efficiently in and out of these harbors. Corps personnel oversee dredging to maintain channel depths at more than 1,000 harbors. More than 48 percent of all consumer goods purchased by Americans travel through these harbors.

In the next 20 years shipment of cargo by container ships is expected to increase by 65 percent. Containerized trade is the fastest growing sector of the economy, doubling every 10 years. That means there will be a steady increase in the number of vessels calling on U.S. ports. In addition, the container ship of choice

infrastructure adjacent to shorelines is vulnerable to erosion from flooding and other natural hazards. The coasts are also regularly threatened and harmed by hurricanes and other major storms.

Over the next 25 years the population of the coastal states of California, Texas and Florida are expected to grow by more than 36 percent putting more strain on the environment and more people and property at risk. The Corps is involved in a wide variety of projects aimed at protecting the coastlines from storm damage and erosion and preserving and restoring ecosystems.

For example, the Corps was the lead agency on 75 of the Coastal America projects that have been





completed to date. Coastal America is an interagency ecosystem restoration effort. The Corps also has been actively involved in efforts to preserve and restore the 11,600 miles of shoreline along the Chesapeake Bay. The Corps work has included restoring oyster beds and wetlands, reducing erosion, and cleaning up contaminated sites. Working in cooperation with a number of other federal and state agencies the Corps has helped restore 2,200 miles of riparian forest buffers, preserved over 6 million acres of land and reopened 1,000 miles of river to migratory fish.

One of the Corps most innovative and comprehensive efforts to address coastal issues is the regional sediment management demonstration initiative. Most coastal areas have either too much or too little sediment. Too much will lead to blocked river channels and smothered reefs. Too little will lead to beach erosion and wetland loss. The regional management program is designed to move sediment from areas where it is harmful to areas where it can be beneficial. This initiative has fostered a series of projects across the country involving partnerships among federal and state agencies and private organizations aimed at developing regional approaches to the management of sediment.



### BALANCING THE BENEFITS: *Oakland Harbor*

The Corps is committed to working with a wide range of community, environmental, business and other groups to ensure that the projects it undertakes not only protect the environment but, whenever possible, enhance it.

An excellent example is the dredging of Oakland Harbor. Over the years, the Corps partnered with a number of organizations to ensure that this project, which is so vital to the area's economy, also benefitted the environment.

As a major port of call for container ships bringing consumer and other goods in and out of the United States, the Oakland Harbor plays a crucial role in the nation's economy. However, like many other U.S. harbors, its role was in jeopardy because it was not deep enough to accommodate the larger container ships coming into the world's fleet.

To address this problem, the Corps undertook an extensive dredging project to deepen the harbor to 50 feet to eliminate shipping restrictions and create a boon to the economy of the Bay Area and the nation. The project was completed in September 2009.

The Corps also recognized an opportunity to use the project to benefit the environment by creating and enhancing wetland habitats in the surrounding area. Working with other organizations, the Corps used dredged material excavated from the harbor to develop or enhance nearby wetland areas.

The project builds upon the success of an earlier Corps effort in which nearly 2 million cubic yards of material, excavated when the harbor was dredged to 42 feet, were used to restore the Sonoma Baylands. The Baylands is a tidal salt marsh habitat on a 348-acre hayfield on the northern shoreline of San Pablo Bay. That project, which was completed in 1998, increased the acreage of suitable habitat for two endangered species: the salt marsh harvest mouse and the California clapper rail.

# Working Together, Looking Ahead

The Corps believes strongly in the importance of forming partnerships with other agencies, environmental organizations, businesses and other groups to share ideas and knowledge, build consensus and ensure the best possible solutions to the challenges facing us as water resource managers. We look forward to building on and expanding these partnerships in the future.

Over the years our partners have included numerous state, tribal and municipal governments, major corporations, the American Water Works Association, Bureau of Reclamation, National Fish & Wildlife Foundation, The Nature Conservancy, U.S. Department of Agriculture, U.S. Department of Energy, U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service and many, many others. We look forward to building on and expanding these partnerships in the future and forming new alliances to help enhance our nation's aquatic resources.

The Corps Engineer Research and Development Center alone currently has more than 180 partnerships underway with private industry, universities, and international, national and state agencies.



And of course there remains the ongoing challenge of balancing our nation's social and economic needs with our obligations to protect the environment. The Corps stands ready to work with our many partners to meet these challenges and to continue our efforts to protect and restore our rivers, lakes, wetlands, and coasts for generations to come.

### For More Information

To learn more about rivers, lakes, wetlands, coasts and the Corps programs to manage and protect them, visit [www.CorpsResults.us](http://www.CorpsResults.us).



The new century has brought with it an array of new challenges. Much of our critical water infrastructure, including locks, dams, harbors, ports and hydropower plants are aging and in need of modernization to keep pace with the changing times and new technology. Moreover, the events of September 11, 2001, introduced an array of new challenges and threats to our water resources.

