

The Need for Evaluation

If communities wish to attack their flooding problems, a variety of methods and measures can be employed for that purpose. It is not clear, however, what effect those measures are having on development in flood hazard areas or whether floodplain land use management programs result in greater benefits to society than they cost. Both of those objectives--reduced susceptibility to flood damage and enhanced social welfare--are contained in federal legislation dealing with flooding (the former in the Flood Insurance Act of 1968 and the latter in the Flood Control Act of 1936).

Gilbert White's assessment of the state of knowledge in flood-hazard management in the mid-1970s concluded that,

It is crucial to any sound policy of flood loss management that the application of land use adjustments be carefully investigated. There is a remarkable lack of knowledge about the . . . effectiveness of floodplain regulations....(White 1975)

After studies in 1975 and 1980, however, the U.S. General Accounting Office reported there had been little progress in curtailing disastrous flood losses by planning for or controlling the uses of flood-prone areas.

Overall Effectiveness

Sheaffer and Roland's (1981) study of 21 communities found that national flood losses will continue to mount with the local regulations mandated by the National Flood Insurance Program. Research at the University of North Carolina (Burby and French et al., 1985) looked at over 2,000 flood-prone communities and found that local officials viewed their own programs as fairly effective in preventing damage to new development, but they saw their programs as much less effective in dealing with the potential for damage to existing development in flood hazard areas or in protecting environmental values. Workshops conducted for the Tennessee Valley Authority by the University of Colorado's Natural Hazards Research and Applications Information Center in 1983 and 1984 highlighted the need for information on the effectiveness of floodplain management measures (Monday, 1983). Finally, officials of the Federal Insurance Administration have observed that local floodplain management, "...while achieving some successes, has not resulted in the level of effectiveness we believe Congress intended" (Bragg and Coughlin, 1984).

Writing in 1983, economist Jerome Milliman observed that government

officials and academic researchers were paying too little attention to the costs of flood damage reduction measures:

Flood losses in a given situation may be too small as well as too large, but we can not know unless we compare expected costs of control with expected damages to be averted. Only if expected losses averted exceed expected costs is more mitigation warranted. By contrast, if the expected costs of adjustment exceed expected benefits, then we will have too much flood protection. Without research on this matter, it is not at all evident whether flood protection is too little or overextendedEfficient use of floodprone lands is desirable; not hazard reduction per se (p. 84).

That same theme has been sounded by other economists, such as James (1987), who stress that while Congress has established flood loss reduction as a national goal, it also has declared that benefits (reduction in damages) must exceed costs, and costs as well as benefits should be counted to "whomsoever they may accrue."

Information Needed to Design Better Programs

Closely related to the issue of whether floodplain management is really effective in dealing with flood problems is the question of how programs can be designed to work well in different types of communities. Freeman (1978) noted that it is as important to understand how a program works as it is to know how well it works. Program implementation specialists understand that programs seeking the same goals are likely to vary considerably both in the measures adopted and the ways those measures are implemented. As a result, effectiveness is likely to vary as well. By discovering how effects change as program components and degrees of implementation change, we should be able to help planners to do a better job in the future of designing programs to meet specific objectives (desired effects).

The search for better programs, however, cannot focus solely on program components. Although a floodplain land use management program originates in the public sector, whether or not it achieves its goals depends upon how the private sector perceives the program and responds to it. In fact, James, Laurent and Hill (1971, p. 5) suggest that the term floodplain land use management is a misnomer, since it is not floodplains we must manage, but people. Because of the importance of private sector decisions to the outcomes of floodplain programs, several observers have asserted that to comprehend why program outcomes vary from one place to another, we need to first

understand how programs affect decisions in the private sector (Allee and Walter, 1977, p. 9; Whipple, Hufschmidt et al., 1976, p. 39; James, Laurent and Hill, 1971, p. 21). By taking into account how program and target group characteristics interact to produce different effects, program planners should be better able to fine tune floodplain management programs to reflect differences from one community to another in the target groups whose decisions their programs seek to alter.

The design of floodplain land use management programs also has to be sensitive to other characteristics of the communities in which they are implemented. Programs have been found to be more effective, for example, where hazard-free sites for community growth are readily available and where expectations for profit from floodplain development have not been raised by past development of flood hazard areas (Burby and French, 1981; Burby, French et al., 1985). In addition, if flooding has occurred in the past, community leaders are more likely to perceive they have a serious problem deserving attention and to do something about it (Rossi, Wright and Weber-Burdin, 1982; also see Mazmanian and Sabatier, 1983, p. 31). Finally, direct state regulation of flood hazard areas tends to reinforce the effects of local programs, making them more likely to achieve their objectives (Burby and French, 1981). More information about how program effects differ with variation in community characteristics should also lead to better program design (to programs more likely to have desired effects in the types of communities in which they are applied).

The North Carolina Research Program

Beginning in 1978, researchers at the University of North Carolina's Center for Urban and Regional Studies and Department of City and Regional Planning have undertaken a comprehensive program of research on floodplain land use management in the United States. That research has evolved in five stages:

- Stage I: National Comparative Study of Local Government Floodplain Land Use Management Programs (1978-1982)
- Stage II: National Comparative Study of Local Government Hurricane Hazard Management Programs (1983-1986)
- Stage III: National Comparative Study of State Government Flood and Hurricane Hazard Management Programs (1983-1986)

Stage IV: In-depth Follow-up Studies of Floodplain and Hurricane Hazard Management (1985-ongoing)

Stage V: Disaster Recovery and Reconstruction Studies (1983-ongoing)

The research described here is the first report from the fourth stage of this research program. In the first three stages our objective was to understand the state-of-the art of flood and hurricane hazard management as it is being practiced in the U.S., and to analyze, at an aggregate level, the key factors that explain the choices communities have made regarding program composition and implementation and the consequences of those choices for program effectiveness. In the fourth stage, we are shifting the focus of our work from broad comparative research on floodplain land use management to a deeper examination of specific management issues, and in the fifth stage we are extending our work from its previous focus on predisaster preventive measures to ways of improving the process of recovery and rebuilding after natural disasters have occurred.

The Research Design

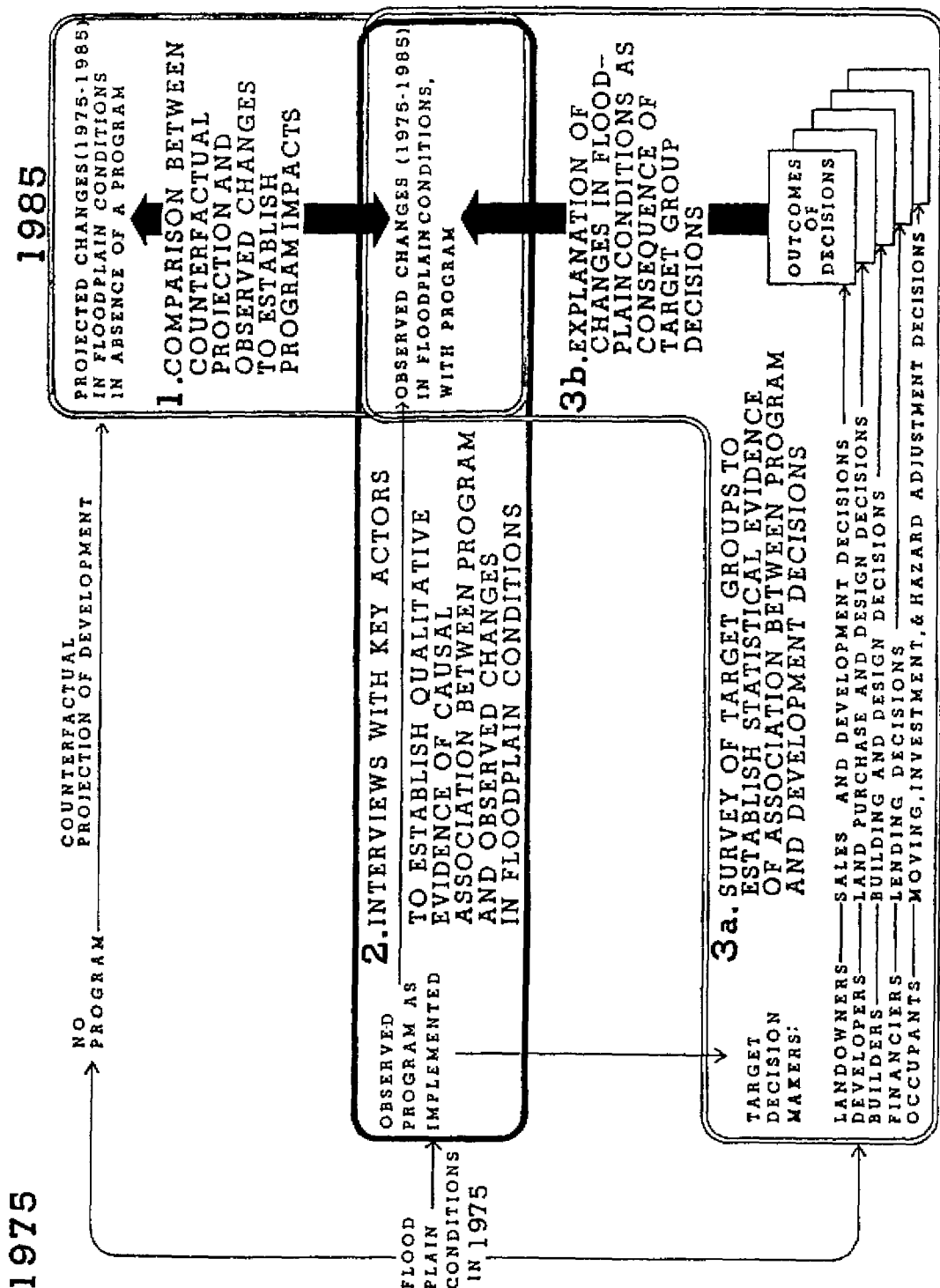
The research reported here was designed to contribute to improved floodplain management by:

- 1) Providing a systematic *ex post* analysis of the impacts of floodplain management programs.
- 2) Tracing variation in impacts back to variations in program characteristics, target group characteristics and decisions, and community characteristics.
- 3) Suggesting changes in local, state, and federal policies that will improve the ability of local floodplain management programs to achieve their objectives.

The research design to achieve those goals is summarized in Figure 1-1. It includes three important elements: element 1 enabled us to measure whether floodplain land use management is having an effect in communities, while elements 2 and 3 enabled us to identify factors that account for variation in program effects.

FIGURE 1-1

OVERVIEW OF RESEARCH DESIGN



With the first element, we established program impacts by comparing changes in floodplain conditions between 1976 and 1985 in a sample of communities that had floodplain land use management programs in place, with projections of changes that would have occurred in those communities without the programs. With the second element, we developed a qualitative explanation of the causal link between program characteristics and observed impacts through in-depth interviews with individuals who were associated with the floodplain management programs and floodplain development in the sample of communities. With the third element, we developed a statistical explanation of the link between program characteristics and observed impacts by 1) analyzing the extent to which decisions by various actors in the floodplain development process--landowners, developers and builders, and building owners--varied with variation in program characteristics; and 2) analyzing how land markets in the sample communities responded to variation in program characteristics, while controlling statistically other factors that might affect market conditions.

In combination, the three elements of the research design enabled us to achieve the objectives of the research: measurement of floodplain management program effects; identification of program characteristics and other factors responsible for producing variation in effects; and thus indication of the program characteristics needed to produce desired program outcomes under different conditions.

Additional details regarding the research design are presented in later chapters reporting the results of this study. We note here, however, that the research design has two unique aspects. First, it combines comparisons of conditions in communities over time (longitudinal and counterfactual analyses) with comparisons across communities (cross-sectional analysis). Second, it combines and integrates statistical and qualitative methods of analysis, thus responding to Denzin's (1978) call for the use of multiple methods in evaluative research, since "no single method ever adequately solves the problem of rival causal factors."

Opportunities for longitudinal research are limited because of the difficulty in obtaining baseline data on conditions in communities at some point in the past. We overcame that problem by building on an important national study of floodplain management conducted in the mid-1970s by Sheaffer and Roland, Inc. for the Federal Insurance Administration (for a description of that study, see Sheaffer and Roland, Inc., 1981). Sheaffer and Roland's research team gathered information on floodplain characteristics, including average expected flood damages, community characteristics, and floodplain management program characteristics for a sample of twenty-one communities for the year

1975. We selected ten of those communities for the research reported here.*

Budgetary constraints required that we select ten of the 15 flood-prone communities for which Sheaffer and Roland, Inc. had assembled baseline data. In selecting those ten, we maximized variation across the "treatment" being studied--community floodplain management programs--in order to increase the likelihood of detecting differences in program effects. Therefore, we stratified communities in terms of the breadth of the floodplain management programs they had in place in 1975 and randomly selected communities from each strata for inclusion in this study.

The ten communities selected for study are as follows (1975/1985 population estimates are in parentheses):

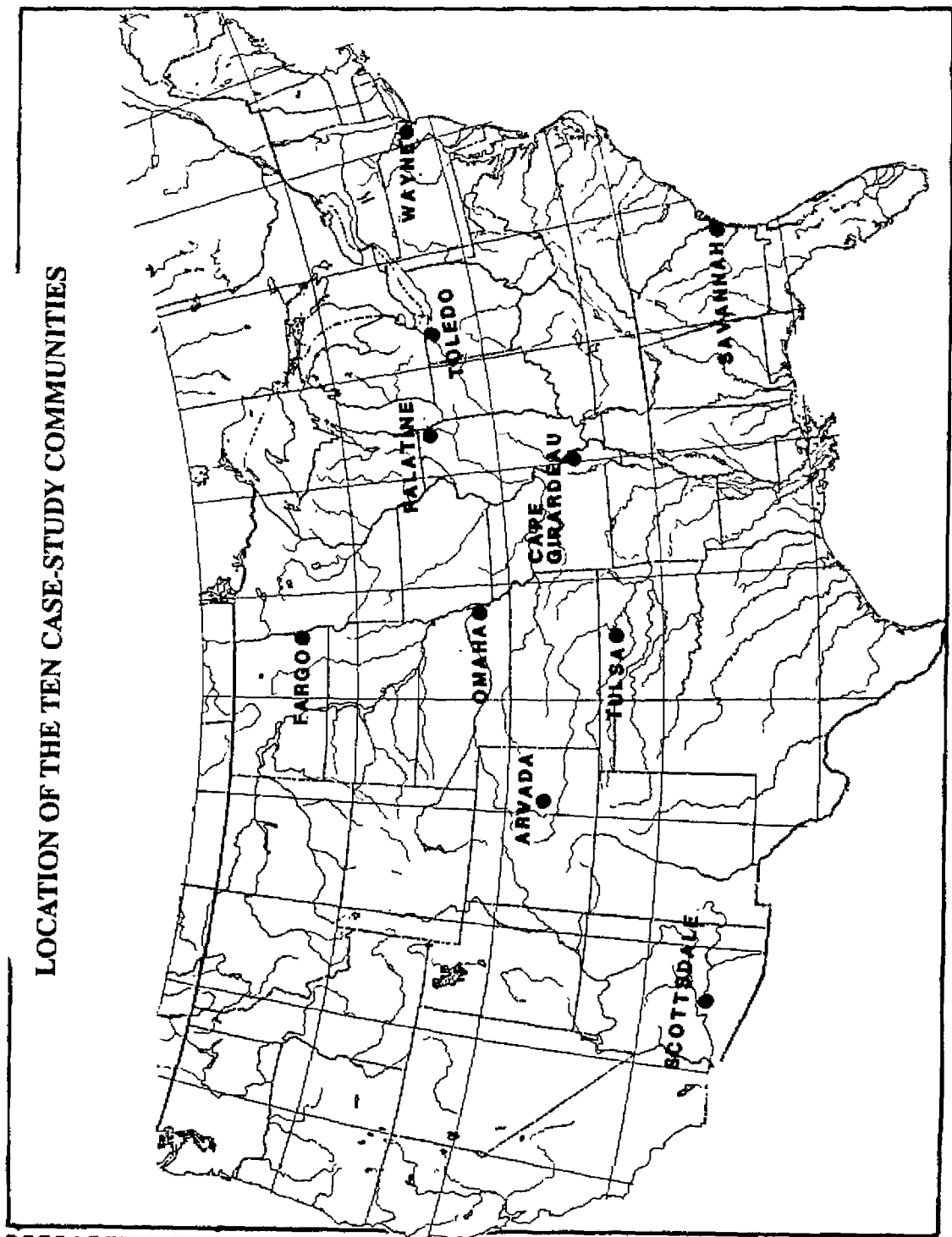
Arvada, Colorado (68,137/88,412)
Cape Girardeau, Missouri (32,822/40,000)
Fargo, North Dakota (57,374/66,042)
Omaha, Nebraska (330,792/333,477)
Palatine, Illinois (29,035/33,413)
Savannah, Georgia (129,870/144,709)
Scottsdale, Arizona (78,118/108,000)
Toledo, Ohio (368,849/343,700)
Tulsa, Oklahoma (345,635/377,700)
Wayne, New Jersey (47,808/48,156)

Figure 1-2 shows the location of each community. Four are suburbs of metropolitan areas (Arvada/Denver; Palatine/Chicago; Scottsdale/Phoenix; and Wayne/Newark) and those four had formulated the most stringent floodplain management programs. Three of the communities were growing rapidly between 1976 and 1985 (Scottsdale, Arvada, and Cape Girardeau); four were growing at a moderate rate (Fargo, Palatine, Savannah, and Tulsa); and three had a stable or declining population (Omaha, Toledo, and Wayne).

* Six of the twenty-one communities included in the Sheaffer and Roland study were exposed primarily to hurricane flood threats. Since our earlier research indicated that program effects vary substantially depending upon the nature of the hazard (see French, 1980), we decided not to consider those six communities for inclusion in this study. The sample of six communities facing hurricane hazards was not large enough to examine the full range of program and contextual factors that could affect program impacts in hurricane-prone areas; therefore, we believed the sample should be limited to those communities where the major threat of flood damage came from riverine and flash flooding, and an adequate number of communities facing those hazards could be studied.

FIGURE 1-2

LOCATION OF THE TEN CASE-STUDY COMMUNITIES



PREPARED BY
Sheaffer & Roland, Inc.

The nature of the flood threat also varied across the communities. Slow-rise riverine flooding threatened Fargo, Palatine, Savannah, and Toledo. Flash flooding threatened Arvada and Scottsdale. Cape Girardeau, Omaha, Tulsa, and Wayne were threatened by both slow-rise and flash flooding. Additional characteristics of the communities studied and their approaches to floodplain management are discussed in Chapter 2.

Prospect

Chapter 2 describes the ten communities we studied, their flood problems, and the characteristics of the floodplain land use management policies they formulated to cope with those problems. Chapter 3 looks at floodplain development that occurred in the communities between 1976 and 1985 in comparison with what might have occurred without floodplain land use management programs. Chapters 4 through 7 explore the floodplain development process from the perspectives of three key actors: owners of vacant land in the floodplain; land developers and builders; and the owners of residential and commercial structures in the floodplain. Each chapter focuses on the effects of floodplain land use management programs on decisions to purchase property in the floodplain, to develop and use the property for various purposes, and to take steps to reduce its susceptibility to damage in the event of a flood. Chapter 8 analyzes the outcomes of those decisions as they constitute a market for floodplain property. Multivariate statistical procedures were used to sort out the effects of floodplain land use management programs on development and land values from other factors affecting the market. Chapter 9 discusses the implications of our data and research findings for floodplain land use management policies pursued by localities, states, and the federal government.