



**US Army Corps
of Engineers**
Waterways Experiment
Station

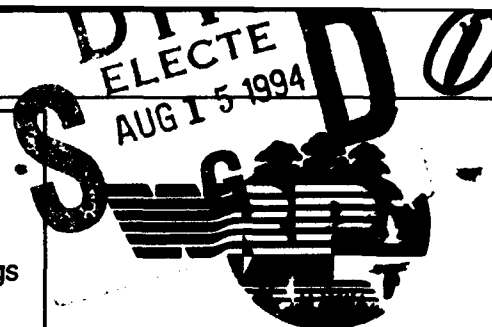
AD-A283 262



Wetland workshop
abstracts due

Corps field notes -
pg. 6

Professional meetings
announced - pg. 7



The Wetlands *Research Program*

Bulletin

Volume 4
Number 2
June 1994

8pg

94-25601



Ultrasonic sensors viable option for water surface measurements

David D. Abraham and Brad R. Hall, U.S. Army
Engineer Waterways Experiment Station

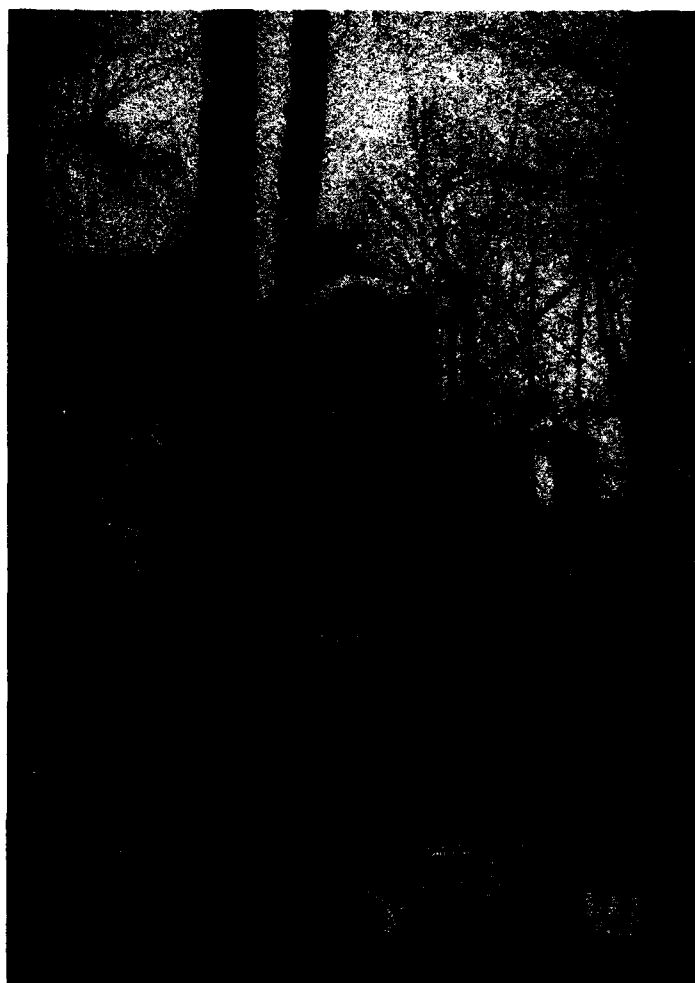
Installing instruments for measuring water levels in a wetland environment can be a high dollar investment as well as a frustrating experience. Traditional installation includes the need for expensive stilling wells. A loss of instruments, and thus data, due to floating debris or fouling caused by suspended sediment or bio-masses may also occur. These negative impacts on a scientific study can be avoided if the experimental design allows the use of an ultrasonic sensor.

Sensors deployed above water

Ultrasonic instruments have been used to measure water surface elevation for a number of years with varying degrees of success. The benefits of these devices derive mainly from the fact that there is no direct contact with water. The inherent shortcomings of using an ultrasonic sensor are the instrument's sensitivity to temperature and wind. Changes in temperatures of 15°F or more over very short time increments can cause the accuracy to vary ± 0.04 ft. Wind can also affect the accuracy and disturb the water surface, resulting in the loss of the signal and thus the distance measurement.

Ultrasonic sensor used in WRP study

As part of a research project to model flow and sedimentation in the Cache River, Ark., bottomland



Instrumentation platform used in Cache River, Ark., field study
(see pg 3)

94 8 12 1 05

DTIC QUALITY INSPECTED 1

hardwood wetland, the measurement of water surface elevations and sediment concentrations at selected locations was necessary. These measurements were needed to adjust and/or modify existing hydrodynamic and sedimentation models to simulate wetland conditions.

Using recording instruments for obtaining time tagged data in wetland environments, as in any hydrologic system, is desirable. Stage hydrographs that capture the peak water surface elevations of individual events are possible if sufficiently small intervals are used. In the Cache River study, 10 min. intervals were used. Water surface elevation accuracies of within 0.03 to 0.05 ft were considered acceptable for purposes of this wetland study. The flow data collection began with the installation of ultrasonic distance meters and water temperature probes at four locations in the wetland.

The commercially available ultrasonic sensor chosen for use in the study had acceptable specifications that included:

- accuracy of ± 0.25 percent of range with no gradient using temperature compensation, which for a distance of 25 feet is 0.0625 feet;
- a resolution of 0.01 feet over full range;
- instrument versatility based on 29 programmable modes to adapt it to various measurement and deployment configurations; and
- corrosion resistance due to a strong stainless steel housing and a ceramic transducer.

The model required a 12 to 24 volts at 95 milliamps power supply. An integrated thermistor compensated for temperature effects on measured distance. During ultrasonic meter operation the thermistor senses the air temperature and adjusts the travel time measured by the ultrasonic sensor to account for the speed of sound at the measured temperature. Testing prior to field deployment showed that all measurements were within the manufacturer's specifications.

The instruments were installed in the wetland by constructing platforms between trees at elevations above the expected maximum water levels. The ultrasonic distance meters were configured for

use with a data logger and solar power input. Thus, each unit was compact and self contained, requiring no external power source. Four units were in service from January 1992 through November 1993. Functioning well, with minimal down time, the units have provided accurate water level measurements at each of the four sites during the data collection period.

A mount was designed and built using $\frac{1}{4}$ -in steel pipe and off-the-shelf electrical connector boxes and fittings (Fig. 1). The mount provided protection from weather and vandalism and served as a convenient means for fastening the sensor to any vertical surface such as posts, walls, and bridge railings. The mount also allowed easy, yet secure, access to the instrument for field calibration and trouble-shooting, if necessary. A data logger was selected to power the instrument and record data. The commercially available model was selected because of its competitive price and the many

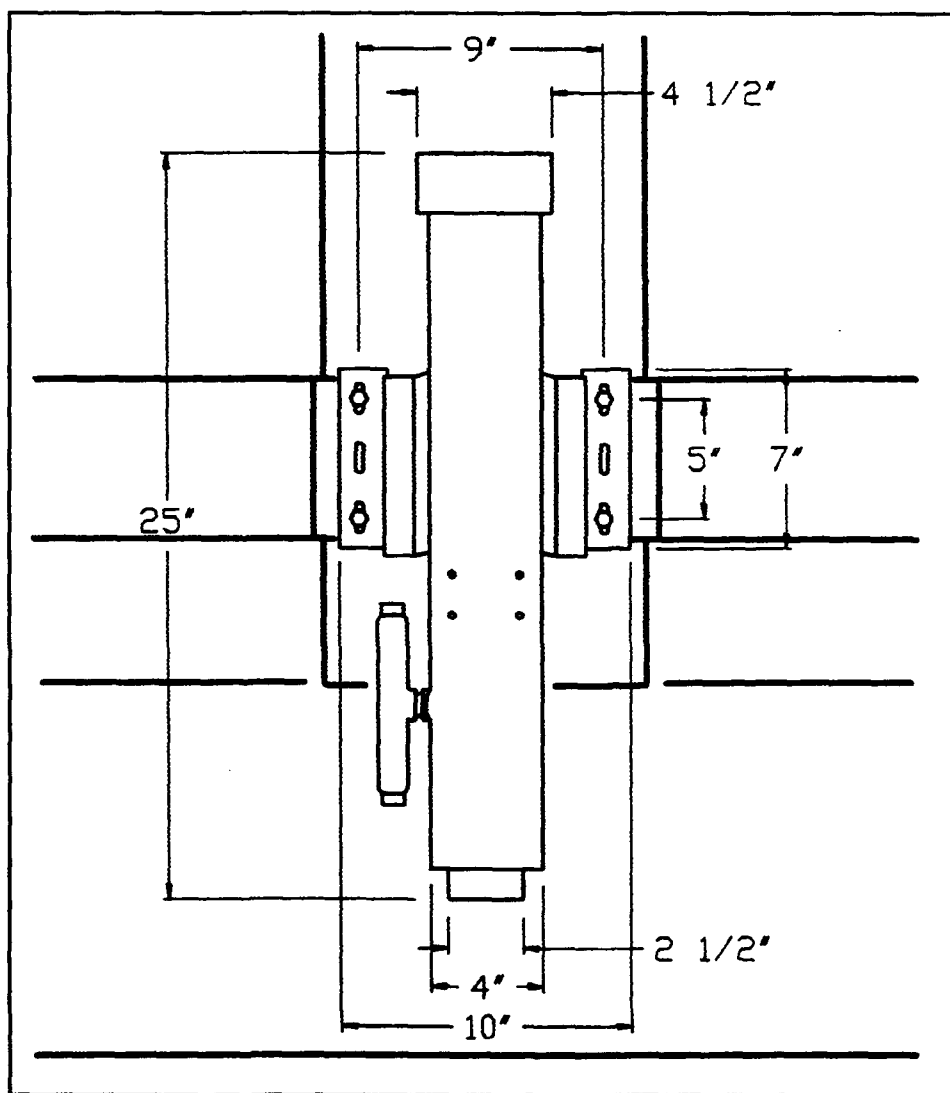
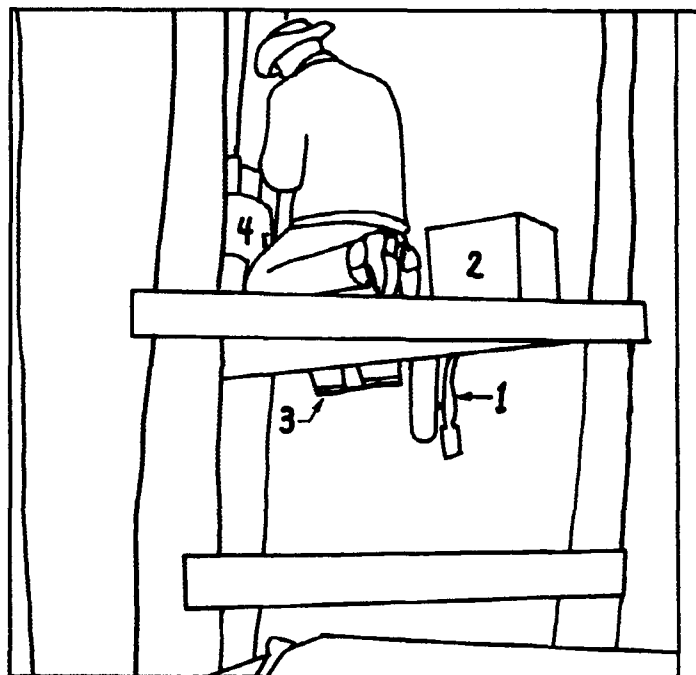


Figure 1. Ultrasonic sensor mount diagram

features suited to the applications in the WRP study. Functions needed included the ability of the logger to log up to 64,000 readings, several analog channels, and a 12 volt power source, all operated from one internal 12 volt battery. This allowed enough storage for at least three months of data, at ten minute intervals, taking readings for water surface elevations and water temperature. A 24 volt solar panel was also installed with a blocking diode to keep the logger internal battery fully charged at all times. The instrument, mount, laptop PC, and logger are shown in Figure 2. The data were downloaded to a laptop PC via the RS-232 communications port. The process was menu driven, and files of up to 8,000 lines of data were downloaded in approximately 2 minutes.

Performance of instruments

Several aspects of the instrument performance should be addressed. First are the performance and reliability of the physical units in the field. Of the four sets of instruments, over the 22 months the instruments have been operating, one sensor malfunctioned due to a bad



Ultrasonic sensor with mount (1), data logger (2), solar collector (3), and other instrumentation (4) mounted on platform in Cache River study area (see pg 1)

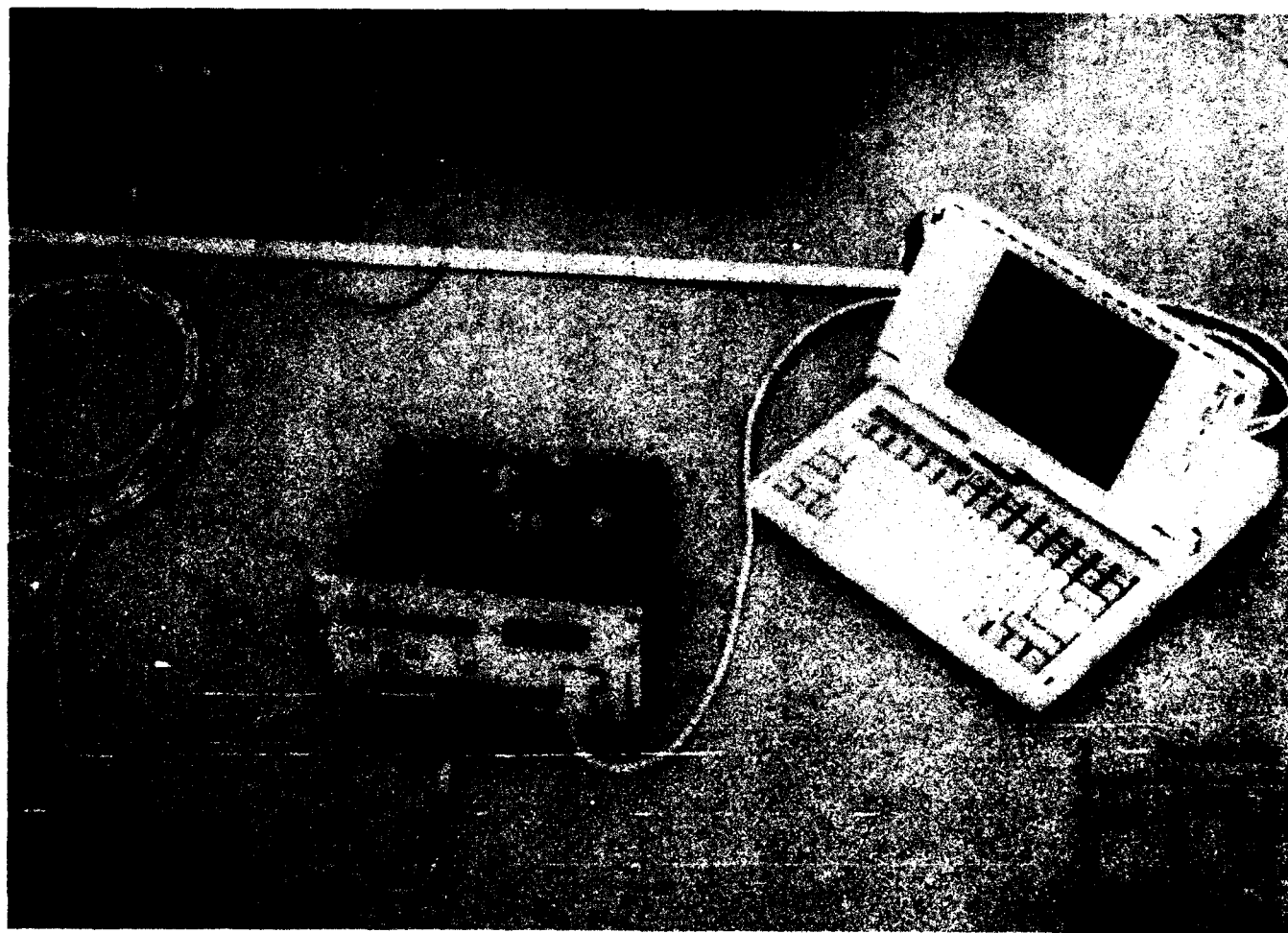


Figure 2. Ultrasonic sensor with mount (rear left), data logger (center, cover in back), connected to personal computer for data transfer

pulse emitter. It was repaired and has since functioned without problems. During the same operating period, one of the data loggers failed, due to a blown fuse. Any other losses of data were due to operator errors.

The second performance factor to consider is the quality of the collected data, which is more difficult to assess. The ultrasonic instruments display a small diurnal pattern in the collected data, even though temperature compensation within the instrument is activated. However, the error introduced by this fluctuation appears to be less than instrument measurement accuracy of 0.05 feet. Testing in a controlled environment over a long time period indicates that the average value over the time period of the fluctuation is very near the true water surface elevation. Overall, the instruments do

provide reliable measurements of water surface elevation in remote environments over long time periods, as shown in Figure 3.

Using ultrasonic instruments to measure water surface elevations is a viable option when accuracies of 0.05 feet can be accepted. Several manufacturers have indicated that better accuracy in similar instruments is under development. The savings realized by use of these systems over conventional float and pulley systems with stilling wells make them an attractive option for wetland studies.

Additional information is available from David Abraham at (601) 634-2846 or Brad Hall (601) 634-3392.

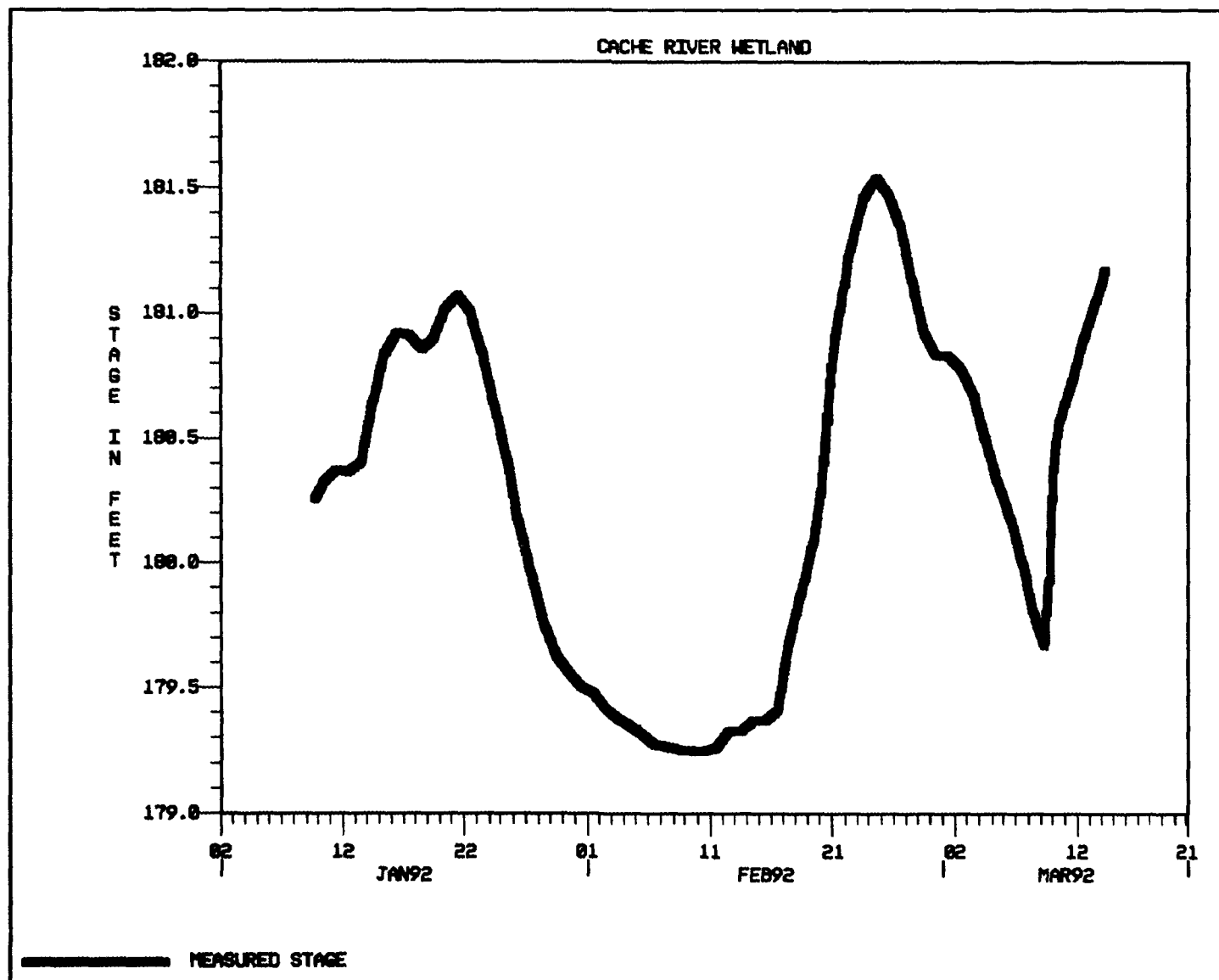


Figure 3. Example of water elevation data obtained through ultrasonic sensor in the Cache River bottomland hardwood wetland

David D. Abraham is a research hydraulic engineer in the Math Modeling Branch, Waterways Division of the Hydraulics Laboratory. He received his B.S. degree in agricultural engineering from the University of Idaho, and M.S. degree in civil engineering from Texas A&M University. Abraham has been working on water resources instrumentation projects in Southern Idaho, erosion control in northern Mississippi, and the Strategic Environmental Research and Development Program. He is also involved in numerical studies for sediment transport in rivers and reservoirs.



Brad R. Hall is a research hydraulic engineer in the Math Modeling Branch, Waterways Division of the Hydraulics Laboratory. He received his B.S. in Environmental Resources Engineering from Humboldt State University, his M.S. in Civil Engineering from Utah State University, and is currently working towards his PhD in Civil Engineering through the University of Minnesota. In addition to his WRP research, Hall focuses on identifying the channel forming discharge in alluvial channels. He led the development of mobile bed modeling capabilities in the CH3D-WES three dimensional hydrodynamic model. Prior to coming to WES in 1989, Hall worked in the Hydraulics Section of the U.S. Army Engineer District, Seattle. He is a registered Professional Engineer in the State of Washington.



Corps' 1995 national wetland workshop abstracts due

The organization committee of the Corps' National Interagency Workshop on Wetlands has received a positive response from wetland professional to its call for topics. Until the firming up of the agenda and the final selection of papers, prospective speakers are encouraged to send in topics; however, it is advised that the abstracts be attached at this time. Abstracts should be 75 to 150 words and all must be received by Sept. 30, 1994. The following is a listing of proposed sessions:

Restoration, Protection, and Creation

- Placement and design
- Construction and implementation (engineering)
- Monitoring for success
- Research field studies
- Constructed wetlands (cleanup and remediation)

Identification and Delineation

- Regional approaches
- Hydrology of hydric soils
- Hydrologic indicators
- Hydrophytic vegetation

Evaluation

- Hydrogeomorphic classification system
- New wetland assessment methods

Processes

- Hydrology and hydraulics
- Sedimentation and erosion
- Water quality
- Soils chemistry
- Biotic components

Stewardship and Management

- Change assessment
- Automated wetland management systems
- Cumulative impacts analysis
- Mapping and inventory
- Research field studies

Other Issues

- Mitigation and mitigation banking
- Watershed planning
- Ecosystem analysis
- Landscape ecology/ modeling

The workshop will be held at the Clarion Hotel in New Orleans, La., April 3 through 7, 1995, under the theme "Technology Advances for Wetlands Science."

Additional information is available from:

U.S. Army Engineer Waterways Experiment Station
Wetlands Research & Technology Center
ATTN: CEWES-EP-W
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
Telephone (601) 634-2569/4217, FAX (601) 634-3664



Corps field notes

Corps North Carolina project earns honors

The National Association of Environmental Professionals has announced the U.S. Army and the U.S. Department of the Interior as winners of the Second Annual Federal Environmental Quality Awards.

The winners were selected by a committee chaired by the President's Council on Environmental Quality. The awards honor federal agencies for excellence in implementing the National Environmental Policy Act. The awards were presented at a luncheon on June 14 during NAEP's Annual Conference in New Orleans.

The U.S. Army's winning project is the Army Corps of Engineers' "Atlantic Intracoastal Waterway Bridge Replacement Projects—Core Creek, Hobucken, and Fairfield." The project, undertaken by the Corps' Wilmington District, Wilmington, N.C., featured extensive cooperation with landowners, the public, and federal and state agencies to minimize environmental impact and restore wetlands. Also contributing to the project's success was the Corps' use of a sophisticated geographic information system to analyze wetland vegetation and soil conditions. This analysis permitted project refinements to further minimize the environmental impact of the bridge construction.

The Department of the Interior will receive its award for the "Outer Continental Shelf Natural Gas and Oil Resource Management Program," administered by the Department's Minerals Management Service. MMS will be honored for its innovative, careful implementation of NEPA reviews of all oil and gas exploration, development, and operation undertaken on the nation's outer continental shelf.

Technical assistance available to Corps regulatory offices

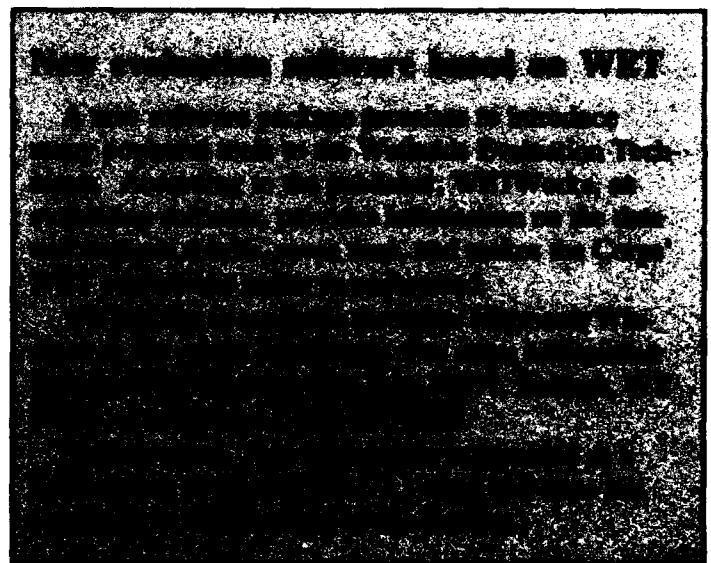
The Wetlands Regulatory Assistance Program allows access to technical experts for problems arising in the wetlands regulatory arena. The WES Environmental Laboratory's Wetlands Research and Technology Center serves as a conduit for requests. Corps District and Division personnel may request support by mailing a WRAP request to Mr. Richard Coleman at the following address:

Commander and Director
U.S. Army Engineer Waterways Experiment Station
ATTN: CEWES-EP-W (Mr. Coleman)
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

The program is funded annually, with FY 1994 funds still available at this time. Assistance is limited to 7 man-days (including travel). There are no charges to the requestor. Request may also be sent by FAX to number (601) 634-3664.

WES wetland experts to be part of national project

U.S. Army Engineer Waterways Experiment Station scientists are working on a new federal interagency project, the Southern Forested Wetland Initiative. The project is designed to evaluate the functions of forested wetlands across the southeastern United States. Currently, federal agencies participating in the project are the National Biological Survey, the U.S. Forest Service, the U.S. Army Corps of Engineers, and the U.S. Geological Survey. The work will, in part, use data collected from WES's Cache River study to test hypotheses and address questions raised by the Cache research. Other objectives of the study include looking at several sites in the southeast, and exploring how wetland functions differ according to the geographic and hydrogeomorphic orientation of the forested wetland. Study sites under consideration are located in Arkansas, Louisiana, Texas, Georgia and South Carolina.



Professional meetings announced

Environmental conference to focus on restoration

The second Environmental Restoration Opportunities Conference and Exhibition (EROC) will take place in, Munich, Germany, Oct. 25-27, 1994. The focus of the conference is business opportunities for environmental restoration in response to national and international requirements. The theme is "Expanding Technology, Cooperation and Financial Engineering."

Information about the conference and exhibition may be obtained by contacting American Defense Preparedness Association, 2101 Wilson Boulevard, Suite 400, Arlington, VA 22201-3061 USA, telephone (703) 247-2575, FAX (703) 522-1885.

American Institute of Hydrology to sponsor annual conference

The American Institute of Hydrology will hold its 1995 annual meeting at the Red Lion Hotel, Denver, Colo., May 14 to 18. The purpose of the conference, "Water Resources at Risk," is to describe issues, management strategies, and technologies in hydrology, hydrogeology, and mining hydrology. General sessions, poster session, short courses, and field trips will be offered.

Authors intending to offer a paper/poster are requested to submit an abstract of not more than one page (about 250 words, double spaced). The abstract must include the title of the paper, as well as each author's name, affiliation, address, telephone, and FAX numbers. The abstract should be sent not later than Aug. 1, 1994, to the Technical Program Committee. Manuscripts for both papers and posters are due Nov. 1, 1994. A biographical sketch of each author is required. Proceedings will include papers and posters and will be available at the conference. The mailing address is: Technical Program Chairmen, Downey and Gutentag, 6301 Eldridge, Arvada, CO 80004, Tel. (303)425-0419, Fax (303)425-1053.

Florida Coastal Management Conference announced

A Florida Coastal Management Conference will be held at the Omni Jacksonville Hotel, Florida, Sept. 25-27, 1994. The conference, "Weathering the Storm," will address issues of concern in coastal areas, as well as provide a forum for the exchange of information on current coastal topics.

Group rate reservations must be made on or before Aug. 25, 1994. Reservations requested after Aug. 25 will be subject to availability, but not necessarily at the group rate.

More information is available from Joy Dorst or Jaime Doubek, Weathering the Storm, The Department of Community Affairs, Florida Coastal Management Program, 2740 Centerview Drive, Tallahassee, Florida, 32399-2100, telephone (904) 922-5438, FAX (904) 487-2899.

Coastal Zone 95 Conference announced

Under the motto "Spotlight on Solutions," the Ninth International Conference, Coastal Zone 95, will take place at the Convention Center in Tampa, Fla., July 17 to 22, 1995. Abstracts to be considered for Coastal Zone 95 must arrive no later than Aug. 1, 1994. Name, affiliation, address, telephone and FAX numbers should be included in submissions.

The biennial conference will focus on three themes: Building Partnerships, Managing Ecosystems, and Exploring the Human Dimension, and will include a combination of formal presentations, panel discussions, and poster sessions.

Registration fees will be announced in the preliminary program which will be mailed in March, 1995. Preliminary programs can be obtained by writing to: CZ 95 Program Committee, c/o Dr. Billy Edge, Ocean Engineering Program, Civil Engineering Department, Texas A&M University, College Station, Texas 77843-3136.

Gulf of Mexico Program to hold symposium

The Gulf of Mexico Program will hold its 3rd Biennial Gulf of Mexico Symposium March 29 through April 1, 1995, in Corpus Christi, Texas.

The Gulf of Mexico Symposium is an opportunity for scientists, teachers, students, citizens, industry, and government officials to hear about and discuss marine debris, toxics and pesticides, loss of habitat, nutrient enrichment, coastal erosion, public health, aquatic resources, and freshwater inflow. Sessions will include speakers, poster presentations, exhibits, an art show, student science projects, special events and field trips.

More information about the symposium is available from Diane Altsman at (601)688-7015 or by calling 1-800-699-GULF.