

## WATER RESOURCES FORECASTING SYSTEM (WARFS)

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### 1. INTRODUCTION

The importance of water resources and its effective management is becoming an increasingly important national priority. This is especially noticed by the general public when an extreme condition of water quantity or quality occurs. For example, floods cause more deaths than any other single weather-related phenomenon, and economic impacts from floods and droughts translate to billions of dollars annually. Increased accuracies and lead times of hydrologic predictions can mitigate significant percentages of these losses as well as provide substantial benefits from day-to-day improvements in water management decisions. Implementation of the National Weather Service (NWS) Water Resources Forecasting System (WARFS) will provide a new generation of prediction products which will provide increased accuracies and lead times.

### 2. BACKGROUND

The Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS) has the mission to provide river and flood forecasts and warnings for the protection of life and property, and to provide basic hydrologic forecast information for economic and environmental well being. In order to improve these services, NOAA, in partnership with other major cooperators, are committed to the

development and implementation of an Advanced Hydrologic Prediction System (AHPS). This effort is a key component in the *NOAA 1995-2005 Strategic Plan* (Baker, et.al., 1993) to enhance NOAA's role in environmental prediction.

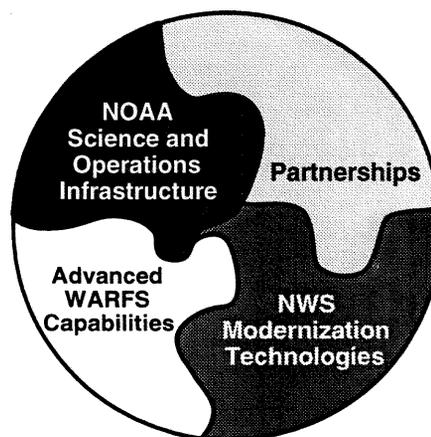


Figure 1. NOAA's Advanced Hydrologic Prediction System (AHPS).

### 3. WARFS DEFINED

The Water Resources Forecasting System (WARFS) is one of four major components that will form the AHPS (Figure 1). Along with WARFS, the other components are: 1) NOAA's current scientific and operational infrastructure, including the National Weather Service River Forecasting System (NWSRFS; Fread, et.al.,

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1991); 2) National Weather Service (NWS) modernization technologies, especially NEXRAD (NEXT Generation Weather RADar - WSR-88D) and AWIPS (Advanced Weather Interactive Processing System); and 3) cooperative and supportive partnerships with other government agencies, universities, and the private sector.

WARFS is an integrated real-time modeling and data management/analysis system which includes provisions for the use of historical hydrologic/hydrometeorologic data and meteorological/climatological forecasts for input to Extended Streamflow Prediction (ESP) simulations (Ingram, et. al. 1995). ESP is the portion of NWSRFS which produces probabilistic forecasts out to several months. These long-range probabilistic forecasts will greatly improve the capability of emergency managers and water facility managers to take timely and effective actions to mitigate the impact of major flood and drought situations. They also provide better support for overall water resources management (e.g. better management of competing water demands between irrigation, fisheries, and hydropower).

WARFS is now being implemented within the upper Mississippi River basin at the North Central River Forecast Center (NCRFC) located in Minneapolis, Minnesota. As additional resources become available, WARFS implementation can be expedited in the entire Mississippi River basin, including the Great Lakes, and activities in other areas also can be initiated, for example, the Columbia River basin which is of critical economic and environmental importance to the Nation. WARFS type forecasting technologies are also being implemented for the Nile River in Egypt (funded by USAID) and the Huai River basin in the People's Republic of China (funded by the World Bank).

Implementation activity components include: integrated data management and analysis, advanced hydrologic/hydraulic modeling, advanced product packaging/dissemination, interdisciplinary sustainable development impact analyses, and a cooperative-institute consortium. These activities will occur in conjunction with participation and contribution by other agencies, academia and the private sector, a portion of which will be orchestrated through the cooperative-institute consortium.

#### 4. BENEFITS

WARFS benefits far exceed the costs associated with its implementation and operation. WARFS will provide a new generation of hydrologic prediction products, extending the period of reliable river forecasts and greatly improve their accuracy, especially under extreme conditions such as experienced in the Midwest in the summer of 1993 (NWS, 1994). Benefits from WARFS will be realized through improved water resources and aquatic ecosystem management, as well as emergency management activities. WARFS also will contribute to DOC's leadership role in fostering economic gains along with environmentally sound decision making, which together enable sustainable development.

#### 5. CONCLUSION

WARFS will provide an advanced hydrologic prediction capability that must be implemented to support more timely and accurate water resources decision making. Its products will be issued by NOAA to a wide variety of users including other federal, state, local and private organizations. WARFS will provide major contributions to NOAA's Strategic Plan through its assistance with:

- Enhanced observations and predictions of the hydrosphere;
- Completion of and capitalization on the NWS Modernization;
- Improvements in application and dissemination of water forecast information;
- Modernizing NOAA's data management system capabilities; and,
- Comprehensive assessment and synthesis of the health of coastal ecosystems.

Furthermore, WARFS addresses needs identified at other levels of the federal government. The National Science and Technology Council (NSTC) Committee on Environmental and Natural Resources (CENR) addresses the need for the implementation of hydrologic prediction procedures like WARFS. Additionally, according to Leon E. Panetta's Memorandum (Panetta, 1994) regarding FY 1996 R&D priorities, "water resources and

natural disaster reduction" and "integrated ecosystem management" are important components which contribute toward the goal of "improved environmental quality." WARFS predictions will provide improved environmental quality as it can assist decision makers involved with environmental restoration initiatives similar to those underway following the Great Flood of 1993 and the existing salmon crises in the Pacific Northwest.

## 6. REFERENCES:

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