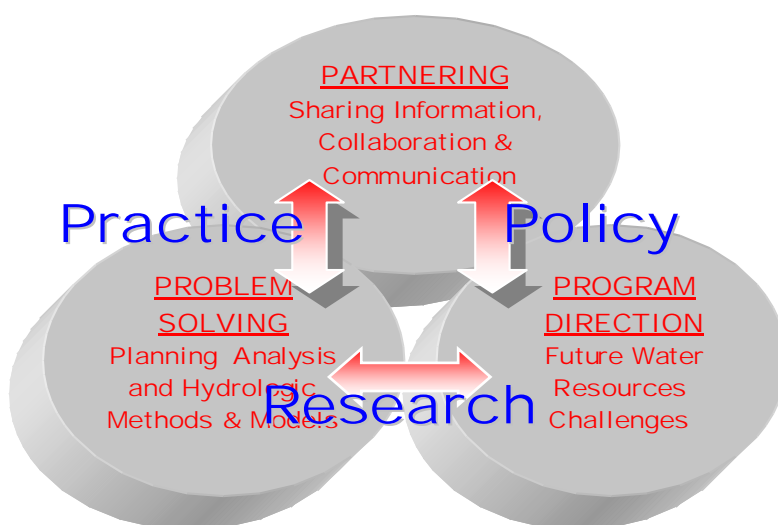


US Army Corps
of Engineers®



ANNUAL REPORT ACTIVITIES OF THE INSTITUTE FOR WATER RESOURCES FISCAL YEAR 2009





IWR Headquarters - National Capital Region Office

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IWR OFFICES & MISSION SPECIALTIES



**HEC
DAVIS, CA**

- **H&H Methods & Models**
- Surface Hydrology
- Hydrologic Statistics
- River Hydraulics
- Ecosystem Function Models
- River Forecasting
- Reservoir Systems & Water Mgt

RIMC
40 FTE
Denver, CO & Pittsburgh, PA

- **Dam & Levee Safety**
- Risk Assessment methodologies

WCSC
NEW ORLEANS, LA

- **Waterborne Commerce Statistics**
- Foreign Trade
- Domestic Commerce
- **Navigation Infrastructure**
- **Dredging & Lock Performance**
- **CW Business Information**

**IWR
NCR
Office**

- **Program Direction**
- Water Resource Trends & Emerging Issues
- Support on CW Strategic Plan
- Policy Development Support
- National Studies
- **Problem Solving**
- Investment Decision Support Methods & Models
- Multi-Objective/IWRM
- Plan Formulation
- Socio-Economic Analyses
- Environmental Evaluation
- Global Climate Change
- Technical Assistance & Capacity Development
- **Partnering**
- Collaborative Planning
- Public Involvement
- Alternative Dispute Resolution
- National Interface
- International Outreach

INSTITUTE FOR WATER RESOURCES

BACKGROUND

The U.S. Army Engineer Institute for Water Resources (IWR) is a field operating activity under the staff supervision of the Deputy Commanding General for Civil and Emergency Operations and the Director of Civil Works, Headquarters, U.S. Army Corps of Engineers (HQUSACE). The Institute is the USACE knowledge center for integrated water resources management (IWRM), and is specifically recognized as a national expertise center for planning methods, risk analysis, hydrologic engineering, conflict resolution and public participation, international water resources, global climate change science, and the collection, management and dissemination of Civil Works and navigation information, including the Nation's waterborne commerce data.

IWR was established by the USACE Chief of Engineers in 1969 with the approval of the House and Senate Appropriations Committees and the Subcommittees on Public Works in order "to enhance the capability of the Corps of Engineers to develop and manage the Nation's water resources, within the scope of the Corps' responsibilities, by developing essential improvements in planning to be responsive to the changing concerns of our society."

The Institute's mission is to facilitate the adaptation of the Civil Works program to future needs by providing the USACE with the capability for developing forward-looking analysis and state-of-the-art methodologies. IWR fulfills this mission by supporting the Civil Works Directorate and USACE Major Subordinate Commands (MSCs) and District offices by providing: (a) analysis of emerging water resources trends and issues; (b) state-of-the-art planning, hydrologic engineering and risk assessment methods, models, training, and custom applications; and (c) national data management of results-oriented program and project information across Civil Works business lines.

The Institute is a member of the Federal Laboratory Consortium for Technology Transfer (FLC), a nationwide network of over 250 federal institutions chartered by the Federal Technology Transfer Act of 1986. IWR also has a cooperative relationship with the National Institutes for Water Resources (NIWR), which represents fifty-four State and U.S. territorial university-based water centers through the U.S. Department of the Interior, U.S. Geological Survey (USGS). The FLC and NIWR provides USACE with the framework for developing technology transfer strategies and opportunities by promoting and facilitating technical cooperation in cooperation with Corps Districts and Expertise Centers and among federal laboratories, industry, academia, and state and local governments.

IWR CENTERS

IWR has offices at five locations, each of which is a USACE designated center of expertise (DX): the National Capital Region (NCR) and Navigation Data Center (NDC) offices in the Casey Building at the Humphreys Engineer Center, Alexandria, Virginia; the Hydrologic Engineering Center (HEC) in Davis, California; the Waterborne Commerce Statistics Center (a unit of the Navigation Data Center) in New Orleans, Louisiana and the Risk Management Center (RMC) which has offices in Denver, Colorado and Pittsburgh, Pennsylvania.

The Risk Management Center (RMC) is IWR's newest remote center, established in 2009 and specializing in providing USACE with a critical mass of engineering expertise in dam and levee safety.

National Capital Region Office: The IWR NCR office is the Corps designated center of expertise for the development of methods, models, and analytical tools used for water resources and water systems planning, investment decision support, conflict resolution and public participation, and international water resources. IWR fulfills this mission through a synergy of water resources planning and socio-economic expertise that blends practice with research, policy development and information. IWR planners, economists, social scientists, civil engineers and specialists in the physical sciences lead Civil Works strategic planning and technology transfer initiatives; conduct national and focused policy development studies; develop a broad range of partnering and investment decision-support techniques, methods and models for integrated water resources management and navigation system applications; interact with national and international members of the water resources community, and partner with the HQUSACE, Corps field offices and laboratories in solving complex technical water resources planning and evaluation problems. In particular, the Institute provides a critical mass of socio-economic expertise within the Corps and serves as the residence for the USACE Chief Economist position, which is responsible for the leadership of the Corps Economics Community of Practice (CoP).

IWR also provides a cadre of international water specialists who lead the USACE's engagement in water resources partnerships around the globe. In 2007 IWR expanded its collaborative partnerships when it established the *International Center for Integrated Water Resources Management (ICIWaRM)*. In February 2008, USACE IWR, through ICIWaRM, was nominated by the U.S. Government to be a UNESCO Category II Water Centre, working in collaboration with key university, federal agency and non-governmental partners sharing an interest in the advancement of the science and practice of integrated water resources management. In June 2008, ICIWaRM's nomination as an international water center was endorsed by the governing body of UNESCO's International Hydrological Programme (IHP), and in September 2009 the nomination of ICIWaRM was endorsed by the UNESCO Executive Board. The nomination was approved by all 193 member states at the UNESCO General Conference in Paris in October 2009. Official designation as a UNESCO Category II Centre took place at a ceremony at UNESCO Headquarters in New York City in late October 2009.

Also residing at IWR's NCR office is the Corps *Center of Expertise in Conflict Resolution and Public Participation (CPC)* which focuses on the processes associated with conflict resolution and the integration of public participation techniques with decision support and technical modeling (Computer Assisted Dispute Resolution - CADRe). The Institute has pioneered the development and advancement of one such CADRe approach known as *Shared Vision Planning (SVP)*, and in 2009 IWR was actively involved in supporting USACE MSC's and district offices, the International Joint Commission (IJC), and a host of State and local governments on the application of SVP as a means to address water resources problems across the nation.

Additional information about IWR and its individual organizational units can be found at its web site at www.iwr.usace.army.mil.

Hydrologic Engineering Center (HEC): The primary goal of HEC from its inception in 1965 has been to support the Nation in its water resources management responsibilities by increasing the Corps technical capability in hydrologic engineering and water resources planning and management. An additional goal is to provide leadership for improving the state of the art in hydrologic engineering and analytical methods for water resources planning. Program efforts in research, training, planning analysis and technical assistance raise awareness of the problems and needs of the Corps and the Nation. HEC is committed to keeping abreast of the latest developments throughout the water resources engineering profession and to make use of this information in a manner best suited to the needs of the USACE nationally and internationally. HEC increases the effectiveness of the Corps and the profession by bridging the gap between the academic community, practicing hydrologic engineers and planning professionals. HEC ground-tests and incorporates state-of-the-art procedures and techniques into manuals and comprehensive computer programs. The procedures are made available to the USACE, United States government and international professionals through an effective technology transfer system of technical assistance, publications, DVD's and training. Technical specialty areas addressed by HEC include: precipitation runoff processes, reservoir regulation, reservoir systems analysis, hydrologic statistics and risk analysis, river hydraulics and sediment transport, environmental flows, groundwater hydrology, water quality and analytical aspects of water resources planning. Application areas include: flood risk management, real-time water control, water control management, hydroelectric power, navigation, erosion control, water supply, watershed studies and ecosystem restoration. Additional information about HEC and its software is available on its web site at www.hec.usace.army.mil.

Navigation Data Center (NDC): NDC is the Corps designated center of expertise for the management of infrastructure utilization and performance information for U.S. waterways and port and harbor channels. Because of the integrated nature of water resources, NDC also directly supports a range of related Civil Works business areas, including hydropower, recreation, environmental compliance, environmental stewardship, water supply, regulatory and homeland security, as well as other Federal, state and local agencies and the private sector. The primary operational arm of NDC is the Waterborne Commerce Statistics Center (WCSC), which provides one-stop capability for national navigation information systems. NDC also provides integrated business information in support of Corps decision making including financial output, performance measurements and performance-based budgeting processes. Additional information about NDC is available on its web site at www.ndc.iwr.usace.army.mil.

Risk Management Center (RMC): The newest organizational element of IWR is the Risk Management Center (RMC). It is headquartered in Denver, Colorado, with a satellite office in Pittsburgh, Pennsylvania. Established in 2009, the Risk Management Center is a center of expertise designed to improve the technical and policy oversight of infrastructure decisions, serve as an independent advisor to senior leadership, maintain and develop risk competencies, and ensure consistency in processes, application of criteria and decision-making.

The mission of the Risk Management Center is to support the Civil Works program by providing a nationally consistent context for managing and assessing risks for dams and levee systems across the Corps, to support dam and levee safety activities throughout the Corps, and to develop policies, methods, tools, and systems to enhance those activities.

The Center will serve as a USACE-wide resource for risk-related tools, assessments, knowledge and methods. It is intended to offer a national perspective as well as support routine District and MSC

dam and levee safety activities. The Center offers services to support dam safety; levee safety; and the Modeling, Mapping, and Consequence Production Center of Expertise.

The goals of the Center are to (1) ensure that risks are managed corporately and reduced in the most efficient matter practicable; (2) lead efforts to support consistent risk-informed dam and levee decisions across the Corps; (3) ensure that consistent processes, policies, and methods are used across the Corps to evaluate risks; and (4) lead strategic planning efforts for risk management.

The roles of the Center include serving as a Corps-wide resource for risk-related tools, assessments, knowledge, and methods; serving as a technical center of expertise for infrastructure risk management and dam and levee engineering; provide a national perspective while working with USACE Communities of Practices and Districts; supporting routine district and MSC dam safety activities and supporting technical activities relating to dam and levee safety.

Information about the services provided by the Center, including about the interaction between the Center and other partnering organizations, such as the U.S. Bureau of Reclamation, the Federal Energy Regulatory Commission; the Association of State Dam Safety Officials, the U.S. Society of Dams, and the Association of Engineering Geologists, is provided at the Institute's website: <http://www.iwr.usace.army.mil/rmc/>.

FY 2009 SUMMARY

The Institute's FY 2009 program continued to affirm IWR's status as an essential USACE institutional asset, serving as the intellectual foundation to the future direction of the Corps Civil Works program, the overarching USACE missions, including international water security and the Corps contribution to the Nation's water resources. The robust mix of planning, policy and, engineering initiatives that IWR executed in FY2009 was strategically targeted to reflect the anticipation of a renewed national emphasis on adaptations to climate change, water resources systems (i.e., regional and watershed level planning), and the stronger need for collaborative relationships between Federal and State governments and other stakeholders in solving water resources at the regional scale. This contemporary planning focus on integrated water resource management in conjunction with the enactment of WRDA 2007, the standup of six Council of Environmental Quality (CEQ) led interagency working groups on the adaptation to climate change, and the development of CEQ's draft Principles and Standards for water resources planning provided the foundation for the 2009 Institute's program.

Overall, in FY 2009 IWR executed a record program of approximately \$70 million with 166 authorized in-house employees, primarily in professional scientific-engineering disciplines, with most possessing advanced degrees. The Institute's in-house staff was supplemented by other experts detailed from USACE field offices and laboratories, and Intergovernmental Personnel (IPA) Act visiting scholars from universities, state and local governments, policy think-tanks, and through contracting with the private sector. A major transforming factor was the Institute's corporate focus on recruitment, with over 50 new hires (almost one-third of the workforce) made across IWR in 2008-2009, including the active use of Federal vehicles such as the Presidential Management Fellows (PMF) Program, and the National Academy of Sciences' Research Assistantship Program (RAP) to bring on recent post-Doctoral graduates as water resources specialists.

Many of the technical and policy development challenges faced in FY 2009 reflect the continued need to transform Federal water resources programs to emphasize 21st Century perspectives, policies and

approaches in view of the program and policy reforms ushered through the enactment of the Water Resources Development Act of 2007 (P.L. 110-114, dated November 8, 2007) and the ongoing revision of the Water Resources Principles and Standards. In particular, the enactment of a number of WRDA provisions directly shaped many of IWR's FY 2009 activities, illustrated by the following examples:

- The revised cost-sharing provisions for **watershed studies** (WRDA 2007, Sec. 2010) served to further the alignment of the Civil Works program with integrated water resources management. To facilitate this alignment, the Institute continued work on the development of an enterprise wide geographic information system (GIS) based watershed investment decision tool (WIDT), on advancements to the Watershed Assessment Tool (HEC-WAT) and the Reservoir Simulation Model (HEC-ResSim), and policy and programmatic initiatives to assist USACE districts in applying regional sediment management approaches (also relevant to WRDA 2007 Sec. 2037).
- The technological advancement of electronically accessible, mission relevant performance data (WRDA 2007, Sec. 2017) reinforced the importance of the IWR-NDC information program (OMBIL - *Operations & Maintenance Business Information Link*) and OMBIL's Regulatory Module (ORM2.0) which was fully deployed to USACE districts.
- The emphasis on **international water resources** (WRDA 2007, Sec. 2030) affirmed the growing importance of U.S. goals for international water security and sustainability, and aligned with IWR's status as the U.S. global center for integrated water resource management under the auspices of UNESCO's International Hydrological Programme (IHP). IWR was officially designated as a UNESCO global water center (ICIWaRM) in 2009.
- The revision and update of the **Water Resources Principles and Guidelines** (P&G) (WRDA 2007, Sec. 2031) manifested IWR's active support to the HQUSACE and Office of the Assistant Secretary of the Army (Civil Works) (OASA(CW)) in scoping proposed P&G revisions. IWR staff composed the bulk of the subject matter experts serving on the Corps internal Principles and Guidelines review team, and assisted the Office of the Assistant Secretary in drafting a proposed revision. The Council on Environmental Quality assumed leadership of the activity and published a draft revision of the Principles and Guidelines in the Federal Register on July 1, 2009. IWR staff summarized hundreds of public comments on the CEQ draft. This summary served as a basis for the Administration's efforts to prepare a revised draft. IWR staff supported HQ and ASA (CW) in analyzing and responding to various CEQ proposals.
- In anticipation of the upcoming revision to the P&G, IWR completed several planning methodology initiatives aimed at seamlessly providing USACE field practitioners with new planning reference tools that are aligned with the contemporary water resources principles. These include an *Economic Primer*, the update of *National Economic Development Manuals for Coastal Storm Damage Reduction and Deep Draft Navigation*, an *Overview NED Manual*, handbooks on the consideration and treatment of *Other Social Effects* and *Regional Economic Development*, a *Multi-objective Planning Manual*, and a *Multi-Criteria Decision Analysis* software module within the IWR Planning Suite Model.
- The provisions of WRDA 2007 (Sec. 2034) for **Independent External Peer Review** (IEPR) resulted in IWR support to HQUSACE in scoping new review procedures and requirements, and the initiation of a new national contracting vehicle administered by IWR for procuring IEPR services across USASCE; and,

- The enactment of the **Levee Safety Program** (WRDA 2007, Title IX), formalized and elevated the role of USACE in national levee safety and was a motivating factor in HQUSACE approval for establishing the Risk Management Center (RMC) within IWR to provide nationally consistent safety assessment tools, approaches and outcomes for dams, levees, and other engineered structures.

Civil Works Strategic Planning Efforts: The release of the inaugural Civil Works Strategic Plan in FY 2004 represented the culmination of a multi-year effort aimed at establishing a new direction for the Civil Works Program based on the contemporary IWRM watershed planning approach. The watershed approach recognizes that the physical, chemical, and biological processes that support the water resources are intertwined and must be managed in an integrated manner. The USACE advocates a holistic view to sustainable water resources solutions in partnership with other Federal agencies, Tribes, State and local governments, and non-governmental organizations.

FY 2009 Civil Works Strategic Planning activities focused on continued implementation of the current Civil Works Strategic Plan (for FY 2004-2009) and building the conceptual foundation for the FY 2010-2014 Strategic Plan – *Sustainable Solutions to America’s Water Resources Needs*.

Recognition of PIANC (World Association for Waterborne Transportation Infrastructure) US Section as “Best Section” for 2008

At the Annual General Assembly of the World Association for Waterborne Transportation Infrastructure (PIANC) held 24-29 May 2009 in Helsinki, Finland, the U.S. Section of PIANC was recognized as the “Best Performing National Section” in PIANC for 2008. Recognition of the efforts of the U.S. Section is based on the extensive participation by members of the U.S. Section on many of the PIANC technical working groups and the proactive approach to technical and technology transfer efforts undertaken by the members of the U.S. Section.

The U.S. Section of PIANC is administered by law under the auspices of the USACE. The President of the U.S. Section is the Deputy Commanding General for Civil Works and Emergency Operations. The Secretary of the U.S. Section is Ms. Anne Cann and the Deputy Secretary of the U.S. Section is Ms. Kelly Barnes. Both Ms. Cann and Ms. Barnes are employees of IWR.

Visiting Scholars Program

The Institute benefits from supporting a number of Visiting Scholar programs which bring the foremost water resources experts from academia, private industry and other agencies and laboratories to residence at IWR for periods of six months to one year. FY 2009 marked the eight year of the Institute’s Maass - White Visiting Scholar program, established in 2001 in recognition of the contributions of, and the Institute’s intellectual alignment with, two of the founders of modern water resources planning’s theoretical underpinnings — Professors Arthur Maass of Harvard University, and Gilbert White of the University of Colorado.

Dr. Yacov Haimen’ from the University of Virginia was appointed Maass - White Scholar for 2008 - 2009 and Dr. Kenneth Strzpek, Professor of Civil, Environmental, and Architectural Engineering at the University of Colorado at Boulder, joined the Institute in 2009 as the Maass-White Scholar for 2009-2010. Dr. Strzpek’s research will focus in the area of climate change and adaptation of water resources.

FY 2009 marked the initiation of a new visiting scholar program, the Frederick J. Clarke Visiting Scholar program, named in honor of Lieutenant General Frederick J. Clarke, Chief of Engineers from 1969-1973. Lieutenant General Clarke was instrumental in securing expert, independent advice on environmental issues facing the Corps by founding the Environmental Advisory Board. The Frederick J. Clarke Visiting Scholar program will provide scholars the opportunity to advise the Corps on important policy issues related to the Corps environmental mission.

Dr. Martin Doyle, Associate Professor in the Department of Geography at the University of North Carolina at Chapel Hill, was the inaugural Frederick J. Clarke Visiting Scholar. While at IWR, Dr. Doyle focused on the determination of the optimal scale for geographic service areas in compensatory mitigation; infrastructure decommissioning; and the evolving political economy of rivers.

American Reinvestment and Recovery Activities

In February 2009 the Congress passed and the President signed into law the American Recovery and Reinvestment Act (Public Law 111-5, dated February 17, 2009). The law provided appropriations for the purpose of job creation and preservation, infrastructure investment, increased energy efficiency through advancements in science and technology, investments in transportation, environmental protection, and other types of infrastructure that will yield long term economic benefits, and stabilize the fiscal condition of State and local governments.

In FY 2009 the Institute received approximately \$10.0 million to carry out Recovery Act related activities. Some of these funds were used by an economic contract to conduct a comprehensive study for estimating the employment impacts and associated secondary economic impacts associated with Recovery Act expenditures. The objective of the *Economic Modeling for Estimating Jobs Project* was to ensure that USACE provides accurate estimates of local employment generation or preservation and associated economic measures, including income and sales. National and regional economic models are being developed for all regions associated with USACE projects that receive Recovery Act funding.

A second Recovery Act initiative, the *Accelerated Corps Water Management System Project*, was conducted through contractors working with the Hydrologic Engineering Center. The objective of the Accelerated Corps Water Management System (CWMS) Project is to enhance the Corps capability nationwide to make well-informed decisions concerning the management of reservoirs and water control systems. During FY 2009 HEC staff worked with three engineering firms to deliver fully functional CWMS model watersheds to 11 Corps District offices.

Other major 2009 initiatives are presented within the context of the key themes which framed these activities – global climate change science and responses to climate change; integrated water resources management; collaboration and partnering; international water resources initiatives; and, technical advancements:

Global Climate Change Science and Responses to Climate Change

During FY 2009 IWR continued to be heavily involved in the US Government's efforts in the advancement of global climate change science and the development of policies to address adaptation to global warming:

- The Director IWR served along with ASA(CW) and the PDASA(CW) on the Council of Environmental Quality (CEQ) Interagency Climate Change Adaptation Task Force;
- Senior staff members of the Institute served on six CEQ Climate Change Adaptation working groups, including on Science, Process, Water, Insurance, International and Emergency Preparedness.
- IWR scientists actively played a role on an interagency group established to develop consistent water management adaptation policies and approaches to address global change across Federal water agencies, and to jointly consider what actions Federal agencies should take to incorporate climate change considerations into their water resources activities. The interagency group was composed of engineers, scientists and water managers from USACE, the U.S. Geological Survey (USGS), the U.S. Bureau of Reclamation (BuRec), and the National Oceanic and the Atmospheric Administration (NOAA) Climate Program Office. The work of this interagency collaborative effort was published in February 2009 as USGS Publication 1331, “*Climate Change and Water Resources Management: A Federal Perspective.*”
- IWR staff members also participated in another interagency group that include representatives from the U.S. Environmental Protection Agency (EPA), USACE, NOAA, USGS, BuRec, and the Department of Agriculture, Natural Resources Conservation Service (NRCS) and U.S. Forest Service, who have come together to cooperate in joint scientific and research efforts aimed at adapting U.S. water programs to address changing climatic conditions.
- IWR scientists and engineers worked with other Corps offices and laboratories on the accelerated development of USACE Engineer Circular (EC) 1165-2-211 (dated 1 July 2009) entitled “*Water Resource Policies and Authorities Incorporating Sea-Level Change Considerations in the Civil Works Programs*” which reflected the Corps scientific collaboration with USGS and NOAA’s National Ocean Service. IWR is also leading other USACE climate change teams to develop more detailed field guidance on the application of the new EC on Sea Level Change for coastal planning, engineering and O&M activities, and to put in place a process for evaluating the vulnerability of USACE coastal projects to climate change.
- As an outgrowth of the Institute’s involvement with the development of the *Western States Watershed Study*, IWR represents USACE in an intergovernmental partnership addressing the scientific needs for climate change impacts on the western waters of the U.S. The interagency team, known as the Climate Change and Western Water Group (C-CAWWG) was initiated by the U.S. Bureau of Reclamation, USGS and NOAA. IWR first engaged with these agencies on C-CAWWG in 2008, and in 2009 IWR became a full partner in C-CAWWG, working in collaboration on several initiatives aimed at describing both the current (short-term) and long term climate change research and development challenges, needs, desired capabilities and “gaps” with regards to western waters.

Integrated Water Resources Management

During FY 2009, IWR staff continued to play central roles in advancing the practice of IWRM through numerous technical efforts, including the following:

- Directing and managing the activities of the International Upper Great Lakes Study under the auspices of the International Joint Commission (IJC). The Study was initiated in 2007 under a Memorandum of Agreement (MOA) between IWR and the International Joint Commission (IJC). IWR is leading the U.S. contributions to the study. A significant milestone was achieved in 2009 with the completion of the first phase of the study in the form of the interim report on the St. Clair River which investigated factors which were possibly responsible for recent declining water levels in Lakes Michigan, Huron and Superior.
- IWR staff participated in the follow-on activities associated with conducting the Corps *Western States Watershed Study*, the findings and recommendations of which were embraced by the Western States Water Council (WSWC) and the Western Governors Association (WGA). Among the key outcomes of this initiative was the establishment of WESFAST – the *Western States Federal Agency Support Team*, with a Federal liaison position, representing all of the Federal water-related agencies, and deployed at the WSWC offices in Salt Lake City. A significant WESTFAST accomplishment was the integration of the Federal Liaison Officer in on-going WSWC initiatives. This coordinated focus included IWR’s involvement in the USACE-led initiative “Building Strong Collaborative Relationships for a Sustainable Water Resources Future.” As part of this initiative, USACE partnered with the other Federal and state water agencies in the conduct of a series of regional meetings and culminated in the USACE hosting of a National Meeting in Washington, D.C. in August 2009.
- An IWR senior scientist served as the co-lead, in collaboration with the USACE Engineer Research and Development Center (ERDC), for the Gulf of Mexico Regional Sediment Management (RSM) demonstration program, and other Corps RSM activities.
- IWR and HEC specialists continued to provide technical assistance on several pilot project partnerships with The Nature Conservancy on their Sustainable Rivers Program.

At the same time, IWR researchers worked to continue advancing IWRM planning, economic and hydrologic and hydraulic engineering tools, resulting in the 2009 issue of the improved *IWR-Planning Suite* software, and the release of new editions of the full range of HEC’s flagship NexGen software products, along with the rollout and immediate field application of state-of-the-art systems models for maritime transportation economics as part of the Institute’s *Navigation Economic Technologies (NETS) Research Program*.

Another significant technology milestone was the completion of the full deployment and training phases for the *OMBIL Regulatory Program Module (ORM 2.0)*, a web-based, enterprise GIS data management system now used by all USACE field offices, which provides the anchor technology for watershed-based analytics and decision-support for the Corps regulatory program, and is expected to play a foundational role for the entire Civil Works program.

Collaborative Planning and Partnering Efforts

Through the Institute’s role in supporting the USACE-wide implementation of the Civil Works Strategic Plan (2004-2009) and the ongoing development of the next Strategic Plan (2010-2014) in accordance with the *Government Performance and Results Act (GPRA)*, IWR continues to promote, support and engage in intergovernmental collaborations and partnering throughout USACE, and with a wide range of national and international institutions and organizations as a means of accomplishing

common goals. IWR continues to serve as the USACE lead for multiple national partnerships and is committed to developing new technologies, processes and policies to further collaborative planning and partnering.

IWR's partnering focus on national water resources issues in 2009 included representing both USACE and the Office of the Secretary of Defense (OSD) on the Executive Office of the President's National Science and Technology Council Interagency Subcommittee on Water Availability and Quality (SWAQ). IWR is likewise supporting USACE participation in the implementation of the President's Ocean Action Plan through integrated networks and partnerships of Federal, state, local, territorial and tribal authorities, the private sector, international partners and ocean communities.

In the advancement of collaborative planning models and guidance, IWR's *National Cooperative Modeling and Collaborative Planning and Management Demonstration* programs work in synergy to test and demonstrate a variety of collaborative modeling tools and concepts. Given the Institute's long history of applying collaborative modeling tools through its signature *Shared Vision Planning* (SVP) process, IWR was positioned to advance and apply contemporary conceptual and methodological approaches, as well as documenting, vetting and publicizing the advances and experiences of other institutions.

During FY 2009, IWR continued to focus on developing new conceptual and methodological foundations, building awareness of collaborative planning tools, and assisting Corps offices and states in improving public participation in water resources planning and decision making.

A milestone event during FY 2009 was the official designation of the Institute's *Conflict Resolution and Public Participation Center* (IWR-CPC) as a USACE Center of Expertise. The Center's activities include providing support to USACE headquarters, providing training and outreach programs to district and division offices, and a direct technical assistance program. In FY 2009, the Center's staff developed a strategic plan for the Center to assist the Corps anticipate, prevent, and manage water conflicts, ensuring that the interests of the public are addressed within the context of the Corps decision making process.

FY 2009 accomplishments included the following:

- Preparing the 3rd *Annual Report on Environmental Conflict Resolution* (dated 10 December 2008) for the Council on Environmental Quality, on the behalf of the Office of the Assistant Secretary of the Army for Civil Works;
- Developing an assessment of the capacity of the Corps to conduct decision making within a collaborative context. A result of this assessment is the development of a set of recommendations to improve the ability of the Corps to collaborate with external stakeholders;
- In association with the Sandia National Laboratory, the U.S. Institute for Environmental Conflict Resolution, and the U.S. Environmental Protection Agency, the Center conducted the second multi-agency National workshop on Computer Aided Dispute Resolution;
- A member of IWR-CPC served as Chairman of the Committee on Best Practices for Collaborative Modeling at the American Society of Civil Engineers' Environmental and Water

Resources Institute, and led the development of a draft of a document on the subject of best practices in the application of collaborative modeling;

- A member of IWR-CPC served on the organizing committee of the first inter-agency workshop on the Application of Technology in Environmental Conflict Resolution;
- IWR-CPC provided technical assistance to the State of California Department of Water Resources in the development of the California State Water Plan;
- IWR-CPC provided technical assistance to local and regional communities in Colorado in developing a pilot study of the application of the shared vision planning process to the Corps Section 404 (of the Clean Water Act) Regulatory Permit Program;
- An interagency agreement was renewed for IWR's Hydrologic Engineering Center (HEC) to work with NRCS agronomists to include agricultural damages in the Flood Damage Assessment model (HEC-FDA), and to reestablish technical support for NRCS employees using HEC's RAS model. NRCS has also continued to participate in the Interagency Levee Task Force and Missouri River basin activities led by USACE.
- A dramatic expansion of the *Silver Jackets Program*, a key partnering mechanism with the Federal Emergency Management Agency (FEMA) and other Federal, State and local agencies to ensure continuous interagency pre-disaster collaboration at the state level, with the number of operational regional teams in FY 2009 growing into six states, and with an additional ten state teams in various stages of development towards the ultimate goal of offering at least one interagency team within every state.
- IWR continued building international water partnerships with the appointment of IWR senior staff to the Governing Board of the United Nations Educational, Scientific and Cultural Organization (UNESCO) *Institute for Water Education (IHE-Delft)*, and the Advisory Board of the *International Center for Water Hazard and Risk Management (UNESCO-ICHARM)*.
- During FY 2009 efforts continued in establishing new Memoranda of Understanding (MOU's) with universities and other professional organizations. These new MOUs will facilitate cooperation in science, technology, and research in aspects of integrated water resource management and capacity building in developing nations and countries in transition. In particular, the partnership agreement with the National Institutes for Water Resources (NIWR), a consortium of 54 State and U.S. territorial university-based water centers administered through the U.S. Department of the Interior, U.S. Geological Survey, provides the Institute with a collaboration and technology transfer mechanism that parallels the USACE organizational emphasis through the MSC's and Districts on working more closely with State water agencies.

International Water Resources Initiatives

FY 2009 will stand out as a milestone in the history of the Institute for two defining events which occurred during the year: (1) the official designation of the International Center for Integrated Water Resources Management as a Category II Center under the auspices of UNESCO, the first such center in

North America, and (2) the active participation of the staff of the Institute in the planning, preparatory activities, and participation during the 5th World Water Forum in Istanbul, Turkey in March 2009.

The International Center for Integrated Water Resources Management was selected as the U.S. Government nominee for consideration as a UNESCO Category II Centre in February 2008 after a national-level competition. With the support of the U.S. National Commission for UNESCO, the U.S. National Committee for UNESCO's International Hydrological Programme (IHP), the U.S. Permanent Representative to UNESCO, and the Assistant Secretary of the Army for Civil Works, ICIWaRM's nomination was submitted to UNESCO Headquarters, approved by the IHP Bureau in March 2008, and endorsed by IHP's 36-member nation Intergovernmental Council (IGC) in June 2008. The nomination of ICIWaRM was endorsed by the UNESCO Executive Board in September 2009. Approval by all 193 member states took place at the UNESCO General Conference in Paris in October 2009. Official designation as a UNESCO Category II Centre was performed at a ceremony at UNESCO Headquarters in New York City in late October 2009.

During 2009, a senior scientist from the Institute was posted to Paris, France to serve as the U.S. Government's science attaché to the U.S. Mission to UNESCO Headquarters in Paris, France, from February-October 2009.

IWR's ongoing engagement with the World Water Council reached a new threshold in FY 2009 in support of the Corps' numerous contributions to the 5th World Water Forum (WWF5), which took place 16-22 March 2009 in Istanbul, Turkey. IWR was actively involved in the extensive WWF5 Thematic, Regional and Political preparatory processes, which began in 2007 and resulted in the definition of six themes and twenty-four topics under the overarching Forum theme "Bridging Divides for Water". Mr. Lindy Wolner, detailed in March 2008 from HQUSACE, Office of Interagency and International Services, served as resident U.S. Government liaison for a one-year assignment at the Secretariat for WWF5, located with the General Directorate State Hydraulic Works (DSI) in Istanbul. A key part of the liaison assignment was to identify and promote U.S. Government agency and stakeholders engagement in the WWF5 preparatory process, providing a linkage between the WWF5 Secretariat, WWC, USACE and a broad range of international and interagency water institutions and organizations, including the U.S. State Department, other U.S. agencies, Non-Governmental Organizations, the private sector, and various international partners.

Other notable international activities during FY 2009 included the following:

- In June 2009, training was provided at HEC for a group of military and emergency leaders from Kazakhstan. The class consisted of basic HEC-HMS and HEC-RAS training.
- HEC participated in a Watershed Assessment study of the Helmand Province in Afghanistan. This was led by the Corps Afghanistan Engineer District and was a multiple District effort. The goal was to identify possible small dam sites for impoundment of water for irrigation.
- HEC efforts in support of the Combined Joint Task Force, Horn of Africa (CJTF-HOA) manifested the development of an HMS model for the Ogaden Basin in Ethiopia. This work was done in conjunction with Naval Facilities (NAVFAC). This model will be turned over to the Ethiopian Ministry of Water when completed in FY 2010.

- HEC participated in Civil-Military Emergency Preparedness (CMEP) activity in Guyana. HEC-RAS and HEC-HMS models were constructed and training provided for Guyana government professionals on the use of the models and how to use related HEC GIS tools. Over the years, HEC has participated in several CMEP activities in various countries.
- IWR staff led training sessions on conflict management techniques for the Mekong River Commission held in Bangkok, Thailand and Vientiane, Laos.
- IWR staff participated in the *United Nations High Level Expert Panel on Water and Disasters*, chaired by the Prime Minister of South Korea, Han Seung-soo Han. The panel was originally convened in 2007 by the U.N. Secretary General's Advisory Board on Water and Sanitation in response to the weather related events including droughts, hurricanes, floods and tsunamis over the last decade. USACE Commander and Chief of Engineers Lieutenant General Robert L. Van Antwerp represented USACE on the *High Level Expert Panel*, along with the participation of Mr. Steven L. Stockton, HQUSACE Director of Civil Works, and Dr. Jerry Delli Priscoli of IWR. The *High-Level Expert Panel* presented its findings and action agenda at the *5th World Water Forum* in Istanbul, Turkey, in March 2009.

Technological Advancements

During FY 2009, technical advancements occurred in a number of areas including the following:

- HEC's analysis, development and documentation of a process to analyze flood risk measures through a systems approach while applying risk analysis methodologies through a cooperative effort with the Corps South Pacific Division and Sacramento District. This was the first application of risk analysis methodologies in the context of a system-wide application within the USACE as a proof of concept. This effort demonstrated that existing risk analysis tools can be applied in a systems context to reveal responses of one region of a system from perturbations to another region. The results of this effort are reported in HEC Project Report 71 entitled "*Documentation and Demonstration of a Process for Risk Analysis of Proposed Modifications to the Sacramento River Flood Control Project (SRFCP) Levees.*"
- Through cooperative efforts with the Mobile District, HEC's successful application of HEC-ResSim modeling efforts to modernize the reservoir modeling of the Alabama-Coosa-Tallapoosa (ACT) and Apalachicola-Chattahoochee-Flint (ACF) river systems. The features of HEC-ResSim to incorporate more powerful system modeling functions and ability to incorporate custom logic into water management decisions provided improved capability to reflect actual operating conditions and allow for greater flexibility for evaluating alternatives.
 - HEC continued to enhance many software products and introduce new products. Released in FY 2009 were: HEC-HMS, Hydrologic Modeling System, Version 3.4.
 - HEC-FDA, Flood Damage Reduction Analysis, Version 1.2.4.
 - HEC-SSP, Statistical Software Package, Version 1.1.
 - HEC-EFM, Ecosystem Functions Model, Version 2.0
 - HEC-RAS, River Analysis Systems Version 4.1.

FY 2009 also saw improvements to HEC-FIA, Flood Impact Analysis, with its loss-of-life capabilities and the new Watershed Analysis Tool, HEC-WAT (which includes HMS, RAS, SSP, ResSim, EFM, GeoHMS, GeoRAS and FIA software).

In FY 2009 the Flood Risk Management Planning Center of Expertise (FRM-PCX) recommended HEC-FDA Version 1.2.4 for certification for use in planning studies in accordance with the strict standards set forth in EC 1105-2-407.

Also, IWR Planning Suite Version 1.0.9.0 was certified to be in compliance with the requirements of the Planning Models Improvement Program.

The Global Grain forecasting model developed under the auspices of the NETS program was certified by the Corps and used for the Upper Mississippi River – Illinois Waterway Navigation and Ecosystem Program (NESP) study

IWR's specific accomplishments during FY 2009 are described in the following sections, organized in accord with the Institute's major focus areas.

FUTURE DIRECTIONS

The Institute's *Future Directions* activities include the identification of emerging water challenges and opportunities and the engagement of the Office of the Assistant Secretary of the Army (Civil Works) (OASA (CW)) and USACE senior leaders on these issues to stimulate "strategic thinking." Such critical thinking is seen as an essential prerequisite in the formation of organizational strategic direction and the implementation of associated new initiatives. IWR employs a variety of approaches to encourage strategic thinking, including the development of water resource outlook papers, academic research, and facilitated senior leader discussions. During FY2009, IWR embarked on a new initiative with the National Institutes for Water Resources (NIWR) and the US Geological Survey (USGS) to solicit proposals on scholarly research related to critical water policy issues. This engagement with the National Institutes for Water Resources will engage some of the brightest and most talented individuals working in the water resources area on current topics while establishing working relationships for emerging topics of the future. In a similar initiative, the Future Directions staff has taken a lead role in special topic support to the HQUSACE on strategic initiatives such as development of the USACE Civil Works Strategic Plan, and OASA(CW) interaction with other Federal agencies in support of Administration led initiatives such as climate change adaptation, greenhouse gas reduction, ecosystem markets development, and urban water renewal.

Strategic Planning: The release of the inaugural Civil Works Strategic Plan in FY 2004 represented the culmination of a multi-year effort aimed at establishing a new direction for the Civil Works Program based on the contemporary IWRM watershed planning approach. The Civil Works Strategic Plan presents a bold initiative for the Corps to manage our Nation's public water resources in collaboration with others through a watershed approach. The watershed approach recognizes that the physical, chemical, and biological processes that support the water resources are intertwined and must be managed in an integrated manner. The USACE advocates a holistic view to sustainable water resources solutions in partnership with other Federal agencies, Tribes, State and local governments, and non-governmental organizations.

The plan's five strategic goals were firmly grounded in the systems perspective of IWRM and are fully aligned with the principle of environmental sustainability. FY 2009 strategic activities focused on continued implementation of the current Civil Works Strategic Plan (for FY 2004-2009) and building the conceptual foundation for the FY 2010-2014 Strategic Plan – *Sustainable Solutions to America's Water Resources Needs*. These activities included conducting policy research, the preparation of multiple “white papers”, the assembly of background material, the identification of emerging issues and new challenges, and the conduct of strategic engagements with senior leaders via Castle Forums and Lunch Roundtables. Castle Forums are off-site events for senior leaders and external thought leaders where they can engage in out-of-the-box thinking and is intended to provide a venue for leaders to recognize (previously undetectable) weak signals for emerging issues and to anticipate potential implications. Lunch Roundtables bring together water experts from outside the Corps to meet with senior leaders to engage in discussions and offer perspectives on water resources issues familiar to senior leaders.

IWR contributed significantly to the drafting of the new *Civil Works Strategic Plan for 2010-2014*. The scenarios developed in FY 2006 and the results of a stakeholder outreach session held in FY 2007 were used to develop six robust cross-cutting strategies which formed the centerpiece of this draft plan. They are: 1) Systems approach; 2) Collaboration and partnering; 3) Risk informed decision making and communication; 4) Innovative financing; 5) Adaptive management; and 6) State-of-the-art technology.

At the same time, these cross-cutting strategies shaped the Civil Works strategic goals for the FY 2010-2014 draft plan, which represented a refinement of the goals within the previous plan. The draft goals were updated as follows: 1) Develop safe and resilient communities and infrastructure; 2) Promote sustainable water resources and healthy aquatic ecosystems; 3) Implement effective, reliable, and adaptive life-cycle project performance; and 4) Build and sustain a competent team.

The Institute's staff and OMBIL national data management systems continued to support the formulation of the yearly budget guidance, the five-year development plan and the evaluation of USACE Civil Works program business areas in conjunction with the Office of Management and Budget (OMB) Program Assessment Rating Tool (PART) through the application of meaningful, outcome-oriented program performance metrics. Significant progress in the refinement of the performance metrics was made in 2009, along with a commensurate improvement in performance evidenced across the Civil Works program, particularly in the inland navigation business line.

Hurricane Protection Decision Chronology: The Hurricane Protection Decision Chronology (HPDC) investigation of the Greater New Orleans hurricane protection system was initiated at the direction of HQUSACE as a complementary activity to the Interagency Performance Evaluation Task Force established following Hurricane Katrina in August 2005. The HPDC provides a chronological record of planning, economic, policy, legislative, institutional and financial decisions that influenced the design, scale, configuration and condition of the Greater New Orleans hurricane protection system. The final report and database of source documents are available on the IWR website

IPET/HPDC (Interagency Performance Evaluation Task Force/ Hurricane Protection Decision Chronology) Lessons Learned Implementation Team (formerly Actions for Change): The IPET/HPDC Lessons Learned Implementation Team was developed to address the lessons learned from the Hurricane Katrina and Rita events. The goals of the effort are to improve public safety and the Nation's water resources infrastructure by providing expert and professional services to the

Nation. The team was divided into four themes: (1) Comprehensive Systems Approach, (2) Risk Informed Decision Making, (3) Communication of Risk to the Public, and (4) Professional and Technical Expertise.

IWR is actively participating on the core teams for the first three themes. The objective of Theme 1, Comprehensive Systems Approach, is to review the dynamic processes that potentially impact USACE projects and to develop guidelines and recommend policy and program changes to address the changes and their impacts. IWR personnel are leading the Temporal and Spatial System Changes project delivery team (PDT), the Watershed Investment Decision Tool PDT, and the Multi-Objective System Planning and Policy PDT. IWR personnel are also members of the Sustainable Solutions PDT.

Theme 2 (Risk Informed Decision Making) includes tasks that collectively aim to infuse risk and reliability concepts into decision making through the lifecycle of Corps projects and related systems. The objective is to develop improved risk assessment and management processes to inform USACE, the public, and other stakeholders of infrastructure condition and critical needs for public safety. The Corps Chief Economist is leading the Theme 2 team and other IWR personnel are members of various Theme 2 PDTs.

Theme 3 (Communication of Risk to the Public) emphasizes the communication of flood risks to the public and public involvement in flood risk management decision making. Initiatives will focus on concepts of residual risk and the involvement of disadvantaged populations that are most likely to be impacted by floods. IWR is leading the Public Involvement sub-team, and is partnering with the National Flood Risk Management team to develop a framework for public involvement in flood risk management decision making.

Intergovernmental Panel on Climate Change: The Institute has been involved in climate change impacts analysis and research since 1978. In 1988, the World Meteorological Organization and the United Nations Environment Programme, recognizing the need for an objective, balanced, and internationally coordinated scientific assessment of the understanding of the effects of increasing concentrations of greenhouse gases on the earth's climate and on ways in which these changes may impact socio-economic patterns, established the Intergovernmental Panel on Climate Change (IPCC).

The Norwegian Nobel Committee awarded the Peace Prize to the Intergovernmental Panel on Climate Change. For his many contributions to the IPCC, Dr. Eugene Stakhiv, IWR, was honored by the Nobel Committee and shared in the Nobel Peace Prize in December, 2007.

Responses to Climate Change: During FY 2009 IWR accelerated its work on the development of a framework for addressing USACE adaptations to climate change. The objectives of the initiative are to develop consistent water management adaptation policies and approaches to address global change, including global warming along with other changes due to demographics, land use, evolving societal values, etc., throughout USACE Civil Works and in partnership with other Federal water resources agencies. The project will provide recommendations for policy and guidance to prepare for, and respond to, climate change and variability.

In February 2009, an interagency group composed of representatives from USACE, the U.S. Geological Survey (USGS), the U.S. Bureau of Reclamation, and the National Oceanic and Atmospheric Administration (NOAA) released a joint report, *Climate Change and Water Resources Management: A Federal Perspective* as USGS Circular 1331. The report presents the best available

science to help water managers prepare for and adapt to the effects of climate change on the nation's water resources.

In late August 2009, IWR began supporting an interagency effort led by the White House Council on Environmental Quality (CEQ) to develop federal recommendations for adapting to climate change impacts both domestically and internationally. The goals of the effort are to make recommendations toward a national adaptation strategy that utilizes a set of best practices, to integrate climate change resilience and adaptive capacity into federal government operations and coordinate interagency preparations, and to develop informed communities that understand their vulnerability to climate impacts. IWR provided representatives on working groups on Adaptation Science Inputs for Policy, Agency Climate Change Adaptation Process, Water, and International Resilience Efforts.

The IWR Responses to Climate Change effort worked closely with the "IPET/HPDC Lessons Learned Implementation Team" (formerly known as Actions for Change). An Engineer Circular on Incorporating Sea-Level Change Considerations in Civil Works Programs (EC 116502-211) was released in July 2009. The Circular was written with NOAA's National Ocean Service and USGS. The Engineer Circular (EC) provides guidance for the incorporation of future sea-level change in management, planning, engineering and maintenance of USACE projects. Another team has been formed to develop more detailed guidance on Procedures to Evaluate Sea Level Change Impacts, Responses, and Adaptation.

IWR successfully proposed a project for the American Recovery and Reinvestment Act (ARRA) to provide a comprehensive library of downscaled simulations of historical and future climate to supplement those developed for the World Climate Research Program (WRCP) 5th Coupled Model Intercomparison Project (CMIP5) and housed at the Program for Climate Model Diagnosis and Intercomparison (PCDMI) at the Lawrence Livermore National Laboratory (LLNL).

A team of water managers and hydraulic engineers was formed to consider climate change impacts to USACE water management. They wrote a strategic plan for how USACE water managers should deal with climate change. IWR organized a full-day workshop on climate change and water management for the USACE Infrastructure Conference to inform water managers on the direction of the USACE climate change program. The Climate Change and Water Working Group (C-CAWWG) agencies (Reclamation, USGS, NOAA, and USACE) participated in the workshop. C-CAWWG is a federal interagency workgroup providing scientific collaborations in support of water management as climate changes. C-CAWWG decided to expand from a focus on the western states to a national focus.

In FY 2009, IWR also began addressing climate change mitigation. We started some pilot-scale projects to develop top-down and bottom-up inventories of greenhouse gases (GHG) several months before the release of Executive Order 13514 on Federal Leadership in Environmental, Energy, and Economic Performance. We began a method to data mine CEFMS and other USACE databases, which combined with travel-distance information, can provide GHG estimates of TDY travel (considered an indirect emission). We also supported a multi-criteria GHG wedge analysis based on the top-down and bottom-up estimates for use in prioritizing emission reductions.

USACE Chief Economist: Dr. David Moser of IWR is the USACE Chief Economist and leader of the Economics Community of Practice (CoP). During FY 2009, the Chief Economist continued to provide support to the IPET Risk and Reliability team.

The Chief Economist's leadership engaged to build and advance the economic analysis capability across the USACE, holding two national meetings and regular teleconferences with senior economists. A subject matter expert (SME) database of all Corps economists was reviewed and updated by senior economists to maintain a directory identifying economists by experience and expertise for each economic activity conducted by the USACE. This SME database is used by MSC economists, planning centers of expertise and others to identify resources for feasibility studies, independent technical reviews, and special purpose teams.

As a complementary activity to building capacity, IWR focused on enhancing technical guidelines and economic manuals available to field practitioners. In FY 2009 work proceeded on the update of water resources planning National Economic Development (NED) Manuals.

In FY 2009, the Chief Economist also continued as the National Team Lead for *Theme 2 - Risk Informed Decision Making*, (formerly part of *Actions for Change*), which transitioned to the Civil Works Campaign Plan Goal 2a. As part of that effort, the Chief Economist led development of approaches and frameworks to articulate the value of risk analysis, with emphasis on risk management, to Civil Works decision making. He served on the team developing and implementing tolerable risk as part of the transitioning of dam safety to a risk analysis approach. He was also involved in issues relating to National Economic Development evaluation of navigation and other economic evaluation issues. Additionally, he developed the initial USACE estimates of job creation from Civil Works ARRA spending and led development of improved modeling to estimate regional economic impacts of Corps spending and project operation.

National Shoreline Management Program: The National Shoreline Management Program, authorized by the Water Resources Development Act of 1999 (Public Law 106-53, Section 215(c)), remains a collaborative, inter-agency effort that is adapting to the recent surge in coastal and ocean initiatives. The program is intended to describe the extent and causes of erosion and accretion along the shores of the U.S., the economic and environmental effects caused by erosion and accretion, and the systematic movement of sand along the shores. The program focuses on the resources committed by Federal, state and local governments to restore and nourish shores, recommend appropriate levels of Federal and non-Federal participation in shore protection and serves to advance the use of systems approaches to sand management.

In FY 2009 the study team developed a new plan for achieving the goals of the study authority in a more limited effort, more in line with the lower level of funding that the study has received. Plans for this more focused effort were modified and approved by Corps leadership and the Coastal Engineering Research Board.

Policy Development: The Water Resources Development Act of 2007 (Public Law 110-114, Section 2031) restated national policy objectives for water resources projects and directed the Secretary of the Army to revise the 1983 Principles and Guidelines that state how these objectives should be accomplished. The Assistant Secretary of the Army (Civil Works) (ASA (CW)) responded on behalf of the Secretary. IWR staff composed the bulk of the subject matter experts serving on the Corps internal Principles and Guidelines review team, and assisted the Office of the Assistant Secretary in drafting a proposed revision. The Council on Environmental Quality (CEQ) assumed leadership of the activity and published a draft revision of the Principles and Guidelines in the Federal Register on July 1, 2009. IWR staff summarized hundreds of public comments. This summary served as a basis for CEQ's efforts on behalf of the Administration to begin preparing a

revised draft. IWR staff supported HQ and ASA (CW) in analyzing and responding to various CEQ proposals.

COLLABORATION AND PARTNERING

The USACE recognizes that the Civil Works mission must be carried out in collaboration with multiple partners and stakeholders with differing authorities, capabilities and perspectives. Thus a major IWR focus has long been as the intellectual nexus for USACE expertise on collaboration, partnering and public participation. In FY 2009 the Corps took several important steps towards official recognition of that role with funding for a Center for Conflict Resolution and Public Participation, along with formal designation of the center in 2009. As an important part of this role, IWR serves as the USACE lead for multiple national collaborative partnerships and is committed to developing new training instruments, technologies, processes and policies to further USACE's overall capability in collaborative planning and partnering.

In FY 2009 IWR shepherded a review of current practices in environmental conflict resolution and continued the National Cooperative Modeling and Collaborative Planning Demonstration programs with multiple Federal, state, university and non-governmental partners. Of particular note, IWR led the development of an interagency federal initiative on the intersection of computer tools and multi-stakeholder collaborative water resources management processes.

IWR represented USACE and the Office of the Secretary of Defense (OSD) through participation in the National Science and Technology Council's interagency Subcommittee on Water Availability and Quality (SWAQ) and its Subcommittee on Disaster Reduction. IWR is leading development of the resultant interagency Federal initiative on Collaborative Tools and Processes for U.S. water solutions.

IWR also developed a handbook on collaborative planning in support of HQUSACE, led execution of Corps-wide Memoranda of Agreement (MOA's) and Memorandum of Understanding (MOU's) and engaged the academic community through the Maass-White Visiting Scholars program, the Universities Council on Water Resources (UCOWR) Fellowship Visiting Scholars program, the National Research Council (NRC) Research Associates program, the American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellows program, and the Leo R. Beard Visiting Scholars program (resident at HEC).

National Partnerships: Forming strategic alliances, both through formal agreements and informal working relationships, is becoming a way of doing business in the USACE, government agencies and non-governmental organizations (NGO's). Driving this movement are the complexity and far-reaching impacts of today's water resource problems, juxtaposed with the limited financial and intellectual resources of any single organization. The USACE is increasingly committed to partnerships as a means of accomplishing common goals. In FY 2009 IWR entered into or laid the groundwork for establishing new MOU's with various federal and non-federal partners.

Natural Resources Conservation Service Partnership: In FY 2009 work continued in support of an existing partnership agreement with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS). The partnership agreement was initially signed between the Corps and the NRCS on July 7, 2005. The purpose of the agreement is to promote a long-term working relationship and collaborative effort to improve the management of water and related natural resources under the missions and authorities of the NRCS and USACE. Collaboration continues to

focus on three areas: (1) watershed planning and implementation; (2) wetlands creation, restoration and enhancement and (3) natural disaster recovery. The agencies also agreed to coordinate other programs and activities, including the Wetland Conservation Compliance (the *Swampbuster* provision of the Farm Bill) and the Regulatory Program (Section 404 of the Clean Water Act).

FY 2009 accomplishments included continued implementation of the action plan that was developed in 2007 and updated in 2008. In January 2009 senior leaders from both agencies attended a Partnership Coordination Meeting to review progress and concur with the 2008 Action Plan. Additionally, NRCS and USACE liaisons made a joint presentation at the 3rd National Conference on Ecosystem Restoration held in Los Angeles, California in July 2009.

An interagency agreement was renewed for IWR's Hydrologic Engineering Center (HEC) to work with NRCS agronomists to include agricultural damages in the Flood Damage Assessment model (HEC-FDA), and to reestablish technical support for NRCS employees using HEC's RAS model. NRCS has also continued to participate in the Interagency Levee Task Force and Missouri River basin activities led by USACE.

U.S. Institute for Environmental Conflict Resolution (USIECR): In FY 2009 work continued on implementing the MOU which the Institute entered into with the USIECR in 2008. The USIECR was established through the Environmental Policy and Conflict Resolution Act of 1998 (Public Law 105-156), as an independent federal entity with the mission to impartially assist in the resolution of federal environmental, natural resources and public land conflicts and controversies through facilitated negotiation, mediation, and collaborative problem-solving. IWR and USIECR have a common interest in the areas of IWRM, water security, and environmentally sustainable development. The MOU focuses on areas encompassing the advancement of techniques for and the facilitation of interagency and intergovernmental negotiations and collaborative planning efforts; process design and related technical and/or advisory assistance on collaborative USACE projects; technical assistance on a broad range of environmental conflict resolution and computer assisted dispute resolution techniques, such as shared vision planning (SVP); and advancing of Federal agency capacity in alternative dispute resolution (ADR) through training and technology transfer.

U.S. Geological Survey Partnership: Significant activities for the U.S. Geological Survey MOA included senior level meetings addressing national stream-gage issues; climate change and related water management issues; the sharing of water data; coastal, geotechnical and biological research; and regional and international water studies, such as on the Great Lakes. A USACE-USGS climate change initiative expanded into a multilateral effort involving technical and scientific staff from four federal agencies, including the two primary Federal water development agencies – USACE and the Bureau of Reclamation, and the two principal water science agencies – the USGS, and NOAA. This interagency group released a joint report in February 2009, *Climate Change and Water Resources Management: A Federal Perspective* as USGS Circular 1331. The report presents the best available science to help water managers prepare for and adapt to the effects of climate change on the nation's water resources.

USACE also partners with USGS on international water resources, as both agencies are core members of the U.S. National Committee for UNESCO's International Hydrological Programme (IHP). The IWR Director is the designated USACE representative on the U.S. National IHP Committee.

U.S. Bureau of Reclamation Partnership: USACE is working closely with Reclamation on the Climate Change and Water Working Group (C-CAWWG), which also includes representation from USGS and NOAA scientists as core members. The group's objectives are (1) to define the most critical gaps in our capability to forecast and adapt to climate change; (2) to conduct collaborative research to address those gaps; and (3) to develop mechanisms to provide training for infusing climate change science into water planning and technical studies. In FY 2009, C-CAWWG decided to expand from a focus on the western states to a national focus.

Oak Ridge National Laboratories Partnership: During FY 2009 IWR continued to implement the MOU executed with the U.S. Department of Energy's Oak Ridge National Laboratories and ERDC in 2005 that centers on energy, security and environmental sustainability. Thrusts of the agreement include joint work on regional energy and water management, transportation modeling, emergency response, homeland security and environmental sustainability.

Sandia National Laboratory: In FY 2009 the Institute signed a Memorandum of Understanding (MoU) with the Sandia National Laboratories. (The MoU was signed on December 18, 2008.) This MoU builds upon the common interests the Institute and the Sandia National Laboratories share in the field of integrated water resources management and computer aided dispute resolution. The Institute and the Sandia National laboratory will initially focus on pursuing opportunities in the application of Computer Aided Dispute Resolution in the field of integrated water resources management and sustainable development in arid and semi-arid areas, infrastructure development and related engineering design standards and procedures, capacity building and training. IWR has in the past worked closely with Sandia National Laboratories through the National Cooperative Modeling Demonstration Program.

National Flood Risk Management Program: In May 2006, in an IWR-led effort, the USACE established the *National Flood Risk Management Program* for the purpose of integrating and synchronizing USACE flood risk management programs and activities both internally and with counterpart activities of FEMA and other Federal, state, regional and local agencies. Its vision is to lead collaborative, comprehensive and sustainable national flood risk management by:

- Improving capabilities to collaboratively deliver and sustain flood risk management and mitigation services to the nation,
- Improving public awareness and understanding of flood related hazards and risks, and
- Coordinating flood damage and flood risk reduction programs across Federal agencies and with local, state agencies and other non-Federal entities.

Some of the program's FY 2009 accomplishments include:

- Establishment of a coordination framework in the field. Prior to 2009, the main USACE efforts to coordinate its own planning, emergency management, levee safety and regulatory programs took place at the national scale. In 2009, the NFRMP expanded these coordination successes to the field by releasing guidance establishing flood risk manager positions at the MSC and district level. Regional workshops were held around the nation during August 2009 to solicit input from USACE field offices and other stakeholders on the goals, scope and specifics of flood risk management coordination efforts at USACE MSC and district offices. Final guidance was released October 5, 2009.

- Improved coordination between FEMA and USACE programs through quarterly meetings of an *Intergovernmental Flood Risk Management Committee* (IFRMC), which provides a venue for FEMA and USACE leadership to coordinate programs and policies, and thus improve program implementation for the flood risk management community.
- Improved coordination and pursuing collaborative opportunities with other Federal agency partners through a *Flood Risk Management Task Force*. The Task Force is responsible for updating and maintaining a Unified National Program for Floodplain Management; coordinating agency policies for flood risk management; identifying and recommending actions of the federal government necessary to reduce losses due to flooding and protect the safety of flood plain residents.
- Expanded coordination between USACE headquarters and FEMA headquarters to ensure that current and future policies for flood risk mapping, certification and other flood risk related policies are fully coordinated and compatible with each agency's programs.
- Completed the work of the *Regional Interagency Levee Task Force* (ILTF) in response to the catastrophic floods in the upper Midwest in 2008. The ILTF enabled a joint Federal-state partnership to address expedited repair of damaged levee systems in the upper Midwest and identify nonstructural mitigation measures that could be implemented during recovery to reduce future flood risks. The ILTF included regional representatives from the USACE, FEMA, Environmental Protection Agency, Economic Development Administration, U.S. Fish and Wildlife Service, NRCS, USGS, U.S. Small Business Administration, Department of Housing and Urban Development, and representatives from the States of Iowa, Illinois, Wisconsin, Missouri and Indiana.
- Policy work, through the "Wise Use of Flood Plains" study, to identify any procedural or legislative changes that may be warranted to allow the Corps of Engineers to be more effective in working with other Federal agencies, states and local governments and stakeholders in the management of flood risk. The study is addressing both the question of how to evaluate the performance of programs and policies in addressing flood risk and how to approach the task of evaluating flood risk at a national scale.

FEMA Silver Jackets Program: The *Silver Jackets Program* is a key mechanism for achieving the interagency coordination necessary to fulfill the goals of the National Flood Risk Management Program.

Through the *Silver Jackets Program*, managed by IWR, the USACE cooperates with FEMA and other Federal, State and sometimes local agencies to ensure continuous interagency collaboration at the state level, leveraging available resources and information between agencies.

The program has created a mechanism to collaboratively solve issues and implement or recommend those solutions, while increasing and improving flood risk communication and outreach. Silver Jackets teams facilitate strategic, life-cycle planning to reduce flood risk and provide assistance in implementing state-identified high-priority actions.

At the end of FY 2009 there were six active state teams (Ohio, Indiana, Idaho, Iowa, Illinois, and Missouri) with an additional ten state teams (Minnesota, Wisconsin, North Dakota, Texas, Kansas, New Mexico, Arizona, Pennsylvania, Mississippi, and Georgia) in various stages of development.

Discussions are continuing with an additional 28 states to develop teams. As these teams develop and mature, their ability to plan for and manage their flood risk and respond to events will increase, ultimately leading to reduced flood risk and damages suffered.

FY 2009 accomplishments include the following:

Ohio: The first pilot Silver Jackets team was established in Ohio in 2005. The Ohio Silver Jackets have excelled in optimizing the use of data and resources of many state and Federal agencies. Coordination through the Ohio Silver Jackets team enabled the community of Marietta to acquire detailed mapping of its community originally developed in association with an ongoing regional watershed study. The team was able to utilize the USACE Planning Assistance to States (PAS) program to provide the initial resources to develop the city's first Flood Hazard Mitigation Plan (FHMP) which enabled the city to gain eligibility for FEMA flood mitigation funds. The FHMP includes both short and long term structural and non-structural mitigation strategies. Implementation of the FHMP was achieved with a Community Development Block Grant from the Department of Housing and Urban Development to install duckbill back flow prevention valves. Through coordination with local, regional and partner Silver Jackets agencies, the team was able to leverage USACE Section 205 funds to implement a flood warning system. Through Silver Jackets, the Corps funded project will utilize USGS stream gages downstream and Ohio Emergency Management Agency rain gauges upstream.

State and Federal funding and expertise are maximized by partnering through Silver Jackets to complete HAZUS runs for 47 counties as part of the State Hazard Mitigation Plan update.

Silver Jackets team members jointly participated in community meetings to communicate and address the risk and assess impacts as a result of levee decertification.

The Silver Jackets team is developing a web-based portal to provide a state-wide tool to facilitate open communication of data among local, state and Federal agencies.

The Ohio Federal Executive Association honored the Silver Jackets team with its award for "Cooperative Interagency Recognition".

Indiana: The second pilot Silver Jackets team was established in Indiana in 2006. Coordination by the Indiana Silver Jackets team has resulted in the following collaborative products and tools to assist the State in identifying flood inundation impacts and supporting flood preparedness planning at the community level.

Joint development of flood inundation model using National Weather Service flood predictions, USGS gage data, USACE depth damage curves, and HAZUS data that can create real time model views of flood inundation areas and depths of flooding. This model is being used by the Indiana Department of Natural Resources to manage and mitigation flood impacted areas and emergency response planning for NWS flood forecasts.

The Silver Jackets team is collaborating to develop a fluvial erosion hazards program to address areas in the state where ongoing erosion is damaging improved infrastructure, facilities, and homes.

The Silver Jackets team facilitated and contributed to the update of the Indiana state Hazard Mitigation Plan, completed in 2008. Hazard mitigation plans are required by all states to be eligible for federal flood and other hazard mitigation programs.

Idaho: The Idaho Silver Jackets team was established in July 2009. The initial Idaho Silver Jackets team activity was to host a listening session to better coordinate the many local, state, Federal agencies and non-governmental organizations contributing to flood risk reduction efforts in the state, and to provide an opportunity for public participation in the development of an update of the state's Hazard Mitigation Plan.

Silver Jacket team members serve on the State Hazard Mitigation Plan Revision Executive Committee. They also service on the panel to rate Pre-Disaster Mitigation grant applications.

Iowa: The Iowa Silver Jackets team began as the Iowa Inter-agency Levee Working Group associated with the Inter-agency Levee Task Force which was created in response to floods which occurred in June 2008. The team transitioned to a Silver Jackets team in July 2009. Iowa Silver Jackets meet on a monthly basis and continue to attend and support the Regional Flood Risk Management Team, which meets quarterly. The Iowa Silver Jackets team also provides support for the Iowa Water Resources Coordinating Council and Iowa Department of Natural Resources Floodplain Mapping project. The team continues to accomplish important site-specific flood recovery coordination assistance. The team is actively pursuing State-wide as well as local opportunities to communicate flood risk and promote wise floodplain use.

Illinois: The Illinois Silver Jackets team began as the Illinois Inter-agency Levee Working Group associated with the Inter-agency Levee Task Force which was created in response to floods which occurred in June 2008. The team transitioned to a Silver Jackets team in July 2009, incorporating the existing state hazard mitigation team as a subcommittee and establishing three additional subcommittees to address structural solutions, emergency preparedness and response, and policy analysis. Current priority activities include:

- Flood Preparedness and Mitigation
- Data Sharing and Tool Development
- Flood Risk Assessment and Communication
- Policy Discussion and recommendations,
- Structural and Non-Structural Solutions.

Missouri: The Missouri Silver Jackets team also began as the Missouri Interagency Levee Working Group associated with the Interagency Levee Task Force, and transitioned to Silver Jackets in 2009. The team continues to support and attend the Regional Flood Risk Management Team meetings on a quarterly basis. The team's current priorities include:

- Hazard Mitigation Plan and associated actions
- Coordinate ongoing flood recovery mitigation efforts;
- Coordinate sharing of Flood Risk Management Team partner data and databases;
- Coordinate multi-agency levee programs and inspection/mapping initiatives (e.g., The National Levee Safety Program, Levee Certification for the National Flood Insurance Program, and FEMA Risk Mapping, Assessment, and Planning (RISK MAP);
- Develop flood risk tools jointly used by partner agencies (e.g., Interactive Flood Risk Mapping and Flood Warning System);

- Jointly coordinate multi-agency congressional/public meetings as needed.

At the end of FY 2009 ten other states (Minnesota, Wisconsin, North Dakota, Texas, Kansas, New Mexico, Arizona, Pennsylvania, Mississippi and Georgia) were in various phases of establishing Silver Jackets teams.

Ocean Action Plan and Ocean Policy Task Force: A June 12, 2009 memorandum from the President to executive departments and federal agencies established an Interagency Ocean Policy Task Force to develop a national ocean policy and a recommended framework for improved stewardship and effective coastal and marine spatial planning. During FY 2009, IWR staff coordinated USACE participation in the workgroups supporting the Task Force, in support of the ASA(CW). The Task Force report will recommend a national ocean policy and revisions to the current ocean governance structure, to include establishment of a departmental level National Ocean Council, priority objectives, and ideas for implementation. The Ocean Policy Task Force will also produce a Framework for Coastal and Marine Spatial Planning. Interim products published for public comment, and the final products are to be sent to the President in March 2010.

Other activities undertaken by IWR during FY 2009 included continued coordination of USACE participation in Ocean Action Plan initiatives, including the Subcommittee on Management of Ocean Resources (SIMOR), and the Council on Environmental Quality, National Science and Technology Council's Joint Subcommittee on Ocean Science and Technology (JSOST). IWR participants engaged other USACE staff depending upon the issues raised to the subcommittees. Among these efforts were facilitating Corps HQUSACE and field office awareness of regional ocean governance initiatives – including the newly formed Mid-Atlantic Regional Council on the Ocean, and co-leading USACE support to the Gulf of Mexico Alliance with ERDC. The Corps is one of thirteen Federal agencies supporting the Governors' Action Plan for Healthy and Resilient Coasts. This Action Plan includes a Gulf Region Sediment Management Master Plan as a product.

National Ocean Service Partnership: The USACE and the National Oceanic and Atmospheric Administration's National Ocean Service (NOS) formed a collaborative partnership as an outgrowth of Ocean Action Plan initiatives, calendar year 2005 post-storm experiences, and recognition of mutually beneficial advances and synergies that could be affected through collaboration. The partnership is leveraging each agency's programs and talents through joint centers for coastal mapping, instrument testing, evaluation and training; improving data sharing capabilities; coordinating vertical datum systems and improving tidal measurement and information; and improving natural hazard risk communication that incorporates consideration of community resilience. In 2009, the partnership focused on the Integrated Ocean Observing System (IOOS) and data management frameworks.

Interagency Committee on the Marine Transportation System: The Corps continues coordinating with the Maritime Administration (MARAD), National Oceanic and Atmospheric Administration (NOAA), the Coast Guard and other Federal departments and agencies to support the *Committee on the Marine Transportation System (CMTS)*, which was initiated in July 2005. The Corps' Chief of Engineers was selected as the initial chair of the Coordinating Board for the CMTS and the Assistant Secretary of the Army (Civil Works) was designated as the Department of Defense principal to the CMTS. The Coordinating Board chair rotated to the Administrator of NOAA in 2007, to the Maritime Administrator in 2008, and the Commandant of the Coast Guard in 2009. It rotates back to the Corps in 2010. IWR provides logistics support and participates on Integrated Action Teams, including leading the team to develop an Assessment of the Marine Transportation

System. A contract was awarded to the Department of Transportation's Volpe Center in 2007 to assist with the assessment and work continued throughout 2008 and 2009. This effort will include a main report and six supporting volumes on challenges facing the MTS. It is scheduled to be completed in 2010.

Regional Sediment Management: The USACE has adopted the Regional Sediment Management (RSM) approach in carrying out its programs involving or affecting sediment. Sediment management spans the USACE Navigation, Flood and Coastal Storm Damage Reduction, and Ecosystem Restoration missions and responsibilities. The RSM approach implements the watershed perspective and the principles of integrated water resources management. The USACE applies this perspective and approach as a major stakeholder in many of the Nation's inland and coastal watersheds.

In 2009, IWR staff continued work on integration of the RSM approach through a range of opportunities that spanned assistance to USACE Headquarters and the field, and in working in multi-agency and stakeholder forums. Included among these efforts was assisting field practitioners with RSM policy and application issues, and sharing experience and knowledge to help build capacity for RSM implementation.

IWR staff organized and led an RSM Policy and Implementation Workshop with field staff, USACE Headquarters Civil Works leadership, Engineer Research and Development Center (ERDC) staff, and state agency participants. Workshop discussions identified priorities for advancing implementation of RSM approaches.

IWR staff also continued to support development of the Gulf Region Sediment Management Master Plan in support of the Gulf of Mexico Alliance. Work was initiated to develop a framework for identifying RSM benefits and preliminary information was developed through collaborative efforts with district practitioners.

IWR staff is supporting ERDC and the Philadelphia District as part of the Delaware Estuary RSM Plan project. Covering an area that is home to 6.4 million people, the Delaware Estuary is the second largest estuary in the United States. With the participation of more than 220 resource agencies and environmental organizations, the development of the RSM Plan uses a system-based approach and incorporates the various competing demands for sediment resources, such as wetlands protection, coastal development, fisheries management, and port management.

Coastal Engineering Research Board: The Coastal Engineering Research Board (CERB) provides broad policy guidance and review of plans and requirements for the conduct of research and development in support of coastal engineering and the objectives of the Chief of Engineers. In 2009 IWR supported the Director of Civil Works in organizing the March 2009 meeting of the Executive Session of the Board in Annapolis, Maryland, whose purpose was to develop recommendations to the Chief of Engineers concerning the conduct of research and development projects in the field of coastal engineering, and the June 2009 meeting of the Board in San Diego, California, whose purpose was to examine the data needs required to enable systems-scale decision making for coastal projects and management.

Environmental Advisory Board: IWR has led the USACE technical team supporting the Chief of Engineers Environmental Advisory Board (EAB) since FY 2004. In FY 2009, the EAB continued to explore field level outreach and internal implementation of the Corps *Environmental Operating Principles* (EOP). The Board held one public meeting in FY 2009 — 15 January 2009 in San Francisco, California — which provided the Board the opportunity to meet with Corps San Francisco

District staff to discuss how the district has implemented the EOP's. The Board also met with local area environmental non-governmental organizations to discuss their views as to how the District has implemented the EOP's.

Inland Waterways Users Board: IWR continued its technical and administrative support of the Inland Waterways Users Board (IWUB) in FY 2009, including the analysis of and reporting on the financial status and capability of the Inland Waterway Trust Fund, assistance with drafting of the IWUB Annual Report to Congress, evaluation of candidates nominated for Board membership and the administration of three IWUB meetings including No. 59 on November 18, 2008 in Chicago, IL, No. 60 on February 20, 2009 in Vicksburg, MS, and No. 61 on August 11, 2009 in Paducah, KY.

Collaborative Planning: IWR has a long history both of applying collaborative modeling tools through its signature *Shared Vision Planning (SVP)* process, and in developing tools and providing technical assistance in conflict resolution and public participation. During FY 2009, IWR continued to focus on developing new conceptual and methodological foundations, building awareness of collaborative planning tools, and assisting Corps offices and states in improving public participation in water resources planning and decision making.

FY 2009 activities included the official designation of the Institute's *Center of Expertise in Conflict Resolution and Public Participation* as USACE Directory of Expertise. The Center's activities include providing support to USACE headquarters, providing training and outreach programs to district and division offices, and a direct technical assistance program. In FY 2009, the Center's staff developed a strategic plan for the Center to assist the Corps anticipate, prevent, and manage water conflicts, ensuring that the interests of the public are addressed within the context of the Corps decision making process. The Center achieves this mission by developing and expanding the application of collaborative tools to improve water resources decision making.

FY 2009 accomplishments included the following:

- Preparing the 3rd *Annual Report on Environmental Conflict Resolution* (dated 10 December 2008) for the Council on Environmental Quality, on the behalf of the Office of the Assistant Secretary of the Army for Civil Works;
- Developing an assessment of the capacity of the Corps to conduct decision making within a collaborative context. An internal review is developing recommendations to improve the ability of the Corps to collaborate with external stakeholders. The assessment is examining and recommending changes in the areas of institutional procedures, political leadership, authority and empowerment, individual skill sets, time and resources, and organizational culture;
- In association with the Sandia National Laboratory, the U.S. Institute for Environmental Conflict Resolution, and the U.S. Environmental Protection Agency, the Center is planning the second multi-agency workshop on Computer Aided Dispute Resolution, to be held in October 2009 in Denver, Colorado;
- While serving as Chairman of the Committee on Best Practices for Collaborative Modeling at the American Society of Civil Engineers Environmental and Water Resources Institute, led the development of a draft of a document on the subject of best practices in the application of collaborative modeling;
- Served on the organizing committee of the first inter-agency workshop on the Application of Technology in Environmental Conflict Resolution, held in Phoenix, Arizona in May 2009;

- Provided technical assistance to the State of California Department of Water Resources in the development of the State Water Plan;
- Provided technical assistance to a pilot study of the application of the shared vision planning process to the Corps Section 404 (of the Clean Water Act) Regulatory Permit Program to assess whether a shared vision planning approach could be used to improve stream flow management under alternative scenarios;
- Provided technical assistance to the Corps *Actions for Change* initiative to promote and encourage public involvement in identifying and selecting appropriate flood risk management plans. This activity is coordinated with the Corps National Flood Risk Management Program;
- Provided technical assistance in promoting the use of collaboration in an international context through partnership with the International Center for Integrated Water Resources Management (ICIWaRM) through various engagements including participation at the *5th World Water Forum*, held in Istanbul, Turkey in March 2009, holding a workshop on integrated participatory water resources planning tools in Lima, Peru in August 2009, in association with the development of a new national water law; and providing technical support to the International Joint Commission in support of the Upper Great Lakes Study.

The Nature Conservancy Sustainable Rivers Project: Begun in July 2002, the Sustainable Rivers Project is a nationwide partnership between the USACE and The Nature Conservancy (TNC) to restore the health and life of rivers across the United States. This nationwide effort to modify operations of Corps dams to improve ecosystems, while maintaining or enhancing project benefits, currently involves work on eight rivers systems - the Willamette in Oregon, the Bill Williams in Arizona, the Green in Kentucky, the Savannah in Georgia and South Carolina, the Roanoke in North Carolina and Virginia, the White, Black, and Little Red in Arkansas and Missouri, the Connecticut in New Hampshire, Vermont, Massachusetts and Connecticut, and Big Cypress Creek in Texas and Louisiana. Sustainable Rivers is working towards its goals through a combination of partnered activities, including demonstration projects, training, software development, and staff exchanges via the Intergovernmental Personnel Act. Successes already achieved are attracting interest from other river management interests both within the United States and internationally, where methods used in Sustainable Rivers are now being applied in Asia, Africa, and South America. In 2008, the USACE received The Nature Conservancy's Outstanding Partner Award in recognition of the broad and successful partnership between the two organizations. IWR Senior Hydraulic Engineer, Mr. John Hickey, is the Corps Technical Liaison with TNC on the SRP program. In that capacity he continues to foster the program by working with representatives from the Corps and TNC on technical and modeling issues.

The Nature Conservancy is interested in expanding the Sustainable Rivers Project. The Nature Conservancy has identified 600 sites that are downstream of a hydropower dam, and believes that with sufficient funding, the Sustainable Rivers Project could be greatly expanded. This would involve Nature Conservancy staff, IWR staff, and personnel from various District offices working in a broad collaborative effort.

Academic and Professional Practice Partnerships

Universities

In FY 2009 the Institute continued its efforts to expand its partnership with academic institutions and professional practice organizations. It is expected that these efforts will lead to signed Memoranda

of Understanding (MoU) with two new partners, Florida International University and the National Institute for Water Resources, in early Fiscal Year 2010.

Florida International University (FIU) is the lead organization of the Global Water for Sustainability (GLOWS) program, a consortium of U.S. and international organizations with extensive experience and expertise in integrated water resources management, financed by the United States Agency for International Development (USAID). FIU is also the home of the NASA sponsored WaterSCAPES University Research Center. WaterSCAPES (Science of Coupled Aquatic Processes in Ecosystems from Space) focuses on an integrated set of research and education activities centered on the interaction between the hydrologic cycle and vegetation dynamics at the scale of ecosystems, analyzing the spatial and temporal changes on this interaction and determining the influence of these changes on water cycling, vegetation structure, biomass dynamics and biodiversity. Collaboration between the Institute and FIU will focus on pursuing opportunities in the field of integrated water resources management, scientific research and capacity building for developing countries and countries in transition.

The National Institutes for Water Resources (NIWR) is a 501(c)4 organization that represents the 54 state and territorial Water Research Institutes and Centers in their collective activities to (1) advance competent research that addresses water problems or expands the understanding of water and water-related phenomena; (2) aids the entry of new research scientists into the water resources field; (3) helps train future water scientists and engineers; (4) infuses the results of sponsored research to water managers and the public; and (5) focuses on applied research, including practical applications to improve water supply reliability and helps resolve water issues, working under the general guidance of the Secretary of the Interior, through the U.S. Geological Survey (USGS). NIWR networks these various Institutes into a coordinated unit, and facilitates, as appropriate, the response of the Water Research Institutes and its membership to other mutual concerns and interests in water. The Institute and the NIWR will use their best efforts to establish a long-term cooperation and partnership in the development and practice of integrated water resources management through scientific research and joint activities or programs that support National, regional, and local water resources needs.

The Institute has previously entered into Memoranda of Understanding with the following educational institutions. Each of the institutions has unique program features that compliment the strengths and talent of the Institute.

Colorado State University, Civil and Environmental Engineering Department/International School for Water Resources (MoU signed January 7, 2008). This partnership with Colorado State University will facilitate cooperation in research in a number of areas including integrated water resources management, scientific research in the adaptation to global climate change and its impacts on water resources, and methods for understanding and managing extreme hydrological events and related natural hazards and disaster preparedness.

The University of Arizona (MoU signed September 7, 2007) is home to the National Science Foundation's Science and Technology Center for Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHARA), thus allowing the Institute and the University to focus on sustainable development and sound water management policies, particularly in arid and semi-arid climates.

The University of New Hampshire (MoU signed September 14, 2007) Institute for the Study of Earth, Oceans, and Space, Water Systems Analysis Group, focuses on the understanding of water resources issues on a global scale and the application of technological improvements in water

resource management, allowing for cooperation in the field of global water science, integrated water resources management, and interdisciplinary scientific research and capacity building, particularly in developing and emerging countries and post-disaster nations and regions.

The Oregon State University (MoU signed September 20, 2007) Institute for Water and Watersheds, focuses on integrated water resource management, sustainable development, ecological design, ecosystem restoration, and environmental conflict resolution, allowing for cooperation in numerous areas including infrastructure development, adaptive management and adaptation to global climate change, flood risk management, hydrologic analysis, risk analysis and systems modeling, environmental restoration, ecological design, consensus building, conflict resolution, alternative dispute resolution, and shared vision planning.

Professional Practice Organizations

In FY 2009 the Institute continued to explore cooperative opportunities with its various Professional Practice Organizations with whom it has entered into Memoranda of Understanding, including the Environmental and Water Resources Institute (EWRI) of the American Society of Civil Engineers (ASCE) (MoU signed August 4, 2007), the American Water Resources Association (AWRA) (MoU signed December 20, 2007), and the Global Water Partnership (GWP) (MoU signed October 9, 2007).

The Institute and these organizations have a common interest in integrated water resources management, environmentally sustainable development, engineering and scientific excellence, water resources education, technology transfer and capacity building. MoU's with these organizations will further the Institute's and their efforts towards developing procedures and methods for integrated water resources management in support of sustainable development, adaptation to global climate change and its impact on water resources, and establishing a long term basis for cooperative efforts in a number of areas including flood risk management, hydrologic analysis, risk analysis and systems modeling, environmental restoration, ecological design, eco-hydrologic analysis and water quality, and capacity building, training, and technology transfer.

IWR Visiting Scholar Programs: The Institute benefits from supporting a number of visiting scholar programs. These programs seek to bring the foremost water resources experts from academia, private industry and other agencies and laboratories to residence at IWR or HEC for periods of six months to one year. Visiting scholars are expected to infuse new energy, perspectives and ideas to the IWR program, while the practical work environment at IWR and HEC provides a stimulating context for mutual exploration of potential advances in water resources planning and hydrologic engineering and analysis.

FY 2009 marked the eight year of the Institute's Maass - White Visiting Scholar program, established in 2001 in recognition of the contributions of, and the Institute's intellectual alignment with, two of the founders of modern water resources planning's theoretical underpinnings — Professors Arthur Maass of Harvard University, and Gilbert White of the University of Colorado. FY 2009 was the sixth year for two other designated visiting scholar positions, both established in 2004: the first a partnership with the Universities Council on Water Resources (UCOWR) and the second, HEC's Leo R. Beard Visiting Scholar program, named after the founding director of HEC. FY 2009 marked the third year since the establishment of two new post-doctoral Fellows programs: the National Research Council (NRC) Research Associateship and the American Association for the Advancement of Science (AAAS)

Science and Technology Policy Fellows program. IWR and HEC underwent a rigorous certification process by independent reviewers in order to qualify for these two prestigious programs.

FY 2009 marked the initiation of a new visiting scholar program, the Frederick J. Clarke Visiting Scholar program, named in honor of Lieutenant General Frederick J. Clarke, Chief of Engineers from 1969-1973. Lieutenant General Clarke was instrumental in securing expert, independent advice on environmental issues facing the Corps by founding the Environmental Advisory Board. The Frederick J. Clarke Visiting Scholar program will provide scholars the opportunity to advise the Corps on important policy issues related to the Corps environmental mission.

Dr. Martin Doyle, Associate Professor in the Department of Geography at the University of North Carolina at Chapel Hill, has been selected as the inaugural Frederick J. Clarke Visiting Scholar. While at IWR, Dr. Doyle will focus his research on the determination of the optimal scale for geographic service areas in compensatory mitigation; infrastructure decommissioning; and the evolving political economy of rivers.

Dr. Kenneth Strzepek, Professor of Civil, Environmental, and Architectural Engineering at the University of Colorado at Boulder, joined the Institute in 2009 as the Maass- White Visiting Scholar for 2009-2010. Dr. Strzepek's research will focus in the area of climate change and adaptation of water resources.

Dr. Paul Kirshen of the Department of Civil and Environmental Engineering, Tufts University continued as the 2007–2009 Universities Council on Water Resources (UCOWR) Visiting Scholar. Dr. Kirshen's work focused on the area of Shared Vision Planning.

Dr. David W. Watkins, Jr. of the Department of Civil and Environmental Engineering, Michigan Technological University continued as the Leo R. Beard Visiting Scholar at HEC. Dr. Watkins' research focused on the next generation of the Corps risk analysis procedures for flood damage reduction and decision making under uncertainty.

Dr. Guillermo Mendoza, a recipient of a Ph.D. in Bioresource Engineering from Cornell University in 2002, joined the Institute as a National Research Council Research Associate in 2009. Dr. Mendoza will support the work of the International Center for Integrated Water Resource Management (ICIWaRM) and the Center of Expertise on Conflict Resolution and Public Participation.

Dr. Stacy Langsdale, Ph.D. in Resource Management Environmental Studies, University of British Columbia continued at the Institute as a National Research Council Research Associate for 2007-2009. Dr. Langsdale's research focus is in the field of modeling and stakeholder based decision support processes as they apply to water resources planning and management.

Dr. Michael Deegan, Ph.D. in Public Policy and Administration, University of Albany continued at the Institute as a National Research Council Research Associate for 2008-2009. Dr. Deegan's research focused on the field of flood risk management and the factors influencing policy formulation, adoption, and implementation.

Previous IWR visiting scholars have included:

- Maass-White Visiting Scholars: Dr. Daniel (Pete) Loucks, Cornell University (2002-2003), Dr. Peter Rogers, Harvard University (2003-2004), Dr. Leonard Shabman, Resources for the

Future, (2004-2006), Dr. Gerald Galloway, University of Maryland (2006-2007), and Dr. Yacov Haimes, University of Virginia (2007-2008).

- UCOWR Fellow: Dr. Bruce Hooper, Southern Illinois University (2004-2005).
- Leo R. Beard Visiting Scholar: Mr. Tony Thomas, founder and president of Mobile Boundary Hydraulics (2004); Professor Jery Stedinger, Cornell University (2005).
- IWR NRC Research Associate: Dr. Peter Rogers, Colorado State University (2006), Dr. Jason Giovanettone, Duke University (2006, at HEC).
- AAAS Fellow: Dr. Alexey Voinov, University of Vermont, (2006-2007).

WATER RESOURCES METHODS AND MODELS

Two major IWR focus areas are (1) the evaluation of engineering, economic, social, institutional and environmental needs and, to address those needs, (2) the development, transfer and application of improved water resources analytical techniques, models and information systems. The goal is to produce state-of-the-art multi-purpose planning and hydrologic engineering methods and models to support investment decisions. This is accomplished by means of programs in research, training, planning analysis and technical assistance.

Planning Models Improvement Program: HQUSACE guidance EC 1105-2-407, *Planning Models Improvement Program: Model Certification*, published in 2005 prescribed a corporate business process and policy for the development, certification, training and on-going support for planning models, with the certification process based on internal and external peer support and review and with the responsibility for establishing priorities and managing the certification process residing with the planning centers of expertise in coordination with the findings of the *Strategic Engineering and Technology Initiative*. In FY 2006 IWR, with input from Corps laboratories and the planning centers of expertise, developed protocols for model certification that include the processes and criteria to be used for certifying planning models. In FY 2008, IWR Planning Suite Version 1.0.9.0 was certified to be in compliance with the requirements of the *Planning Models Improvement Program*. Also in FY 2008, HEC-FDA, (Flood Damage Reduction Analysis) Version 1.2.4, a frequency-based model for the estimation of inundation damages, was submitted for certification by the Hydrologic Engineering Center.

IWR continues to actively participate in the model certification efforts, providing input on policy and processes and as a member of the HQUSACE Model Certification Panel.

Navigation Economic Technologies Research: For more than a century the USACE has played a key role in maintaining a robust national economy by ensuring that farmers, manufacturers and businesses can easily transport goods up and down our Nation's rivers and out to sea via coastal ports. The Navigation Economic Technologies (NETS) Research Program supports the navigation mission by developing state-of-the-art, credible, independently verified economic models, tools and techniques to be used by USACE field planners in informing investment decision making at all levels of the agency. The knowledge and tools developed by the NETS research program are based on reviews of economic transportation and market theory, current best practices both within and outside of the USACE; data needs and availability; and peer recommendations.

The NETS program developed tools and techniques in the following areas of investigation:

- The Global Grain forecasting model was certified by the Corps and used for the *Upper Mississippi River – Illinois Waterway Navigation and Ecosystem Program* (NESP) study.

- The Survey Model was also certified by the Corps and used for the NESP study. The Survey model incorporates the findings of NETS shipper response research, directly responding to criticisms made by the National Academy of Sciences to the structure and inputs of previous models.
- The channel widening version of the HarborSym model continues to be used by Corps districts. Model certification has begun on the HarborSym channel widening model. The NETS team is extending HarborSym functionality to include channel deepening analysis for bulk carriers.
- Prototypes for suite modules have been developed for the *Navigation System Simulation* (NaSS).
- NETS' shipper response research (also known as the "Wilson-Train" Technique) is being incorporated into Corps legacy models. Working with the Planning Center of Expertise for Inland Navigation, NETS has completed a survey to estimate the shape of the shipper response curves on the Ohio River. The NETS team is working in conjunction with the Oak Ridge National Laboratory and the Planning Center of Expertise for Inland Navigation to incorporate these results into the *Ohio River Navigation Investment Model* (ORNIM).
- NETS researchers continue to develop techniques to evaluate and forecast container freight traffic.
- NETS researchers conducted event studies of the unplanned closure of lock structures at McAlpine Lock, Greenup Lock, Lock 27 on the Upper Mississippi River, and locks on the Upper Mississippi River in association with flood events in June 2008.

The focus in FY 2009 is to complete and transfer the tools and techniques developed by the NETS Research Program to the Planning Centers of Expertise for Inland and Deep Draft Navigation. The NETS web site www.nets.iwr.usace.army.mil is being updated and finalized as a publicly available archive of the research program.

Environmental Sustainability: The Environmental Sustainability Project, managed by Dr. Richard Cole, includes activities that pertain to the implementation of the Environmental Operating Principles. During Fiscal Year 2009, an assessment of the condition of freshwater biodiversity at Federal water resources projects was completed for IWR publication. A new metric for measuring the benefits from ecosystem restoration projects has been developed and two technical reports have been submitted for final editorial review before publication through ERDC. A third technical report comparing the new metric with other metrics, an ERDC technical note, and journal article on the new metric are in peer review. Dr. Cole participated in the Actions for Change Sustainable Solutions Project Delivery Team, which completed two draft reports on sustainability definitions and principles, which were in review as of September 2009. An IWR report presenting a framework for achieving environmental sustainability by USACE was undergoing review and a final draft was nearing completion in September 2009.

IWR Planning Suite: Version 1.0.9.0 has been certified in compliance with the requirements of the Planning Model Improvement Program (PMIP) guidance. This model is a water resources investment decision support tool that performs computations associated with cost effectiveness and incremental cost analyses used during the formulation and evaluation of planning alternatives that produce non-monetary or a combination of monetary and non-monetary outputs. Originally designed

to assist with the development and comparison of alternative plans for ecosystem restoration and watershed planning studies, the program can also be applied to a wide variety of integrated water resources planning and management problems by identifying which plans are the best financial investments, then displaying and comparing the effects of each plan on a range of decision variables. This program was downloaded over 300 times during 2009. Cost/Effectiveness and Incremental Cost Analysis along with a software demonstration was provided at two PROSPECT training courses. A “Multi-Criteria Decision Analysis” module, and an “Annualization” module were beta-tested during the year. The “Annualization” Module is being tested for certification during FY 2010. The Annualization module computes the annualized cost and outputs based on user provided implementation costs, discount rate, periodic operation and maintenance costs, period of analysis, benefits streams, ecological response rates, etc. A draft guide for the annualization tool as applied to a case-study and a draft guide for the *Multi-Criteria Decision Analysis* tool was also developed.

Watershed Based Investment Decision Tool: The Watershed Based Investment Decision Tool (WIDT) is a web-based utility being developed by the U.S. Army Corps of Engineers (Corps) to facilitate geospatial analyses and decision support nationwide and across all the Corps Civil Works business lines (ecosystem restoration, flood risk management and coastal storm damage reduction, hydropower, navigation, regulatory, recreation management, and emergency management). The WIDT links users with information residing in databases within and outside the Corps, and provides users with techniques for visually illustrating and summarizing multiple types of data important to Corps decision-makers at multiple reporting scales (National, District, Division, Basin). The Corps has recently partnered with the U.S. Forest Service and the University of Redlands (California) to integrate the strengths of Ecosystem Management Decision Support (EMDS) software. EMDS integrates the logic engine of NetWeaver (Rules of Thumb, Inc.) and the decision modeling engine of Criterium DecisionPlus (InfoHarvest, Inc.) to enable landscape-scale evaluations of potential actions based on management priorities. This approach will facilitate and expedite efforts to deliver knowledge-based decision support, ecological analyses, and assessments of asset/resource-stressor relationships at any geographic scale, under alternative future conditions and under alternative climate change scenarios.

IWR Regulatory Support: IWR supports the Regulatory Sub-CoP through policy analysis and training. In FY 2009, IWR supported USACE headquarters implement the 2008 Mitigation Rule (published in the 10 April 2008 Federal Register, “Compensatory Mitigation for Losses of Aquatic Resources; Final Rule”). IWR helped plan and conduct the Corps Regulatory Mitigation Workshop focusing on how to implement the rule. IWR continued its major role in teaching the interagency course entitled “Mitigation Banking Interagency Review Team Training”, at the National Conservation Training Center in Shepherdstown, WV in June 2009.

IWR continued its long-standing support to USACE headquarters in managing the Regulatory PROSPECT courses and the Regulatory Executive Seminar, to which it added a Senior Manager’s Training Seminar in August 2009.

IWR has had a major role the last several years overseeing the development of the new Corps regulatory database — ORM 2.0 — the second version of the OMBIL (Operations & Maintenance Business Information Link) Regulatory Module. IWR is now managing the modification and maintenance of the database.

Since FY 2008, IWR has actively managed the development of the Regional Internet Bank Information Transfer System (RIBITS), a compensatory mitigation bank data program. IWR has

been leading the second phase of the RIBITS contracts awarded in late FY 2008, including the legacy mitigation bank data collection.

Transportation Systems: The Transportation Systems Program supports HQUSACE and USACE district offices in accomplishing waterborne navigation project planning and evaluation responsibilities through the provision of (1) uniform and consistent maritime transportation data concerning costs of operation and replacement of foreign-flag and domestic commercial vessels and (2) comprehensive statistics on the composition and physical parameters of the world deep draft fleet and the domestic shallow-draft inland fleet. Macro-level world trade and cargo flow forecasts are also provided. Work completed in 2009 included updating of vessel operating costs for both the deep and shallow-draft fleets with an increase in statistical samples and the number of ship types covered compared to previous years; world trade and commodity flow forecasts; distribution of updated materials and statistics from various maritime industry data subscriptions; renewal of new multi-year contracts for transportation, trade and economic forecasts from Informa Economics, Inc. and IHS Global Insight, and award of new contracts for the development of cruise ship, Great Lakes and oceangoing barge vessel operating costs, and a containership trade model. The Global Insight service also includes updated barge and rail transportation modal cost models. Future work includes customization of Global Insight's "Trade Navigator" software to provide disaggregation of trade forecasts down to the individual port level.

Flood Damage Data: The Flood Damage Data Collection Program is intended to produce generic relationships for computing expected annual flood losses and tools for the collection and management of floodplain inventory data. In FY 2009, IWR initiated a post-flood data collection in Cedar Rapids and Iowa City, Iowa following the historic flood event that occurred in those cities in June 2008. The program provided training and technical support for IWR-GeoFIT, a geospatial floodplain inventory tool for residential, business, and public property. IWR initiated plans for a major update of IWR-GeoFIT. Analysis was completed and an Economic Guidance Memorandum was released on generic damage functions for vehicles. The program began to develop appropriate roadway taxonomy for analyzing flood damage to roads. Work was also initiated on defining the most important mechanisms and associated parameters that lead to roadway damage.

System-Wide Water Resources Research (SWWRP): System-Wide Water Resources Research (SWWRP), a joint effort between IWR, led by HEC, and ERDC, is focused on expanding research activities to the "System Wide" perspective, reflecting a concerted effort by USACE to follow concepts of sustainable development in a watershed context. Funding from SWWRP supports the development of multiple software packages that are widely used throughout the USACE and the professional engineering community, including: HEC-HMS (Hydrologic Modeling System), HEC-RAS (River Analysis System), and HEC-WAT (Watershed Analysis Tool). In addition to the HEC developed applications, collaborative efforts are also underway between HEC and ERDC. One is the coupling of HEC-ResSim and the ERDC software CE-QUAL-W2. The second effort is the coupling of HEC-RAS and ERDC's Adaptive Hydraulics software, ADH. ADH is a multidimensional hydraulics modeling package. Also, the Nutrient Sub-Module, NSM, and a sediment library are being developed at ERDC. Both of these are being coupled with HEC-HMS and HEC-RAS. Details on all of these products are available on the HEC website <http://www.hec.usace.army.mil/>.

Flood and Coastal Storm Damage Reduction Research (FCSDR): The Flood and Coastal Storm Damage Reduction Research (FCSDR) program is a collaborative effort between ERDC and IWR. HEC is the lead office within IWR with regards to the FCSDR Program. FCSDR looks at methods to improve the analysis of and development of tools relating to modeling of flood damage and flood

damage reduction techniques including risk and uncertainty. Funds from FCSDR support the development of HEC-WAT (Watershed Analysis Tool), HEC-ResSIM (Reservoir Simulation Model), HEC-SSP (Statistical Software Package), HEC-FRM (Flood Risk Management), HEC-FDA (Flood Damage Analysis), and HEC-FIA (Flood Impact Analysis). Details on all of these products are available on the HEC website <http://www.hec.usace.army.mil/> and can be found in other sections of this report.

IWR-HEC H&H and Risk and Uncertainty: Funds from FCSDR support the development of the HEC-FRM, (Flood Risk Management) software. This new tool is the next generation of the Hydrologic Engineering Center's Flood Damage Analysis (HEC-FDA) model. It will include a systems approach, event-based sampling, the ability to do scenario analysis, and structure-by-structure, cost, non-structural, loss-of-life, and agricultural damage analyses. The tool will accommodate many, if not all, of the recommendations that the Corps concurred with from the National Research Council report on the Corps' implementation of risk analysis for flood damage reduction (*Risk Analysis and Uncertainty in Flood Damage Reduction Studies*, NRC, 2000), and it will also aide in implementing the Chief of Engineers' Actions for Change initiative.

HEC is also working on the modifications to various engineering guidance documents via the Guidance Update Management Program (GUMP) program. Among others these documents included EM 1110-2-1413, "Engineering and Design – Hydrologic Analysis of Interior Areas", EM 1110-2-1619, "Engineering and Design – Risk Based Analysis for Flood Damage Reduction Studies", ER 1105-2-101, "Risk Analysis for Flood Damage Reduction Studies" to include materials generated from research actions.

Additionally, HEC is participating on the project delivery team (PDT) for the new Engineer Circular (EC) addressing levee system evaluations for the National Flood Insurance Program (NFIP). This EC will supplement and clarify existing levee evaluation policy, procedural and technical guidance; provide an overview of documentation requirements; outline an Independent Technical Review (ITR) process; and summarize authority and funding mechanisms.

IWR-NCR Alternatives Analysis and Decision Making (AA&DM): The AA&DM in the old structure of ERDC, was a stand-alone program aimed at addressing decision making criteria, such as social impacts and economics. It evolved into a methods approach to address a growing number of concerns, including how to formulate and evaluate projects that do not have an economic basis or justification for being. Ecosystem restoration projects, the newest mission of the Corps of Engineers, falls into this category. In the AA&DM program there are several work units aimed at this objective.

The "Catalog of Management Measures" is an illustrated set of management measures which was created to better enable planners to consider a wider range of alternatives, including non-structural for ecosystem restoration projects. The catalog has been digitized and posted on the IWR website to promote greater access. The catalog is available at <http://www.iwr.usace.army.mil/inside/products/pub/MMDL/FLD/>.

The IWR Planning Suite was initially a tool for conducting cost effectiveness and incremental cost analysis on restoration projects. It guided planners and decision makers to the alternative plans that provided the greatest amount of output for the least cost. It has grown to include plan formulation assistance as well as accommodating a tradeoff analysis tool known as Multi-Criteria Decision Making or "MCDM." The next effort will attempt to link environmental values to the output discussions.

A continuing work unit in the program in FY 2008 is the research subject entitled “Estimating Flood Damage to Roads” caused by severe and prolonged flooding events. A model is being developed to link the expected damages to roads based on the severity of a given flood. Future efforts will link the cost of those damages in terms of time lost in travel due to damages.

A new research project initiated in FY 2008 entitled “Non-Structural Flood Damage Reduction Measures” is aimed at producing cost estimating techniques for implementing a number of defined non-structural measures. This effort is being jointly produced by IWR and the Huntington District.

Planning Methodologies:

National Economic Development Manuals: IWR is in the process of updating the National Economic Development (NED) Manuals series, originally published between 1987 and 1991. The manuals are important basic references for economists and others involved in planning and analysis of Federal water resource projects. The manuals discuss the principles and concepts associated with NED benefits and provide detailed procedures to measure and calculate benefits. The updated manuals will be exclusively web-based to increase accessibility for field personnel, facilitate the maintenance and update of the manuals, improve the efficiency and effectiveness of providing up-to-date information to the field, and be responsive to a diverse audience. IN FY 2009 the Economics Primer and the Overview NED Manual were completed. Additionally, the NED manuals website (www.iwr.usace.army.mil/ned) was improved to expand the search capabilities and publish all of the original manuals online. The Deep Draft Navigation Manual will be published in 2010. The Coastal Storm Risk Management Manual and updates to the 2008 Flood Risk Management Manual are under development and are scheduled to be completed by Fiscal Year 2011.

Update of “Digest of Water Resources Policies and Authorities” and “U.S. Army Corps of Engineers Civil Works Policy Pocket Reference”: The policies and guidance established for the Corps of Engineers are contained in a voluminous body of public law, executive orders, Engineer Regulations, Engineer Manuals, and policy memoranda. In order to make this guidance more accessible to users, the Corps of Engineers publishes Engineer Pamphlet 1165-2-1, “Digest of Water Resources Policies and Authorities” (also referenced as the “Policy Digest”). The last revision of the Policy Digest occurred in 1999. This pamphlet is a ready reference, providing a brief summary, in digest form, of the existing administrative and legislative water resources policies and authorities pertinent to the Civil Works activities of the Corps of Engineers. In order to maintain the value of the Policy Digest as a reference tool, IWR has revised the Policy Digest to bring the reference up to date. The updated Policy Digest has been internally reviewed and will be released as a web-based publication with hyperlinks to original policy sources in 2010.

A companion of the Policy Digest is the “U.S. Army Corps of Engineers Civil Works Policy Pocket Reference” (also referred to as the “Pocket Digest”). This ready reference was last updated in December 2005 and has also been revised at IWR to include policy changes. It will be released as an abbreviated hardcopy pocket edition of the larger Policy Digest.

Other Social Effects (OSE) Handbook: EC 1105-2-409, “Planning in a Collaborative Environment” reemphasizes the importance of fully considering the Other Social Effects (OSE) and Regional Economic Development (RED) accounts in project development, evaluation and decision making. The OSE handbook provides field analysts with the framework and tools they need to perform an OSE analysis. The handbook includes a framework and principles for OSE analysis, tools for performing analyses, and examples by business line. The OSE handbook is the third item produced

addressing the OSE account. Previous reports on this subject include an IWR white paper entitled “*Review of Guidance and Procedures for Regional Economic Development and Other Social Effects*” (published in August 2006) and a research report entitled “*Theoretical Underpinnings of the OSE Account*” (published in March 2007). The OSE Handbook will be published in the first quarter of FY 2010. It will be available at the IWR web site. Also under development are an OSE Primer and a training module on OSE.

Regional Economic Development Handbook: IWR is in the process of finalizing a handbook on Regional Economic Development (RED). The need to perform RED has grown in recent years given the renewed emphasis in EC 1105-2-409, “Planning in a Collaborative Environment” on the consideration of all four accounts (National Economic Development (NED), Environmental Quality (EQ), RED, and Other Social Effects (OSE)). This handbook will provide valuable tools and insights into the use of RED analysis. It includes discussion of RED for each of the Corps' business lines. Consideration of RED impacts in the planning process will result in more comprehensive accounting of project contributions and effects. The draft RED Handbook was reviewed internally and externally in FY 2009. It is scheduled to be published in FY 2010.

Multi-Objective Planning Manual: In response to ER 1105-2-100 (“Planning Guidance Notebook”), EC 1105-2-404 (“Planning Civil Works Projects Under the Environmental Operating Principles”) and EC 1105-2-409 (“Planning in a Collaborative Environment”), the Corps has been increasingly encouraged to formulate projects having multiple objectives. Since few Districts have performed true multi-objective planning, IWR is developing this manual to educate planners how to perform this more complex type of decision making. A draft version of this manual is currently under review.

NexGen Software: HEC continued to enhance many software products and introduce new products. Released in FY 2009 were:

HEC-HMS, Hydrologic Modeling System, Version 3.4: New simulation features were added to the HEC- HMS Version 3.3 software. They include: a new option in the Snyder Unit Hydrograph transform method for specialized use in the Ft Worth and Tulsa Districts, hydrologic order sorting for watershed elements, and improved results visualization. Parameter editors were upgraded to give visual identification of required data as compared to optional data. In addition, as with any new release, the identification and repair of a number of bugs also took place. Finally, a Validation Guide was published that describes the numerical tests used to verify that computed results are accurate and precise.

HEC-FDA, Flood Damage Reduction Analysis, Version 1.2.4: This long awaited product has many new and improved features which are discussed in the “What’s New” section of the HEC-FDA web page. <http://www.hec.usace.army.mil/software/hec-fda/whatsnew.html>. HEC-FDA provides the capability to perform an integrated hydrologic engineering and economic analysis during the formulation and evaluation of flood risk management plans. HEC-FDA is designed to assist study team members in using risk analysis procedures for formulating and evaluating flood risk management measures and analyzing the economics of flood risk management projects. It computes expected annual damage (EAD) and equivalent annual damage and provides the annual exceedance probability (AEP) and conditional non-exceedance probability as required for levee evaluation.

In FY 2009 the Flood Risk Management Planning Center of Expertise (FRM-PCX) recommended HEC-FDA Version 1.2.4 for certification for use in planning studies in accordance with the strict standards set forth in EC 1105-2-407, and work began on a minor update version 1.2.5.

Development continued regarding version 1.4, which incorporates significant computational updates and program improvements, and represents the final incarnation of HEC-FDA in its traditional software development environment. Work continued in parallel on version 2.0, which implements the computational engine of version 1.4 in a contemporary Java-based environment, and permits integration with HEC-WAT.

HEC-SSP, Statistical Software Package, Version 1.1: This is a new release of the SSP software. It includes some new capabilities. These include General Frequency computations and Volume-Duration frequency computations. Additional capabilities are also being added to SSP. Version 2.0 is scheduled to be released near the end of FY 2010.

HEC-EFM, Ecosystem Functions Model, Version 2.0: HEC-EFM is a software tool designed to help determine ecosystem responses to changes in flow regime of a river or connected wetlands. It allows the study team to visualize and define existing ecologic conditions, highlight promising restoration sites, and assess and rank alternatives according to predicted changes in different aspects of the ecosystem. Version 2.0 was released in November 2009. This version incorporates several new features and expanded capabilities, including the addition of HEC-EFM Plotter. Plotter is a new accessory that helps users view, navigate, and interpret the output generated by HEC-EFM.

HEC-RAS, River Analysis Systems Version 4.1: HEC-RAS Version 4.1 supersedes version 4.0, which was released in March of 2008. Several new simulation features have been added to the program since that time. Version 4.1 of HEC-RAS includes the following new features:

- New RAS Mapper Floodplain Delineation Capabilities
- Hydrologic Routing Reaches Within an Unsteady Flow Model Run
- New Flow Data And Boundary Conditions Editor for Unsteady Flow
- Contraction/Expansion losses for Unsteady Flow
- Minor Losses for Unsteady Flow
- New Junction Hydraulics Option for Unsteady Flow
- Groundwater Leakage for Storage Areas
- Water Quality Modeling Enhancements
- Sediment Transport Modeling Enhancements
- User's Manuals and Help System

Other minor enhancements were also added. The development team has also continued careful and systematic testing of the program since the last release. The results of that testing in combination with reports from users has allowed the identification and repair of various problems. Some minor problems that did not affect results but caused problems in the program interface have been repaired without being specifically documented.

More information about these software packages and other HEC software can be found on HEC's website, <http://www.hec.usace.army.mil>.

FY 2009 also saw improvements to **HEC-FIA, Flood Impact Analysis**, with its loss-of-life capabilities and the new Watershed Analysis Tool, **HEC-WAT** (which includes HMS, RAS, SSP, ResSim, EFM, GeoHMS, GeoRAS and FIA software). A beta version of the WAT was released in FY 2008 and is available for use and testing. Official releases of this software will be completed in FY 2010. HEC and ERDC continue to integrate HEC-ResSim and CE-QUAL-W2 for modeling of

water-quality constraints on the operations of one or more reservoirs. HEC and the USGS, in association with IHE-Deltares, are also working together to integrate HEC-RAS and the USGS MODFLOW software.

INTEGRATED CIVIL WORKS SYSTEMS

Performance based budgeting, performance measurement and program assessments are increasingly important. In response, IWR created a corporate data warehouse of financial and navigation infrastructure inventory data, lock characteristics, navigation project profiles, OMBIL outputs, waterborne commerce, lock performance, hydropower, recreation, water supply, National Recreation Reservation System and environmental stewardship data. Data from these sources is linked, integrated and combined to generate performance measures, which are then used in the budget process.

OMBIL: The Operations and Maintenance Business Information Link (OMBIL) Plus, a centralized performance management information system, encompasses the Civil Works business lines of navigation, hydropower, recreation, environmental compliance, environmental stewardship, water supply and regulatory. The OMBIL decision support system distributes data to support a variety of Corps management initiatives, performance-based budgeting and Federal and public data requirements.

In support of the Civil Works business performance measurements, the Navigation Data Center (NDC) extracts expenditure data from the USACE Financial Management System (CEFMS) and combines it with business output data to generate efficiency and effectiveness measurements, including submissions to the Office of Management and Budget. NDC data supports and is a source of information and data used in the Corps “*Value to the Nation*” publications and the Federal government’s recreation access site: <http://www.recreation.gov>. Navigation data is also integrated with CorpsMap, providing an intranet web-based GIS interface. All of NDC’s publicly available navigation and water transportation data is available at www.ndc.iwr.usace.army.mil or on its annual CD-ROM.

ORM 2.0: IWR has completed development and deployment of OMBIL Regulatory Module Version 2 (ORM 2.0). ORM 2.0 is a web-based geospatial database application for tracking and managing all aspects of the Corps regulatory process. ORM 2.0 was developed using a unique combination of Corps in-house expertise and contract support. ORM 2.0 supports a consistent national business process for the regulatory program resulting in consistent tracking and reporting of program performance. ORM 2.0 integrates with USACE district enterprise geographic information systems and other federal and state agencies. ORM 2.0 provides the foundation for watershed based decision making in the Corps regulatory program. By the end of FY 2008, the database was deployed and historical data loaded for all districts with continual improvements being implemented.

CWMS: The Corps Water Management System (CWMS) is a comprehensive data acquisition and hydrologic modeling system for short-term decision support of water control operations in real time. CWMS supports field-level decision making within the Corps water management mission. It embodies data acquisition, validation, transformation and management; forecasting, simulation and decision support analysis; and information dissemination.

The first version of CWMS was released in 2002. CWMS has been updated at roughly annual intervals at the thirty plus Corps offices with water control management responsibilities. Improvements to the system continue via a field-prioritized betterments program. Version 1.5 was released in FY 2007, and is the current production system.

At the end of FY 2009, version 2.0 was being tested for release to the field. This version includes major revisions to the basic database structures, allowing water control users more direct access to their data and enabling them to make more effective use of the features inherent in the commercial Oracle database at the center of CWMS. A public release of the modeling component of CWMS, HEC-RTS (Real Time Simulation) will closely follow the release of CWMS 2.0.

In addition to software development, HEC has been actively engaged with ACE-IT and the CWMS management team to configure a standard hardware platform for CWMS and other water control programs. This effort will produce a more uniform and easily supported implementation of water control data and modeling systems throughout the Corps and support the uniform access to water control data nationwide through access to roll-up databases at the Corps enterprise processing centers. Information about CWMS and other HEC software is available on the HEC web site <http://www.hec.usace.army.mil>.

WATER RESOURCES TRAINING AND EDUCATION

The Institute for Water Resources, including HEC, has always been a leader in innovation within the Corps of Engineers family. IWR has been responsible for developing techniques and approaches for economic analysis, risk analysis, planning methodologies, public involvement, conflict dispute resolution, water conservation and other topic areas. HEC, through the development of hydraulic, hydrologic and planning analysis methods and models, has built a reputation recognized throughout the world in the fields of hydraulics and hydrology. Over the course of their existence, both IWR and HEC have made considerable effort to build appropriate training vehicles for the instruction in the use of the various tools they have developed. As a result, each office routinely offers eight to twelve courses per year through the Proponent-Sponsored Engineer Corps Training (PROSPECT) program and/or through other training venues, such as workshops and seminars.

PROSPECT Program and Specialty Workshops: IWR continued the USACE Proponent Sponsored Engineer Corps Training (PROSPECT) program in 2009 by presenting 26 week-long courses (fifteen led by the IWR-NCR and eleven by HEC). The PROSPECT courses covered a wide range of Civil Works water resources topics: Public Involvement and Teaming in Planning; Public Involvement Communications; Regulatory for New Regulators; Regulatory – Procedural Issues; Regulatory –Decision-Making; Regulatory Executive Seminar; Hydrologic and Hydraulic Engineering; Water Resources Planning; Ecosystem Restoration; Flood Risk Management; Collaborative Planning; and Plan Formulation. Specialty workshops often used pieces of the PROSPECT training courses but generally, the specialty workshops were built specifically for the requesting office and often included topics outside of the normal PROSPECT training. IWR is committed to technology transfer and the dissemination of its tools, processes and procedures. The organization and staff are committed to provide assistance in using our tools, through workshops, telephone consultation or whatever may be necessary.

IWR-NCR assumed responsibility for several of the Planners Core Curriculum (PCC) courses in FY 2007 and 2008. IWR staff worked with field instructors to present three of the courses as they were originally created. These included Collaborative Planning, Environmental Considerations in Planning, and Plan Formulation. Other IWR courses included Risk Analysis - Water Resources Planning; Conflict Management and Dispute Resolution taught primarily by contractors; Public Involvement - Communications, again taught by contractors; Regulatory I - New Regulators; Regulatory IIA - Procedural Issues; and Regulatory IIB - Decision Making, all of which were taught by Corps regulators from across the country. In addition to the IWR sponsored courses, IWR staff

members are active members in a number of other PROSPECT courses, teaching special topics such as Cost Effectiveness and Incremental Cost Analysis (IWR-PLAN), Economics, Forecasting, Risk Analysis, and Environmental Benefits Evaluation.

In addition to the aforementioned training, IWR is also responsible for managing the Corps Planning Associates (PA) program, which is designed to be comprehensive training to build future leaders in the Planning Community of Practice. The program is a series of interrupted one, two and three week sessions interspersed with trips back to the home district to keep up with the workload. Students are committed to keeping their work at home moving while participating in the program.

IWR manages the Corps' Regulatory Executive Seminar for senior managers and works closely with Corps HQ Regulatory personnel in support of new course development.

IWR is now embarking on a new capacity development venture on an international scale through its *International Center for Integrated Water Resources Management (ICIWaRM)*. IWR has been nominated by the U. S. Government, through the Department of the Army and the U.S. Department of State, to become a UNESCO Category II Water Center. When the UNESCO designation is approved (expected in October 2009), it is anticipated that IWR and IWR-HEC will be called on to place even greater emphasis on water resources training and education for developing and emerging nations around the world. IWR has constructed a new classroom in the Casey Building to accommodate future classes of national and international students.

Under the auspices of the PROSPECT program, HEC conducted ecosystem oriented training courses such as "Water and the Watershed" and "Hydrologic Analysis for Ecosystem Restoration" as well as a full menu of hydrologic engineering and planning analysis topics, including courses on H&H for Dam Safety Studies, CWMS Modeling for Real-time Water Management, Risk Analysis for Flood Damage Reduction Projects, Hydrologic Engineering Applications for GIS, Advanced Steady Flow Analysis with HEC-RAS, Sediment Transport Analysis with HEC-RAS, and Advanced Applications of HEC-HMS.

In addition to the PROSPECT program, HEC conducts many specialized training classes for a wide variety of clients.

In FY 2009, HEC staff presented a hydrologic modeling course in Ethiopia as part of the Combined Joint Task Force-Horn of Africa host nation agreement. This training built on the prior efforts initiated in FY 2008.

As part of a hydraulic and hydrologic information exchange, the Crisis Management IV program sponsored by US Southern Command (SOUTHCOM), an HEC engineer presented HMS and RAS training from 6-9 April 2009, in Georgetown, Guyana.

HEC support to the Civil Military Emergency Preparedness program continued in FY2009 with a week-long training activity for Kazakhstan water managers and emergency management officials. The workshop provided training on water management activities for flood prediction, prevention and warning.

HEC has assisted the Corps' Engineering Risk and Reliability Directory of Expertise with a number of dam and levee safety risk assessment efforts. One effort was a training course delivered in December, 2008 on the development and use of hydraulic and consequence models in support of risk assessments using HEC-RAS/GeoRAS and HEC-FIA.

In December, 2008, HEC taught a Risk Analysis for Flood Damage Reduction Studies training course to Sacramento District planners, project managers, economists and engineers presenting risk concepts and analysis methods required by present Corps guidance in the study of flood damage reduction projects. The course objective was to enable participants to adapt the methods to specific studies. The course emphasized policy issues and the implementation of risk and uncertainty methods for sizing and evaluating flood damage reduction projects. Workshops enabled participants to have hands-on experience in applying risk concepts.

HEC conducted or contributed to courses about DSSVue in Fort Worth and St. Paul, MN; Nonstructural Measures for Flood Risk Management course in Davis, CA; Steady Flow Analysis using HEC-RAS in Omaha, NE; and a Planning Associates course regarding Flood Risk Management in Folsom, CA.

Planning Excellence Program: Throughout FY 2009 IWR provided managerial and technical support to the Planning Community of Practice (CoP) in the execution of the Planning Excellence Program. This included the management of the Planning Associates (PA) program and conduct of the three-week “Washington DC Experience” module for the FY 2009 class. The goal of the PA program is to develop planning leaders who can manage complex planning studies that lead to quality decision documents and who will provide water resources technical and professional leadership in the future.

IWR, in coordination with HQUSACE, is responsible for the implementation of the program, including setting up the criteria for selection of candidates, development and delivery of training sessions and financial management and logistical support.

IWR also provided support to the local delivery of four of the seven Planning Core Curriculum courses by the Corps Major Subordinate Commands (MSCs). These four courses provide the basic, full-performance training needed by entry level planners across the USACE as the means to accelerate their progress to the journeyman stage of their career development. These courses include: Environmental Considerations; Economic Analysis; Plan Formulation; and Public Involvement and Team Planning. IWR also supports to the local delivery of the Risk Analysis WRP&M course.

Advanced Degree Program in Integrated Water Resources Planning and Management

The USACE strives to provide optimum training and development opportunities in order to assure maximum efficiency of members of its workforce in the performance of their official duties. The Advanced Degree Program in Integrated Water Resources Planning and Management has been developed to ensure that the USACE maintains its standing as a leader in water resources planning and management. The program was designed to promote interdisciplinary degrees at the graduate level that were specifically geared towards water resources practitioners.

IWR has worked closely with the Universities Council on Water Resources (UCOWR) to develop a program which addresses the many challenges that the water resources planning and management community faces.

Courses are offered at five universities: The University of Arizona; The University of Florida; Harvard University; Johns Hopkins University; and Southern Illinois University.

REIMBURSABLE TECHNICAL ASSISTANCE

Reimbursable project work was undertaken by the Institute for USACE field offices as well as: HQUSACE Civil Works Planning, Engineering, Operations, Regulatory, Office of Homeland Security; and Office of Interagency and International Activities; the Engineering Research and Development Center (ERDC), Coastal and Hydraulics and Environmental Laboratories; the Federal Emergency Management Agency; the International Joint Commission (IJC); the U.S. Agency for International Development (USAID); the National Weather Service; the U.S. Geological Survey; the Natural Resources Conservation Service; other Federal agencies; and approved Thomas Amendment Agreement technical support to the Lower Colorado River Authority, Texas and the Tampa Bay Water Authority, Florida. Other projects for USACE clients included navigation systems economic evaluation, technical advice and guidance on plan formulation, incremental cost and cost effectiveness analysis, risk analysis, watershed and reservoir system modeling, water quality, river hydraulics, wetlands hydrology, water control management, regional statistical analysis, flood damage analysis, flood warning response systems, GIS applications in hydrology and hydraulics, groundwater modeling and water supply in support of interagency investigations.

IWR worked on a variety of projects including: post-Katrina IPET support, hydraulic modeling, and risk analysis; Ft. Worth Flood Warning modeling; development of an integrated forecasting model for the National Weather Service for joint operations on Feather and Yuba Rivers, CA; Tooele and Ft. Huachuca groundwater modeling; development of HEC-RPT software for use on the Savannah River as part of the Sustainable Rivers Project; providing additional features in HEC-RAS software for the Tampa Bay Water Authority; helping the Lower Colorado River Authority implement CWMS for their water management needs; contributing to the revision of Bulletin 17B; writing levee certification guidance; working with the Corps Screening Portfolio Risk Assessment teams evaluating the safety of the Nation's dams; assisting the Corps' Engineering Risk and Reliability Directory of Expertise with a number of Dam and Levee Safety studies and efforts; assisting the Sacramento District and the South Pacific Division perform a risk analysis of the Sacramento River from a systems context; working with the Mobile District to modernize its Alabama-Coosa-Tallapoosa (ACT) and Apalachicola-Chattahoochee-Flint (ACF) reservoir modeling applications using HEC-ResSim; working with the Detroit District to experiment with an unsteady flow HEC-RAS model for routing flows from Lake Superior to Lake St. Clair; and numerous miscellaneous consultations.

HEC entered into an agreement with the Sonoma County Water Agency and initiated another agreement with the South Florida Water Management District. Both of these agreements will allow HEC to add specific enhancements to the HEC software that provides capabilities for these agencies.

In October 2008, HEC staff participated in a field trip, symposium, and workshop on water management challenges in the Yangtze River Basin in China. The field trip included visits to the Xiangjaba Dam construction site, the Upper Yangtze Native Fish Reserve, and a flood retention basin near Jingzhou, China.

In December 2008, HEC staff travelled to Mexico City to present training on how to evaluate environmental flows to the Mexico Institute of Water Technology.

In June 2009, training was provided at HEC for a group of military and emergency leaders from Kazakhstan. The class consisted of basic HEC-HMS and HEC-RAS training. HEC also participated in a Watershed Assessment study of the Helmand Province in Afghanistan. This was led by AED

and was a multiple District effort. The goal was to identify possible small dam sites for impoundment of water for irrigation. This study is expected to resume in FY10.

During FY 2009, work continued on the development of an HMS model for the Ogaden Basin in Ethiopia. This work was done in conjunction with Naval Facilities (NAVFAC). This model will be turned over to NAVFAC when completed. HEC staff provided training in Addis Ababa, Ethiopia as part of a continuing capacity building effort through the Combined Joint Task Force – Horn of Africa program.

HEC also participated in Civil-Military Emergency Preparedness (CMEP) activity in Guyana, funded through SOUTHCOM. HEC-RAS and HEC-HMS models were constructed and training provided on the use of these models and how to use some of the HEC GIS tools. Over the years, HEC has participated in several CMEP activities in various countries.

CIVIL WORKS PROGRAM AND PROJECT INFORMATION

IWR maintains, develops and provides a full range of international, national and USACE project and program data and information for decision support for the Corps, other federal government agencies, the private sector, and the public on key Civil Works activities. National water resources database concept development, design, implementation, operation and maintenance activities are provided through a combination of in-house and private sector systems analysts, statisticians, engineers and scientists who work in close coordination with USACE users. Also IWR acquires external data from other federal agencies and private sector sources, to be used by the Corps for integrated analysis and benchmarking. These data are used within the Corps for program management, budget development and justification, OMB Program Assessment Rating Tool, numerical models and real time management at the project. Major initiatives within the past year have been the development and creation of performance measures for the Corps business lines to reflect the efficiency and effectiveness of the programs and analysis.

Navigation Data Center: The Navigation Data Center (NDC), located at the National Capital Region headquarters of IWR at Ft. Belvoir, VA., is the central manager of navigation, hydropower, recreation, environmental stewardship, water supply and regulatory program data for the Nation. Information provided by NDC directly supports the USACE annual Civil Works performance-based budgeting program. NDC is responsible for national level executive oversight and management responsibilities, including the development of Federal and USACE Engineer Regulations (ER's), the Code of Federal Regulations, and their enforcement. OMB, acting on legislative mandates, recognizes USACE, acting through NDC, as the Federal collection agent for waterborne commerce, vessel activities and waterway infrastructure data and statistics.

NDC accomplishes its objectives of supplying timely and accurate data through the following activities: assessing user requirements; developing, designing, operating and maintaining systems to collect, process and store data and information; developing and disseminating data, information and statistical products; training providers and users of project and program information and data; and maintaining knowledge of the latest developments in the area of technical and content interoperability. As a national statistical center, NDC coordinates extensively with other Federal statistical agencies and data users, representing the U.S. government before other nations in the development of data and information standards and protocols and in the negotiation of data exchanges. NDC actively participates in corporate information integration and coordination within the USACE and plays a lead

role in developing, coordinating and disseminating water resources information for performance measurement and management purposes. It leads the development of strategic communication with both internal communities of practice and external water resources interests, stakeholders and communities.

Waterborne Commerce and Vessel Statistics: Under the authority of the River and Harbors Act of 1922, as amended and codified in 33 U.S.C. 555, the USACE is to collect, process, distribute and archive U.S. waterborne commercial vessel trip and cargo data. These data and statistics are used to analyze the feasibility of new water transportation projects and activities; to set priorities for new investment and rehabilitation; and for management of the operation and maintenance of existing projects.

Under Federal law, vessel operating companies must report domestic waterborne commercial vessel movements directly to the USACE. The types of vessels include, but are not exclusively limited to: dry cargo ships and tankers, barges (loaded and empty), towboats (with or without barges in tow), tugboats, crew boats and supply boats to and from offshore locations, newly constructed vessels from shipyards to the point of delivery, ferries and other passenger vessels, and vessels remaining idle during the monthly reporting period. Harbor Maintenance Tax information, providing the name of the shipper of the commodity and the shipper's Internal Revenue Service number or Social Security number, is also reported for the cargo movements into or out of ports that are subject to the provisions of section 1402 of the Water Resources Development Act of 1986 (Pub. L. 99-662). U.S. foreign waterborne import, export and in-transit cargo and vessel movement data is provided to the Corps by the U.S. Customs and Border Protection, the U.S. Bureau of the Census, and the Port Import Export Reporting Service.

Movement data acquired by the NDC Waterborne Commerce Statistics Center is primarily for the use of the USACE and other governmental agencies. Since 2004, data have been incorporated into the USACE budget preparation process, providing the navigation project outputs and performance measures used to rank and justify operation and maintenance funding requests. Summary statistics, which do not disclose movements of individual companies, are also released to private companies and to the general public.

International Trade Data System (ITDS): During FY 2009, the Institute's Navigation Data Center continued its involvement in the development of the *International Trade Data System* (ITDS). ITDS is a multi-agency technology initiative administrated by the e-Customs Partnership, a public-private partnership led by Customs and Border Protection (CBP). Both the public and private sectors have steering committees and numerous sub-committees.

The objective of this initiative is to provide a secure, single source interface for the collection, input, analysis, and proper dissemination of international trade and transportation statistics. The Corps is one of over 20 government agencies working with the trade and transportation community to implement this initiative.

In FY 2009 the ITDS initiative incurred a significant reduction in funding, which in turn resulted in a pushback of critical timelines. However, IWR mitigated the funding impacts by working directly with CBP to insure critical development was accomplished before the reduction in funding. The Corps and CBP worked together on a project to develop a module for identifying vessel activity at the dock level as opposed to the port level. The module is scheduled to be placed into production

during the third quarter of FY 2010. Further, the Corps and CBP partnered to develop a prototype module that provides Harbor Maintenance Fees for imports broken out by port.

Coastal and River Information Services (CRIS): CRIS is a public-private initiative lead by the USACE, the U.S. Coast Guard, NOAA, the IRS, and private sector representatives to establish a single method for electronic reporting and disseminating information on U.S. coastal and inland waterways. CRIS members serve on several Integrated Action Teams on the *Committee for the Marine Transportation System (CMTS)*.

The goal of this effort is to provide a framework by which domestic transportation and related information on U.S. coastal and inland waterways can be transmitted and received using one message, one set of codes, and at one time for Federal reporting purposes. The program will serve a wide range of safety, operational, security, environmental, and statistical needs.

In FY 2009 the *Federal – Industry Logistics Standardization (FILS)* sub group adopted and incorporated the use of a universal code for navigation locations. Adoption of the code allows for transfer of information regarding locations between the participating agencies; USACE, IRS, USCG, CBP, and others. Additionally, a Federal Initiative for Navigation Data Enhancement (FINDE) sub group was formed in late FY 2009 to leverage standards developed in FILS for locations and vessels, and to provide more complete, accurate and reliable navigation information for monitoring commercial cargo and vessel activity on our Nation’s waterways, enforcing regulations, and making capital investment decisions. The FINDE sub group also developed a prototype project in New York that fuses Automated Identification System (AIS) data from the Coast Guard and other Federal sources together. It was expected that majority of the results of FINDE will be captured in FY 2010. However, despite the late formation in FY 2009, the group was able to improve the spatial coverage of commercial facilities in New York Harbor from 60% to 100%.

The University of Toledo prototype was completed in FY2009, and provides public access to the Corps inventory of commercial vessel and cargo handling facilities. As a result the lag time for providing facility information to the Corps and external customers was reduced from over a year to less than a week.

The Corps and Customs and Border Protection harmonized their dock inventory systems and further chartered a project to keep the systems in synchronization. The synchronization project will be completed by June 2010.

Navigation Infrastructure Inventory: Navigation Infrastructure Inventory information supports the USACE Federal Central Collection Agency responsibility for documenting the Nation’s commercial port infrastructure served by Federal channels. Data for approximately 40,000 individual navigation points of interest (NPIs) are published on the Internet. Dock data are updated as each port facility is contacted and characteristics are verified. New update and survey procedures are being developed to increase the frequency of update and to allow individual facility operators and port authorities to update their own facility information in the database.

Navigation Infrastructure Inventory information is used to identify industries served by the Federal channels and is part of the budgetary process of prioritizing projects. The U.S. Coast Guard (USCG) is another primary user of the information in the execution of its homeland security mission. A new initiative begun in FY 2008 was the formation of the Federal - Industry Logistics Standardization group, which is a working group comprised of the Corps, IRS, USCG, CBP and the barge and tow ing

industry. The highest priority task is to produce a definitive list of NPIs with unique identification codes and accurate geo-location that both the public and private sector can use when communicating with each other. A list of NPIs is located on the Corps' NDC website: www.ndc.iwr.usace.army.mil/ports/ports.htm.

Lock Performance and Characteristics: The lock performance database provides the USACE access to individual lock near-real-time information as well as summary and performance statistics. The data are entered into the database by the lock operator as the vessel is locking through the chamber. A national data warehouse provides all USACE users direct access to current and historical data and summaries. The data is used by the USACE and other agencies, such as the U.S. Coast Guard and the Tennessee Valley Authority (TVA), in the execution of their missions, and in the formulation of the USACE budget. A successful pilot project at several New Orleans lock sites demonstrated the ease of using the Coast Guard required vessel Automated Information System (AIS) signal to increase lock operator situational awareness by visualizing on a map the location and identification information of all vessels in the vicinity of the lock. This is now in production and daily use at all New Orleans navigation locks enabling the lock operator to better plan the locking sequence. To further the use of existing technology, selected timing events are automatically entered into the lock database as the vessel moves past designated trigger points in the locking process. This reduces the data entry demands on the operator and improves the accuracy of the database. Investigations are underway to implement this capability nationwide.

Lock characteristics data and the physical descriptions of all the USACE owned and operated locks are updated as information changes. Lock characteristics and performance information are available on the public web site, <http://www.ndc.iwr.usace.army.mil>. The lock databases are feeder systems to the OMBIL decision support system. The lock data are used to supply the OMB required performance data of lock unavailability due to mechanical problems.

Dredging Statistics: This web-based ORACLE database is successful in supplying information on all USACE performed and contracted dredging to the USACE, industry and private users. Data entry and report generation is accomplished via the USACE intranet and enables all USACE members to access the central system information. National briefings with Corps and Industry employ the data from this central system and the database is used to generate specific reports such as the Small Business Report for dredging contracts. Biweekly reports are posted on the public web site to inform the industry and public of Corps and contracted dredging activities. These reports are now available in downloadable spreadsheet format providing more functionality for report users. Standard reports and summaries plus customized queries and reports are quickly generated to meet Corps and user needs. Use of the information has resulted in improved bidding competition and more efficient utilization of dredging equipment. The dredging database is a feeder system to the OMBIL decision support system.

Recreation: Recreation data for the Corps' 4300 recreation areas are collected and maintained within the OMBIL database. Recreation inventory (recreation areas, visitor centers, facilities, and amenities), outputs (e.g. visitors, visitor hours) and activities (e.g. citations and interpretive contacts) are combined with revenues and expenditures to produce performance measures that assist the Corps in making management decisions for the Recreation program. This data is furnished to public websites such as Value to the Nation, www.vtn.iwr.usace.army.mil, CorpsLakes, <http://corpslakes.usace.army.mil/visitors> and the federal interagency recreation website at www.recreation.gov. In FY 2009, OMBIL has focused on improving the accuracy of the visitation data and the inventory of recreation projects. OMBIL also supported the budget process by

continuing to supply data to the *RECreation Budget Evaluation SysTem* (Rec-BEST), Recreation Self Assessment Tool, and RecStatus, project information and benchmarking report, developed by ERDC.

IWR, in collaboration with ERDC, has provided additional technical support to Corps Recreation Business line activities. The activities that were accomplished in FY 2009 include continued support the Performance Based Budget Development for Recreation Business line; Regional Economic Impact Analysis of Recreation; GIS Application and the implementation of Google Earth application for all Corps Recreation projects; and other miscellaneous technical support to Corps Natural Resources management activities.

IWR provided technical support for individual public survey submissions on recreation planning and recreation management.

Hydropower: Hydropower data from the 75 Corps power plants is collected and maintained within the OMBIL database. For those power plants in the Northwestern Division that have automated control systems (Generic Data Acquisition and Control System or “GDACS”), electronic upload of generation data is in place. Data such as power generation statistics, unit availability and revenue generated, enable the Corps hydropower program to determine its performance, make budgeting decisions and furnish OMB with program performance information. In FY 2009, all five hydropower performance measures for the FY 2011 budget process were supplied by OMBIL hydropower data. Also included in OMBIL Plus is a module related to capturing the ongoing water supply reallocation studies.

Water Supply: IWR serves as the HQUSACE national program manager for the Water Supply business program. In this capacity, the annual budget and the five-year development plan for that portion of the USACE Water Supply budget is developed in coordination with the MSCs and the strategic plan as presented in the Program Assessment Rating Tool. It is necessary to develop annual budget guidance to the MSCs, collect their data, prioritize it in conjunction with the seven other business lines and eight program areas, present the data to the senior leaders of Civil Works, the Assistant Secretary of the Army (Civil Works) and a panel of water supply examiners from OMB. The annual program must then be modified and adjusted as necessary based on OMB comments and directives.

IWR is responsible for the development and maintenance of the USACE database of Water Supply projects. This database was originally developed in 1996, updated in 2004 and again in 2005. In 2006 an effort was undertaken to develop a Water Supply module in OMBIL and this effort is still underway. This process, once loaded into the Water Supply module of OMBIL, will enable a continual update of the water supply data, similar to other business lines. There was no 2006 database due to the effort required to initiate the OMBIL effort. Beginning with the 2007 database, the yearly data reports have been a combination of the new OMBIL data, where loaded and the old 2005 data from those districts which have not completed the loading process. The 2009 database shows there are 133 Corps multipurpose projects which contain storage space for municipal and industrial water supply. These projects are located in 26 states and in 22 of the 38 Corps districts. In these projects the Corps has 366 repayment agreements representing some 11.14 million acre-feet of storage space and an investment cost of \$1.45 billion of which about \$800 million has been repaid with interest to the U.S. Treasury. The storage space is capable of providing some 5.4 billion gallons of water per day for use by municipalities and industries which have signed repayment agreements. This yield is capable of providing the indoor household needs of approximately 80 million people

and represents about seven percent of the nation's off stream municipal and industrial water supply needs.

During FY 2009 a water supply workshop was developed under the initiative and guidance of the Water Supply Business Line Manager. This workshop, held in Tulsa, OK from June 2-4, was attended by 64 people, including members of the Department of the Army Office of General Counsel, HQUSACE, four MSCs, 12 districts, IWR, the NWD Hydropower Analysis Center, as well as representatives from the Southwestern Power Administration and the states of Texas, Oklahoma and Kansas. The workshop proved very successful as a forum for participants to raise questions, share experiences, present their water supply management approaches and increase their knowledge of the USACE municipal and industrial water supply program and policies. The presentations from the workshop can be found at the Institute's website: <http://www.iwr.usace.army.mil/inside/products/pub/pubCleanWaterSupplyWorkshopPrs.cfm>.

Optimization Tools for Navigation (OTN): The optimization tools for navigation program supports multiple initiatives concerning methods and analyses to minimize costs or enhance efficiencies for asset management of the Corps' waterborne navigation operation and maintenance (O&M) program. Related initiatives include support for enhanced development and field testing of the *Channel Analysis Design Evaluation Tool* (CADET) in partnership with ERDC as technical scoping and review lead and NAVSEA-Carderock as prime technical developer. Also supported is the development of a centralized system for benefit evaluation of the O&M program for deep-draft harbors (the *National Navigation Operation and Maintenance Performance Evaluation and Assessment System*, also referred to as "NNOMPEAS") and investigations and research conducted in concert with the U.S. Naval Academy, to better quantify critical inputs for navigation analysis.

INTERNATIONAL WATER RESOURCES

The Institute formed the International Water Resources program in 2006 as a means to better coordinate the various international initiatives that are under its purview. These initiatives fall into three categories: global water resources strategies, international partnerships, and technical and advisory support. These initiatives and the major projects that fall under them include:

International Upper Great Lakes Study: Throughout FY 2009, IWR played a major role in directing and managing the activities of the International Upper Great Lakes Study. The Study was initiated in 2007 under a Memorandum of Agreement (MOA) between IWR and the International Joint Commission (IJC) for a 5-year, \$15 million US-Canadian study focusing on the *Lake Superior Regulation Plan* and the potential erosion problems associated with the St. Clair River channel. Drs. Eugene Stakhiv and Anthony Eberhardt are the U.S. co-Director and co-Manager of the Study. IWR is leading the U.S. contributions to the study, as was the case with the last IJC Great Lakes Study, the International Lake Ontario-St. Lawrence River Study, completed in 2006.

The first phase of the Study, which investigated factors possibly responsible for recent declining water levels in Lakes Michigan, Huron and Superior, will be completed during the first quarter of FY 2010. The report, entitled "Impacts on Upper Great Lakes Water Levels: St. Clair River", describes the investigations of nearly one hundred scientists from dozens of agencies and universities from the United States and Canada. It concludes that although man-made factors such as dredging have increased the flow capacity of the St. Clair River, the main factors responsible for the decline are

related to natural hydroclimatic variability and glacial isostatic adjustments. Since the factors are natural, no remediation will be recommended.

Upon completion of the first phase of the study, emphasis will shift to investigating improvements that can be made in the management of outflows from Lake Superior. The work will concentrate on defining performance indicators and “coping zones” related to coastal processes, hydropower, commercial navigation, recreational boating, municipal and industrial water uses and the ecosystem. A shared vision model will use these indicators and zones to formulate and evaluate alternatives to the Lake Superior regulation plan, 1977-A, which has been in use since the early 1990s. An adaptive management strategy will also be developed so that future hydrologic conditions can be considered both with existing outflow control works in the St. Mary’s River and possible additional structures in other Great Lakes connecting channels such as the Detroit and Niagara Rivers. The work of this phase is managed by the Lake Superior Regulation Task Team. Dr. Eberhardt is the US Co-Lead of the Task Team. The International Upper Great Lakes Study is scheduled for completion in March 2012.

International Center for Integrated Water Resources Management (ICIWaRM): USACE and IWR continue to take an active role in international water related research and policy issues through the *International Center for Integrated Water Resources Management (ICIWaRM)*. During FY 2009, efforts continued towards receiving official United Nations Educational, Scientific and Cultural Organization (UNESCO) approval of the International Center for Integrated Water Resources Management as a Category II Centre.

The International Center for Integrated Water Resources Management had been selected as the U.S. Government nominee for consideration as a UNESCO Category II Centre in February 2008 after a national-level competition. With the support of the U.S. National Commission for UNESCO, the U.S. National Committee for UNESCO’s International Hydrological Programme (IHP), the U.S. Permanent Representative to UNESCO, and the Assistant Secretary of the Army for Civil Works, ICIWaRM’s nomination was submitted to UNESCO Headquarters, approved by the IHP Bureau in March 2008, and endorsed by IHP’s 36-member nation Intergovernmental Council (IGC) in June 2008. The nomination of ICIWaRM was endorsed by the UNESCO Executive Board in September 2009. It is expected that approval by all 193 member states of UNESCO will take at the General Conference in Paris in October 2009. Official designation as a UNESCO Category II Centre will take place at a ceremony at UNESCO Headquarters in New York City in late October 2009.

Activities and projects: During FY 2009, a new initiative undertaken by the ICIWaRM has been in support of the *Modernization of Management of Water Resources Project* in the nation of Peru. The nation of Peru is undergoing a fundamental shift in the way it manages its water resources. In March 2009, a new water law was passed authorizing the creation of a National Water Authority (ANA) and River Basin Councils (RBC) to implement Integrated Water Resources Management (IWRM) planning at a national level scale. In support of the Government of Peru to implement integrated water resources management, ICIWaRM is providing technical advice and capacity building in coordination with the National Water Authority (ANA) and the project lenders, the World Bank and the Inter-American Development Bank, which are providing loans in the amount of US \$20 million in support of the project. ICIWaRM team members Drs. Guillermo Mendoza (IWR), Hal Cardwell (IWR) and Aleix Serrat-Capdevila (University of Arizona, Center for Sustainability of Semi-Arid Hydrology and Riparian Areas) led an IWRM workshop for ANA in August 2009 in Lima, Peru. The workshop focused on the application of Shared Vision Planning, an integrated participatory water resources planning tool, within the context of a Peruvian setting. As a follow up to the

workshop, ICIWaRM staff has been collaborating with national and regional ANA staff to develop shared vision planning guidelines based on Peru's unique needs.

In another case of ICIWaRM staff supporting technical assistance in Latin America, Dr. Jason Giovannetone continued work on the development of a Drought Atlas for selected pilot areas of Latin America in partnership with the Water Center for Arid and Semi-Arid Zones in Latin America and the Caribbean (CAZALAC) — another UNESCO Category II Water Centre, with whom IWR entered into a Memorandum of Understanding in July 2006. This project was inspired by the IWR's National Drought Atlas of the U.S. — a unique source of information about the frequency, severity and duration of drought as reflected by precipitation depths and streamflows.

Also in FY 2009, another member of the staff of the ICIWaRM, Dr. Eugene Stakhiv, co-chaired a UNESCO Sponsored Steering Committee tasked with preparing guidelines to assist water resources practitioners in finding better and more efficient solutions to water resource problems, as well as playing a catalytic role in promoting holistic integrated actions amongst water practitioners, ultimately leading to more sustainable societies. Towards that end, under Dr. Stakhiv's guidance, the Steering Committee produced four documents: *IWRM Guidelines at River Basin Level – Part I: Principles*; *The Guidelines for IWRM Coordination – Part 2-1*, *The Guidelines for Flood Management – Part 2-2*, and *Invitation to IWRM for Irrigation Practitioners – Part 2-3* in 2009.

Future activities planned for FY 2010 include Dr. Stakhiv's collaboration with the Global Water Partnership in organized the first inter-academic US-Ukrainian meeting on scientific approaches to adaptation to climate change in the water sector, including flood protection activities in Carpathian Region. Included on the agenda of the meeting are the following topics: Climate Change in the Black Sea Region as part of the Global Climate System; Climate Change and Floods; Reservoirs and Irrigation Systems Management; and Ground Water.

World Water Assessment Program: The World Water Assessment Programme (WWAP) is the flagship programme of UN-Water. Housed in UNESCO, WWAP monitors freshwater issues in order to provide recommendations, develop case studies, enhance assessment capacity at a national level and inform the decision-making process. ICIWaRM provided extensive support to the WWAP in 2009, and in particular on its preparation of the third *World Water Development Report* which was released during the 5th World Water Forum in Istanbul, Turkey, in March 2009. IWR staff and fellows contributed in the areas of indicators, water policy, waterway transport and climate change adaptation.

World Water Council: The *World Water Council* (WWC) is an international association of over 400 public and private organizations involved in water-related activities. Established in 1996, the WWC includes the principal United Nations water agencies and international banks as its founding organizations. The main activity of WWC is hosting the World Water Forum, which is held once every three years. As the main international event on water, it seeks to enable multi-stakeholder participation and dialogue to influence water policy making on a global scale, thus assuring better living standards for people all over the world and a more responsible social behavior towards water issues in line with the pursuit of sustainable development. IWR's ongoing engagement with the WWC reached a new threshold in FY 2009 through numerous contributions to the 5th *World Water Forum* (WWF) which was held 16-22 March 2009 in Istanbul, Turkey, with the theme "Bridging Divides for Water." Mr. Steven L. Stockton, HQUSACE Director of Civil Works, was elected to the WWC Board of Governors in 2006 and continued to serve on the board through 2008 and into 2009. Mr. Stockton will be eligible for re-election to the Board of Governors in November 2009. Dr. Jerry Delli Priscoli (IWR)

serves as the alternate and is a representative on the WWC Executive Bureau. Ongoing WWC activities involve close liaison with the U.S. State Department, in particular, the Bureau of Near Eastern Affairs and the Bureau of Oceans and International Environmental and Scientific Affairs, on the dialogues and content of the WWF, so as to assist U.S. interests.

The 6th *World Water Forum* will be held in 2012 in Marseilles, France. Dr. Delli Priscoli has been appointed to serve on the international steering committee for this forum.

Fifth World Water Forum: IWR's ongoing engagement with the World Water Council reached a new threshold in FY 2009 through numerous contributions to the 5th *World Water Forum* (WWF5), which took place 16-22 March 2009 in Istanbul, Turkey. IWR was actively involved in the extensive WWF5 Thematic, Regional and Political preparatory processes, which began in 2007 and resulted in the definition of six themes and twenty-four topics under the overarching Forum theme "Bridging Divides for Water". Mr. Lindy Wolner, detailed in March 2008 from HQUSACE, Office of Interagency and International Services, served as resident IWR liaison for a one-year assignment at the Secretariat for WWF5, located with the General Directorate State Hydraulic Works (DSI) in Istanbul. A key part of the liaison assignment was to identify and promote U.S. Government agency and stakeholders engagement in the WWF5 preparatory process, providing a linkage between the WWF5 Secretariat, WWC, USACE and a broad range of international and interagency water institutions and organizations, including the U.S. State Department, other U.S. agencies, NGO's, the private sector, and various international partners.

IWR's commitment and support of successive WWF's is another means of applying the USACE's extensive institutional expertise to the issues raised in government reports including the *Senator Paul Simon Water for the Poor Act, 2009 Report to Congress*, prepared by the U.S. State Department, and the USAID report entitled *Addressing Water Challenges in the Developing World - A Framework for Action*. The USAID report identifies three key challenges that must be addressed to achieve a water secure world. These include, improving water resources management among competing needs; improving access to water supply and sanitation, and promoting better hygiene; and improving water productivity in agriculture and industry. IWR staff in collaboration with USACE Headquarters staff provided significant input to both of these reports.

These activities and subsequent efforts by IWR will contribute to the successful implementation of WWF5 outcomes, strengthen and expand interagency and international partnerships, and help to achieve U.S. government goals for international water resources.

Other notable international activities in FY 2009 included USACE led training sessions on conflict management techniques for the Mekong River Commission held in Bangkok, Thailand and Vientiane, Laos; and USACE participation in the *United Nations High Level Expert Panel on Water and Disasters*, chaired by the Prime Minister of South Korea, Han Seung-soo Han. The panel was originally convened in 2007 by the U.N. Secretary General's Advisory Board on Water and Sanitation in response to the unprecedented climate-related disturbances such as droughts, hurricanes, floods and tsunamis over the last decade. USACE Commander and Chief of Engineers Lieutenant General Robert L. Van Antwerp represented USACE on the *High Level Expert Panel*, along with the participation of Mr. Steven L. Stockton, HQUSACE Director of Civil Works, and Dr. Jerry Delli Priscoli of IWR. The USACE hosted the *High Level Expert Panel's* fourth meeting, held in New Orleans, LA, in October, 2008. The *High-Level Expert Panel* presented its findings and action agenda at the 5th *World Water Forum* in Istanbul, Turkey, in March 2009.

During FY 2009, Dr. Delli Priscoli continued to serve as Editor-in-Chief for *Water Policy*, an internationally acclaimed peer-reviewed international journal that is published six times per year. China will now be translating each edition of *Water Policy* into Chinese for distribution across China.

UNESCO Partnerships: A large number of UNESCO-related activities are sanctioned by the U.S. Government, in particular those related to the U.S. National UNESCO Commission and the U.S. International Hydrological Programme (IHP) Committee.

In 2006, the IWR Director, Robert A. Pietrowsky, was selected to be one of six permanent Federal agency members of the newly established U.S. National IHP Committee, and he has been part of the USG delegations to UNESCO at the IHP Intergovernmental Council (IGC) Meetings in 2004, 2006 and 2008.

IWR personnel gave presentations at and otherwise participated in the Fall 2008 and Spring 2009 meetings of the U.S. National IHP, as well as a U.S. hosted meeting of UNESCO Region 1 (Western Europe, North America, Turkey and Israel) IHP Committees. IWR personnel also attended by invitation a meeting of the Region 2 (Latin America and the Caribbean) IHP Committees.

In support of these activities, USACE has five MOUs with IHP and its UNESCO water centers: an umbrella agreement with IHP; a second MOU with UNESCO-IHE (Institute for Water Education, Delft, the Netherlands); and newer IWR agreements with ICHARM (International Center for Hazard and Risk Management) in Tsukuba, Japan (signed July 3, 2006); CAZALAC (Centre for Arid and Semi-arid Zones of Latin America and the Caribbean) in Chile (signed July 3, 2006); and CATHALAC (Water Center for Humid Tropics of Latin America and the Caribbean) in Panama (signed August 22, 2007).

IWR manages these agreements and is also engaged through an MOU with the Global Water Partnership (GWP) and its efforts to implement integrated water resources management in developing countries. GWP is an international NGO with the financial support of the European Union and the World Bank. IWR has been working with select members of GWP Technical Working groups to develop IWRM protocols.

During 2009, a key set of activities involved moving forward USACE IWR's International Center for Integrated Water Resources Management (ICIWaRM) toward an eventual designation by UNESCO as a Category II Center. The center had been selected as the U.S. Government nominee for consideration as a UNESCO center in February 2008 after a national-level competition. With the support of the U.S. National UNESCO Commission, the U.S. National Committee for UNESCO's International Hydrological Programme (IHP), the U.S. Permanent Representative to UNESCO and the Assistant Secretary of the Army for Civil Works, ICIWaRM's nomination was submitted to UNESCO Headquarters, and subsequently approved by the IHP Bureau in March 2008. Ultimately, the center was endorsed by the IHP 36-member nation Intergovernmental Council (IGC) in June 2008 at its bi-annual meeting at the UNESCO Headquarters in Paris, France. IWR Director Robert A. Pietrowsky and Dr. Eugene Z. Stakhiv were part of the official USG delegation attending the IGC meeting. During the IGC meeting, Dr. Stakhiv was also re-elected to a four-year term to the Advisory Board for UNESCO's International Center for Water Hazards and Risk Management (ICHAARM) in Tsukuba, Japan.

Support for UNESCO's Hydrology, Environment, Life and Policy (HELP) program continued in partnership with one of ICIWaRM's core partners - the National Science Foundation's Science and Technology Center for Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHARA) at The

University of Arizona. ICIWaRM co-sponsored a HELP workshop for the Western Hemisphere, hosted at SAHARA in November 2008 in Tucson, Arizona.

Another high visibility international water resources activity in support of the Mekong River Commission (MRC) was carried out in collaboration between IWR-ICIWaRM, HQUSACE, USACE Northwestern Division, Portland District, and other key U.S. agencies such as the Bonneville Power Authority (BPA). This involved a technical exchange and a study tour to the Columbia River Basin by fifteen senior officials of the Mekong River Commission (MRC) led by Dr. Jerry Delli Priscoli of IWR. The MRC chose the basin because it and the Mekong share some similar natural characteristics and because several decades ago the Columbia faced similar development and management decisions as many of the Mekong Basin countries face now. In addition, the Columbia River Basin demonstrates innovative approaches in basin management and public participation. A similar second study tour funded by the World Bank was conducted for senior World Bank officials and Brazilian water resources officials.

Upon his re-appointment to the ICHARM Advisory Board in June 2008, Dr. Eugene Stakhiv was subsequently elected as board chairman, while also serving as co-chair of the joint UNESCO-IHP & Network of Asian River Basin Organizations (NARBO) sponsored initiative to develop IWRM Guidelines at the river basin level. IWR Director, Robert Pietrowsky, continued his service as a member of the Governing Board of UNESCO-IHE in Delft, The Netherlands. He also co-presented a paper entitled *Putting UNESCO Centers to Work: Implementing the IHP-VII Program in Developing Nations* at UNESCO's International Conference on *Water Scarcity, Global Changes, and Groundwater Management Response*, December 2008 at Irvine, CA,

At the close of 2008, Dr. Will Logan of USACE IWR-ICIWaRM was selected to serve at the U.S. Mission to UNESCO in Paris as the U.S. Science Attaché in 2009 and served in this role during the first half of 2009. In addition to assisting with the approval process needed to gain UNESCO designation of ICIWaRM as a Category II Centre, Dr. Logan was responsible for most matters related to science and engineering and represented the U.S. Government on science issues during meetings of UNESCO's General Conference and Executive Board. Dr. Logan also assisted in securing membership for the United States on the UNESCO IHP's Intergovernmental Panel for the period from 2010 – 2014, which will permit the United States to have a more effective and influential role in the future direction of the IHP.

Dutch Rijkswaterstaat: The Corps signed an MOA with the Dutch Directorate for Public Works and Water Management (Rijkswaterstaat, "RWS"), part of the Ministry of Transport, Public Works, and Water Management in May 2004 as a means to more effectively exchange information and resources. The RWS has a mission quite similar to that of the USACE and much collaboration has transpired regarding flood and coastal zone management, urban protection, flood risk and safety measures and general water resources policies that highlight the similarities and differences between our respective countries.

This exchange of technical expertise has been particularly useful in the wake of coastal hurricanes in 2005 (Katrina and Rita) and 2008 (Gustav). The following are the main areas of focus.

- **Dredging:** The Dutch have extensive experience and a long history of the subject of dredging and dredging technologies, including the re-suspension of sediments as a result of dredging activity; handling and treatment of contaminated sediment; risk assessment and

characterization, remediation options, confined disposal techniques, and beneficial use; and methods for reducing dredging costs.

- **Coastal Zone Management:** The Dutch have developed an extensive range of structural and non-structural approaches to coastal zone management, including an array of storm surge barriers, flood gates, reinforced levees and floods. In 2006 the Dutch government developed the “Room for the River” program which involves a number of innovative techniques designed to improve floodplain management. The program design presents an integrated spatial plan with the main objectives of flood protection, master land use planning, and an improvement of the overall environmental conditions.
- **Risk and Reliability:** The Dutch have worked closely with the Corps on post-Katrina support and they have developed a unique approach to addressing flood and storm safety. The United States and the Netherlands have much to share in terms of addressing the subject of risk and reliability. The exchange of ideas regarding the principles of risk and reliability has application to activities in many Corps district offices including New Orleans, Sacramento, and Jacksonville.

In May 2009 a delegation from the U.S., including representatives from the USACE, visited the Netherlands to learn about the Dutch experience with respect to water management, climate change and growth stewardship and provide technical exchange on the subject of the U.S. national response framework and the role of the Corps of Engineers in emergency preparedness, response, recovery and mitigation.

The first draft of a study comparing and contrasting water management trends in the United States and the Netherlands has been prepared and is undergoing review for publication in 2011.

In FY 2010 USACE plans to pursue a multilateral agreement with Japan and the Netherlands to develop internationally agreed upon standards for levee evaluation and construction.

Japanese Ministry of Land, Infrastructure, Transport: USACE participates in an ongoing technical exchange program with the River Bureau of the Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT). The program is governed by an *Implementing Arrangement (IA) under the “Agreement between the Government of the United States of America and the Government of Japan on Cooperation in Research and Development in Science and Technology,”* signed in Toronto, Canada on June 20, 1988, as amended and extended. The IA was signed by the USACE Chief of Engineers at the Third World Water Forum in Kyoto, Japan, in March 2003 and renewed for an additional 5-year term on 26 February 2008. The IA names the Chief of Hydrology and Hydraulics at the St. Louis District as the Technical Program Officer (TPO), responsible for the technical exchange on the USACE side and names the Director of Civil Works as the oversight authority for the exchange. The national project management oversight authority has been delegated to IWR and within the Institute to HEC. To date, the exchange has consisted of annual technical exchange meetings alternating between sites in the U.S. and Japan and facilitation of requests for information between USACE and the River Bureau.

The agreement has not only fostered the exchange of water resources technical and management information, but also may be considered part of the growing relationship on cooperation on

addressing large scale disasters, improving water conditions that lead to country stability, and the overall U.S.-Japan relationship in support of our national security interests in Asia.

Under the auspices of the agreement with MLIT, Mr. Leonard Hopkins, the TPO, and Mr. Tom Evans of HEC Water Management Systems Division, hosted a Japanese delegation at a technical meeting in New Orleans, in January 2009, marking the 5th U.S.-Japan Conference on Flood Control and Water Resources Management. Topics discussed at the conference included climate change, risk management, natural environment and preservation, and river information systems. Corps representatives gave presentations on Emergency Management, Response to Global Climate Change, and the Corps Flood Risk Management Program.

International Technical Reimbursable Projects: In FY 2009, HEC was involved in several international activities. In March 2009, HEC participated in the World Water Forum in Istanbul, Turkey. Presentations were made and a Learning Center workshop was presented. In June 2009, training was provided at HEC for a group of military and emergency leaders from Kazakhstan. The class consisted of basic HEC-HMS and HEC-RAS training. HEC also participated in a Watershed Assessment study of the Helmand Province in Afghanistan. This was led by AED and was a multiple District effort. The goal was to identify possible small dam sites for impoundment of water for irrigation. This study is expected to resume in FY10. Work on the development of an HMS model for the Ogaden Basin in Ethiopia continued. This work was done in conjunction with Naval Facilities (NAVFAC). This model will be turned over to NAVFAC when completed. HEC also participated in Civil-Military Emergency Preparedness (CMEP) activity in Guyana. HEC-RAS and HEC-HMS models were constructed and training provided on the use of these models and how to use some of the HEC GIS tools. Over the years, HEC has participated in several CMEP activities in various countries. Additionally, several international groups have visited HEC to understand what we do and see if there are ways they could collaborate with us.

Lastly, a collaborative effort between HEC and the USGS on combining the HEC-RAS software with the USGS's ModFlow software is continuing. It was been decided to use a method developed in Europe, OpenMI, to facilitate this combination. Coordination is continuing with the Deltares organization in the Netherlands. Deltares has expertise that HEC has contracted to help with the software combination. HEC and Deltares personnel had a very productive week-long meeting at HEC and additional collaboration is scheduled in the future.

WORLD ASSOCIATION FOR WATERBORNE TRANSPORT INFRASTRUCTURE (PIANC)

The World Association for Waterborne Transport Infrastructure (PIANC), formerly known as the International Navigation Association, is an organization with twenty-two national sections and membership in 65 countries, including 31 qualifying members, two international river commissions, about 450 corporate members (private companies, harbor agencies, firms, laboratories, universities, etc.) and about 2,000 individual members. From its headquarters in Brussels, Belgium, it acts as a clearinghouse of technology and experiences relating to ocean and inland navigation improvements which are exchanged among engineers, scientists, port operators, and marina and vessel owners, to name a few. Its objective is to advance, on a worldwide basis, the sustainable development of all kinds of navigation through the exchange of technical information on port and waterway development. The objective of the Association is met by holding International Congresses and by publishing technical bulletins and special reports. Special reports are published describing the results of the work of international research teams, or working groups, composed of those national members

interested in the particular subject under study. The organization also serves as an excellent source of identifying individual and corporate expertise throughout the world on PIANC-related subjects.

The United States, a member of PIANC since 1902, provides an annual appropriation for the support and maintenance of the organization. This includes an annual subvention to PIANC and payment of a portion of the travel expenses of officially appointed U.S. delegates (Commissioners) to meetings of the Annual General Assembly and Congresses. The annual appropriation for the U.S. Section PIANC is currently \$45,000, including the annual subvention of approximately \$15,000. The U.S. Section is administered by law under the auspices of the USACE. It is located at the IWR NCR Humphreys Engineer Center facility. The U.S. Section is composed of dues-paying individual and corporate members. U.S. Section membership on September 30, 2009 totaled 221, consisting of 194 individual members and 27 corporate members.

United States National Commission: The United States National Commission constitutes the governing body of the U.S. Section. In 2009 the ex-officio officers of the U.S. National Commission were: Chairman, Jo-Ellen Darcy, Assistant Secretary of the Army (Civil Works); President, MG Meredith W.B. Temple, Deputy Commanding General for Civil Works and Emergency Operations; Secretary, Ms. Anne Cann, an employee of IWR.

In 2009, U. S. National Commissioners were: Mr. Shiv Batra, Vice President representing the Western Region and President, INCA Engineers, Inc.; Mr. James McCarville, Vice President representing the Eastern Region and Executive Director of the Port of Pittsburgh Commission; Dr. Robert Engler, Vice President representing the Central Region and Senior Environmental Scientist, Moffatt and Nichol; Mr. John Headland, Senior Vice President and Regional Manager, Moffatt and Nichol; Mr. Dave Sanford, Director of Navigation Policy and Legislation, American Association of Port Authorities; Dr. Craig E. Philip, President and CEO, Ingram Barge Company; Mr. Dominic Izzo, Project Director, KBR; and Dr. Sandra Knight, Office of Oceanic and Atmospheric Research, NOAA.

PIANC Activities: PIANC, in cooperation with the Japan International Cooperation Agency, the U.S. Army Corps of Engineers, and the Japan Ministry of Land, Infrastructure and Transport, organized and conducted a Special Session on Inland Waterborne Transport (IWT) at the 5th World Water Forum (WWF) in Istanbul, Turkey in March 2009. The WWF is one of the largest international water-related events, and for the first time in WWF's history, inland navigation was included on the agenda. PIANC USA took this the opportunity to involve PIANC in this conference in order to strengthen PIANC's role as the leading international authority on inland navigation. The IWT session was organized by Mr. Ian White, Chairman of PIANC's Inland Navigation Commission, and Ms. Anne Cann, Secretary of PIANC USA. PIANC also producing a Side Paper published by the United Nations World Water Assessment Programme entitled, "Inland Waterborne Transport: Connecting Countries."

In July of 2009, the US Section of PIANC held its Annual Membership Meeting in Pittsburgh, PA, at the Port of Pittsburgh Commission and co-hosted by the USACE Pittsburgh District. More than 90 PIANC USA members participated in the full day meeting which included technical presentations including "Navigation Infrastructure Data Updates - USACE & Public Participation" and "Life Cycle Management of Port Structures - Recommended Practice for Implementation."

The 2009 PIANC USA winner of the DePaepe-Willems Paper Competition presented his winning paper on "Investigation of Turbulence Characteristics for Model Cutter Suction Dredging

Operation.” A networking reception was held that evening, including a PIANC Young Professionals social.

In May of 2009, the PIANC International Annual General Assembly (AGA) was held in Helsinki, Finland. Members of the U.S. delegation included MG Meredith W.B. Temple, Ms. Anne Cann, Mr. Shiv Batra, Dr. Robert Engler, Mr. James McCarville, Mr. John Headland, Thorndike Saville, Jr., P.E., and Mr. Harry Cook.

In September 2009, PIANC USA helped organize the Smart Rivers 2009 Conference in Vienna, Austria. More than 60 people attended from the United States, and several gave presentations.

As part of the U.S. Section’s Latin American outreach activities, PIANC USA participated in the first Hemispheric Convention on Port Environmental Protection held in Foz do Iguacu, Brazil, July 2009. In addition, Ms. Lillian Almodovar presented a paper at the Hemispheric Seminar on Challenges of Women in Ports held in Santo Domingo, Dominican Republic, August 2009. Mr. David Grier, U.S. Army Corps of Engineers, serves as the PIANC USA Latin American liaison.

In 2009 PIANC USA launched a redesigned website with a broader, in-depth scope of information on issues and concerns of PIANC members and USACE personnel working in the navigation industry. Announcements, publications and fact sheets, past and upcoming conferences, news and events, membership information, and organizational and administrative concerns are presented in a fresh layout and structure, with greater detail and easier navigation. This redesigned web site has a clean, contemporary look and is more friendly and informative (www.pianc.us). Starting in 2009, the U.S. Section began producing a bi-monthly newsletter (instead of quarterly), *PIANC Bulletin*, containing U.S. Section information and industry news. Kelly J. Barnes, U.S. Army Corps of Engineers, ERDC, is the editor of the PIANC Bulletin.

PIANC Executive Committee (ExCom): PIANC International’s Executive Committee ensures the executive management of the Association and monitors the decisions and directives of the AGA and the Council. The U.S. representative on the ExCom is Mr. Shiv Batra, President, INCA Engineers, Inc. (Vice President of Western Hemisphere).

Representatives to Committees and Commissions: The principal business of PIANC is the sponsorship of technical working groups. The U.S. Section is represented by Principal and Co-Principal Members of the Commissions managing technical working group activities. The U.S. representatives were:

Environmental Commission — Dr. Susan Rees, U.S. Army Corps of Engineers, Mobile District; Dr. Todd Bridges, U.S. Army Corps of Engineers, ERDC. Young Professional Representative: - Ms. Sandra Brasfield, U.S. Army Corps of Engineers, ERDC.

Inland Navigation Commission — Mr. John Clarkson, U.S. Army Corps of Engineers, Huntington District; Mr. William Ronald Coles, WR Coles and Associates

Maritime Navigation Commission — Mr. E. Dan Allen, Moffatt and Nichol, and Mr. Vahan Tanal, Vahan Tanal Consulting.

Recreational Navigation Commission — Mr. Bob Nathan, Moffatt and Nichol; Mr. Jack C. Cox, HDR. Young Professional Representative: Ms. Jessica McIntyre, Moffatt and Nichol.

International Cooperation Commission – Mr. David Grier, U.S. Army Corps of Engineers; Bengt Bostrom, Consultant. Mr. Edward Schmeltz, AECOM, serves as the Chair of the Commission.

Promotion Commission – Dr. Thomas Wakeman, Stevens Institute of Technology

Young Professionals Commission – Ms. Jessica McIntyre, Moffatt and Nichol

New Technical Working Groups: In 2009, ten new Working Groups were formed. The groups are listed below along with the name of the U.S. Representatives.

InCom 137 (Navigation Structures Resilience to Overloading) – David Sullivan (Chair), Dale Miller, and Kenton Braun (YP)

InCom 138 (Mechanical and Electrical Engineering Lessons Learnt from Navigation Structures) – Brenden McKinley, Tim Paulus

InCom 139 (Values of Inland Waterways) – David Grier

InCom 140 (Semi-Probabilistic Design Concept for Inland Hydraulic Structures) – Andy Harkness, Robert Patev, Anjana Chudgar and Perry Cole

InCom 141 (Design Guidelines for Inland Waterways) – Elizabeth C. Burg

InCom 142 (Inland Navigation Safety) – John Clarkson (Chair), Jeff Lillycrop, Joshua VerDught (YP)

MarCom 144 (Classification of Soils and Rocks for the Maritime Dredging Process) – Majid Yavary, Greg Sraders

MarCom 145 (Berthing Velocities and Fender Design) – Cliff Ohl, Elizabeth Burkhart, Kevin Matakis

EnviCom 143 (Screening Evaluation of Environmental Effects of Navigation and Infrastructure Projects) – Igor Linkov, Burton Suedel, Sandra Brasfield (YP)

EnviCom Permanent Task Group (Climate Change Permanent Task Group) – Dr. Kate White, Rolf Olsen, Jason Giovannetone (YP)

Working Group Reports Published in 2009: In 2009, four Working Group Reports were published. The Reports are listed below along with the name of the U.S. Representatives. PIANC changed the Working Group/Report numbering system in 2008.

InCom 106 (old #29) (Innovations in Navigation Lock Design) — Dale Miller and YP Michael Tarpey

RecCom 105 (old #15) (The Use of Alternative Materials in Marina Construction) — Terrence Browne

EnviCom 109 (old #11) (Long Term Management of Confined Disposal Facilities for Dredged Material) — Dr. Michael Palermo and Dr. Paul Schroeder

EnviCom 107 (old #12) (Sustainable Waterways within the Context of Navigation and Flood Management) — Dr. Craig Fischenich and John Clarkson

2009 Active Working Groups and the names of the U. S. Representatives:

InCom 30 (Inventory of Inspection and Repair Techniques of Navigation Structures) — Robert Willis, Ron Heffron, and YP Chad Linna

InCom 31 (Organization and Management of River Ports) — Jim McCarville

InCom 32 (Performance Indicators for Inland Waterways Transport) — William Harder

InCom 127 (Fish Passage) – Mark Cornish, John Plump, and YP Aaron Buesing

InCom 128 (Alternate Bank Protection Methods for Inland Waterways) – S. Kyle McKay

InCom 129 (Waterway Infrastructure Asset Maintenance Management) - José E. Sánchez and James R. Fisher

InCom Permanent RIS WG (River Information Services) – Richard Lockwood and Jeff Fritz

InCom 137 (Navigation Structures Resilience to Overloading) – David Sullivan (Chair), Dale Miller, and Kenton Braun (YP)

InCom 138 (Mechanical and Electrical Engineering Lessons Learnt from Navigation Structures) – Brenden Mc Kinley, Tim Paulus

InCom 139 (Values of Inland Waterways) – David Grier

InCom 140 (Semi-Probabilistic Design Concept for Inland Hydraulic Structures) – Andy Harkness, Robert Patev, Anjana Chudgar and Perry Cole

InCom 141 (Design Guidelines for Inland Waterways) – Elizabeth C. Burg

InCom 142 (Inland Navigation Safety) – John Clarkson (Chair), Jeff Lillycrop, Joshua VerDught (YP)

MarCom 39 (Monitoring of Breakwaters) — James D. Prehn

MarCom 46 (Maritime Freight Transshipment) - Doris Bautch

MarCom 47 (Criteria for the Selection of Breakwater Types and their Optimum Damage Risk Level) — Dr. Jeffrey A. Melby

MarCom 48 (Guidelines for Port Constructions, Related to Bowthrusters) — Marcel Hermans and Gary Greene

MarCom 49 (Horizontal and Vertical Dimensions of Fairways) — Michael J. Briggs

MarCom 50 (General Principles for the Design of Maritime Structures) — Bill Papparis

MarCom 51 (Water Injection Dredging) — Timothy L. Welp

MarCom 52 (Criteria for the (Un-)Loading of Container Ships) — Dan Allen

MarCom 53 (Design and Construction of Maritime Structures in Tsunami Prone Areas) — John R. Headland and Michael J. Briggs

MarCom 54 (Use of Hydro/Meteo Information to Optimize Safe Port Access) — Robert Weeks and Majid Yavary

MarCom 55 (Safety Aspects of Berthing Operations of Oil and Gas Tankers) — Larry Cunningham, Sarah Rollings, and YP Larry Wise

MarCom 56 (Application of Geotextiles in Waterfront Protection) — Doug Gaffney

MarCom 57 (Stability of Pattern Placed Revetment Elements) — Margaret Boshek

MarCom 135 (Design Principles for Container Terminals in Small and Medium Ports) - Dimitris Pachakis, Laurence Emsley and Steven Gray

MarCom 144 (Classification of Soils and Rocks for the Maritime Dredging Process) – Majid Yavary, Greg Sraders

MarCom 145 (Berthing Velocities and Fender Design) – Cliff Ohl, Elizabeth Burkhart, Kevin Matakis

RecCom 17 (Guidelines for Marina Design) — Dennis Kissman

RecCom 130 (Anti-sedimentation Systems for Marinas and Yacht Harbors) - Richard Dornhelm

RecCom 131 (Catalogue of Marina Construction Elements) – no U.S. representative

RecCom 132 (Dry Stack Storage) – Tonu Mets

RecCom 133 (Economic Aspects of Recreational Navigation) – Michael Herrman

RecCom 134 (Design and Operational Guidelines for Superyacht facilities) – Mark Pirrello

EnviCom Expert Group 2 (Environmental Benefits of Waterborne Transport) — Keith Hofseth (chair), Alfred Cofrancesco and Nick Pansic

EnviCom 15 (Environmental Aspects of Dredging and Port Construction Around Coral Reefs and Cold Water Hard Bottom Benthic Communities) — Dr. Mark Sudol and Russ Kaiser

EnviCom 16 (Management of Ports and Waterways for Fish and Shellfish Habitat) — Dr. Douglas Clarke

EnviCom Expert Group 3 (Climate Change and Navigation) — Dr. James Corbett

EnviCom 136 (Recommendations for Sustainable Maritime Navigation) – David Moore

EnviCom 143 (Screening Evaluation of Environmental Effects of Navigation and Infrastructure Projects) – Igor Linkov, Burton Suedel, Sandra Brasfield (YP)

EnviCom Permanent Task Group (Climate Change Permanent Task Group) – Dr. Kate White, Rolf Olsen, Jason Giovannetone (YP)

CoCom 2 (Best Practice for Shoreline Stabilization Methods) — Lesley Ewing

CoCom 126 (Training in Ports and Waterways) – Dr. Billy Edge

IWR and U.S. Section PIANC Coordination with the Organization of American States, Inter-American Committee on Ports: IWR, through the U.S. Section-PIANC, participated in several conferences in conjunction with the OAS Inter-American Committee on Ports (OAS-CIP) during FY 2009. These meetings included the OAS-CIP Executive Board, held in March in Buenos Aires; the First Hemispheric Convention on Port Environmental Protection, held in July in Foz do Iguacu, Brazil; and the Hemispheric Seminar on Challenges of Women in Ports in the 21st Century, held in August in Santo Domingo, Dominican Republic. The Executive Secretary of the CIP was also a featured speaker at the PIANC-US Annual Meeting, held in July in Pittsburgh, PA. The CIP serves as a permanent Inter-American forum for port related issues among the 34 member states of the OAS. Its purposes include serving as the principal advisory body of the OAS on all topics concerning development in the port sector. It proposes and promotes hemispheric cooperation policies, improvements and port sector cooperation agreements, and the collection and dissemination of data and information. The U.S. delegation to the OAS-CIP is led by the U.S. Maritime Administration (MARAD), under guidance of the State Department, and with participation by the Coast Guard, EPA, and the Corps (through observer status for PIANC-US). The CIP currently has four active Technical Advisory Groups (TAGs). These include Port Operations, Port Security (chaired by the U.S.), Navigation Safety, and Environmental Protection. The U.S. became a new member of the TAG on Environmental Protection in 2007 and is now a member of all four TAGs. The U.S. Section-PIANC is engaging the CIP to explore opportunities to share expertise on port management, development of common standards, improving dredging technology, addressing ballast water issues, and potentially assist plans for inland waterway development in the Amazon and Parana- Paraguay basins. IWR, through PIANC-US, will participate in two CIP meetings in FY 2010, including the Executive Board and the CIP General Assembly, both in Panama City, Panama.