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	Water Resources People & Issues INTERTERVIEW WITH GILBERT T. WHITE	
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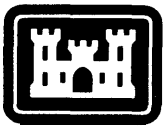

US Army Corps
of Engineers

Water Resources People and Issues

interview with

Gilbert F. White

EP-870-1-43

Water Resources People and Issues

GILBERT F. WHITE

by
Martin Reuss

Office of History
United States Army Corps of Engineers
Fort Belvoir, Virginia

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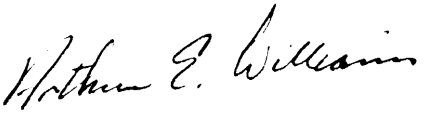
Preface

Few people have influenced water resources planning more than Gilbert White. Within the Corps, his impact is reflected in the Floodplain Information Services Program, which has been in existence for over 30 years. Also, the Corps' Office of History has accepted the responsibility to preserve and catalog White's papers, which are an invaluable research source for social scientists, historians, planners, and policy makers. A register of these papers will be made available as soon as possible.

This present interview is the third published in the *Water Resources People and Issues* series. Through in-depth interviews, this series presents the thoughts and careers of key individuals who have influenced United States water resources development. We commend this interview to all those interested in the past and future of water resources planning.

Nancy P. Dorn
Assistant Secretary of the Army
(Civil Works)



Arthur E. Williams
Lieutenant General, USA
Commanding

Interviewer

Dr. Martin Reuss is a senior historian in the Office of History, Headquarters, U.S. Army Corps of Engineers, specializing in water resources development. He holds a Ph.D. from Duke University and is the author of several books and articles dealing with the civil works program of the Corps of Engineers.

This edited manuscript is the product of a tape-recorded interview conducted by Dr. Reuss in Dr. White's office at the University of Colorado on June 25, 1985.

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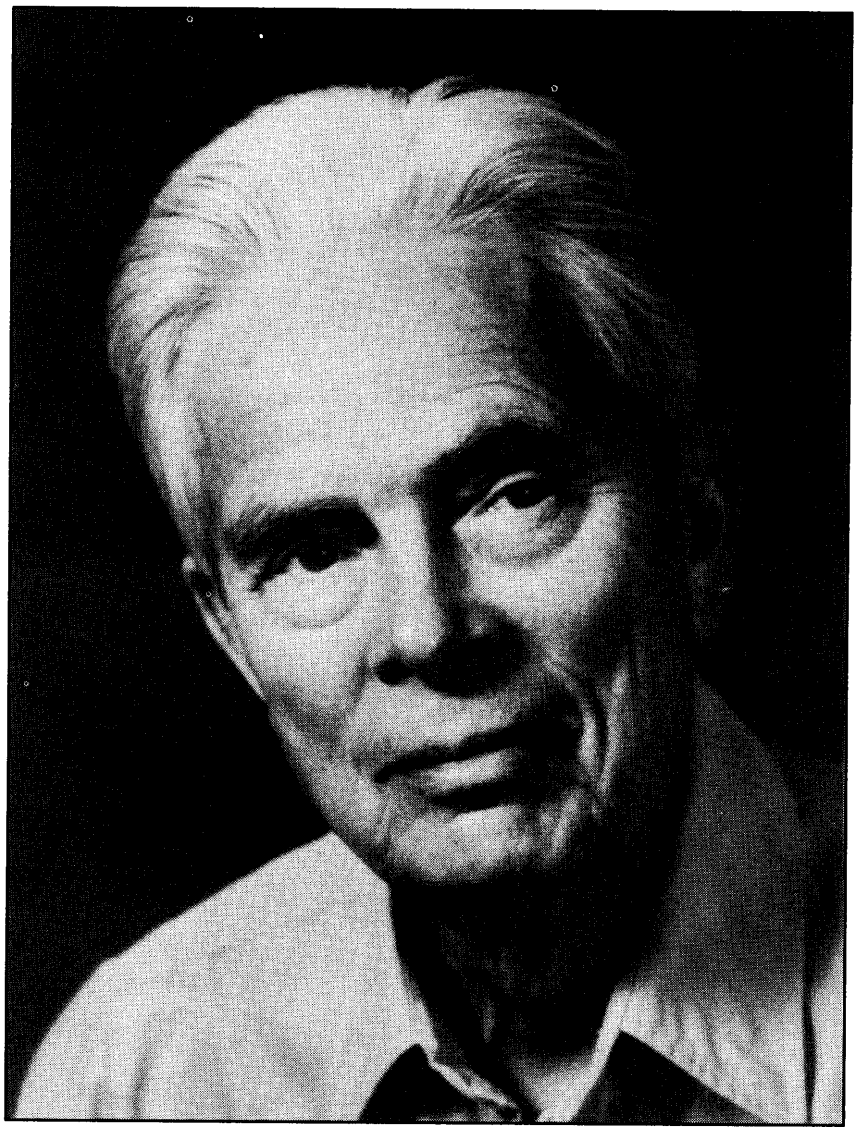

Gilbert F. White

Introduction

Gilbert White's influence on floodplain management practice in the United States can hardly be overestimated. Even before his path-breaking 1942 dissertation, *Human Adjustment to Floods,* was accepted and subsequently published by the University of Chicago Department of Geography, he had begun raising questions about the effectiveness of structural devices such as levees and dams in flood prevention. Although humans have resorted to various protective edifices for centuries to control floods, White's work demonstrated that flood control structures not only occasionally fail the standards of reliability set by planners but can actually increase the damage done when unsuspecting people risk lives and money to develop the land supposedly protected. One flood, one break in the levee, could spell disaster. White advocated the use of nonstructural solutions, such as zoning restrictions and floodproofing, to complement or replace more traditional structural approaches.

While White's academic career is distinguished, it is his commitment to public policy that dramatically expands the significance of contributions. His essays and books shun abstract theory and speculation in favor of clear policy analysis. His goal is to influence the management of natural resources and to do it in a way that takes into account psychological and sociological phenomena as well as physical constraints. He is fascinated by the gap between our scientific and technological capability to manage water as good stewards and our actual willingness to do so. Central to the issue is the question of how hazards are perceived, whether they be droughts, floods, or pollution. In analyzing the problem, White employed interdisciplinary methods and insights long before such an approach became fashionable. Moreover, with one eye on lessons from the past, he has never lost sight of long-term objectives: sustaining life in all its forms and avoiding violent confrontation both with one another and with nature itself. These are responsibilities that require not only professional expertise but strong spiritual values.

White's work reflects a sensitivity to the human condition rooted both in his training as a geographer and his Quaker faith. His global studies of the interaction between humankind and water resources implicitly suggest that the choices humans make in one corner of the world may contain lessons for others elsewhere. For over fifty years he has studied the human environment, ever enlarging our understanding of the intricate relationship between social development and the natural world. In this, his legacy among twentieth century geographers is unrivaled.

Vita

Gilbert F. White
Gustavson Distinguished Professor Emeritus of Geography
University of Colorado

Born: November 26, 1911

Education: S.B., S.M., Ph. D., University of Chicago

Positions Held

Geographer with the Mississippi Valley Committee, National Resources Committee, and National Resources Planning Board, 1934-1940

Member, Bureau of the Budget, Executive Office of the President, 1940-1942

Member, American Friends Service Committee, 1942-1946

President, Haverford College, 1946-1955

Professor of Geography, University of Chicago, 1956-1969

Visiting Professor, University of Oxford, 1962-1963

Professor of Geography and Director, Institute of Behavioral Science, University of Colorado, 1970-1978

Director, Natural Hazards Research Applications and Information Center, 1976-1984

Other Professional Activities

Member, Hoover Commission Task Force on Natural Resources, 1948

Vice-Chair, President's Water Resources Policy Commission, 1950

Member, UNESCO Advisory Committee on Arid Zone Research, 1953-1956

Chair, United Nations Panel on Integrated River Development, 1957-1958

President, Association of American Geographers, 1961-1962

Consultant, Lower Mekong Coordinating Committee, Cambodia, Laos, Thailand, and Vietnam, 1961-1962, 1970

Chair, American Friends Service Committee, 1963-1969

Member, Special NSF Commission on Weather Modification, 1964-1965

Chair, Bureau of Budget Task Force on Federal Flood Policy, 1965-1966

Chair, Committee on Water, National Research Council, 1964-1968

Chair, Steering Committee for High School Geography Project, 1964-1970

Member, UNESCO Advisory Committee on Natural Resource Research, 1967-1971

Member, Advisory Committee on Environmental Science, National Science Foundation, 1968-1971

Scientific Advisor on Man-made Lakes to Administrator of United Nations Development Programme, 1966-1971

Chair, Commission on Man and Environment, International Geographical Union, 1969-1976

Member, Scientific Committee on Problems of the Environment, International Council of Scientific Unions, 1970- (President, 1976-1982)

Chair, Advisory Board, Energy Policy Project, 1972-1974

Chair, International Environmental Programs Committee, National Research Council, 1972-1976

Chair, Environmental Studies Board, National Research Council, 1975-1977

Member, Joint Consultative Committee, Egyptian Academy of Scientific Research and Technology-U.S. National Academy of Sciences, 1978-

Chair, Commission on Natural Resources, National Research Council, 1977-1980

Member, Technology Assessment Advisory Council, U.S. Congress, 1973-1975

Member, Earthquake Studies Advisory Panel, U.S. Department of the Interior, 1973-1976

Trustee, Resources for the Future, 1967-1979 (Chair, 1974-1979)

Consultant, Water Quality Studies on Nile–Lake Nasser, 1975-1979

Executive Editor, *Environment, 1983-*

Honors

Distinguished Service Award, Association of American Geographers, 1955-1974

Quantrell Award for Excellence in Undergraduate Teaching, 1967

Daly Medal, American Geographical Society, 1971

Eben Award, American Water Resources Association, 1972

Thomas Jefferson Award, University of Colorado, 1973

Royal Geographical Society of London, Honorary Corresponding Member

Soviet Geographical Society, Honorary Member

National Academy of Sciences

American Academy of Arts and Sciences

Environmental Award, National Academy of Sciences, 1980

Gustavson Distinguished Professor Emeritus, University of Colorado, 1980

Soviet Academy of Sciences, Foreign Member

University of Colorado Medal

University of Chicago Alumni Medal

Co-winner, Sasakawa International Environmental Prize, 1985

Co-winner, John Tyler Prize, 1987

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"The Meaning of the Environmental Crisis," *Geography, Resources, and Environment: Vol. I: Selected Writings of Gilbert F. White,* R. W. Kates and Ian Burton, editors, Chicago: University of Chicago Press, 1986, 279-289.

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"Assessment of Flood Risk," *Violent Forces of Nature,* R. H. Maybury, editor, Mt. Airy, MD: Lomand Publications, 1986, Chapter 10.

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"Environmental Ethics," *Environment,* Vol. 28, No. 6, 1986, 1.

"The New Cities at Threat," *Environment,* Vol. 28, No. 9, 1986, 1.

"Foreword," *Nature on the Rampage: Our Violent Earth,* Washington, DC: National Geographic Society, 1986, 8.

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Water Resources People and Issues

GILBERT F. WHITE

by
Martin Reuss

Interview with

Gilbert F. White

Q: Professor White, could we begin by talking about your early family history, where you were born, your father's and mother' s background?

A: I was born in Chicago right near the University of Chicago. We lived there because my father was working for the Burlington Railroad and stationed in Chicago. My mother had decided, when they moved to Chicago in the 1890s, that we ought to be located near the university. She was from Atchison, Kansas, and she'd gone with her mother to the Chicago World's Fair in 1893. When they arrived in Chicago they stayed in a boarding house out near the Midway next door to the house in which the new young president of the University of Chicago, just being started that year, was living. My mother became enthusiastic about William Rainey Harper and his wife and thought that this was a very promising institution. When she married and they moved to Chicago, my father, who'd had to drop out of school and go to work at the age of 12, was concerned about his children, as yet unborn, having a better education than he'd received. They decided they would live near the university. Our family has lived there ever since. Their planning turned out to be remarkably accurate. Out of their four children, three of us attended the University of Chicago and took degrees there.

Q: Now you went through the elementary school system and the high school system in Chicago, I take it?

A: I went to the Ray Elementary School, the University of Chicago High School, which had been founded by John Dewey, and then took three degrees at the University of Chicago.

Q: Was there ever any question about your going to the University of Chicago? Did you ever think about going anywhere else?

A: No. We were all enthusiastic about the University of Chicago, and it was also the cheapest thing for us to do because we could live at home and walk three blocks to the university.

Q: Did you major in geography from the very beginning? How did your interest in geography develop?

A: I decided to go into geography when I was a sophomore at the university and took a course in geography. But my interest, I think, had already been formed because my father was a partner in a ranch in the Tongue River Valley in Wyoming, in addition to his railroad job. I used to spend the summers at the ranch irrigating, helping with the hay, helping drive the sheep to the mountains, tending sheep camp. I was interested very early in natural resources matters. But our ranch experience came to a close in the 1930s with the combination of the Depression, the drought, and grasshoppers. An early spring storm made my father go broke and he dropped out of the ranch [operation]. By the time I got to the university I was quite alert to anything that was being said about natural resources and water and land. When I encountered a group in the geography department that was interested in this, that was to be a logical intellectual home.

Q: Now, was the University of Chicago unusual or even unique in having an interest in this particular area of geography at that time?

A: It was unique in two respects, I think. It was the first full-fledged geography department in the United States. The founding chairman as a physical geographer-geologist, [Rollin D.] Salisbury, with his right-hand person being Harlan Barrows, who had become the chairman. They were much under the influence of [Charles R.] Van Hise of the University of Wisconsin, who you may recall published the first book on conservation of natural resources in the United States. In addition to establishing an early and strong department, they had from the outset a clear interest in conservation problems.

Q: Was there a European influence in that department, would you say? The reason why I ask that is that it's my impression that, in general, geography departments are more influential in Europe than in the United States. There seems to be a longer tradition of people majoring in geography-paying

serious attention to geography—than in the United States. Maybe my suppositions are wrong.

A: That was the case and that still is the case. I've lectured in the Moscow State University where the geography faculty numbers 350. There's nothing like it in the United States in terms of the amount of detail and sophistication of specialization.

The European influence on Chicago was modest. There was a much stronger influence from American scholars. Edith Semple, who did historical geography, had been a visiting professor there. In the days when I was an undergraduate there was more interest in the work of Isaiah Bowman and Semple and the application of Frederick Jackson Turner's theories of occupation of semi-arid areas than there was drawing from European geography, although we all studied Humboldt and Ratzel and the other major writers.

Q: So you took a BA in geography, or was it a BS?

A: It was a BS. And then an MS.

Q: Did you write a master's thesis for your MS?

A: Yes, I wrote a master's thesis on an English estuary, Humberside. The reason for this was that there was an opportunity to do field work in England in 1931 during the summer. I took that opportunity and used material from it for a master's thesis which I completed in 1934, two years after my bachelor's degree. At that time I also completed all of the formal requirements for a Ph.D. so that I had only a doctor's dissertation to write. I then knew I wanted to write it in the field of natural resources. This was the spring of '34. Barrows had been appointed to the Mississippi Valley Committee of the Public Works Administration, which was headed by Secretary of the Interior Ickes, a Chicagoan who had known Barrows and Merriam. Charles E. Merriam, a leading professor of political science, had just been appointed to the new National Planning Board. Barrows said to me, in effect, "We have a six-months' job at most, working on preparation of a report of the Mississippi Valley Committee. Why don't you come to Washington for a few weeks or a few months and lend a hand?" I gladly

grasped that opportunity and instead of staying a few months I stayed eight years.

Q: Let me go back for just a half a second here. Was your master's thesis done under Harlan Barrows, too?

A: No, it was done under Henry Leppard, who had worked on his thesis under Barrows and had made a comprehensive study of the Peace River Valley in Canada as a new settlement area.

Q: Was your thesis basically one of historical geography or a study of the impact of the estuary on human population?

A: It was a pedestrian piece of geographic morphology, describing the land use.

Q: Then what made you turn to your thesis topic?

A: I saw a way of taking advantage of the summer work that I had been able to complete in '31, using material already in hand, rather than because I wanted to pursue that topic any further.

Q: I presume that Professor Barrows had no particular problem with your choice of topic?

A: Not for the thesis.

Q: Well, for a Ph.D. dissertation?

A: That developed very slowly, after '34. When I went to Washington in '34 I didn't have a Ph.D. topic. All I had to do was find one. It took me several years to find one and altogether eight years to complete a dissertation.

Q: So the thesis came easily but the dissertation didn't come so easily. You were working as a Ph.D. student under Professor Barrows at this time?

A: Yes.

Q: And then he asked you to work on the Mississippi Valley Committee. What kind of work did you do for Professor Barrows on the committee.

A: The committee was established by Harold Ickes and Colonel Henry Waite, who was the deputy director of PWA [Public Works Administration], because following the establishment of PWA they had been deluged with projects for water management, chiefly for the Mississippi Valley. And Waite and Ickes began to have questions as to how one Mississippi Valley project related to another.

There was, as you know, a series of reports that the Corps of Engineers had begun to prepare under Section 308 of the earlier Flood Control Act [1927 River and Harbor Act]. But in addition to those reports, the first of which was on the Tennessee River, there were numbers of projects that were beginning to emerge from the Corps' studies, from Bureau of Reclamation studies, and from some state agencies.

As I heard the explanation, Waite said he'd like to have someone tell him how these various proposals fitted together, the extent to which they raised common problems of policy, and the extent to which what was being proposed in the near future with PWA financing would assist or work against what might be considered a long-term plan. He appointed a group to prepare a report to be presented some time in 1934. The members of the committee divided up the task of writing the report. Barrows had the responsibility for writing a section on the Missouri Basin. Sherman M. Woodward, who had headed the Hydraulics Lab at the University of Iowa, was given responsibility for the lower Mississippi. I found myself digging up information, preparing syntheses of available reports, and doing some field collection of data through state agencies and in offices of the Bureau of Reclamation and the Corps of Engineers. The other members were Herbert S. Crocker, Glen E. Edgerton (Edgerton frequently represented Markham), Henry S. Graves, Edward M. Markham, Charles H. Paul, and Harlow S. Person.

So in the months from March on in 1934 I very quickly gained a firsthand acquaintance with the District offices of the Corps of Engineers in the Missouri and lower Mississippi areas and visited Vicksburg and New Orleans. I generally collected data which Barrows and Woodward used in preparing their sections of the Mississippi Valley Committee report.

Q: When you came to these Corps offices you came as a representative of the Mississippi Valley Committee presumably?

A: Yes.

Q: What kind of reception did the Corps give you? Do you recall?

A: Yes. There was a cordial reception for two reasons. One was that the Chief of Engineers, General Markham, was a member of the Mississippi Valley Committee. Markham attended some of the meetings, but Colonel Glen Edgerton represented him at most of them. Edgerton was a very intelligent, thoughtful representative of the Corps who had the respect of everybody on the committee and who must have had the respect of the people in the Corps because when the word went out that we wanted something, it was always provided. The response was friendly.

The other reason was that here was a group trying to put together much of the work on which people in the Corps had been laboring for a long time. In a number of cases, people for the Corps served short times as assigned staff to the Mississippi Valley work. I remember one person was Cone from the Southwest area, who had been mainly responsible for the 308 reports on the Arkansas, Red, and White rivers. He came in and was useful. At that stage, the Corps personnel regarded this as an opportunity to get their experience and judgment presented in a larger context. All was not promising. I recall one interview with a team working on the New Madrid floodway. After the members had presented their report, one asked Woodward what he thought they needed. He replied dryly, “An historian. ”

Q: Did you get to meet Harley Ferguson, who was the president of the Mississippi River Commission at that time and the Division Engineer down there?

A: Yes. I met him. He was a fine person. I didn’t have very direct dealings with him. I spent much more time with Gerard Mathes, for example.

Q: The Senior Engineer?

A: Yes.

Q: Okay. You got your data on the lower Mississippi partly from the Corps and then you came back to Washington and drafted a report?

A: It was an iterative process of preparing a report which the committee finally produced under the chairmanship of Morris L. Cooke, who had been designated by the President for this committee under Ickes.

Q: And what did the report finally say?

A: The report recommended a whole series of policies and projects for the Mississippi Valley. At the time, I did not realize fully that a part of the hidden agenda for the report was Morris Cooke's deep personal concern for rural electrification. Some of us on the staff were surprised that so much attention was given to information of a statistical and graphical sort about the lack of electrification on farms in the United States and the Mississippi Valley.

One of the outcomes of submitting the report was the establishment of the Rural Electrification Administration, and one of the men whom Cooke had brought in with him to serve on the committee-Harlow Person—and his assistants, E.J. Coil, S. P. Langhoff, and Perry Taylor, immediately went into setting up the new Rural Electrification Administration.

From this I learned that there are skillful people who take a public assignment of this sort, pick out one or two practicable outcomes, and then focus on those. In this case, Cooke focused on establishing REA. The other members of the Mississippi Valley Committee weren't interested in REA but they cooperated in getting out a report which enabled Cooke to persuade Roosevelt to establish the administration. Some of the members of the committee, I know, felt a little disappointed because Cooke didn't spend much time trying to push their other recommendations.

Q: Well, this report comes at a time when there was still a great deal of controversy over the single-purpose versus multi-purpose approach to river development. And, as you know, there were many people in the Corps who still considered that navigation ought to be the primary goal of federal

involvement. Was the report advocating a multi-purpose approach to river development?

A: Very clearly so.

Q: And since Markham was a member of the committee, did he sign off on this report as had the other committee members?

A: Yes. They all signed off. This took a great deal of skillful drafting, but it was not so much a problem of the Corps versus other agencies or individuals, I think, as it was a matter of stress within the Corps. The Corps had been going through this process in preparing the 308 reports, and while we were doing this, the TVA was picking up the Corps' report on the Tennessee, revising it, dismissing the Corps as the engineering agency for the Tennessee Valley Authority, and establishing its own engineering staff. TVA was using Sherman Woodward as a principal engineering consultant in doing so.

So, people were very sensitive to the challenge of multi-purpose development. It was evident that Markham and Edgerton were not fighting this. They were trying to draw the best they could out of what the Corps had invested in works and experience and material from their 308 reports in meeting the new view. But when one visited in Arkansas or Louisiana or Tennessee or Mississippi, one realized that there were many, many people in the Corps who had not accepted this view.

Q: It seems almost unbelievable to me that the TVA, then headed by Arthur Morgan, would have ever seriously considered using the Corps of Engineers as an engineering agent for their projects, considering Morgan's long animosity toward the Corps.

A: Yes, but under the TVA legislation they had the authority to do so if they wished.

Q: But do you recollect any serious consideration of that proposal?

A: I never heard of there having been any serious consideration but one would need to consult the TVA records. Arthur Morgan had to sell H. A. Morgan and Lilienthal on the notion that TVA would set up its own engineering

agency. I do recall Woodward telling with some embarrassment how he had been ordered by the TVA board to go to the St. Louis office and tell them that he was there to collect all the engineering material that the TVA now wanted.

Q: You didn't go back to Chicago immediately after you completed that report, did you?

A: The National Planning Board became the National Resources Board on July 1, 1934, and the MVC became its Water Planning Committee, with Graves dropping off. The NRB was abolished on June 7, 1935, and the National Resources Committee was established in its place. There was established, under the National Resources Committee, a series of specialty committees: one on land, one on water, one on energy, and so on. The Water Resources Committee then was appointed with Abel Wolman of Maryland as chairman and with several of the members of the Mississippi Valley Committee on the new Water Resources Committee. (A fine oral history by Wolman has been prepared by Walter Hollander, Jr.)

A number of the Mississippi Valley Committee people didn't transfer over. Barrows did, as did the representative of the Corps, with William Snow replacing Edgerton. One representative each from the Bureau of Reclamation, the Soil Conservation Service, Fish and Wildlife, U.S. Geological Survey, U.S. Public Health, and Federal Power Commission came in. I was asked to serve on the staff of the new committee, which I did. In time I became secretary of the Water Resources Committee and stayed with it and its successors until 1940, when I went over to the Bureau of the Budget.

Q: What was your initial assignment for the Water Planning Committee under the National Resources Board?

A: The first task of the Water Planning Committee was to prepare a section of the report of the National Resources Board. The National Resources Board had been requested by the President to prepare a report on national planning and public works in relation to natural resources, including land use and water resources. This it did in December of' 34. It enlarged its activities and scope of interest to the whole country, but proceeded then to examine all of the problems of water policy, water data, and modes of making decisions about public works which had been described by the Mississippi Valley Committee.

Q: Approximately when did you work on this report?

A: From about July of 1934 to December '34. Cooke was still chairman of the Water Planning Committee, but his interests were shifting in the other direction. He was not replaced as chairman until he had the REA fully under way.

So by the end of '34 you had a report from the National Resources Board. Then it promptly was replaced by other agencies with very similar membership. It was at that stage that Wolman took over from Cooke as chairman. Markham continued as a member; John Page was the representative of the Bureau of Reclamation. Other members were the head of the Soil Conservation Service, the head of the Fish and Wildlife group, the chief hydrologist from the U.S. Geological Survey, the principal engineer from the Public Health Service, and the principal engineer from the Federal Power Commission. Barrows and Woodward; Thorndike Saville from New York University; Ed Hyatt, state engineer of California; and four nongovernment folks along with Wolman made up the total committee.

Q: Was Marshall Layton from the Geological Survey the chief hydrologist?

A: No. It was N.C. Grover. They then undertook to prepare, basin by basin, an examination of problems and promising projects-construction projects and investigation projects—for the whole country.

Q: This report was then submitted to the President?

A: It was submitted to the President on November 9, 1936. The device for doing so was that under the old Public Works Planning Act the President was empowered to prepare a program of public works. They used this as the legislative authority on which they then proceeded. This continued for a period of years. The National Resources Board, National Resources Planning Board, National Resources Committee-it went through various names but retained substantially the same top membership—never had solid legislative authority from the Congress. Congress was unwilling to establish them as a permanent, well-grounded organization; they lived by executive orders and broad interpretations of other legislation. Marion Clawson describes the process in New *Deal Planning* [Baltimore: Johns Hopkins Press, 1981].

Q: As a matter of fact, as I recall, that original National Planning Board went by the wayside because it was originally funded through the Emergency Appropriations Act of '33. Then when that funding was gone, they had to disband and then come up with some other. . .

A: They did. And they continually did this. The new National Resources Board was set up by executive order, not by Congress.

Q: Now, Congress must have gotten a copy of this report, though, somewhere along the way. I mean, this report went to the President. Clearly it would have been sent to Congress, too.

A: Oh, yes. It was sent to Congress.

Q: Do you know if this report had any kind of impact on subsequent congressional deliberations prior to the 1936 Flood Control Act? Was there any connection between the two?

A: There was frequent discussion in the old Interior Building and the old Executive Office as to what the role of the findings of the Mississippi Valley Committee and the National Resources Board had been in shaping either agency policy or congressional legislation. It was tantalizing for the people who had been connected with the committee at the top because if an agency such as the Soil Conservation Service or the Corps of Engineers or Bureau of Reclamation found something in the Mississippi Valley Committee report or National Resources Board report that looked sound and promising to them, they picked it up and used it as part of their ordinary presentations to the Congress. Thus, the planning agency got very little credit for it on the Hill if it seemed a good idea. If it was an unpopular or troublesome idea, the agencies could say, well that's what the National Resources Board was proposing. And the Resources Board members had no significant influence on the Hill beyond what the President could claim for them.

Q: How about Abel Wolman himself? Did he have influence on the Hill?

A: No direct influence. The board followed a policy. When I speak of the board I mean the National Resources Board, National Resources Planning Board, National Resources Committee. They had a practice of making

recommendations to the President. They did virtually no lobbying on the Hill. They did not encourage their staff or their principal members to participate in activities on the Hill and therefore they were always at the mercy of the members from the principal agencies. Ickes, Secretary of Agriculture [Henry A.] Wallace, Secretary of Commerce [Daniel C.] Roper, Secretary of Labor [Frances] Perkins, FERA [Federal Emergency Relief Administration] Administrator [Harry L.] Hopkins, Frederic Delano, Charles E. Merriam, Wesley C. Mitchell, and the Secretary of War were members of the board after the original planning board was abolished. They took a rather detached view. They drew from the board what they could that was useful. They didn't identify themselves closely with the board. The history of the board, I think, has been thoughtfully recorded by Marion Clawson.

Q: In your deliberations for both the Mississippi Valley Committee and the National Planning Board did, you pay much attention to methods of land acquisition for flood control? Was that a concern?

A: In that earliest year it was not a major concern that I can recall.

Q: After you got through with the report for the National Planning Board, what was your next assignment?

A: Then I began the activities of the National Resources Committee. The National Resources Committee put out a series of reports called Drainage Basin Problems and Programs—one in '36, one in '37—which were comprehensive and which helped set out for the benefit of everybody in the field the programs of all the interested agencies, including state agencies. They identified questions that had been raised about projects by specifying priorities and recommending studies.

Q: Did these questions include financial questions? Cost sharing and things of this sort?

A: Yes, very much so.

Q: Did you get at all involved at this time in the deliberations on the '36 Flood Control Act?

A: Yes.

Q: In what way?

A: At this point I wish that I had access to the archive files and some of the numerous memos that passed back and forth. I've never gone back to look at those. If you were to decide to use some of this material, I'd want to check it out in the archives.

The way in which the board, or committee, became involved was that efforts to establish a national flood control policy were sparked by supporters of the Corps of Engineers. The Department of Agriculture—the head of the Forest Service and head of the Soil Conservation Service-were unhappy about this. It became plain that Congress would have to pass legislation to provide support both for the Corps and for the two agencies in Agriculture. Other groups in the government were also disturbed about a prospective heavy commitment to financing Corps projects for flood control. They used the National Resources Board people as one means among many of trying to reach the President on the importance of having some kind of integrated planning provided under the proposed act instead of having it solely under the corps.

As the legislation took shape following the disastrous floods of 1936, the board was an instrument for proposing that the President push for a more comprehensive kind of river basin study and management than was provided for by having it all going to the Corps. As passed, it included provisions for the Agriculture people doing their own thing. Collaborating with the Corps was present in theory but not in practice. A series of efforts was made using the chairman of the National Resources Board and Vice Chairman Frederic Delano, uncle of the President, to persuade the President to veto the bill. He did not.

The same process followed the Ohio River floods two years later. That led to the Flood Control Act of '38. The board again tried to persuade the President to veto it, which he didn't feel was wise. Then the issue was very much the issue of cost sharing for reservoirs. And it was felt strongly by members of the Water Resources Committee, which included Barrows and Wolman, that to remove cost sharing from the major reservoir projects, even though such action would simplify the process of getting the projects started,

would open the door further to a flow of economical y unjustified undertakings.

Q: Was New England the major problem, the Connecticut Valley?

A: It was not the major problem, but [Massachusetts Representative John] McCormack from New England was the leader in an effort to push through both the 1936 and the 1938 acts, arguing that only by simplifying the funding process would it be possible to take the measures which they felt were so urgently needed.

Q: Of course, Will Whittington was chairman of the House Flood Control Committee and he had about six or seven reservoirs being contemplated down in his home district.

A: Yes, in the Yazoo. I would say that, as I recall, the major articulated pressure came from New England. Others around the country joined in cheerfully.

Q: How about the Ohio River Basin at this point?

A: Yes, also.

Q: Was there also a discussion at this time of land acquisition for both reservoirs and floodways and spillways and things of this sort?

A: Yes. By that time it had come to the front.

Q: And do you recall what the discussion was about? As I recollect, there was a question about land easements versus condemnation and things of that sort.

A: There were several questions. One was the use of condemnation rights. A second one was whether or not easements would be more suitable than fee simple purchase or condemnation. And the third was the question of subsequent control of the reservoir frontage for purposes of recreation and wildlife, and in what agency this control would rest.

Q: Was there any kind of change of thinking within the water subcommittee about real estate problems? I recollect that there was some discussion of this, particularly as it pertained to the lower Mississippi about fee simple versus land easements on some of these floodways down there. And originally they were for the fee simple solution; then they went to land easements, I think. There seemed to be a great deal of internal turmoil. I get this from reading some secondary literature and things of that sort.

A: There was, for example, the Birds Point New Madrid floodway. There was a good deal of argument that I heard over whether, if simple flowage rights were acquired, it would ever be politically feasible for the Corps to use the floodway. Some tough characters said unless you buy this outright and manage it, you're not going to be able to use it for flood control purposes. I think that was certainly one of the more critical issues that was argued on the lower Mississippi.

Q: You continued to work on the National Resources Planning Board until what time?

A: I worked until 1940. At that stage, I had been helping the Bureau of the Budget, with which we worked very closely because the National Resources Planning Board offices were right next door to the Bureau of the Budget in the old Executive Office Building, in preparing an executive order which required all federal construction agencies to submit proposed plans to the Bureau of Budget for review prior to submission to Congress.

Q: That would have been 1939-40?

A: Yes. I had helped draft that. The President then issued the order and the director of the Bureau of the Budget asked me if I would come and work in their Legislative Division on putting this into practice so far as land and water projects were concerned. I sat at a small desk in the Legislative Division under Fred Bailey in the Bureau of the Budget for a couple of years, seeing everything that went over the President's desk dealing with land and water.

Q: Did you feel that you were successful in that position? Did you feel that the intent of the executive order was being carried out?

A: We had had some prior experience with this kind of an exercise. It's interesting that back in 1937 the National Resources Committee had been the instrument through which the first effort at environmental impact assessment was made, as far as I know. That was at a time when many of the technical people in federal agencies and many state people were gravely concerned about the way in which small reservoir projects were being built around the country and the way in which land drainage of wetlands was being carried out with public funds. This concern became so acute that the director of the Fish and Wildlife group [Ding Darling] asked the Water Resources Committee to look into the problem and see what could be suggested by way of reducing the number of ill-conceived and poorly managed drainage projects and water-storage projects around the country.

I served as a staffing man for the group. It soon was apparent that the files were full of horror stories of reservoirs that leaked, dams that failed, dams that didn't serve their purpose, drainage projects that destroyed large areas of wildlife habitat without proportionate gains in economic production. In the opinion of the group that reviewed this situation—it was an interagency group–agencies that were involved in undertaking new projects should at least notify the other agencies about what they were planning to do before they started. The notion was that this would give other agencies an opportunity to study possible conflicts and deleterious effects, and raise questions with the sponsoring agency.

The group recommended to the President that he issue an executive memorandum telling all agencies that before they started a new water-storage project or a new land-drainage project they should let the other ones know. This was done. A system of regular reporting was established. Subsequent experience showed that the agencies could wait until they were about ready to launch a project and then inform the others. It then became very difficult for the others to have much influence on the proposed development.

Q: Of course, by this time you've got a relatively new agency on the block, too—Soil Conservation Service.

A: Oh, yes. The whole history of the little waters movement and the small dams activity which Morris Cooke had promoted with Hugh Bennett is a fascinating record of conflict of thinking about effects of water management. After they left the Resources Board, Cooke and Person promoted the publication *Little Waters*, which became very popular. People who remained on the Water

Resources Committee were most unhappy about this kind of promotion. They countered with preparation of the first edition of a manual called *Low Dams.* That's where *Low Dams* got started, through our Water Resources Committee.

Q: Which basically, as I recall, is a how-to-build kind of thing almost.

A: And what to look out for in designing it. Its initial stance was one of prudence: what not to do, what to do, raising all sorts of cautions, pointing out gains that can be realized but also severe damages that can be incurred as a result of ill-advised and ignorant activity.

So you had Morns Cooke's *Little Waters* getting a lot of publicity and the Water Resources Committee, representing the major federal agencies, putting out *Low Dams* and then getting the agencies to continue the publication on their own.

Q: Of course, now Morns Cooke evidently did influence Roosevelt . . .

A: He did.

Q: . . . on what later was to be called the upstream-downstream controversy. And am I to gather from your remarks that Abel Wolman and the people who worked for him didn't have a similar kind of influence on Roosevelt with this *Low Dam* book?

A: That's correct. Morris Cooke was a much more skillful political operator. He was primarily a politician in the best sense; that is, he was interested in shaping public policy. He started out with an aim and he found evidence to support it, whereas the people on the Water Resources Committee started out with the basic data and technical analysis, and finally arrived at suggestions about policy. Cooke could run circles around them when it came to getting over to the White House and to some members of Congress. He had no hesitation about going to Senator [George W.] Norris or other people on the Hill on whom he knew he could rely. Wolman and others on the board were asked not to lobby; the board was to advise the President and his cabinet.

Q: I would assume that some of the Midwestern congressmen would have been in Morns Cooke's camp.

A: Yes. It was and is a very attractive idea. He was not unduly encumbered by scientific evidence as to what the effects would be. Cooke didn't really care very much about the upstream-downstream controversy. It was all right to have people like Leopold and Maddock write a book on the flood control controversy, but I don't think that Morris ever worried about their findings. I'm not sure he ever read the findings. I worked with him in later years.

Q: Are you suggesting that Cooke thought that building reservoirs far upstream was simply more attractive politically?

A: No. He wasn't seeking votes. He was basically convinced it was a good thing just as he was basically convinced that low-cost electricity was a good thing for the welfare of the nation. And he would brook very little argument about the possibility that it might be desirable to cost power at what would be the economically marginal rate rather than at a promotion rate. Cooke was not trying to get political influence for himself. He didn't want elective office. He was a missionary who primarily was interested in low-cost power and who became intrigued with the notion of small dams.

Q: You worked for BOB . . . ?

A: For two years.

Q: For two years, about '39 to '40?

A: No, '40 to '42.

Q: And you were mainly reviewing these reports that came in subsequent to the executive order of '39?

A: Or any legislation that was proposed. The Bureau of the Budget had several divisions. It had an Estimates Division that handled the big budget preparation. It had an Administrative Management Division. It had a Legislative Division under Fred Bailey, who was an astute and wise assistant

director of the Budget. The Legislative Division looked at anything that went over to the President's desk that involved proposed legislation, any proposed executive order, or any report to Congress. It typically reviewed these items with the notion that it would request the author of the item to state at the conclusion of the report that it is or is not "in accord with the program of the President. " Harold Smith, who then was director of the Budget, used to go over and see the President every day when the President was in town. He would typically take over a batch of papers from all parts of the Budget; always some from the Legislative Division. The latter typically provided the President with a summary of the proposal in one or two pages and stated the options. In effect, they said we want your approval to say it is either in accord with your program or not in accord with it, or to suggest alternative action. The same procedure applied to signing or vetoing congressional legislation. The President ordinarily would read these and the next day when Smith came back he would say or write OK or no or respond with a question.

Much of the material that went out then simply said this is in accord with the program of the President. If it were not, some of it could be disapproved in a straightforward way. Other parts would present problems that the Bureau of the Budget could try to grasp and reconcile.

Q: Later on, talking about after 1965, evidently people in the Bureau of the Budget had no particular love for the Water Resources Council that was set up in the '65 act, partly, I suppose, because they felt that they could handle these kinds of matters themselves. They didn't need a WRC to help them. Was there any similar animosity on the part of the Bureau of the Budget toward some of these New Deal agencies that you'd been associated with in the 1930s? Maybe the Bureau of the Budget didn't think those agencies were necessary either?

A: Not that I recall at that time. You recollect that the Executive Office of the President was a new institution that Louis Brownlow had engineered. It had, under Harold Smith, very much a sense of mission of being a coordinated, integrated group. It was fiercely proud of the small number of personnel that were involved. I doubt if there were more than 50 professional people in the bureau at that time. The standard operating procedure under Harold Smith and Fred Lawton and Fred Bailey was to get other people to do as much as you can.

Your role is not to make decisions but to bring the critical decisions up to the top and to present the information in a concise, incisive way so that the folks at the White House could make an informed political judgment. There would be one person that was responsible for budget estimates for a major agency. There were two or three that were handling Defense, Interior, and so on, and just a small handful in the legislative group. We were not to get out and tell people how to manage their business. We were there to see to it that they knew what others were doing and if there were conflicts, the conflicts were resolved so far as possible at the executive level.

Q: Beginning in 1940 the President began to issue some executive orders dealing with national defense, and I forget when the War Production Board was established, '42 perhaps. In any case, how did the coming of World War II affect the water resources business while you were there in Washington?

A: The water resources activity became less important, of course, particularly in '41. After Pearl Harbor (I am a Quaker and a conscientious objector to military service) I told Harold Smith that I didn't feel I should stay with the Executive Office after the declaration of war and that I would like to go do volunteer service with the American Friends Service Committee. His position was that he would not like to see me leave; I could remain on nonmilitary matters. Under the Selective Service regulations I was doing work classified as of "national importance." If the draft board asked him, he would say no. But if the draft board didn't ask him, I could go ahead. My draft board in Washington told me they would give me permission to work with the Friends Service Committee on relief work in Europe, and to consider it as work of national importance. There was then a legislative stricture against COs serving overseas, and I therefore was not classified as a CO.

So I left the Bureau of the Budget and in the closing months I worked with Milton Eisenhower, with whom I had been associated through his being land-use coordinator in the Department of Agriculture, in setting up the new War Relocation Authority. I simply was sort of a general utility person to check out the suitability of prospective personnel for his agency.

Q: What did you do overseas?

A: I did relief work for French children, for refugees, and for people in concentration camps in Vichy, France.

Q: Did you know French?

A: Yes, and I learned it better.

Q: How long were you over there?

A: After the Germans took over Vichy, I stayed on. I was one of, I think, two Americans who were free to move around in a German-occupied area carrying on relief and arranging for transfer of activities to non-American activities, until about February '43. Then, through a misunderstanding, I turned myself in and was taken to Germany with the Americans who'd been interned all that time. I spent 13 months in Germany and finally in '44 was with the American diplomatic group that was exchanged for Germans.

Q: Where were you located in Germany?

A: We were located in a gilded cage at Baden-Baden.

Q: It doesn't sound too bad if you're going to be a POW.

A: Oh, it wasn't. This was the diplomatic group in detention. We were in a fine hotel and we had good food, considering the circumstances. I lost weight, but it was much better food than I'd had in France, and it was a comfortable kind of internment by comparison to what I' d been seeing in French camps.

Q: After you were released you came back to the United States and then what did you do?

A: I continued as a volunteer with the American Friends Service Committee. I was in charge of raising money and supplies for the sufferers from the Bengal famine where about two million people had died-one of the least-known tragedies of the Second World War. And for sending supplies and people to a Friends unit that worked behind the Japanese lines in China, providing medical services and supplies for both Mao and Chiang Kai-shek. Then I was assistant executive secretary for the Service Committee. When the war ended,

I accepted an invitation to go back to the University of Chicago and join the faculty, by which time I had received my Ph.D.

Q: We missed something here along the line. Let's get back to your dissertation.

A: I had decided the problem of floodplain occupance was one that deserved attention. It certainly captured my curiosity and I had worked on it on weekends and nights.

Q: In Philadelphia?

A: No, in Washington, in the late thirties, early forties. It was a problem which I had very much in mind and that I could frequently discuss with colleagues in the Geological Survey or the Corps or Soil Conservation Service. And so when Pearl Harbor occurred—I remember walking into the Executive Office that Sunday morning when word came from Pearl Harbor—one of my early reactions was, I'll have to finish up that dissertation mighty quick.

Q: Well, your dissertation must have been influenced by what you discovered in Washington working with these various committees.

A: Oh, yes, it was. Very much so.

Q: Can you sort of outline in brief the most significant ways it was affected by your work in Washington?

A: One of the first jobs I had with the Mississippi Valley Committee was looking at the proposals for flood control in the Missouri Basin and the lower Mississippi, and one of the haunting questions that came up was what will be the effect of doing this work, if it is now financed by PWA, when the bulldozers start moving in the next few years? That question continued to pester me.

Along with it was the question of how to compare the social desirability, in terms of the local community or in terms of the nation, of making funds available for a new irrigation project on the Loup River in Nebraska or for

a flood control project in South Dakota or an improvement in a levee in the Yazoo Basin.

I was constantly searching my mind and the minds of others for frameworks in which one could arrive at a judgment of feasibility. This was a very exciting time because [Columbia University economist John Maurice] Clark had just come out with his work on the economics of public works. The first rudimentary efforts were being made on benefit-cost analysis, most of which were in Corps 308 reports and some Bureau of Reclamation reports, and I constantly saw those. So it was an easy and natural shift for me to try to work out a framework for examining what was happening on floodplains.

Q: Your concern for trying to take into account the national desirability of a local project strikes me as if it's still very much with us. And in fact the term that popped up in the 1970s was "national scoping. " Is that what we're talking about, in a sense? An early accounting of what later becomes what people like Oliver Houck . . . do you know Ollie Houck in the National Wildlife Federation?

A: I know him.

Q: He used to talk an awful lot about this concern about national scoping, not only in terms of projects but in terms of regulations, too. Regulatory 404. So it seems like you may have been the father of this kind of concern.

A: Oh, no. It was a concern of many people at the time. We sat around discussing it in late hours, at night, at lunches. One of the frequent troublesome questions was how does the body politic arrive at judgments as to what is in the national interest, and to what extent it can rely on the evaluations of the local people who are concerned. This lands you right into the whole question of cost sharing and of the wisdom of market decisions affecting externalities.

Q: I was going to say, given your concerns then, what did you think of early cost-benefit analysis? Did you think these were valid analyses? And what about their concern or lack of concern for what we now call intangible benefits?

A: I wrote an article on this. It appeared in the *Journal of Land and Public Utility Economics* along about, I think, 1936. I have subsequently said it was probably the first and certainly the worst article that's ever been written on the subject. It was a rudimentary kind of a searching for what's involved in benefit-cost analysis, and how to deal with tangibles and intangibles, taking flood control as an example. It is not an article that appears in the University of Chicago collection. But it was illustrative of a concern that not only I but many others had at that time. We now take for granted many of the concepts that were then just beginning.

There was lively and incisive discussion of what constituted an effective benefit-cost analysis. We spent a lot of time arguing about what constituted a damage, what constituted a tangible benefit or an intangible benefit, how one dealt with secondary benefits (as the term came to be used), how to avoid double counting, and appropriate discount rates and time horizons. I was somewhat amused by the fact that when Robert Dorfman put together a symposium on benefit-cost analysis a good many years ago he didn't include water resources analysis because he argued this didn't require the same kind of sophisticated investigation that the other fields did. I think it still requires much more careful investigation than given it so far.

Q: Well, okay, so you were working on your dissertation on weekends and evenings and you submitted your dissertation to the University of Chicago in 1944?

A: No, I finished it in '42—with the help of the young woman who is now my wife in order to get through with it. And I took it to the University of Chicago. Barrows went over it with great care and revised it and I passed my exam. Then I left for France.

Q: When did you marry the young woman then?

A: We agreed that we wouldn't get married until I came back, whenever that was going to be. It was a very uncertain time.

Q: The dissertation was published by the University of Chicago. Wasn't it published in '44, an early publication?

A: It was published in two forms. The University of Chicago at that time had a policy of simply publishing a few copies of a doctor's dissertation, putting it in a few libraries around. And that was what was done with mine. Then people began hearing about it and asking for copies, and so they published it in what came to be a monograph series. So you'll find different dates ranging from '42 to '45 depending on when people got access to it.

Q: In a nutshell, what do you think is the most significant finding in your dissertation?

A: My judgment, which may not be that of others, is that the dissertation suggested a simple but fundamental concept that, for any mode of resources management, finding the optimal use of a resource theoretically involves canvassing the whole range of alternatives that are open to society, and then trying to estimate what the consequences would be, both favorable and unfavorable, of undertaking any one of those alternatives or a combination of them. This was applied to floods. The same notion would apply to any other kind of resource management.

Q: This idea, which includes social well-being as well as the effect on the environment and so forth, strikes me as something that later on became law via NEPA [the National Environmental Policy Act]. Do you see that connection?

A: Yes, indirectly.

Q: What you're suggesting in your dissertation later on does become in fact a law of the country, a major environmental policy. You must have been very proud at that time to see . . .

A: That would be going too far. I didn't have any part in drafting NEPA. I knew some of the people who did. The notion of alternatives came out, for example, in a very interesting session at an Airlie House meeting which the Conservation Foundation held in 1968, just before NEPA was drafted [The *Careless Technology].* There was a lot of argument about how to prevent some of the unwise projects that were being discussed at that time. I remember recounting the history of several African water projects as well as the Presidential Memorandum of 1937, and noting what we had learned from

it. These involved prior consultation on possible effects and alternatives. I think some of those lessons were in the minds of the people who drafted the NEPA legislation.

Q: So in 1945 you joined the University of Chicago faculty?

A: No. I was through in '46. But rather than going back to the University of Chicago, I made my peace with Robert Hutchins, who was then president, and asked to be excused. Instead I went to Haverford, where they had invited me to be president. I spent the next nine and one-half years at Haverford.

Q: Was Haverford's Quaker background an inducement?

A: Yes. It was a small, high-quality college with a genuine Quaker commitment, and that seemed to me where I'd like to try to put my energy as much as I could.

Q: But of course, Haverford is an undergraduate college with no graduate school. Did you see that as an advantage or a disadvantage, or did you think about it at all? Because generally, of course, the colleges with the graduate schools are going to have the larger research commitment.

A: Oh, yes. I knew that I wasn't going to be able to do any significant research while I was at Haverford. And I didn't know whether I would ever get back to a full research program. But I felt, and my wife felt too, this was the kind of service we wanted to undertake at that stage. We were fresh from the war experience, and we felt it was important to promote education that was international in outlook and that seriously looked at ways of preventing another war. Haverford was one little spot in which one might have an opportunist y to help further those concerns.

Q: So I assume you maintained your contacts with the American Friends Service Committee too at this point?

A: I did, yes.

Q: Continued to work with them a bit?

A: I served on their committees. It wasn't until after I left Haverford that I became chairman of its board.

Q: And did you get involved then with some of the refugee problems in Europe which the Service Committee was still involved in after World War II?

A: Yes. I was on the first mission of the American Council of Voluntary Agencies that went into Germany after the end of the war. There I met Lucius Clay again, whom I first met when he was a captain in the Corps of Engineers. We went in as the representatives of civilian groups, looked into what was the condition of the German civilians at that time, wrote a report that infuriated Lucius.

Q: I gather you found that civilians were not living in a style to which they'd been accustomed.

A: Well, they were not living in a style in which he said they were living. And as a result of this report he did reluctantly give permission for civilian agencies to carry on relief work in Germany. So I found myself having been detained by the Germans and dealing with refugees from the Germans during the war, and trying to help the Germans themselves at the end of the war.

Q: While you were at Haverford College did you also maintain ties with people back in Washington?

A: Yes, I did. I tried to keep a hand in on some of the activities in Washington or in the United Nations that were relevant to what I'd been doing before. I served on one of the task forces for the Hoover Commission on Executive Organization.

Q: This would have been the first or second one?

A: The first, in 1948. And I was vice chairman of the President's Water Resources Policy Commission under Truman in 1950.

Q: How did you get involved in the Hoover Commission? Were you invited, or were you interested in joining that effort?

A: I never knew who nominated me. Hoover asked me if I'd serve on that task force. The chairman of it was Leslie Miller, who was then governor of Wyoming. It was a fascinating enterprise.

Q: Had your feelings about the Corps of Engineers changed at all by this time? By the late forties, of course, there was a significant amount of bad press as a result of some reservoir projects in particular. How did you feel about the Corps at this time?

A: I don't think my feeling about the Corps has changed significantly over the years. I think it's about the same now as it was then, although the Corps itself had changed during that period. My attitude towards it has always been that the Corps was headed by very intelligent, bright people; that the form of organization in which commissioned officers had the responsibility for making all the major decisions was unfortunate and a handicap to the Corps; that it was assiduous in carrying out whatever jobs were handed to it; and that by virtue of its organization it was very, very slow to change but capable of changing. And I see the Corps as having been in that posture in the 1930s and I see it so today.

Q: Well, I'll get back to that later on, of course, particularly in line with the book you may have read by [Daniel A.] Mazmanian and [Jeanne] Nienaber, *Can Organization Change ?* Have you seen that book?

A: No, I haven't. In fact, I haven't heard about it.

Q: Well, I'll get you a copy. Your dissertation was published by the University of Chicago?

A: Not by the press, but by the Geography Department.

Q: And it then gained some reputation around the country. You must have gotten some inquiries about it from people interested in the same sort of things you're interested in. Do you see any impact of it politically? Do you

hear about congressmen or politicians reading this kind of book, or is it mainly limited to an academic audience?

A: I never had any indication of politicians looking at it. Most of the response I had was from people within the agencies or from a few academicians who came across it. In fact, it was some of them that publicized the book rather than my having undertaken to do so.

Q: Was the book used at all during the drafting of various reports by the first Hoover Commission?

A: Oh, yes, certainly the ideas were incorporated.

Q: The first Hoover Commission, as I recall, came up with a recommendation to get the Corps of Engineers out of civil works. What did you think about that?

A: At the time I felt that if Hoover had been strong enough to bring about a genuine national water resources agency in which he incorporated the Corps and Bureau of Reclamation, it would have been a desirable move. Several of us had dinner one night with President Hoover and he recalled his early experiences with the Corps of Engineers. He was rather hostile to it. And he said he was prepared to get the Corps out of the water business. My feeling was if he could get the Corps out of the water business and the Bureau of Reclamation out of its similar more narrowed channel, and lead to development of a genuine national water management agency, this would be highly desirable. He never was able to do that. Lacking that, my view was make the best you can out of two agencies that are both deeply rooted in communities and political power structures of the United States and try to help them do the best they can without an administrative change.

Q: And so we then get into the preparation of what was to be called the Green Book, and then there's BOB Circular A-47. Were you involved with those efforts, too?

A: Yes, but in a rather peripheral way. I was involved in trying to get them started, and I suggested some of the people who worked on them at the time, such as Ed Ackerman, who left his post as assistant general manager of the

TVA (having previously filled the post I had left vacant at Chicago) and had worked on drafting a lot of the material. I served as a reviewer for some of the materials. I was not an author, a primary author. But I thought they were desirable.

Q: Clearly, you thought they were desirable because they offered some necessary guidance to the agencies. But there were some restrictions put on agency activities and agency planning, particularly by BOB Circular A-47. I wonder what were your opinions of them? For instance, as I recall, the planning guidance limited agencies to developing 50-year flood projects rather than 100-year flood projects.

A: No, I didn't approve of that. There were lots of the details of it I didn't approve of. I thought the nature of the effort was commendable. This always happens when an agency undertakes to formulate rules and procedures. They tend to adopt a more conservative kind of criteria. When in doubt, they compromise in an unimaginative fashion. So I wouldn't say that I approved of all aspects. What I did approve was the effort to formulate criteria.

Q: What do you think would have happened if Truman had been allowed to serve another term, or hadn't been kept to two terms, and he had been elected President in '52 rather than Eisenhower? Do you think that A-47 would have been repealed? Do you notice that A-47, as I recall, was promulgated in the late months of the Truman presidency?

A: That's right. And it came in the wake of the President's Water Resources Policy Commission. We recommended this kind of action, which the Bureau of the Budget picked up.

Q: But I wonder whether Truman would have gone along with it if he'd been President.

A: I don't know. I had observed one aspect of agency response to this kind of an effort that came out again from the drainage basin problems and programs report to which I referred earlier. And that is that once such an effort is made by a central executive agency to coordinate the activities, the agencies go through a certain period of tension and mutual irritation. Then they gradually work out accommodations to reduce stress and delays or circumvent

improvements. It happened after the 1937 memorandum; it happened after the Coordination Act of '43; it has happened with respect to the NEPA preparation of environmental impact statements.

Q: Of course, sometimes it happens under a great deal of political pressure. Again, I'm thinking of the upstream-downstream controversy and the kinds of concerns expressed by the Corps of Engineers and the Soil Conservation Service, particularly dealing with the Arkansas, White, and Red river basins.

A: Yes.

Q: There seemed to be no meeting of minds within the committees, as I recollect. The meeting of minds, such as it was, was hammered out in Congress.

A: That's right. Irving Fox was very much involved in trying to get that reconciliation.

Q: I suppose there are limits to how far an agency can bend, or be willing to bend.

Well, Eisenhower comes into the presidency. His Bureau of the Budget established what I think is seen by the Corps as a fair number of constraints on Corps civil works and planning. The Bureau of the Budget seems to be in favor of small projects rather than large projects, cost sharing; seems to be in favor of limiting the planning cycle, shortening it sometimes. As a matter of fact, there are some parallels between the Eisenhower administration and the Reagan administration, I would think.

A: Yes.

Q: Well, did you get involved in any of these deliberations or do you recall the response to these kinds of initiatives on the part of the Bureau of the Budget in particular?

A: I was just on the peripheries of those discussions and I was unsympathetic with any effort to make the Bureau of the Budget more of a managerial agency because I was and am more traditional in the view of what the

function of the Budget office should be. I felt the Budget office should be a very powerful group within the government, but that it should not be a genuinely managerial group. I think the temptation has been for it to take on these various managerial responsibilities.

Q: Well, how did you get involved in the mid-fifties with people like Francis Murphy, and I gather some others, too, who continued your interest in human adjustment to floods? You were still at Haverford College at the time.

A: No.

Q: I thought you said you were at Haverford for ten years?

A: I left Haverford at the end of 1955 and the University of Chicago was courageous enough to reappoint me to its faculty, taking the risk of having a somewhat worn-out college administrator in an institution which laid heavy stress on research. I had been president of Haverford for ten years.

Q: Hadn't you been teaching, too?

A: Yes. While I was president I taught one course a year on natural resources. I felt I ought to teach along with everybody else. Also, I took a salary which was the equivalent of the highest salary paid to a professor, including summer work, because I didn't want to get into a position of being dependent on an income beyond what I might as a professor later expect. So there wasn't a great financial jolt in going from Haverford back to the University of Chicago.

Q: Was Hutchins still there?

A: No. Larry Kimpton was there. Hutchins had left. He'd gone with the Ford Foundation. His shadow was still strong.

As soon as I got back to Chicago I turned to the research interest I had had before. I thought it would be a good idea to try to find out what had been happening to the nation's floodplains since the Flood Control Act of 1936 had been passed. I went to Resources for the Future and they kindly gave me a

small grant to do a study on this for which we were able to enlist the interest of some of the people at Chicago. That was the beginning of a series of research activities on floodplain occupance and its implications.

Q: Why did you leave Haverford?

A: I felt I had done about all I could at that time. I'd helped them reduce their student enrollment and increase their endowment several-fold. I had enlisted a largely new faculty and started a number of new programs. We had a cooperative agreement with Bryn Mawr and Swarthmore. Things seemed to be going just fine. I thought that was the right time to leave. I knew that if I didn't leave then I probably never would leave administrative work. Margaret Mead had been at our house for dinner the preceding year and at some stage we were talking about my going back to do more research. She gave mea cool look and said, "You know you're on a one-way street. You'll never get **out** of educational administration. They never do. " That was the challenge.

So I began thinking about whether I could really get back to research. And Chicago was, as I indicated, sufficiently risk-taking in outlook to appoint me.

Q: And you immediately got involved in this question of floodplain occupance.

A: Yes.

Q: Now Francis Murphy's book comes out. I think about '56, wasn't it? Something like '57?

A: No, it comes a little later. The main project was to find out what had happened in the floodplains since 1936, and there were a number of issues that came out of this. One issue was the role of floodplain regulations in changing what happens on floodplains. Another issue was the role of perception in looking at alternative methods of dealing with flood losses. I had been convinced that if the kind of research we were carrying on was going to have any influence we had to involve in it, in some fashion or other, people who were on the firing line in the interested agencies. So from the outset we made a point of consulting with people in the Corps, in the Soil

Conservation Service; TVA. Jim Goddard, of course, was a great help in this direction.

It seemed obvious to try to involve somebody from the Corps in the follow-up studies at this stage. Dick Hertzler was one of those who I recall was interested at the time. I can't recall all of the people who were involved. But permission was obtained for Murphy to use a research fellowship grant from the Office of the Secretary of the Army to come and work at Chicago. He completed his study and it was published in '58. The effect of doing this was, on the one hand, to check at an early stage all of our findings and methods against somebody who knew the Corps from the inside, and, on the other hand, to make our findings more credible to people in the Corps because here was one of their own who was participating and having an opportunity to say exactly what he wanted to say.

Q: Do you know whether Murphy had any problems in the Corps as a result of this publication?

A: Unfortunately, he died early. I don't know what the course of events would have been if he'd lived longer. I remember his telling me at the time that there were some people in his office . . .

Q: At Seattle?

A: Yes . . . who felt that he was wasting his time on this kind of enterprise. But by and large, he'd had interested and supportive comments from other people.

Q: Were you aware, and were people in the field aware at this time, that in fact the cost of flood damages had increased since the 1936 Flood Control Act despite all the flood control measures that had been developed by the Corps and other agencies? Was that something that was pretty well known or something that only comes out as a result of some of these kinds of studies?

A: It was something that was suspected but there hadn 't been any solid evidence. And people didn't quite know how to interpret some of the aggregated national statistics. One reason for doubt was that the damage data on the national level were poor data. There has been and still is no genuine uniformity in the mode of collecting flood damage data and so one was

suspicious of the aggregated statistics. The approach that it seemed wise to take was not to rely so much on the statistics but, rather, to go and look on the ground at what had happened to land use. That provides more precise, accurate information.

Q: Let me pursue that for a moment, because it's something near and dear to my heart as an historian. When planners of any sort, water planners, come up with data to justify a project it seems like they usually go to National Weather Service data, or perhaps to the Corps. And they look at things like gauge readings, maybe climatic conditions, things of this sort. But they look at it from a relatively broad point of view. In other words, there may be a gauge reading that shows a river flooded but it doesn't show how long the river flooded in a particular place, how much damage was done, or even whether the people were seriously affected by flood damage. That kind of data can only be obtained, it seems to me, from newspapers, from interviewing people, and so on. It's not the kind of data that's collected on a formal basis by interviewers, so far as I know.

So how do people come up with data that really is convincing data? As an historian, I know several cases where an agency comes up with data that suggests there's a horrible flood problem, but when you look at it by reading contemporary accounts and so forth, people weren't really seriously adversely affected. What's the answer to that?

A: One of the projects of the old Water Resources Committee was to try to get the federal agencies to adopt a uniform system for collecting flood damage data. I have a report that we published at that time. It had only modest effect on the activities of the agencies. We never persuaded the National Weather Service, Soil Conservation Service, and the Corps to adopt completely reconciled and searching modes of obtaining damage data. I say searching modes because it was, I think, early apparent that rather than depending on quick surveys after a flood and newspaper data from previous floods, it would be desirable to have very careful sample investigations of selected areas which would then enable the investigator to make estimates of what the full set of gains and losses would be from different modes of using the floodplain. This is what one wanted to come out with in the long run. We never were able to get agencies to do that. The nearest approach to it came when the old Water Resources Council began collecting data. It, however, was dependent upon modes of data collection and record keeping and publication practiced by the respective agencies involved.

One of the arguments that a number of us had made from the very earliest time of critical examination of Corps of Engineers flood control projects and of the policies embodied in the Flood Control Act of '36 was that we needed to recognize that the proper concern with floodplains was not in preventing flood damages. The concern was making optimal use of floodplains. With that different objective one then needs different data, different forms of analysis.

Q: But optimal use of floodplains would necessarily depend on knowledge of past floods, would it not?

A: Yes. But then the knowledge of past floods that is required is of a different character than the knowledge that's required when the aim is to reduce flood damages, because one then is interested in what the floodplain has been used for, what its social value has been, and what its social liabilities have been.

Q: Would one also be interested in finding out how long after a flood you could not use the floodplain for the purpose intended?

A: Yes.

Q: I'm just probing.

A: Well, take an example of one cultivated field in a floodplain. The traditional method of examining that in terms of a flood control project is to ask what losses have occurred with past floods in that field. Now, this is significant but one would like, I think, to know what the production has been on that field year after year, how this production may have been affected by flooding, not only in terms of crops lost but yields gained. And one would then want to know what sort of measures the farmer takes to optimize his returns from that field, including cultivation practices, the kind of seed he uses, any technical measures that he may take within the field to, for example, minimize scouring by stubble in the post-harvest season, and so on. This requires a different mode of examination than just collecting the flood damage data. Some of it can be done without a long historical record, but one also is interested in an historical record as a means of indicating what the range of experience has been and what some of the possible constraints in the future

might be, rather than just racking up a list of so many dollars damage per year over whatever is the convenient period of record.

Q: Well, we were talking about some of these early essays dealing with human occupance of floodplains that you were involved in after you came back to the University of Chicago. Was Murphy's the first one that came out in 1958, or had there been an earlier one?

A: It was the first one that followed the basic one on changes in urban occupance.

Q: The one that you had done?

A: The first was a joint effort. Then, we had a series of special studies, one by Jack Sheaffer on flood-proofing, which was a recognition of another gap that we saw as we tried to put together a broader theory of how societies make decisions about floodplains. That was supported by Jim Goddard in the TVA.

Q: By about 1960 then do you feel you had a fairly articulated idea about an alternative approach to floodplain management? In other words, a nonstructural approach versus structural?

A: I'd say by the early sixties. By the mid-sixties.

Q: In 1959, as I recollect, the Senate, perhaps partly in response to some of the Eisenhower administration policies, developed a select committee to examine water resources.

A: Yes.

Q: And out of this came, well, some issues from the Kennedy administration.

A: Yes.

Q: Were you involved in some of this early work of the Senate Select Committee?

A: Yes, I was.

Q: Can you explain how?

A: I was drawn in as a consultant. Ted Schad was in charge of the staff, and I remember talking with Senator Kerr and others who had their own private agendas of what they wanted to come out of the Senate Select Committee. I was interested in seeing that the TVA had a chance to state what its experience had been in efforts of floodplain management and also in getting the Corps to express its view of what it saw happening in the field. I did have a hand in one draft of the final report of the Senate Select Committee.

Q: Do you recollect what some of the major points of that report were?

A: It was transmitted on January 30, 1961, with a large number of appendices. It recommended, among other things, completing basin-wide studies, a grants program to the states for water planning, a scientific research program on water, a biennial national water assessment, and four steps to enhance water efficiency, including regulation of floodplain use and delineation of flood hazard areas.

Q: Okay. Soon after Kennedy took office he asked his various cabinet secretaries who were involved with water resources to come up with a new plan for coordinated development, and out of that comes Senate Document 97. Were you involved with that effort at all?

A: Yes, I was. Again on the periphery. I was involved in making comments about it at different stages, but I didn‘t have a major drafting responsibility.

Q: There was, as I recall, in that report some mention of a nonstructural approach.

A: Yes.

Q: Was that partly due to your influence?

A: Partly. By that time a good many other people had the idea, too. Certainly TVA would have espoused it.

Q: The report in a sense supersedes BOB Circular A-47?

A: Yes.

Q: To your mind was it an improvement on A-47?

A: I think so. Again, I was strongly in favor of the effort they were making but was distressed at the way some of the issues were resolved in what I thought was a rather pedestrian fashion. I'd have to go back and look at that.

Q: By pedestrian, do I interpret that as gutless?

A: Partly; also unimaginative.

Q: So it was a political compromise? Is that what you're saying?

A: There were few indications of efforts to change the approach in any radical fashion. It was a series of moderate adjustments of what had been the prevailing policy. And I remember there were a number of discussion papers that were out at the time being prepared. Many of them had, as I recall, some interesting and more challenging ideas, but they got watered down through the process.

Q: Now, who would be offering these discussion papers? People within the various departments?

A: Some within the departments, but some from the outside. I can't recall, did Art Maass make any contributions to that?

Q: I don't recollect that at all.

Beginning about 1961 and then introduced annually thereafter for the next two or three years, there was a bill that would have authorized the establishment of a water resources council. Again, was your advice requested or solicited in the preparation of these bills?

A: I don't think I had any significant involvement after the basic Senate Select Committee report.

Q: Do you recollect what your reaction was toward this bill; toward the idea that the bill addressed?

A: Yes. I was for it. I had been very strongly involved in the recommendations drafted by the Senate Select Committee, which then carried over in some fashion or other and finally into the creation of the Water Resources Council. It's hard to trace the ancestry of some of those ideas. You're better at that than I am.

Q: Do you recollect some of the reasons why this bill wasn't passed until 1965? It was first of all the Water Resources Council Act of 1961, '62. Do you recollect any of the political problems that perhaps kept the bill from being passed?

A: I don't have a solid basis for judgment on that. I was deeply involved in research at Chicago. I heard a lot of secondhand opinions from friends in Washington, including the argument that the major federal agencies were opposed to it, just as they had been opposed to a permanent National Resources Planning Board. But I wasn't on the battlefront enough for a valid opinion. Ted Schad would know.

Q: I want to go back and pick up a few loose threads for a moment. People whom you had gotten to know in the forties or even earlier-I presume you probably kept up acquaintances with them later on?

First of all, Hoyt and Langbein. An obvious, of course, grouping together. When did you get to know these people? I'm sure you must have gotten to know Walter Langbein pretty well.

A: Yes, and W.G. Hoyt. I think I first encountered both in the Geological Survey. I've forgotten when Walter joined the survey. I became interested in the flood problem in the early thirties-that is, '34, '35. The Mississippi Valley Committee financed C.S. Jarvis to put together the first real compilation of flood records. I don't know whether you know that volume that he produced. It came out as a Geological Survey Water Supply paper. He was the first to be responsive to the issue you were raising earlier as to what is solid evidence from the hydrological area about the occurrence and frequency of floods. And I negotiated the funding for the Jarvis volume as just a youngster, playing a secretarial role. Jarvis was a person who had worked with the Corps, and tremendously knowledgeable about flood problems.

W.G. Hoyt was in the Water Resources Division. John Hoyt was in charge of part of it.

Q: How were they related?

A: I seem to recall they were brothers. But I'm not sure about that. And then Hoyt and Langbein joined forces to do their book on *Floods,* which I think is an absolutely first-rate book. So I was in touch with them from the late thirties, I would say. And I used to talk with them about material I was poring over in connection with my dissertation.

Q: I see. Do you feel that Hoyt and Langbein's book on floods had a significant impact on, well, say the planning processes within the various water resources agencies?

A: Oh, I do. I think that they were the first to pull together the scientific information about floods in a coherent sort of a structure. If you compare what they were saying with what had gone before, all of the books on flood control engineering and so on, it was a definite step forward. The Jarvis study was published as a Water Supply paper in 1936. It was suggested by the Mississippi Valley Committee, and the new Water Planning Committee gave him additional support to carry out the work. Gerard Mathes was very supportive of it. One of the efforts that was made at that time was to tie in that effort with the scientific groups—the American Society of Civil Engineers, the American Geophysical Union—so that when the book came out

it would have respectability in the circles from which the operating engineers and hydrologists in the federal [sector] would come.

I think Langbein is the smartest person who has worked on floods in this whole time, and certainly the most original.

Q: I was trying to get an interview before he died.

A: That's a shame.

Q: Another person who you must have met somewhere along the line was Arthur Maass.

A: Oh, yes.

Q: When did you first meet Professor Maass? Would it have been on the Hoover Commission?

A: I can't recall accurately. My impression is that Art came to Washington after I had left. When did he first come to Washington?

Q: Well, actually, according to my interview with him, he was working in the Bureau of the Budget in the late thirties and then, of course, his dissertation was completed about 1949, then *Muddy Waters* comes around '52.

A: When was his dissertation published?

Q: Well, *Muddy Waters is* his dissertation. In '52.

The Hoover Commission probably published part, I guess, in '50 or something like that. I think his dissertation wasn't completed until about '48 or '49.

A: I' m very much aware of him in that time. But I don't have any recollection of working with him before I left Washington. It was afterwards. It was after the Hoover Commission started at the end of the war. There was a

convergence of interests when I was vice chairman of the President's Water Resources Policy Commission in 1950. But then there were frequent contacts.

Q: Did you have the opportunity to read *Muddy Waters* when it came out? Do you recollect your reaction to it?

A: You mean as a complete document? Yes, I thought it was a very thoughtful, useful review of the situation. It marked a new stage in political and economic examination of water management.

Q: How about Harold Ickes' introduction to it? Do you recollect that? This is the one where he talks about the Corps of Engineers as being above the law or something like that.

A: Yes. I remember thinking at the time that it was unfortunate that Ickes had come out as strongly as he had because it seemed to me that he prejudiced the document in the eyes of lots of other people. That was typical of him. He came out very strong for anything that he believed. It made it extremely difficult for anybody in the Corps to take the document seriously.

Q: How about Richard Hertzler? You mentioned his name before.

A: R.A. Hertzler. I worked with him when he was in the Office of the Secretary of the Army. I was interested in keeping in touch with those people and letting them know what we were finding out in the studies going on in Chicago. I found him one who was interested in the possibility of new ideas developing in the Corps and giving support to people who were more innovative. Gene Weber came along with a very similar posture, I would say. I found him always ready to listen to the sort of findings we were getting and giving critical reactions. We did involve them in a little workshop we had out at the University of Chicago, which then led to the idea of there being a floodplain information program.

Q: Howard Cook? Do you recollect when you first got to know him? Did you get to know him very well?

A: Howard's a very thoughtful person. I never felt I really knew him well because he had personal convictions and interests that were slow in surfacing. We did a paper together for one of the international conferences, and he worked on the Water Policy Commission. I guess that was his last major assignment. Howard was an independent thinker who had great difficulty expressing his views in a fashion that showed their relationship to the views of other people.

Q: I see. Did you get to know any of the Chiefs of Engineers at this time, in the fifties or sixties? Did you know Emerson Itschner, Samuel Sturgis, or [Walter K.] "Weary" Wilson?

A: Itschner and Sturgis I recall meeting. I never had any very close dealings with them. The one I knew best was Markham.

Q: Professor White, in the mid-sixties we see the development of a cause we call the environmental movement. One aspect of that movement is a growing concern about the way in which the nation is husbanding its water resources. There's a Rampart Dam controversy in Alaska which involves the Corps. There's the earlier Grand Canyon controversy involving the Bureau of Reclamation. And in the mid-sixties Senator Moss introduces a water act that would again diminish the Corps' responsibility in water resources. Strictly in regard to water resources, do you recall what your impressions were as this environmental movement begins? Did you feel that the concerns being raised by Senator Moss or other critics of the Corps of Engineers were warranted? Did you feel there was basically self-interest? Do you recall anything about that?

A: The most significant controversy during that period, in my recollection, was the Echo Park controversy, which, of course, involved Utah and would have influenced Moss and others there. To me the essence of that controversy was the concern to look at all of the consequences of a given environmental intervention and a discontent with whatever agency was involved in trying to push for single-purpose efforts without considering those consequences and the alternatives. That's my own bias as I look at it in retrospect. That same concern then shows up in the NEPA act. It is quite different from what appeared to me to be the underlying causes for the environmental movement as we talk about it having taken shape in the late sixties and moving in the early seventies, both in the United States and worldwide. I would look for

the causes of that environmental movement not so much in concern for alternatives and full investigation of consequences. I think they're of a broader sort. It was partly a product of increased affluence.

Society could afford to consider the effect that Echo Park had at Dinosaur Monument. In part, it reflected a discontent which was growing quite rapidly with big business, big government, big universities. In part, it came from discomfort with the increasingly complex technology, a distrust of confident human control of nature. And certainly in the late sixties it was a displacement phenomena growing out of the Vietnam War in the United States and in some other countries.

So I would think of the environmental concerns of the sort represented by Rampart and Echo Park as of somewhat different origin than those that led to the great push for NEPA at the end of the decade.

Q: In 1966 you got involved with a Bureau of the Budget study dealing with floodplain management. I wonder if you could explain to me the origins of that study and your involvement in it, and conclusions?

A: As I recall, the director of the Bureau of the Budget called me up and asked me if I would come in and talk about the status of federal flood control activities, indicating that there had been extensive expressions of dissatisfaction among bureau staff about the policies that were being followed and the appropriation programs. I went in and talked with a number of the staff, and they proposed that I should do a consultant's report on the status of flood control. I thought it over and said I thought that would be largely a sterile activity. I might be able to write a moderately intelligent report but I didn't think it would have any significant influence. I felt that something that might possibly have influence would be a joint effort in which there were representatives of the federal agencies serving as individuals but nevertheless drawn from the agencies, together with people from the outside who could jointly present their reactions and their recommendations to the director of the Bureau of the Budget, with the knowledge that the findings were going to be carefully reviewed later by the agencies. The bureau accepted that recommendation, so I became chair of a group or task force, rather than doing an independent study.

Q: Who were some of the primary people on the task force?

A: Well, let's see. The task force included Jim Goddard, who was the obvious person from the TVA and the person with whom I'd had closest working relations up until that time. But from the other federal agencies there was Dick Hertzler, Walter Langbein, Harry Steele from Agriculture, Irving Hand from Pennsylvania, and Martin Schussheim from the housing agency. Then we had three others from the outside: John Krutilla, an economist from Resources for the Future, and me. Perhaps the most influential member of the group was John R. Hadd, who was the representative from the Bureau of the Budget staff and who took a lively and very thoughtful interest in the whole enterprise.

Q: What biases did he bring into the task force? I mean constructive bias. Did he have any philosophy that he was trying to . . . ?

A: No, he didn't. He was a young, inquiring, dedicated member of the bureau who had been asking a lot of questions about what was happening in this field and was much interested in learning what the people who were drawn in for this purpose and who were in a position of justifying budget presentations had to say about it.

Q: How long did the task force work on the study?

A: I'd say about a year.

Q: And this study was called finally *A Unified National Program for Managing Flood Losses ?*

A: Although the group had been put together and I had first been asked to work on federal flood control policy, the title of the report was different from that which it had been intended to be.

Q: It's a significant difference, is it not?

A: Yes. And the budget group went along with that.

Q: The difference then being one of emphasizing flood control instead of lessening flood damages?

A: Yes. In fact, I would like to have had it speak on making best use of the floodplains. But people thought that was pushing it too far, that it would be a more attractive and supportable set of recommendations if the title were reducing or managing flood losses. You realize this came along after Senate Document 97, and it came after the Water Resources Planning Act. We had the, as it now proves in retrospect, sanguine view that with the Water Resources Council in operation and with the new federal flood insurance program which had been renovated and put into operation, we could expect some substantial changes in federal management of floodplains. That set of hopes was not fully realized. One reason was that the Bureau of the Budget wouldn't let go of some of its responsibilities.

Q: To the WRC?

A: Yes. I never fully understood why that was. It was not from lack of effort on my part to go and talk with people in the Budget and the director over there to try to understand why they were so reluctant to give the WRC responsibility to insist that the recommendations were carried out. But they were reluctant.

Q: Who was the director at that time?

A: The last person I recall discussing it with was Elmer Staats. Of course, Elmer went over and became Comptroller General. I think Elmer was the last person I talked with.

My hunch is there was a particular person in the bureau who steadfastly held the line against relinquishing duties to the WRC. At the same time, he was unwilling to exercise the duties himself. The result was a halfhearted and inconsistently sustained activity on the part of the bureau.

Some interesting ideas came out of the task force's lively discussion. John Krutilla, in the best econometric mode, suggested that what the U.S. ought to do was simply grind down all of the federal activities with respect to floods. Just make a lump-sum payment to the owners of property in floodplains for what we considered to be, at that time, the vulnerability of the property to

flood losses. To the owners we would say, " We'll give you the money. Now you do with it what you want. If you experience losses you can pay for it. If you want to invest your money in an insurance fund, you can do that. If you want to build a levee, you can to that. But the federal government isn't going to help you. " Of course it never did float, but it was the kind of idea with which we were playing at the time.

On flood insurance, we had some excellent suggestions. We suggested that a new flood insurance activity should only get under way in a fashion [whereby] the rates fully reflect the risk for the new occupants of floodplains. We thought that a program should be on an experimental, small regional basis. If the new Federal Insurance Administration had adopted that policy, they would have avoided most of the problems that have occurred since. Particularly, they might have discovered by taking a couple of sample basins the difficulties that then ensued on a national scale and could have corrected those before they made the long-term commitments.

Q: This report, *A Unified National Program for Managing Flood Losses,* came out in 1966, I believe. It's an interesting time for water resources development because you do have some interest in nonstructural flood control solutions, and you have some interest in new ways of planning water resources projects.

Let me take the first point, the nonstructural. Did you see any interest or did you see interest evinced on the part of the Corps of Engineers or any other water resources agency in the mid- 1960s in developing nonstructural solutions?

A: Certainly there was interest from the standpoint of the Office of the Secretary of the Army. And among individual members, including some top officials in the Corps, I encountered considerable interest. John Hadd joined the Corps' planning office and was an articulate interpreter. At the same time, the field organization was very slow to adopt this view in practice. It was a case of approving in principle but not in practice.

Q: Do you have any explanation of that in terms of personalities or do you just think it was organizational inertia?

A: Certainly organizational inertia would play a role as it would with any large well-established group that was being confronted with new ideas. But there was more to it than that. I think a major obstacle was the feeling among many members of the Corps staff that they were not trained to do and were not competent for the sorts of analysis that were called for in examination of nonstructural alternatives. They were reluctant to expose themselves to judgments and data analysis relating to recreational land use, wildlife values, or comparative function in an urban economy of units located in alternative sites. This was well beyond their training. They didn't want to produce analyses that would then be criticized by people outside the field.

It was interesting to me that some of the people who found it easier to engage in analysis of nonstructural measures were those that had been trained outside of the engineering professions. Some of the geographers, for example, were ones that picked it up—people like George Phippen.

Q: Why do you find that interesting? Wouldn't that be logical that a person in the social science fields would be able to more easily analyze human impact than an engineer would?

A: I should have recognized this at the time. But many of us did not. The engineers did not deny the desirability of making that kind of analysis. They simply were reluctant to do it themselves or to have any of their staff do it. It wasn't easy to have an argument about the approach in principle. People would say, yes, that's a good idea; we ought to do it. Then when it came to trying, they held back. It came out in some little Corps workshops that were held around the country later, much later. I think if we had suggested that the Corps launch workshops for engineers, by engineers, not social scientists coming to enlighten the engineers, but some engineers who knew how to do it themselves telling others, it might have moved much more rapidly than it did. This gets at the whole question of how to generate change in perspective; change in a sense of confidence among members of a big complex organization.

Q: The engineers didn't seem to be too reluctant to count in recreation in a cost-benefit ratio once that was made legal as a result of the 1965 Recreation Act.

A: Sure, but that was a much simpler kind of analysis. All they had to do was get some figures about user days, and get some economist to tally up for them

the estimated cost of a user day, and they could put it right into the same kind of analysis they'd been applying to tallying up flood losses or returns from irrigated crops. The alternative approach would have required their looking at the whole pattern of land use and structure of the community, what influence the proposed change in recreational land use might have on the community, and what other alterations might be made in recreation.

Q: This is perhaps an unfair question since you're trained as a geographer, not as an engineer, but do you have any kind of evaluation of the skills of the engineers in the Corps in the 1960s? Do you think they were well trained to do the work they were doing?

A: I think they were moderately well trained to do what they were supposed to be doing. They were not trained to do much innovative work. I would say in the late sixties the Corps was beginning to change in the sense that it was making more conscious efforts to introduce new views and to encourage its professional members to reach out and understand what other groups were doing.

Q: In the early 1960s the Harvard water group developed some interesting new procedures for evaluating water projects, procedures that involved the use of computers, for one thing, computer simulation. Did you have any opportunity to observe how willing the Corps was or other federal water resources agencies were to accept these new kinds of procedures?

A: At the time I thought that the Harvard water program was highly imaginative and thoughtful, and I thought Maass and Hufschmidt clearly had a major impact on the thinking of people who came there. The participating individuals were, on the whole, enthusiastic. They had a sense of being part of a new mode of thought. Then they returned to their offices and, according to the testimony of a few of them whom I knew-and I knew only a small proportion-they were faced with trying to support new viewpoints and their new skills with members of the staff who were not convinced. They were very cautious about it. I'm sure that Maass and Maynard Hufschmidt have ideas now about ways in which their training was translated into action. And I certainly, in terms of individuals, felt that the Harvard program had a major effect.

Q: What, during this time, was your relation with the Resources for the Future organization? Were you doing much work for them?

A: My connection with Resources for the Future goes back to the first mid-century conference—it had been funded by the Ford Foundation—in which I was a participant and out of which came the recommendation that a couple dozen of us made that the Ford Foundation should establish something like Resources for the Future. It was so funded and it continued to have Ford funding for about 25 years.

When I moved from Haverford to Chicago I got my first research grant from Resources for the Future. As I recall, it was $17,000 for that first study. Then later on I became a member of the RFF board, and the final six years I was chairman of the board. I was chairman at the time the Ford Foundation decided to withdraw its support from any such organizations. We then had to decide to either take terminal support money on condition of becoming a sub-unit of Brookings Institution or go out on our own and raise a large amount of money to become independent. We decided to try the latter, and were fortunate in receiving support to become a freestanding institution. We persuaded the Ford Foundation to give the same $7 million that would have gone to Brookings to RFF in the event it could assure a total endowment of over $20 million. We did.

During much of that period I was associated with RFF only in the sense that work I was doing happened to converge on or cross the kinds of work the people on the RFF staff were doing. I saw people such as John Krutilla and Allen Kneese and exchanged ideas with them on frequent occasions.

The most significant thing, I think, that was going on at that time was broader than the flood loss management effort. That was the attempt to encourage people to look at water development in terms of alternatives and full examination of the full consequences. The National Research Council had a group that was working on exactly this problem at the time, and I think its reports on alternatives in water management, both in general and then using the Colorado Basin as an example, were influential in helping people consider the full implications of multiple-purpose development. It went a step further than the Harvard seminar, or training program. I can illustrate that by taking the flood field.

I remember once meeting with the Harvard group for an examination of the way in which they were treating the economic analysis of flood loss reduction

projects. They were using standard optimization techniques for computing, in a very sophisticated fashion, what the probable flood events might be, what the damages would be from events of different magnitude, and judging what would be an optimal solution. When I asked if they had ever considered looking into a floodplain to see what happened in the floodplain, as distinct from computing the losses that would be experienced or averted, they said they weren't interested in that; that wasn't a part of the kind of analysis that they were pursuing and that they were training people to pursue. That was typical, I would say, of the economic analysis that was going on. You didn't, for an irrigation project, go in and look at the quality of life of the farmers. You looked at what you could tally up on returns from crop production or sales. In the case "alternatives" approach, there was strong emphasis on trying to find out what actually happened to the lives of the people involved, which we still find difficult to do. But this notion was just beginning to gain popularity.

Q: In the late 1960s you also became fairly involved with the evolution of the flood insurance program. Can you explain how you got involved in that and your perceptions of that program as it evolved?

A: I first became interested in it from the whole array of questions that emerged from asking why occupance in the floodplains continued as it had between 1936 and 1956. Flood insurance was one of those facets, along with flood proofing, flood forecasting, land-use regulations, and so on. Flood insurance had seemed to a number of us to be one of the more promising instruments that could be used involving some federal support but hopefully turning out to be a self-supporting effort in which market forces could play the most effective role in managing location decisions in or off a floodplain. In the late 1930s I had arranged for Alfred Manes, the German scholar, to report on European experience with flood insurance.

When the first Flood Insurance Act was passed I found myself working very hard to prevent it from ever going into effect because as the first administrator had planned to carry it out it would have had just the opposite effect.

Q: When was that passed?

A: It was passed but wasn't put into effect. There was a hiatus. Then the new legislation was passed and there was a question of how it would be put into

effect. Again, a number of us tried very hard to influence the way in which the insurance administration would proceed. We tried to get them to adopt a series of studies, to try their program on an experimental pilot basis. We failed on that. Instead, the new administrator was committed to blanketing the country with his activity.

Q: Do you remember the name of the administrator?

A: George Bernstein. He stayed on with some interest in that program after he had moved out as administrator. He promptly began making large commitments for surveys, for mapping programs, and for doing this not using the regular federal agencies but bringing in consulting engineers. It became a trough in which a number of engineering outfits fed. In my opinion, they might have done much better to carry on a more modest program using, as was first envisioned, the Corps and Geological Survey for that purpose.

When Gloria Jiminez became administrator a number of us again expressed our concern about the way the program was going and she did hold a meeting out here in which the views that had predominated in this Unified National Program were once again stated. She adopted a number of those ideas which she carried out until the end of her service. She was at the end of the Carter administration.

Q: What kinds of changes would you like to see made in the flood insurance program?

A: About two years ago we here in the Natural Hazards Information Center were instrumental in helping the Tennessee Valley Authority take the lead in making an evaluation of what had happened in the towns in which they'd been carrying on floodplain management for several decades. They finally worked out a study in cooperation with FEMA [Federal Emergency Management Agency] that is just now coming to a close. This, as far as I know, is the most comprehensive appraisal of actual floodplain management practices that has ever been undertaken. I think it's a shame the Corps of Engineers didn't participate in this or do the same much earlier. They were aware of it but they didn't find it practical to take part.

On the basis of some of those preliminary findings I would say, first, that the insurance program has been carried out too widely, too fast, and, as a result,

has made unwise commitments to mapping procedures, to rate structures, and to modes of technical advice to the states and communities. It's only slowly been able to recognize the faults and correct them in part. I think that a good case can be made for a very minimal amount of mapping. It was believed by the first administrators of the Federal Insurance Administration that they were going to be confronted by a host of court cases challenging the way in which they set rates and boundaries in flood zones. In fact, this didn't materialize. There has been only a handful of cases, none of which has had a major impact on the operation of the agency. The courts have held that if there were some reasonable basis for establishing a rate or a zone, this was sufficient.

Second, they are recognizing that by working through state organizations they could proceed more efficiently and with better recognition of problems on the ground than by trying to work through their regional offices. Much of the sort of work they've done could have been at the very outset decentralized to state organizations, who in turn would have reached the localities.

Third, they could have provided, and now are providing through the state organizations, better technical advisory service, and are placing less emphasis on rather sluggish pronouncement and enforcement of regulations as to what local communities are to do.

Finally, they could have moved much more rapidly to establish truly actuarial rates for all the new construction in all of the communities. If they had started that promptly, they could have put into the local community and local insurance companies the process of deciding when it was economically and socially desirable for a community to permit some kind of encroachment on the floodplain.

Q: You're leading me into my next question, which is when do you think flood insurance ought not to be granted at all? How can that kind of issue be decided if people consistently build in areas that are fairly frequently flooded? What kind of federal flood insurance ought to be given them? It 's, of course, an old question. What's your answer?

A: The more we learn from some of these evaluations the less easy it is to give a simple answer. But I think the original aims are still appropriate, namely, not to give insurance for any development in the floodway however the floodway is defined. Second, to make the rates for any new development in

the floodplain thoroughly actuarial, taking into account prospective changes in frequency of floods, which is, we now know, likely in most urban areas. And third, encouraging the municipalities that have responsibility for the land-use regulations to develop these regulations in connection with plans for the use of the floodplain rather than just being obliged to meet a relatively simple requirement from the Federal Insurance Administration. They should have regulations that satisfy a few criteria about frequency and about rise in flood stages as a result of encroachment.

Q: How do you take into account the so-called catastrophic flood-the once-in-l00-years flood?

A: There was a very interesting development of the notion that there could be a flood of sufficiently low frequency that no effort should be made to cope with it. The Federal Insurance Administration picked one percent of a recurrence interval of a hundred years. And some of us were involved in that because we recognized they initially had to have some figure to use. The one-percent flood was chosen. I think Jim Goddard and TVA colleagues would be considered parties to the crime. With the lack of any other figure, the concept taken from TVA's "intermediate regional flood" seemed a moderately reasonable figure. We generally use the term "catastrophic flood" for events of much lesser frequency.

This goes back to my earlier criticism of the FIA and its determination to cover the country promptly. In covering the country promptly they established one criterion—the 100-year flood. I think it would have been much more satisfactory if they had not tried to impose a single criterion but had recognized that there could be different criteria for different situations. This could have been practicable administratively even though a federal administrator would say it's far easier, cleaner, to have a single criterion that blankets the country as a whole.

What's the effect of having a single criterion of 100 years if in doing so a local community is encouraged to regulate any development up to that line and then to say we don't care what happens above that line? We know that in a community like Rapid City [South Dakota] the floods were of a lesser frequency than 100 years, and a community ought to be aware of this possibility.

A simplified national policy tended to discourage communities from looking at the flood problem in a community-wide context, considering the whole range of possible floods that would occur.

So I would say that any community ought to be sensitive to the possibility of there being a 500-year flood or 1,000-year flood. It should try to consider what it would do in that circumstance, and wherein it could organize its development so that if and when that great event does occur it will have the minimum kind of dislocation.

Q: In recent years, in the Reagan administration, there evidently has been some discussion about the advantages of not building up to the 100-year flood, that you build to something less than a super flood.

A: I wouldn't call a 100-year a super flood.

Q: Okay. I shouldn't have used that term anyway–but the catastrophic flood.

A: All right.

Q: Okay? With the idea in mind that, one, of course, it's cheaper . . .

A: Cheaper for whom?

Q: Cheaper for the government, just in terms of construction, not in terms of flood damage. And, two, that it perhaps would discourage people from building there and therefore there might be some advantage to that. And, three, that it might actually prevent catastrophe because if you buildup to the limit that you need to protect against a 100-year flood and then that, say the floodwall breaks, you have a worse tragedy than if you hadn't built up to that line, and you built something perhaps more substantial, lower to the ground or whatever, which gets us into engineering questions about what happens when water goes over a wall, and so forth. Do you have any reactions to this line of thinking?

A: I think there's some foundation for it. Certainly there is foundation for the view that when a sense of security is cultivated for protection up to a given

level, then when a failure occurs, as is likely in time, the resulting damages will be greater than if there hadn't been that confidence. But the alternative to talking about a particular level is trying to make the levels appropriate for given communities. What would be catastrophic for one community wouldn't be for another community because of the social development that has taken place in it. The kind of approach that I would hope will be adopted in time is one in which communities develop combinations of solutions that are suited to their particular conditions and history and that a federal policy could be one that encouraged rather than discouraged it.

Q: But could community definition of what a catastrophe is be overruled by the federal government that perhaps would be involved in emergency efforts after a flood or in building the flood-prevention facilities in the first place? How would that work?

A: The federal government has a variety of ways in which it can influence what a community does. It can build works or not build works. And the conditions under which it builds works, as the Corps knows, vary with the community. It can provide flood forecasts, although I would say that to the extent local communities can be encouraged to do their own flood forecasting this is highly desirable. I believe the National Weather Service has moved even more in that direction than before, toward providing the technical facilities for a community to do its own flood forecasting.

It can provide insurance or withhold insurance in a number of ways. As was indicated earlier, the ways in which the Federal Insurance Administration has been providing insurance have had a net effect of increasing catastrophe protection.

Then it can provide relief. We all know that no matter how tough the federal government may be in saying it's not going to provide relief unless such-and-such actions have been taken previously, it's going to find it very difficult to carry out such a policy when a disaster strikes.

Q: Okay. Let me turn to another subject for a moment. In 1969 Congress passed NEPA. I think we alluded to this before, but did you have any involvement in the drafting of NEPA or any input at all into that whole process by which NEPA was developed?

A: No. I had no direct involvement. I knew some of the people who were doing the drafting and I took part in meetings when it was being discussed. The points I raised are ones which I'm sure other people raised too. They had to do with the importance of requiring the agencies to indicate the whole range of alternatives that were available and making an effort to suggest what would be the consequences of each alternative. I did not do any of the drafting of the language.

Q: Now, even before this time the Corps had established a floodplain information program. In what way, if any, were you involved in helping to establish that program?

A: As we completed the studies of the changes in urban occupance and were exploring implications, one of the ideas that surfaced and received a good deal of support was that communities could be more intelligent in dealing with flood problems if they were provided with information about flood hazards and about the kinds of measures they could take to deal with a flood hazard. This was most dramatically exemplified by the Tennessee Valley Authority staff and with the assorted consulting services they had given to their communities. We held a workshop at the University of Chicago in which we tried to explore this idea. Gene Weber came from the Corps. Jim Goddard and a number of other people attended. Out of that and other measures (I can't pretend to know all of the other activities that were going on) the Corps decided to establish a floodplain information service. Legislative authority was obtained, although it probably was not necessary, in 1960, as I recall.

Q: Is that when Jim Goddard came over?

A: No, it was after House Document 465 that Jim Goddard came to the Office of the Chief. But the first systematic exploration of the idea of what ought to be done was at a meeting out at the University of Chicago that went on over a couple of days. During the same period we had stimulated the USGS to prepare its flood-hazard map of Topeka and had begun discussions of comprehensive flood-hazard mapping for the entire Chicago metropolitan area by the USGS.

Q: What is your evaluation of the Corps' information program since that time? Has it been successful, in your mind?

A: I don't know enough about it to know whether it's been successful or not because the Corps hasn't carried out full evaluations of what's been happening in the communities. If we ask them they give us information about how many inquiries they've had. But that doesn't tell me what happened thereafter in the community. It's like being able to say that so many acres have been protected by levees or reservoirs but not what's happened in those acres of land.

Q: So there's been no follow-up by the Corps on what's happened with this advice?

A: So far as I am aware, nothing beyond keeping a kind of a log, a systematic log, of who asked them for advice about what. I have the impression that the service has been downgraded, that as a part of the floodplain management effort it has a less important role in the Planning Branch of the Corps than it was expected to have at the outset. Again, this is an impression. Goddard came in with the idea that floodplain management was going to be a more important part of the Corps operations than it turned out to be. After he left the post it became less important in terms of the sort of recognition that was given to the people in that unit. They have been well informed and very conscientious individuals.

Q: Do you know whether the FPMS [Floodplain Management Services] program made any suggestions that the program would not be part of planning but maybe would be in kind of a branch or something? Were there any ideas about that?

A: I heard a lot of discussion about it but I was never party to the arguments that went on within the Corps on that subject.

Q: I see. Do you think this service is known very well to localities? How do localities find out about this service that the Corps offers? I should be asking the people in the Corps, I realize.

A: I do have a few impressions that are not statistically valid. Other sections of the Corps, in my observation, are entirely capable of never telling a local community there is a floodplain management service. If a community hears about it, fine. But it's not one of the services all sections of the Corps were

pushing. This, I think, varies from District to District as to how strongly it is enforced.

Q: Do you think perhaps that one problem that might develop here is that a community might say-the engineers or whoever in the community might say-gee, you gave us a good idea, now how about giving us the money to do it? Do you feel there's a reluctance on the part of communities to get involved in some of these efforts without a substantial investment on the part of the federal government?

A: With respect to a few communities that I know, the representatives of the Corps, in effect, said to the community, try to get us to obtain money for a real survey that we'll carry out. They didn't say, you know you could get most of what you want by having a floodplain information report, and then use some local consultants to work out a plan for yourself here.

I think the Planning Division was less than vigorous in trying to sell the services of the Floodplain Management Group.

Q: I see. Do you think perhaps that the District offices too were not particularly vigorous in advertising this service?

A: Yes. That would appear to be the case. What I think is clear is that in a number of instances the representatives of the District office did not mention, let alone push, the floodplain management services as being a possible aid to the solution of a local community's problems.

Q: Well, in the early 1970s, at least according to some people, the Corps had a change of heart. General Fred Clarke as Chief of Engineers established an Environmental Advisory Board and promulgated several regulations with the intent of carrying out the spirit and the specific guidance of NEPA. To what extent, if any, do you think the Corps did change at this time? Is that too big a question?

A: I don't think I have anything more than horseback opinions on that. A fairer judgment would be based on very careful analysis of what the Corps had been producing in the way of reports at that time.

I was in the position of arguing with Arthur Morgan at the time he wrote his last book on this point. Arthur was dismissing the Corps out of hand. I was saying I think that the Corps is changing and that there is some hope here and you are unfair in asserting that it's not different than it's ever been, and it's incapable of making changes. I think it has, as I've seen representatives of the Corps operate. Just how far this has gone for all of the Districts in the country, I don't know. I would say that this fact is a partial indictment of the Corps. The Corps should have undertaken some evaluations to find out for itself the consequences of its own internal operating processes. How much influence have its various efforts like the advisory board and its directives that were sent out had? Perhaps it has made an evaluation and some of us on the outside don't know about it. But I' m not aware of it. So I would applaud the TVA's candid effort to find out the results of its activities in several score communities. I want to see the Corps do the same.

Q: You tried to educate people, as I understand it, on the importance of addressing flood damages as well as flood prevention. To what degree do you think you've been educating the Corps of Engineers?

A: I think it is clear that at the present time, by contrast with the 1930s or 1950s, the top management in the Corps of Engineers in its public declarations is adopting a view that would be consistent with much that I and others have been advocating. What direct influence I may have had in that I'm not at all clear. I' m not sure that I've had any influence. But through a conjunction of events the top management's position has changed. That's evident.

How far this gets down to the area or District office it's hard to say without the kind of evaluation to which I was referring. It's unfortunate that the Corps has not made such evaluations itself. I once used the figure of speech that getting the Corps of Engineers or the Bureau of Reclamation to change its operating procedures was like burning a pile of damp newspapers. It's a slow process in which you have to continually ventilate the field, but I think it has happened to some degree. The question is the degree.

Q: Have you ever suggested to anybody in the Corps or anybody in the Office of the Assistant Secretary of the Army for Civil Works that an evaluation be made?

A: Way back I did, at the time of Clarke. But I think the response at that time may very well have been, well, we're getting a new program started-give us time and then we'll look at it. Most recently I made it to some representatives of the Corps when we were getting under way with the evaluation of TVA with FEMA, but it didn't seem practical for the Corps people to join.

Q: Let's turn to some things in which I think you're still very much involved. I'm interested in the origins of the Institute of Behavioral Science and how this institute got off the ground, what your involvement was with it, and how you got to the University of Colorado.

A: I had nothing to do with the Institute of Behavioral Science being organized. It dates back now over 20 years, and it was started within the university by an administration that wanted to upgrade the quality of its social science and behavioral science faculty. At that time there was a small group of able research people that did collaborate from several departments. The university took advantage of their being familiar with each other and interested in interdisciplinary effort to put together a new unit for which they could get funds. At that time the National Science Foundation had a Center for Excellence program. They were able to bring new money into the university, and with this new money they were able to recruit faculty that otherwise wouldn't have come. For example, Kenneth Boulding moved in economics from Michigan to Colorado, not because of the attraction of the economics department at the University of Colorado, but because of the opportunity to work in an interdisciplinary unit.

The institute was a straightforward effort by the university to build a quality social science faculty. It did so. There were a number of faculty who wouldn't have come if it hadn't been for the institute or who wouldn't have stayed if it hadn't been for the institute.

I came from the University of Chicago in 1970 because I was interested in an institution where there was more opportunity for interdisciplinary research than there was in Chicago, and because this was an area in which I thought we would like to live on retirement. While we greatly enjoyed the University of Chicago, we did look forward to retiring in the University of Colorado neighborhood since we already had a summer place here in Colorado.

We responded to a university invitation to come out and join the institute. I was first invited to be just a professor in the institute. Then, at the last minute, they lost a director and asked me to take that post. I did. After I'd been here a little while I became much interested in an interdisciplinary effort to look at research on natural hazards in a broad context. This built on what Ian Burton, Bob Kates, and other geographers and I had learned from studying floods and droughts and applying it to other kinds of natural hazards. Those perturbations from extreme events included earthquakes, hurricanes, landslides, tornadoes, lightning. With Eugene Haas from the Department of Sociology, we obtained an NSF grant to do an assessment of research on natural hazards, which later led to the NSF establishing a research program in that field.

Q: Is the methodology transferable?

A: I think it is. There are obvious limitations and one needs to be sensitive to those. It's entirely clear that in the earthquake field the Office of Management and Budget set up a group to look at earthquakes in the same way we had looked at floods earlier. The kind of research that then began to be carried on about earthquakes followed the lines of the research that had been started on floods in terms of land use, problems of warning systems, applicability of insurance programs, areas of seismic vulnerability, and the like. I think the best test of there being something that can be learned from comparing the experience in one natural hazard field with another field is that the Natural Hazards Workshop which NSF helped start and fund to get people to attend in the first year now operates without any financial support beyond putting together the program. The federal agencies themselves pay for the center. The people who attend the workshop come at their own and their agencies' expense. People apparently think they're getting something worthwhile out of it. It is a rare example of carefully organized, periodic communication between producers and users of research in a field having large policy implications.

Q: I guess what I don't understand is the methodology that you're applying to various natural disasters and natural hazards. Why can 't the methodology y, whatever it is, also be applicable to human hazards, like fires in a city or something of that sort? What is there unique about natural hazards versus human hazards in terms of assessing probabilities, the amount of damage, etc. ?

A: There's nothing unique. It's a matter of convenience and manageability. First of all, there is no natural hazard that is completely natural. Any kind of hazard to society always involves some interaction among natural processes and social processes or structure. You don't have a catastrophe from an earthquake if people don't live in a place where they're vulnerable to earthquakes. [The situation is] similar for floods and hurricane coast or landslide areas. Even with lightning people have a choice of where they locate and what kind of technology they adopt to make themselves more or less vulnerable to lightning.

So all of the natural hazards have their social components, and, similarly, most hazards which are primarily the result of human technology have some natural components. One could think of some that don't have any. For example, the hazard of an airplane blowing up without any relation to the atmospheric conditions at the time. The effects of an explosion in a chemical plant, however, may be greatly influenced by the prevailing weather.

The appropriate mode of analysis is, I would say, just the same. The reason we started here to think only of natural hazards-we made this conscious decision-was that the whole field of natural and technological hazards was too big and complex to try to tackle all at once. We felt that we could do a more effective job, both in analyzing research needs and in providing a clearinghouse program, by limiting ourselves to an array of extreme events that were primarily natural. We now have a cooperative discussion going on with Clark University, which has been working on technological hazards, and with the University of Pennsylvania, which has been working particularly on the risks of industry, to promote exchange of ideas. FEMA has funded an effort to try to put together a data base that includes all of these. Our position here is that while this is a good idea, if we had tried to include all of them eight years ago, we'd probably still be floundering around. Instead, we may have made a fairly significant impact on the smaller sector.

Q: This may sound like a presumptuous question, but to what extent are you using your skills as a geographer in your present work?

A: The approach that a number of us, including Robert Kates and Ian Burton, have taken to natural hazards has been a distinctively geographic approach, and it's one that others can share. In terms of the kinds of methods that are applied, geography has probably had more to contribute than any other discipline. Geographers are in space a little like historians are in time; they

have the capacity to deal with a variety of components of a complex situation. So, geographers found it easier to deal with the notion of alternatives in water management. They found it easier than economists or engineers to deal with problems of floodplain occupance.

I would say that most of what I've done in the field of natural hazards, including floods, has involved a primarily geographic approach. It has always asked what are the ways in which society can adjust to the distinctive characteristics of any natural setting in terms of place and location. This requires looking at what the experience has been in any other places similar to the natural site. It also requires looking at what would be the constraints that would be set by that natural or social environment to activities that could be carried on.

I've followed the same kind of approach in dealing with domestic water supply in developing countries. I think it is distinctively, but not exclusively, geographic. It was consistent for me to work on the NSF-supported High School Geography Project during the 1970s while doing research on hazards.

Q: Have you ever used historians in the institute? There is a dimension of time.

A: We've been delinquent in that. We've had a few historians who have been interested, but by and large either they haven't wanted to take part or we haven't been skillful in enlisting them. I'll give you as an example people that have worked with me—Robert Kates and Kenneth Hare-who are doing similar work and who have been using historians. A number of people have applied this approach to the broad problem of what would be the effects on human society and environment of a change in climate that might be induced, for example, by changes in $C0_2$ or other greenhouse gases. And the Scientific Committee on Problems of the Environment, with which I'd been associated, has just published a comprehensive report on the different methods that could be followed to estimate the effects of a climate change. All too often, meteorologists or biologists jump to very quick conclusions that if there were a one degree change in the temperature there would be specific social effect.

In that effort there are several historians who are participating. They are saying let's look back to any periods witnessing extreme climate stresses in history and ask what can we learn of the way in which societies responded at that time.

Similarly, in the natural hazards field we've had a few people who have looked at responses to earlier stresses as a result of extreme events. Historians haven't been very much interested. We've been more successful in getting anthropologists to pay some attention to it. For example, we have a group here at the University of Colorado that's gone back and looked at what has appeared to be the consequence of great volcanic eruptions in Central America in the fourth century A.D. Not the historians.

Q: I want to go back and pick up a few odds and ends that I either omitted asking you about before or else I saved purposely until the end. One of the things that I did omit asking you about is your work on the Great Plains Committee, back in the 1930s. Can you explain what that committee was all about?

A: In the mid-thirties there were two great drought years during a longer period of drought: 1934 and 1936. The drought was probably unprecedented in recorded history, and there was severe social economic distress. Along with the drought there were new government agencies that were concerned with the public welfare and there was an economic depression. These three combined to produce not only widespread human suffering but an extraordinary effort on the part of the national government to deal with that suffering and to alleviate it. In 1934 widespread drought relief measures were undertaken in the United States through the Public Works Administration, the Works Progress Administration, and the Federal Emergency Relief Administration. The Mississippi Valley Committee report commented on problems of drought, and the National Resources Board the following year had a special section I wrote about the Great Drought of 1934.

Then came a period of relaxation and an even more severe drought in '36. At that stage, under the instigation of a whole array of New Deal agencies, there was a unified effort to ask what we could do now that would prevent this from happening again. The President set up an emergency drought committee in the early summer of '36 and then it presented a brief report commenting on various positive actions that could be taken. He appointed a full-fledged committee under Morris L. Cooke in the summer of '36 to report by the end of the year on a long-term program. The report, which Cooke shepherded, brought together the work of many federal agencies, principally the Land Division in the Department of Agriculture. I was on the sidelines because I was involved in water resources at that time. And we made

contributions through it. It was the first attractive-looking government report that had been put out. Did you ever see it?

Q: No, I don't think I have.

A: It was distinguished by its graphics, by its quality of writing, and by the way it was marketed, because Morris Cooke called wide attention to it. He took it over and presented it to the President. The President made a variety of comments about it. It probably was the first time that a group of federal agencies joined together to propose how a disaster which the country had just experienced could be prevented in the future. Parts of it, the analysis of the environment of the Plains—its climate, its soils, vegetation, water resources—are quite accurate today. (I have written this up in the *Great Plains Quarterly* for spring 1986, pages 84 to 93.) Parts of it, its analysis of the capacity for technological change in respect to both crops and ground-water exploitation and its estimate of the capacity of society to change in planning resource, were way off base. It's one of the early cases in the history of the United States where there was a unified effort by all the agencies to grapple with a major social and environmental problem and to propose a single set of solutions.

Q: What was your involvement?

A: Oh, I was secretary of the Water Resources Committee. The Water Resources Committee was asked to contribute to the water part of it. It was mostly agricultural economics and soil conservation.

Q: Another issue that I didn't discuss with you and a project which did produce a handsome publication is the National Water Commission Report, published in 1973. Do you know what I' m referring to? Howard Cook was involved with it.

A: Yes. That was the one that Ted Schad directed, and Chuck Lute was the chairman. I was a consultant for that, as I had been for the report of the Senate Select Committee on Water Resources in 1960.

Q: To what extent did you get involved?

A: I took part in planning the studies that the National Water Commission commissioned, and reviewing some of the materials that were turned out. I didn't do anything beyond that. That is, I didn't draft any single part of the set of reports. I only helped plan the studies and made suggestions about who might participate in producing the documents. Howard Cook was the sort of number two man to Ted Schad in that.

Incidentally, that group is, I think, unique. They still have an annual meeting. The members of the commission and the senior staff under Chuck Lute and Ted Schad get together once a year and talk things over. I think that the latest one, this year, was down in Arizona. There's a great sense of camaraderie and common mission.

Q: Professor White, you've also been very much involved in various United Nations enterprises. I wonder if you could explain some of the projects you've been involved with on behalf of the United Nations, such as taking part in the United Nations Scientific Conference on the Conservation and Utilization of Resources at Lake Success in 1949.

A: Most of them have grown out of my interest in the United States. I expect the first international program in which I became involved grew out of my experience with the drought studies and led to my being drawn into the first international scientific research program that UNESCO established on arid zone research. That was back in the early fifties. I helped them organize cooperative research activities dealing with better use of arid lands. This included the first International Conference on Arid Land Research, which was held in the Southwest under AAAS [American Academy of Arts and Science] auspices in 1955, and the 30th anniversary, which is to be celebrated by another conference in Tucson in October '85.

The United Nations was very much interested in promoting integrated river development in various developing countries around the world. I was asked to serve as chair of a panel of people from a number of countries (Colombia, France, the Netherlands, the USSR, the UK) that brought out a report on river basin development that's been used often and revised in 1970 by the United Nations.

That was in the late fifties. Out of this came interest in the environmental effects of big river projects. I served for a while under the leadership of Ralph Townley as the consultant to the United Nations Development Program

in establishing a set of studies with developing countries on how they could salvage large reservoir projects that they had undertaken in a burst of enthusiasm without being fully aware of the full set of side effects. This included the Volta River in Ghana, the Kainji in Nigeria, Kariba in what is now Zimbabwe and Zambia, and the High Aswan in Egypt. In each case I headed an interdisciplinary mission that set up a plan of action between the concerned country and the UNDP. In the late 1970s I returned to the Nile as consultant for a joint study of the downstream effects of the High A swan, and for the first six years of the eighties was a member of a joint consultative committee on applied science in Egypt. Later, I was senior author of a paper reviewing the world water resources and needs for the United Nations water conference in 1977.

One reason I got into that was that I'd been working on the lower Mekong with the four countries there on social economic aspects of the land and proposed reservoir system. That appraisal was funded by the Ford Foundation and the coordinating committee of the four countries.

I was drawn into the new United Nations environment program after the Stockholm conference of 1972 on various kinds of studies that they were interested in promoting in developing countries. One assignment was as senior consultant in planning the World Conference on Desertification in 1977. I expect the most recent job I did for them was to help edit their major review of what had happened to the world environment between 1972 and 1982. An Englishman (Martin Holdgate), an Egyptian (Mohammed Kassas), and I put together a final document drawing on work from about 150 different scientists.

Q: Is that available?

A: Yes, it's published by Tycooley Press, an Irish publisher, and is entitled *The World Environment: 1972-82.*

So I have worked with the United Nations in a variety of ways. I've done some other things. And I worked with the World Health Organization in studies on domestic water use.

Q: In which countries?

A: Back in the early sixties, after I had gotten well along with the flood studies at Chicago, I found myself most interested in how decisions were made about water use and management. The Rockefeller Foundation very kindly offered to support me in anything I wanted to do for a couple of years in this field of research. I decided I would like to look into the most elemental decisions made about water and see if that could not provide some new insights into water management.

My wife and I picked East Africa as an area in which there's tremendous diversity of both culture and environment. We went into about *35* different sites and inquired about how people decide to use water. At least 60 percent of the people on the earth go and draw water from someplace outside the household every day, including a lot of people in the States.

We did something which is rudimentary but nobody had done before. We found out where they got their water, how much they used, and what it cost them to use it in terms of time, energy, money, and health. To do the health part of it and for general perspective, we were fortunate to join forces with a British medical biology researcher, David Bradley. Out of it the three of us produced the first examination of what is involved in carrying domestic water to a household, and how people make their choices as to where they will go. In almost all cases people have alternative sources from which they can draw the water. Thus, they make two decisions everyday: how much water they'll draw, and where they will go to get it, which involves who will go to get it, generally "she."

We were able to work this out with the assistance of field interviews by students from Kampala, Nairobi, and Dar es Salaam. Since then, it has been done hundreds of times in other places. This led us into all sorts of collaboration with people in various countries and in other disciplines—economists, engineers, sociologists, anthropologists-all interested in the same problem of providing potable water. Then the United Nations Drinking Water Decade was established in 1981. We were involved in several of the plans and preparations for that. That's been another international activity related to decisions about water.

Q: While it's not exactly a natural hazard, I am curious about the extent, if any, you've gotten involved in these recent concerns about nuclear winter. I understand there's a central international consortium which has been organized

to analyze the possible impact of nuclear war. Have you been involved in any of that?

A: Yes. I was president of the Scientific Committee on Problems of the Environment for six years and active in its founding in 1969. This is under the International Council of Scientific Unions and it's made up of representatives from 36 national academies of science and about 15 international scientific unions. It functions by selecting a few problems on which it organizes international collaboration among scientists in the environmental field. The problems must be, one, of large international significance, two, interdisciplinary (if they weren't interdisciplinary they'd be handled by a particular union), and, three, ones for which we can recruit first-rate scientific personnel. We've never had a problem getting money. If we could satisfy the other criteria we could get the money. SCOPE has made pioneering examinations of environmental risk assessment, global biogeochemical cycles, and ecotoxicology.

At our general assembly in Ottawa in 1982 we decided that we ought to look into the environmental effects of nuclear war and, according y, organized a study group. It took us a year to get it organized because we decided we shouldn't do it unless we had both U.S. and Soviet participation. The Soviets finally came in on it. Since then we have put together a report which will be made public in Washington on the environmental consequences of nuclear war. The first volume will be on atmospheric consequences, and the second on biological, ecological, and agricultural consequences.

We explicitly are not trying to deal with the full human consequences of nuclear war because the World Health Organization has a partial report on that, and because it seemed a step beyond what is already a very speculative kind of analysis. We've had more than 200 scientists working on it. People from over 30 countries participated. We've followed a plan of holding workshops in different countries so as to reach the scientists in those countries but also to assure a global view of the problem. Our first planning meeting was in London. The next was in the Swedish Royal Academy of Sciences. Then a major workshop in New Delhi, another in Leningrad, one in Paris. This year we've had workshops in Hiroshima, Tokyo, Toronto, Melbourne, and Caracas.

Q: Have you attended all of these workshops?

A: No, I was ill and couldn't go to some of them, and some of them I didn't need to attend. The last one was a writing workshop at Essex and that's where I was this month for a couple of weeks.

We expect to turn out—I have the draft manuscript on the desk now—these two volumes. We commissioned a Canadian journalist to write a popular version, which will be published as a paperback. I think it will be the closest anyone has achieved so far to a consensus among the world's scientific community as to what would happen if there were a major nuclear exchange.

Q: Is it as scary as the predictions have it?

A: In some respects it's less so. In other respects it's more so. It's a much more careful, balanced set of judgments than those made public in Washington last October, but it opens up some possibilities that hadn't been generally recognized. It indicates, most of all, that a very uncertain set of processes would be triggered by an explosion. You cannot be certain that there would not be a nuclear winter. That's the most conservative way of putting it. But you can also be certain that there would be a whole set of radioactive consequences that could be quite severe, and that any dislocation in this system of food supply and distribution could be horrendous. Of course, it would be even if there weren't a nuclear winter. This is the ultimate natural hazard.

Q: The ultimate natural hazard. I thought it would be the ultimate human hazard.

A: But as with all of our natural hazards, it's a human intervention in natural systems that then has human impact. If people didn't move into floodplains we wouldn't be worrying about flood damages. If people didn't invent and set off nuclear bombs we wouldn't be worrying about profound perturbations of the atmosphere.

That's the most recent question I've been working on. I worked on it for two reasons. One, I was involved in starting it in SCOPE, and then had the duty of raising about **$600,000** to finance it, which turned out to be, with Tom Malone's participation, not a difficult task. We rallied support from all around.

I was also intrigued with this whole notion of how the human race faces up to an overarching hazard, and I was interested in seeing it through. My contributions on the scientific side have been minimal beyond a chapter touching on societal effects, but I was involved in planning it and seeing that it gets properly drafted.

Q: There seems to be a strange contradiction between the way people react to the threat of earthquake in California and the way they react to a nuclear war. Both are or could be called catastrophes in the case of California. In the case of the earthquake, though, people of California don 't seem to get too worried. They say if it comes, it comes. Whereas in the case of nuclear war they'd be very much concerned about it even though pushing the button is a human decision.

A: That's a perceptive query, the answer to which a number of us have been struggling. I have tried to involve in our discussions of the nuclear war situation a few of the people who worked on perceptions of natural hazards. Some who did the first work on how people in California perceive a hazard; why they are not worried about real estate in seismic safety zones, for example; looking for possible parallels, differences.

When we carried out our first study of how people in San Francisco viewed the earthquake hazard, we had a rejection rate of 75 percent, which is almost unheard of in survey literature and indicated a flawed study design. People didn't want to talk about it. And when one says that the Californians are not worried about the earthquake hazard one has to recognize that to some extent they may not want to discuss their worries because they don't know anything to do about it. They deny it. And we now have the same sort of a problem of denial with respect to nuclear war.

One of the lessons that we may have learned in part from the work on natural hazards is that many people are realistic in their perception of an extreme event to the extent that they have some sense of efficacy in dealing with it. If a person feels that he or she can cope with the event then they're more likely to discuss it in terms that a scientist would regard as accurate and precise. If they feel they have no command over it and that there's nothing that they can do to cope with it, then they have difficulty describing it or even thinking of it in accurate terms.

In the case of nuclear war there is some sense of efficacy. Some believe that they could stop the bomb. They could freeze its production. That's probably why the nuclear freeze has been appealing. From a political standpoint, it's a simplified, unrealistic kind of action in the opinion of many policy experts. To ordinary people it seems a practicable kind of action.

I would argue that with respect to the environmental movement, one reason people became devotees of certain kinds of environmental action in the late sixties and early seventies was that they had a sense of efficacy about it. They could stop Echo Park Dam from being built. And they did, at the time. They could stop a dam in Grand Canyon. And some people feel this about the nuclear weapons today. Others don't, and they find it very difficult to even think about. According to some studies, youngsters find it easier to think about it and are more ready to articulate their anxiety than are adults. A number of school systems have special counseling programs for youngsters who are worrying about nuclear war.

Q: Let's turn to a happier subject.

A: I thought that might be an appropriate way to conclude; starting out talking about little things like floods and ending up with nuclear war.

Q: Well, I want to conclude with just a couple of questions, We haven't talked much about your wife, and we haven't talked much about your family in general. Why don't you fill me in on your children, your wife and what she does, and SO forth.

A: I met my wife in Washington in the home of Colonel Clark, deputy administrator of the Public Works Administration, where we'd both been invited for dinner. She graduated from Vassar and later went into the National Labor Relations Board as a field investigator. Earlier she was a part of the survey opinion work that was first undertaken in the United States. As you may know, it was organized under M.L. Wilson's aegis in the Department of Agriculture, with a top-notch group of social psychologists, Jerry Bruner, Rensis Likert, and others who later formed the Institute for Social Studies at the University of Michigan. They did the first surveys of people's opinions about what was going on in the country. They began asking why farmers do not take advice. Then came the war and they were asked to find out why people bought bonds. That stimulated her interest in survey

research. We had decided to marry before I went to Vichy, France, in 1942 but wanted to await my return, whenever that would be. I was detained for a year in Germany, and we were married following my exchange in 1944.

After the war she accompanied me to Haverford. It was a very demanding, time-consuming effort to be the wife of a president in a college where many of the students were returning veterans her age. When our youngest child went off to school she began working with me on problems of domestic water.

Q: Is she a Quaker, too?

A: Yes, we're both convinced Quakers. And were both members of the Florida Avenue Meeting in Washington. We joined separately but then came to know each other later. Since then, Quaker meeting has been an integral part of our lives.

We have three children, all fine people doing useful work. Our oldest teaches economics at the University of Illinois. And the second one maintains a glass studio in Oakland, California.

Q: Are those both sons?

A: No. The oldest is a son. The second is a daughter, the glass blower. The third took a Ph.D. in anthropology and now is raising a family and teaching part-time at the University of Victoria. We have none around here, I'm sorry to say.

Q: Well, it makes for a peaceful existence, I suppose, anyway.

A: We came to Boulder because I'd had the experience of working on a ranch as a boy and wanted my children to have it. So I looked around for a ranch that we could spend the summer in that was high and dry-one of our daughters was then somewhat asthmatic—and was within driving distance of a university library. I drew radii from Laramie, Fort Collins, Boulder, Colorado Springs, Albuquerque, for an operating ranch. It turned out there was such a rancher in Sunshine Canyon who took his cattle to the high country. So I wrote to him. His wife's reply was come live on our home place next summer if you

will take care of the stallion, any sick cattle, keep people from running off with our tractors, and pay us $150 for the summer. So we sent our $150 and that's how we came to Sunshine Canyon. The ranch family was a great one, and we all enjoyed and learned from them.

Q: And you bought the place?

A: No, he didn't want to sell the land. We found another place up the road.

Q: So, in other words, the invitation you got from the university came after you . . .

A: We'd been coming out here for 12 years.

Q: Oh, I see. Well, I always ask this question at the very end, so I'll go ahead and ask it of you. Looking back over your life, and you've obviously had a very productive life, is there anything that you regret or that would like to change if you had to do it all over again? Any missed opportunities?

A: It may seem complacent, but I don't think so. I can look back and see where I made a number of decisions which might have led me quite different ways, and possibly would have been more productive, but I don't regret them. I don't regret having been as diverse as I have been in my interests. I know that if I'd gone deeper into a particular subject I might have made more significant contributions. Then, I wouldn't have had the fun of exploring in some of the other directions. I'll have to think about that. I'm not harassed by the thought that I took the wrong directions.

Q: There are a number of people I've interviewed who have had exactly the same answers, so you're not alone. Do you have any other comments about your life that perhaps we didn't cover adequately enough?

A: I think I've always tried, to use a trite phrase that I see on bumper stickers these days, to think globally and act locally. I've tried to keep in mind what the predicament of the human race was, and then find something I could do that was more concrete and possibly helpful at the local level.

Q: I have to ask you this question as a result of what you just said. To what extent was your philosophy and were your concerns motivated by your religious beliefs?

A: I think it has been all along a sense that people ought to strive for a kind of harmony with their fellow humans in nature.

Q: Well, thank you very much.

Abbreviations and Acronyms

AAAS	American Academy of Arts and Science
CO	Conscientious Objector
FEMA	Federal Emergency Management Agency
FERA	Federal Emergency Relief Administration
FIA	Federal Insurance Administration
FPMS	Floodplain Management Services
MVC	Mississippi Valley Committee
NEPA	National Environmental Policy Act
NRB	National Resources Board
PWA	Public Works Administration
REA	Rural Electrification Administration
RFF	Resources for the Future
TVA	Tennessee Valley Authority
UK	United Kingdom
UNDP	United Nations Development Program
USGS	United States Geological Survey
USSR	Union of Soviet Socialist Republics
WRC	Water Resources Council

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