



WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: An Evaluation of Data Needs to Support Flood Frequency Estimation for Regulated Sites

Duration: From September 1, 1996, to August 31, 1997

Federal Funds: \$20,361

Non-Federal Funds: \$42,918

Principal Investigators, University, and City:

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Congressional District: Sixth

Water Problem and Need for Research:

Damages as a result of flooding in the U.S. amount to several billion dollars annually, and have steadily increased with time, even when the time value of money is accounted for (L.R. Johnston Assoc., 1992; Dunne and Leopold, 1978). Population-adjusted death rates attributable to this natural hazard have also increased slightly, while the death rates caused by lightning, tornadoes, and tropical cyclones have dropped during the same time period. In fact, the death rate due to flooding alone is about as great as that due to these other three hazards combined. Reasons for these trends are complex, but they are in large measure directly attributable to the increased occupancy and use of flood-prone lands. Flood "control" projects, and especially structural alternatives such as dams and levees, provide some measure of protection against the ravages of flooding, but history has shown time and again that floods simply cannot be controlled, and that structural alternatives may even aggravate the problem by reducing the attenuating effects of floodplain storage. Structural projects also lead to a false sense of security on the part of those who live and work in the supposedly protected area, with the consequence that encroachment into the floodplain becomes socially and politically inevitable. Then, when a flood event does occur (which it will, given enough time), the damages are likely to be as great, if not greater, than they would have been had the project not been implemented.

Flood frequency analysis provides a basis for engineering design of hydraulic structures and flood protection facilities, as well as for nonstructural approaches to flood damage mitigation, such as floodplain and floodway management and zoning. A tremendous amount of effort has been expended towards the development and demonstration of improved techniques for flood analysis and prediction, but it can be argued that most of this effort has been misdirected. The largest proportion of annual flood damages occurs along fairly sizeable rivers and streams, which are typically regulated due to the construction of dams and reservoirs, yet the research on flood analysis and prediction continues to focus mainly on unregulated systems where the available data conveniently conform to the assumptions made in traditional methods of frequency analysis. The problem of flood frequency estimation on regulated rivers and streams is much more complex than is the unregulated situation, but is one that must be solved if flood damages along regulated streams are to be effectively reduced. It is the intent of this project to make an initial evaluation of the data requirements that are necessary for a solution to the regulated flood frequency estimation problem. The results should then begin to provide some guidance for the design of necessary data collection programs. The focus of this effort will concentrate on a hypothetical reservoir with physical and operating characteristics typical of those found in the humid southeastern U.S. It is envisioned that this initial effort will then provide a springboard from which more comprehensive studies may be initiated.

Expected Results, Benefits, Information, etc.:

The benefits of a study of the type proposed here will not be felt immediately and temporarily, but rather will have a long-term value. The beneficiaries will be the U.S. public at large, and especially those who occupy and use riparian lands along regulated rivers and streams.

Because the changes which may be made (and which frequently are made) in reservoir operating policies cause corresponding changes in the downstream flood frequency characteristics, the results and information provided by this study will be one step towards improving the decision-making process as it relates to operating policies. This study will also begin to provide some initial guidance related to the design of additional data collection programs which are likely to be necessary to support a solution to the regulated flood estimation problem, and thus should be quite useful to the USGS and similar data collection organizations. Finally, the results of this study should also be of value to the scientific community concerned with the chemical, biological, and geological processes in riparian systems, as flood behavior and characteristics have a direct bearing on these sciences as well.

Results of this work will be made public through manuscripts which will be submitted for publication in the refereed archival literature, as well as through presentations at conferences and symposia which are frequently attended by the Principal Investigators.