STATUS OF LOCAL PROGRAMS IN FLOOD HAZARD REDUCTION*

Raymond J. Burby
Center for Urban and Regional Studies
University of North Carolina at Chapel Hill

Sixteen years have passed since passage of the National Flood Insurance Act in 1968 spurred a massive increase in local flood hazard reduction programs. During that period, we've witnessed a revolution in local floodplain management and a reduction in the rate of increase in flood losses. Having said that, however, I think that most would also agree that we have a long way to go before we get on top of flooding as a serious national, state, and community problem. In this paper, I will briefly review what local governments are doing to reduce flood hazards and then look at how effective those efforts have been in terms of achieving private sector compliance with flood hazard management objectives. The paper concludes by identifying those states where compliance is most advanced, indicting how those states differ from states where private sector compliance with flood hazard management objectives is less complete, and suggesting what states and localities should do next about community flooding problems.

Local Flood Hazard Reduction Programs

Local flood hazard management programs are designed to reduce flood damages to existing development at risk and to minimize the risk of flooding to new development locating in flood-hazard areas. In order to reduce flood damages to existing development, communities have two choices: keep flood waters away from structures and people at risk or move the structures and people out of the way of flood waters. The first approach is very popular. About 70% of the flood-prone communities in the U.S. have in place some sort of engineering solution (e.g., channel improvements and dikes and levees) to their flooding problems. Those structures, however, usually do not solve the problem entirely. Our research suggests two reasons: communities with structural protection in place have a higher rate of new floodplain development than communities without structural protection, but in many cases those structures do not provide protection against flooding from very large (and very rare) storm events. The second approach to

dealing with flood losses to existing structures--moving buildings and people out of the way of the flood waters--is more effective than the first approach, but it is rarely used. Recent national surveys we've conducted indicate that only 2% to 3% of the flood-prone communities in the U.S. have relocated buildings from flood hazard areas.

In addition to preventing damages to existing development, local flood hazard management programs seek to prevent losses to new construction, either by guiding that development away from flood-prone areas or by requiring that buildings locating in the floodplain be elevated and/or floodproofed so that they are reasonably free of flooding. Our research indicates that localities are much more likely to use the second approach than the first. Most communities in the National Flood Insurance Program have adopted new ordinances or amended their existing development codes (zoning and subdivision regulations) so that, if properly enforced, new construction in flood-prone areas will be free of damage from most flood events. Communities are much less likely, however, to have done anything to keep new development from locating in flood hazard areas. About two of every five flood-prone communities in the U.S. have adopted floodway regulations, but less than one in five have taken steps to minimize development of the floodway fringe through land use regulation, land acquisition, preferential taxation, or capital improvements policies designed to minimize the attractiveness of flood-prone areas for development.

The amount of attention communities pay to floodplain management varies depending upon who is in charge of the local program. Across the nation, we found responsibility for floodplain management distributed as follows. The chief executive is in charge of the program in a quarter of the localities; the building inspector in a quarter of the localities; the planning director in about a fifth; the public works director or city engineer in about a fifth; and in the remaining tenth of the communities' programs are run by a variety of persons, such as the town clerk, city council, planning board, or a regional agency. Contrary to what most people might expect, the best programs aren't found where the chief administrator is in charge; in fact, those tend to be the programs with the lowest priority, fewest flood control and land use management measures in place, and programs that are not rated as very effective. Instead, localities pay the most attention to floodplain management when either the planning department or public works department runs the program. Where planners are in charge, programs tend to focus on

land use management measures; where public works is in charge, programs tend to focus more on flood control, but in both cases programs tend to be more fully developed than in localities where floodplain management is directed by the chief administrator or city council or where program responsibilities have been assigned to the building inspector, planning board, or some other group.

Program Effectiveness

Given the floodplain management measures localities have adopted and who's in charge, how good a job are localities doing with floodplain management? We tried to gauge that in three ways: 1) by the amount of new construction occurring in flood hazard areas; 2) by local program officials' and state officials' judgements about how well programs are achieving flood management objectives; and 3) by the extent to which property owners are complying with what we call "best management practices" for floodplain development. Here is what we found in a national survey of over 900 flood-prone localities conducted in 1983.

Preventing Encroachment on Flood Hazard Areas

Of 956 communities we surveyed in 1983, 65% had issued no building permits for floodplain development during the preceding year. Across all 956 communities, 94% of the building permits they issued during 1982 were for construction located outside of designated flood hazard areas; 6% of those permits were for construction located in an area subject to flooding (in coastal communities that figure rose to 18% of all new development). Since we do not have data on the proportion of those communities located in the floodplain, it is difficult to say whether, on average, flood hazard areas are receiving a greater or lesser proportion of new development than would occur in those locations by chance. In general, however, it does not appear that local floodplain management programs are having much effect on where new construction occurs in a community.

Officials' Perceptions of Program Effectiveness

When local officials were asked to evaluate the effectiveness of their floodplain management programs, about half rated their programs as very effective in preventing flood damage to new construction occurring in areas subject to flooding; about a third rated their programs as very effective in preserving the natural

values (flood storage, aquifer recharge, etc.) of flood hazard areas; and less than a third rated their programs as very effective in reducing flood damages to existing structures or public property. When state officials were asked the same question, they were about half as likely as local officials to rate local floodplain management programs as very effective in achieving any of those objectives. From either a state or local perspective, however, there is obviously room for improvement in the performance of local floodplain management programs.

Property Owner Compliance with Best Management Practices

In addition to asking local officials about overall program performance, we also asked them how well property owners in their jurisdictions were complying with what we term "best management practices" for development of flood hazard areas: elevating structures above the level of the 100-year flood; avoiding fill and other obstructions of the floodway; installing adequate storm drainage systems in new subdivisions and other development; and floodproofing existing structures. If we rate compliance as good when over half of the property owners are complying with those best management practices, then here is what we found. In two thirds of our national sample of communities, compliance with elevation and floodway fill practices is good; compliance with storm drainage practices is good in about half of the communities; and compliance with floodproofing practices is good in about a quarter of the communities. Again, there seems to be room for improvement at the local level.

High Compliance States

The top ten states in terms of local officials' ratings of property owner compliance with the four best management practices for development in flood hazard areas are, in order: Illinois, Hawaii, Minnesota, Rhode Island, Michigan, New Jersey, Washington, Virginia, South Carolina, and Nebraska. How do those and other high-ranking states' flood management programs differ from states where property owner compliance is not rated as well? To find out, we gathered data from the states about their flood management programs and combined those data with information obtained from our national sample of local governments. Here is what we found.

Thirteen of the factors we looked at seem to have a significant effect on property owner compliance. In order of the magnitude of that effect, they are: 1) scope of local government floodplain management programs in a state; 2) scope of state flood hazard information and education programs; 3) percent of the population in a state living in communities in the regular phase of the National Flood Insurance Program; 4) degree to which state program goals emphasize environmental protection as well as property damage abatement; 5) degree of state officials' contact with local government officials; 6) percent of a state's population living in metropolitan areas; 7) degree to which local officials are satisfied with technical assistance received from federal agencies; 8) degree to which flood-free sites for new development are available within a state's flood-prone localities; 9) absence of Corps of Engineers expenditures on new works in a state during the period 1978-1982; 10) number of state personnel working in flood hazard management programs; 11) presence of a "moralist" political culture in a state (people in the state tend to value positive governmental action in the public interest); 12) scope of state floodplain regulations; and 13) extent to which flood hazard management is a priority interest of the governor. Overall, those thirteen factors explain about 40% of the variation from state to state in property owner compliance with floodplain best management practices.

Next Steps

To conclude, I'd like to suggest where I think local floodplain management programs should be heading, based upon the results of our research at the University of North Carolina at Chapel Hill conducted over the past decade. To start, we need to think of ways of getting floodplain management onto local political agendas more often than we have in the past. States can help with that in a number of ways. They can work to increase local officials' awareness of the flood problem. They can work at the state level to link floodplain management to other program objectives; for example, the U.S. Environmental Protection Agency's recent move to require states to regulate major nonpoint sources of pollution, such as large shopping centers, should create opportunities to combine water quality and flood management objectives in state and local stormwater management programs. Finally, states can use various carrots and sticks to get local governments to think more

seriously about flooding. Our research indicates that state regulatory programs, for example, are effective not only because of their direct effects on property owners but also because of their indirect effects in persuading localities to give floodplain management more attention than they otherwise would.

Once floodplain management gets on the local political agenda, our research suggests that local programs are more effective when localities use multiple methods to achieve their objectives for flood hazard areas. Thus, we've found that while local regulations are a necessary first step in floodplain management, local programs should also encompass, depending upon local circumstances, flood control measures, watershed treatment measures, land acquisition, flood warning, and other local activities that will reduce the potential for flood losses and environmental damage. Furthermore, those multiple measures will likely work together better if they are formulated as components of a local floodplain management plan.

We also think that localities should be paying more attention to various innovative techniques for floodplain management. We believe the "cutting edge" of floodplain management at the local level will include the establishment of various exactions on new private development in flood hazard areas so that such development starts paying the full costs associated with a flood-prone location. Revenues raised through such exactions can be set aside in a fund earmarked for reconstructing public infrastructure damaged as a result of flood events. We also think that localities also need to begin paying more attention to stormwater management than they have in the past. Finally, we expect to see a number of innovative land use management techniques, such as transfer of development rights, applied to floodplain management.

State governments are in position to help localities with all of the "next steps" I've outlined here. We've made tremendous progress in floodplain management at the local level over the past two decades. With continued and expanded efforts at the state level, that progress should continue.

---

*The research reported in this paper was supported, in part, by National Science Foundation research grants DAR78-07603 and CEE-8209884. Any opinions, findings, conclusions or recommendations expressed herein, of course, are those of the author and do not necessarily reflect the views of the National Science Foundation.

THE CONNECTICUT COASTAL HOMEOWNERS' FLOOD PREPAREDNESS PROGRAM

Alan M. Levere
Connecticut Department of Environmental Protection

Introduction

The Coastal Homeowners' Flood Preparedness Program (CHFPP) brings municipal flood information to potentially vulnerable coastal homeowners, and it is delivered to them in their homes.

As the pilot program was being developed, we realized that there was no significant funding or staff time set aside. There was no allotment for it in the various departmental work plans, and the more thought we gave it, the more unclear it became where the responsibility for it should lie. Possibly our Coastal Management staff or Water Resources staff should have led the way, or maybe the Office of Civil Preparedness or the towns themselves should have, and what about Federal Emergency Management Agency (FEMA)? The Department of Environmental Protection had no authorization to take responsibility, but it seemed to be the logical next step to accompany the flood information we had on hand. Utimately, we took charge.

We spread the information because the residents do not know about flooding, and because their lack of knowledge results every year in deaths. Flooding also has huge monetary repercussions at every level of government. Unfortunately, when all of the NFIP rate maps (FIRMs) are drawn and the Flood Insurance Studies (FIS) are in order, the information leaves the federal ranks and begins to trickle down through the system. It gets to the state level and then down to the municipality, but the trickle usually ends before the information gets to those who need it most to protect themselves--the homeowners. The whole reason for these programs was the vulnerable position of the homeowner, who frequently never sees the work that has been done regarding his or her actual homesite.

Program Goals

Our intent was to inform the participants of the nature of the coastal processes, the formation and intensities of coastal storms, the probable

coastal effects, and the best ways to combat individual loss. The first major goal of the program was to structure it so that each individual would know exactly what the next hurricane would do to his or her home. We wanted them to ask, "How can I protect myself from the possible loss when the hurricane comes?"

The second main goal was to advance the program with no misunderstanding of our intent. We did not want homeowners to think we were big government coming in to tell them what to do, or worse, suggesting that we wanted to take their homes. We tried to emphasize the effects of the natural processes. For example, the movement of one spit along the Connecticut coast has been charted for the last 130 years or so. In one 111-year period of time, the littoral movement and erosional actions, on both the spit and the attached shoreline, combined to produce a net land loss of approximately 40 acres. The emphasis was that the coast is not static and as residents they have good reason for long-term concern.

Groundwork

The groundwork for this program was laid over the course of two summers. In 1982 an inventory was taken of all the structures in the A-, B- and V-zones of Connecticut's 25 coastal communities. The boundaries of the flood zones on the FIRMs were transposed onto the aerial photographs and the structures tallied. The results showed 3,941 structures in the V-zones and 19,099 in the A-zones, representing about 57,600 residents.

In 1983, as part of a public information project, a questionnaire was sent out regarding coastal flooding. The results showed that 87% of the people who now live at the coast did not live there when we had our last hurricane in 1955. Ninety-eight percent were the owners of the homes they lived in, and about 75% of those that answered were not aware of any type of municipal flood mitigation or preparedness programs.

Location of Presentation

The first step was to locate the chief elected official of the town, the beach association president, and a home in which to make a presentation to all property owners. The desired location for the presentation was the living room of a flood-prone home, in order to keep the presentation on a personal level with a small group (15-20 people). The first meeting was held in a V-zone home with the ocean physically there in the backyard. The combination of the high tide and the posted flood and wave height levels had the hoped-for effect on

the listeners.

Alternative locations were in either the less dynamic A-zone homes or the beach association meeting house. These were used when a V-zone home was not available (sometimes because of owner reluctance and other times because the beach association president was adamant about using the hall so more people would benefit). In these instances, the group met at the shorefront and observed the elevations posted on the outside of a volunteer's home, and then moved to the hall for the balance of the presentation.

Contents of the Presentation

The introduction included an explanation of the FEMA flood frequency terminology and related flood elevations. The first phase is to help homeowners understand what this terminology means, and the greatest tool of the entire program is used to accomplish this. It is two pieces of string placed along an outside length of the house at different levels. One level is the projected 100-year flood elevation for that home, and the second, higher level is the wave height elevation. The impact of actually seeing the storm level of the ocean has proved to be very sobering. This display, coupled with two strings inside the meeting place at the same elevations, brings home the damage potential of the 100-year event.

Occasionally we encountered the sentiment that the flood levels displayed were not of much importance locally because of a protective seawall. However, a slide sequence, borrowed heavily from the FEMA New England presentation, demonstrates what happens to a seawall in a severe coastal storm. The town of Scituate, Massachusetts was hit by a winter gale in the spring of 1978, and though it did not reach hurricane proportion, the destruction of the storm was great. The slides show the direct wave attack on the seawall, its resulting collapse, and the destruction of the supposedly safe homes behind it.

It becomes obvious to those in attendance that when a storm of magnitude does strike the Connecticut coast, they will be in danger. If it is a large and destructive storm, there may be nothing anyone can do but evacuate. However, there are plenty of things for homeowners to do before the storms to lessen their losses, and instruction in mitigation methods is the third phase of the seminar.

Each person receives a copy of a hazard mitigation manual and we go through it together, section by section, concentrating heavily on the chapter entitled, "Options and Techniques for Reducing Flood Damages." Permanent,

contingent, and emergency measures are all described and the options--from elevated structures to wet and dry floodproofing to sandbagging--are well illustrated. A close review of each is included. The home in which the meeting is being held is then assessed for its potential losses. Preventive measures and proper cleanup and repair techniques make up the greatest portion of the information in the text.

Information on the NFIP, and a floodproofing cost-benefit analysis follow to make the manual and seminar as comprehensive as possible.

Residents' Current Awareness

It was a surprise to the DEP staff, on one hand, that current awareness of flood hazards and mitigation was as high as it was. One resident had raised the utility wiring in his basement to above the highest water line he had seen, and others had put in new patio porches at, or above, the 100-year flood elevation. Still others knew about littoral drift and erosion. On the other hand, there were groups similar to one gathering of beach association presidents and their elected leader. Of the nine people in attendance, eight were not aware of the existence of the NFIP, and they had a grand time locating their land holdings on the FIRMs.

The greatest percentage of the population was between the two extremes. Most residents had some knowledge about flooding in their area, but some of them felt that they had already seen the greatest wrath of the ocean. Indeed, they had been through seasonal, and sometimes potent, localized storms, but they have ranged from nuisance flooding, to some severe, highly localized damages.

Exposure

The bulk of the publicity for the CHFPP in its pilot year was through word of mouth. However, we were fortunate to get some "press" in a small circulation regional magazine, as well as an article in the DEP's monthly publication. The desired time of publication for these articles was simultaneous with the storm season.

Applicability

The program proves versatile in its applicability to almost any flood-prone area, whether the concern is wave-induced coastal flooding, still-water inundation, or riverine floods. The emphasis can easily be changed from barrier beach housing to larger homes behind a seawall with little format adjustment. The principles of flood prevention are similar wherever there is

the potential for high water.

The smaller scale of Connecticut's coastal flood problem made the program easily workable, but larger coastal states would have to expand their efforts correspondingly. While the results of every such program are extremely valuable, a larger state's problems are magnified by both population size and geographical problems of coordination. This program is definitely workable, but easier to do on a county-wide basis than statewide.

The Future of the Program

The pilot Coastal Homowners' Flood Preparedness Program of 1984 was a success. Overall cooperation of the municipalities was good. The beach associations had an honest interest in their constituents' safety, the preservation of their community niche, and increasing their own general knowledge. The homeowners that attended the seminars proved their interest by virtue of their voluntary attendance, the questions they asked, and their compliments to the program.

The information the coastal residents receive in the Flood Preparedness Program is the information that can save the federal government money through reduced insurance claims.

With three summers of research behind us, we are firmly convinced that shoreline property owners don't understand the potential catastrophic flood losses that they face, but they will listen to us if we prepare materials they understand, and if we, as public agencies, leave our government office buildings and go out to them at the shorefront.

Because we set up, experimented with, and worked the bugs out of our pilot project at our own expense in 1984, FEMA has funded us to improve and expand the 1985 program. Our immediate goal this year is effectively instructing 1,000 heads of households, representing about 2,100 coastal residents, in a large cross-section of our potentially hazardous shoreline communities.

If we can convince ten residents to purchase flood insurance, or persuade as many households to move expensive rugs and miscellaneous other valuable furnishings above predicted flood levels when they realize flooding is imminent, our program will pay for itself in reduced insurance claims.

Everyone who attended any seminar has been sent, one year later, a questionnaire to establish whether or not any mitigative precautions have been taken. Only when these results come in will the long-term impact of our seminars be known.

TRAINING AND EDUCATIONAL PROGRAMS
ARIZONA FLOODPLAIN MANAGEMENT ASSOCIATION

David A. Smutzer
Vice Chairman, Arizona Floodplain
Management Association
&
Manager, Flood Control Planning
Pima County Department of Transportation
and Flood Control District

AFMA

The Arizona Floodplain Management Association (AFMA) was founded in 1982 by floodplain administrators responsible for management, enforcement of regulations, and flood hazard mitigation in their respective communities. The Association is the first of its kind in the country and was the first state chapter to be accepted into the Association of State Floodplain Managers. AFMA is a non-profit corporation that provides a means of communicating changing state and federal regulations, and the latest methods available to accumulate and analyze technical data. The necessity of such an organization is evident by the fact that all 89 communities within the state participate actively in the National Flood Insurance Program (NFIP). Specific goals of AFMA include: 1) enhance cooperation among the private sector, local, state, and federal agencies responsible for floodplain management; 2) encourage and promote new and innovative approaches to managing the state's floodplains in order to achieve the greatest social and economic benefit and general welfare for the citizens; 3) provide a forum for the education and training of those involved in floodplain management.

Membership

The Arizona municipalities and communities that have elected to participate in AFMA are afforded one representative with voting privileges. These general voting members serve as elected officers and vote on all Association business. Associate membership in AFMA is open to all citizens and private firms with an interest in floodplain management. These members contribute to the various technical and educational workshops and programs, and provide valuable input to assist the Association in meeting its goals. AFMA has grown

from 18 general voting members and eight associate members in 1982, to 49 general voting members and 99 associate members in 1985.

Organization

The general voting members hold quarterly meetings at various municipalities throughout the state each year to which the associate members are invited. From the membership, specific committees are formed to concentrate on the mechanics and goals of the Association.

The training and education of floodplain administrators and associate members in various technical and non-technical subjects is necessary to enable the Association to meet its goals and objectives. There are five vehicles within AFMA to provide training and education: 1) technical and non-technical seminars held during quarterly meetings; 2) sponsorship of short courses; 3) workshops; 4) quarterly newsletter; 5) participation on ASFPM committees.

Technical and Non-Technical Seminars

Technical Topics

During each quarterly meeting the Association offers technical and non-technical seminars and lectures by its general membership and guest speakers recognized for expertise in their specific fields. The topics are related to floodplain management problems generally associated with the region of the state where the meeting is being held. Technical topics have included:

Sand and gravel operations. An actual court case involving a sand and gravel operator versus Pima County regarding enforcement of its floodplain management ordinance. The case was used to present the various hydraulic and geomorphic effects the operation had on existing floodplain development structures (including bridges) and river morphology. The discussion detailed the impacts on the river system, including headcutting, channel bed degradation and aggradation.

Case history of bridge failure. Review and analysis by Simons, Li & Associates of a bridge failure due to flooding and erosion caused by upstream floodplain encroachment. The presentation outlined specific documentation and photographs detailing the changes to the natural floodplain due to encroachment.

U.S. Army Corps of Engineers Urban Study Program. Explanation of the procedures for communities to request assistance for flood control projects. An ongoing urban study program within the Phoenix metropolitan area was discussed in detail to demonstrate the extent of the Corps involvement.

Discharge frequency analysis. A presentation by an expert hydrologist on flood frequency analysis for the Santa Cruz River in Pima County, Arizona. Due to the discharge recorded during the flood of October 1983 (largest flood of record), a need to revise the regulatory discharge developed for the Federal Flood Insurance Studies was apparent. Due to urbanization of the lower portion of the basin since 1960, in conjunction with increase of average annual rainfall, frequency of significant floods increased as compared to the record preceding 1960. By utilizing the annual maximum floods for the past 25 years, a log extreme value line indicates a threefold increase over the existing regulatory discharge.

Fundamentals of levee and dam design. Arizona Department of Water Resources officials explained their role in the review of design plans, inspection and construction coordination of dams, reservoirs and miscellaneous flood control projects. Also, discussed were the criteria for obtaining funding assistance from the state for flood control projects.

Real time flash flood warning. Presentation by Maricopa County Flood Control District on the selection of equipment, the installation, and function of precipitation and stream gauges for various watersheds surrounding the Phoenix metropolitan area.

Other technical topics have included the influence of geology on storm water runoff management, impact of urbanization on channel stability, design of protection for existing development on alluvial fans, and soil cement application and use in Pima County for flood control projects.

Non-Technical Topics

State legislative issues. Ongoing reports by attorneys associated with AFMA on proposed state legislative issues involving floodplain management regulations. These presentations guided the Association's successful effort to improve state floodplain management legislation.

Public immunity laws. Municipal Attorney's definition and interpretation of immunity protection for public officials. Specifically, public agencies and employees no longer can rely on good faith immunity as a defense in an immunity case filed against public officials.

Panel discussion. To present various viewpoints, panel discussion have been held involving representatives from the federal and state agencies, public and private engineers, attorneys and university professors. Topics have included the Letter of Map Amendment Process, interpretation of state and

federal regulations, various floodplain management ordinances, assistance to smaller communities, flooding on the Colorado River, and the October, 1983, floods in southern Arizona.

Multi-use flood control projects. A presentation on and tour of a unique multi-use urban flood control project given by a former city official. The presentation included a discussion of the planning and construction of the project which successfully incorporated flood control design with open space, parks, golf course and transportation facilities.

Real world data base. A presentation by an aerial photogrammetric firm on the processes of aerial photography and topographic mapping as it relates to floodplain delineations. The presentation outlined scheduling of aerial photography as dictated by weather conditions, types of photographic equipment, and the various mapping scales and desired accuracy, and the associated costs.

Manufactured housing regulation. Representatives from the State Office of Manufactured Housing outlined state standards and laws regarding the installation of mobile homes in floodplains. It was noted that due to an unenforceable regulation, neither state nor local building inspectors are inspecting for the required support systems and/or wind tie-downs.

Floodplain management tools for alluvial fans. A presentation by Anderson Nichols on identifying the flooding characteristics, flood dynamics and flood hazard of alluvial fans. The discussion detailed comprehensive approach to non-structural floodplain management techniques and structural flood control improvements including planning, design and construction of development on alluvial fans. A video tape to aide the discussion of a physical model was shown to demonstrate structural and non-structural approaches to development on a alluvial fan.

Other topics have included a three-part seminar on non-technical hydrology, efforts to promote similar organizations in California, Nevada, Utah and New Mexico, presentation by the U.S. National Park Service and their experiences of flash floods and early warning systems, and channel bank erosion and lateral migration of channels and their impact of floodplain management regulations.

Short Courses

AFMA has sponsored two short courses: one with the American Society of Civil Engineers, and the second as a sole sponsor. The course books used for both short courses were made available to AFMA members who could not attend

to insure that all members are familiar with current technology.

Open channel hydraulics. The Civil Engineering Department of New Mexico State University discussed the fundamentals of open channel flow and gradually varied flow principles. The intensive, concentrated program also involved the use of computers to analyze hydrologic and hydraulic problems.

Rainfall-runoff modelling. Consulting engineers from Denver, Colorado presented the concepts of runoff modelling, rainfall losses, runoff hydraulics, and applications of computer models.

Workshops

In addition to the seminars, AFMA also has had several workshops held between the scheduled quarterly meetings to discuss special problems. Topics have included legislative issues and review and participation in FEMA's Map Initiatives Project Study (MIPS).

Quarterly Newsletter

The Association publishes a quarterly newsletter to inform members of the activities in flood hazard management, current and proposed changes in the NFIP, and important legislative activities affecting state and local flood hazard management programs. In addition, the minutes from each meeting and items of interest to the Association members are also included.

ASFPM Committees

AFMA, as a member of the Mapping and Engineering Standards Committee of ASFPM, played a major role in participating in the Mapping Initiatives Project Study. Of the 300 nationwide responses to FEMA's questionnaires, more than 65 questionnaires were completed by AFMA Members. AFMA members participate actively in various ASFPM committees, and can thereby aid in the dissemination of information to all AFMA members.