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WORKINGPAPER

NUMBER 7

ESTIMATES OF THE WELFARE INCOME EFFECTS OF
FLOOD PREVENTION FOR COMMERCIAL AND
INDUSTRIAL PROPERTY

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APRIL 1976

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ABSTRACT

This study is based on the premise that the utility of additional monetary income is inversely proportional to the progressive Federal income tax structure. Selected beneficiaries of a case study small watershed project in a commercial and industrial area were identified, and their incomes were estimated. Since they had greater than average incomes, the welfare effects of program benefits are estimated to be less than calculated monetary benefits.

Key Words: Small Watershed Program, Evaluation, Social Welfare Effects.

PREFACE

The Small Watershed Program of the Soil Conservation Service (SCS) is a multiproject water resource development program. SCS early recognized the importance of continuing studies of the economic aspects of the program and has provided support to the Economic Research Service (ERS) to make studies since the very beginning of the program. This report presents results of one of these studies. It is the third phase of a three-part study of the welfare income effects of small watershed development. Phase I developed a procedure to estimate the income benefits of flood protection to residential property owners. It was described in an ERS staff report entitled, "The Contribution of P.L. - 566 Watershed Investments to Community Income," July 1971. Multipliers, based on the marginal utility of income were developed to convert monetary benefits to social welfare equivalent benefits. Phase II focused on agricultural benefits from increased values of crop production and damage reduction to agricultural structures. This was covered in an SCS administrative report, "A Methodology for Estimating the Income Distribution Impacts of PL-566," dated June 1972.

The third phase of the study, reported herein, treats the remaining private property -- commercial and industrial. The approach used is designed to be compatible with the previous phases.

This study could be used by project planners in evaluating social impacts under multiobjective planning procedures. Administrators of public resource investments will also find this study informative.

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SUMMARY

Estimating welfare benefits from flood control projects completed under the provisions of PL-566 requires the identification of beneficiaries and their income levels. A conversion factor representing the marginal utility of income is applied to monetary benefits to estimate welfare equivalent income. A case study was used to develop and test procedures.

Current SCS methods of estimating flood damage reduction benefits can be extended to identify the owners of protected property. Internal Revenue Service tax summaries can be used to estimate income levels of individual partners, proprietors, stockholders, or lessors.

"Benefit Equivalent" multipliers, based on progressive Federal tax rates, can be developed. However, the theoretical basis for using Federal tax rates as a surrogate for welfare equivalency is weakened by the special deductions and exceptions available to people with incomes from sources other than wages and salaries.

This study found that the beneficiaries of flood reduction projects in commercial and industrial areas average between 50 percent and 250 percent more income than the average taxpayer. Therefore, when the "Benefit Equivalent" multiplier is applied in commercial and industrial areas, welfare equivalent income is less than monetary benefits using current evaluation procedures.

ESTIMATES OF THE WELFARE
INCOME EFFECTS OF FLOOD PREVENTION
FOR COMMERCIAL AND INDUSTRIAL PROPERTY

by
N. D. Kimball 1/

INTRODUCTION

Problem and Need for Study

Over the past two decades, public water resource planning has evolved into an explicit consideration of multiobjectives. Decisions concerning future investments of public funds depend in part on social and environmental criteria as well as the former economic efficiency criteria, which has been embodied in benefit-cost analysis (11).^{2/}

One social criteria is the distribution of income. Federal funds spent on water resource projects often redistribute income. The direct benefits of flood protection projects accrue primarily to owners of property. The welfare impact depends upon the income levels of the beneficiaries. Procedures are needed to identify the beneficiaries, to estimate their income levels, and to estimate the utility of benefits according to the income levels of the beneficiaries (hereinafter referred to as "welfare equivalent benefits.")

1/ Agricultural Economist, Natural Resource Economics Division, Economic Research Service, U.S. Department of Agriculture.

2/ Underscored numbers in parenthesis refer to reference list at the end of publication.

Objectives

The main objective of this study is to develop methods to evaluate the welfare implication of public investments in small watershed projects in commercial and industrial areas. The specific objectives are:

1. Develop a method to identify commercial and industrial beneficiaries and quantify the amount of their benefits from flood damage reduction programs.
2. Develop a method to determine annual incomes of beneficiary groups.
3. Develop a method of measuring the change in welfare of beneficiaries.
4. Illustrate the use of these methods with a case study.

It was assumed that the method for evaluating welfare impacts should be compatible with current procedures of evaluating flood damage reduction benefits.

STUDY METHODS

Beneficiaries and Income Levels

Flood damage reduction benefits in commercial and industrial areas accrue mainly to owners of land, buildings, fixtures, equipment, and inventories. They may be stockholders, partners, proprietors, or investors, whose incomes differ considerably. According to the local county assessor, the owner of real property is rarely the operator of the business. Therefore, methods must differentiate between properties by type, especially real and personal. A small part of flood control benefits is the prevention of loss caused by interruption of business. Beneficiaries of this type are protected from loss of wages and profits.

For this study, the income levels of beneficiaries were determined in several ways, ranging from personal interviews with owners of flood plain property to an evaluation of published income tax data. In practice, the method of determining income levels would depend on the amount of detail needed which would in turn depend on the importance of the income distribution effects to the project; the time and funds available to conduct investigation; and the availability of data. Individual beneficiaries cannot always be identified or located, or they may not be willing to disclose their incomes, or both.

The method used to determine flood plain ownership is an extension of flood damage evaluation methods currently practiced by the Soil Conservation Service (8).

Indirect Losses

Losses from the interruption of business (other than physical damages) were assumed to be 20 percent of direct damages. This is in keeping with current SCS procedures. Research to refine this procedure is outside the objectives of this study.

Tax statistics indicate that workers in manufacturing and wholesale trades have about the same income as the average taxpayer. Because flood control benefits going to these groups would not change welfare equivalent benefits very much, it probably would not be worthwhile to attempt a more precise estimate of wage benefits.

Future Business Structure and Ownership

Normal SCS procedures involve the estimation of future development in the flood plain. Often land is being converted from agriculture to business and residential uses. In this study, the identification of the owners of land, building, fixtures, and inventories was also required. There was no method of predicting future ownership by kind of property. Current business ownership patterns existing in the project area were assumed to hold for the future in this study.

City, county, and regional planners can assist in estimating the "with" and "without project" development of an area. Local building and zoning ordinances indicate possible future land uses. Existing building codes could be used. For example, first floor heights and types of foundations could be specified. The evaluation of the benefits of projects would only be considered above the specified floor level. Planners and assessors have knowledge of the trend in property investments and business ownership. For

example, land and buildings in new shopping centers and office complexes are often owned by investment companies and businesses are owned by proprietors. This pattern might be projected to continue into the future.

Benefit Equivalent Multiplier

The third objective of the study was to develop a method of measuring welfare impacts of flood protection benefits in relation to the income levels of the beneficiaries. It has been hypothesized that the Federal income tax rate is inversely proportioned to the marginal utility of an individual's income, and that monetary benefits can be converted to welfare equivalent income by a multiplier based on the Federal tax rate (5). In phases I and II of this research, methods and procedures were explored to develop benefit ratios (hereafter referred to as BE ratios) (2) (5). The basic assumption underlying the use of BE multipliers is that marginal Federal income tax rates reflect equimarginal sacrifice. Consequently, the inverse marginal tax rates indicate the marginal utility of income by income class. The difference between monetary benefits and welfare equivalent indicates the change in welfare through public expenditures for flood control. When benefits accrue to below-average income groups, total welfare is assumed to increase.

Tax rates were converted to benefit equivalents by multiplying the inverse of the income class marginal tax rate by the average rate for all taxpayers. This procedure weights individual marginal income relative to the average. The inverse of the tax rate represents the welfare value of added income to beneficiaries. If an individual's tax rate is half the average rate, an additional dollar would be worth twice as much as additional income to individuals with average income. The BE multiplier in this case would be 2. If the beneficiary's tax rate is three times the average, the added income

would be worth one-third of the average, and the BE multiplier would be .33. Money income times the BE multiplier equals welfare equivalent income. In phase I and II, marginal tax rates were found to give an irregular BE multiplier; they did not follow a regularly increasing amount as income increased. Consequently, average tax rates were used because of a more even rate of increase. Table 1 shows both average and marginal BE multipliers. Both average and marginal tax rates were obtained from per capita adjusted gross income class. Both are the percentage of taxes relative to per capita adjusted gross income. The last two columns of table 1 show the BE ratios. They were calculated by dividing the mean tax rate at the \$8,000 to \$9,000 income level (10.4 and 13.5 for average and marginal rates respectively) by the rates for each income level. The mean BE is then 1. Problems and limitations of BE multipliers developed in this study are discussed in the following section.

Evaluation of BE Multiplier

The basic Federal income tax structure is progressive, but when deductions are applied, the effective rates of taxation on marginal taxable income are not steadily increasing. Table 1 shows that taxpayers in the \$3,000 to under \$4,000 income class pay a higher rate on their last \$1,000 in income than those in the \$8,000 to under \$9,000 income class, and they pay only .4 percent less than the \$10,000 to under \$11,000 class.

A major deviation from the equimarginal sacrifice principle has arisen from adjusting tax rates and deductions for purposes other than obtaining revenue at progressive rates. Some of these provisions are accelerated depreciation of property, interest deductions, and investment credits to encourage investments; interest and tax deductions to promote home ownership;

Table 1--Average and marginal gross income, and income tax by income levels and benefit equivalents, United States, 1970 ^{1/}

Adjusted gross income	Number : of returns	Adjusted gross income		Income tax		Tax rate		Benefit equi. ^{2/}
		: Marginal : change	: Per capita	: Marginal : change	: Per capita	: Average : Marginal	: Average : Marginal	
Dollars	1,000	Dollars		Dollars		Percent		
1,000 under	6,288	1,498	950	7 ^{3/}	7	.5	20.8	19.28
2,000 "	5,609	2,488	990	97	93	3.9	2.67	2.08
3,000 "	5,147	3,507	1,019	234	137	6.7	1.55	1.07
4,000 "	5,086	4,506	999	359	125	8.0	1.30	1.08
5,000 under	4,761	5,496	990	488	129	8.9	1.17	1.04
6,000 "	4,655	6,493	997	620	132	9.5	1.09	1.02
7,000 "	4,429	7,496	1,003	752	132	10.0	1.04	1.02
8,000 "	4,284	8,490	994	886	134	10.4	1.00	1.00
9,000 "	4,174	9,497	1,007	1,035	149	10.9	.95	.91
10,000 under	3,681	10,487	990	1,172	137	11.2	.93	.98
11,000 "	3,261	11,487	1,000	1,337	165	11.6	.90	.82
12,000 "	2,790	12,488	1,001	1,518	181	12.2	.85	.75
13,000 "	2,368	13,487	999	1,680	162	12.5	.83	.83
14,000 "	2,006	14,486	999	1,868	188	12.9	.81	.72
15,000 under	5,538	17,064	2,578	2,387	519	14.0	.74	.67
20,000 "	1,909	22,109	5,045	3,485	1,098	15.8	.66	.62
25,000 "	768	27,151	5,042	4,708	1,233	17.3	.60	.56
30,000 "	918	37,170	10,019	7,783	3,075	20.9	.50	.44
50,000 "	351	65,835	28,665	18,892	11,109	28.7	.36	.35
100,000 and over	77	184,990	119,155	73,373	54,481	39.7	.26	.30

^{1/} Source: (10)

^{2/} The mean tax rate (10.4 average and 13.5 marginal) divided by the class tax rate.

^{3/} Average tax for incomes below \$1,000 was 13 cents (10).

and tax exemptions for municipal bonds to subsidize local investments. Effective tax rates are less progressive than nominal rates because low income taxpayers cannot participate in investment programs. Most of their income is from wages, and consequently, taxable. Even if these objectives benefit the Nation, they do not follow the equimarginal sacrifice principle.

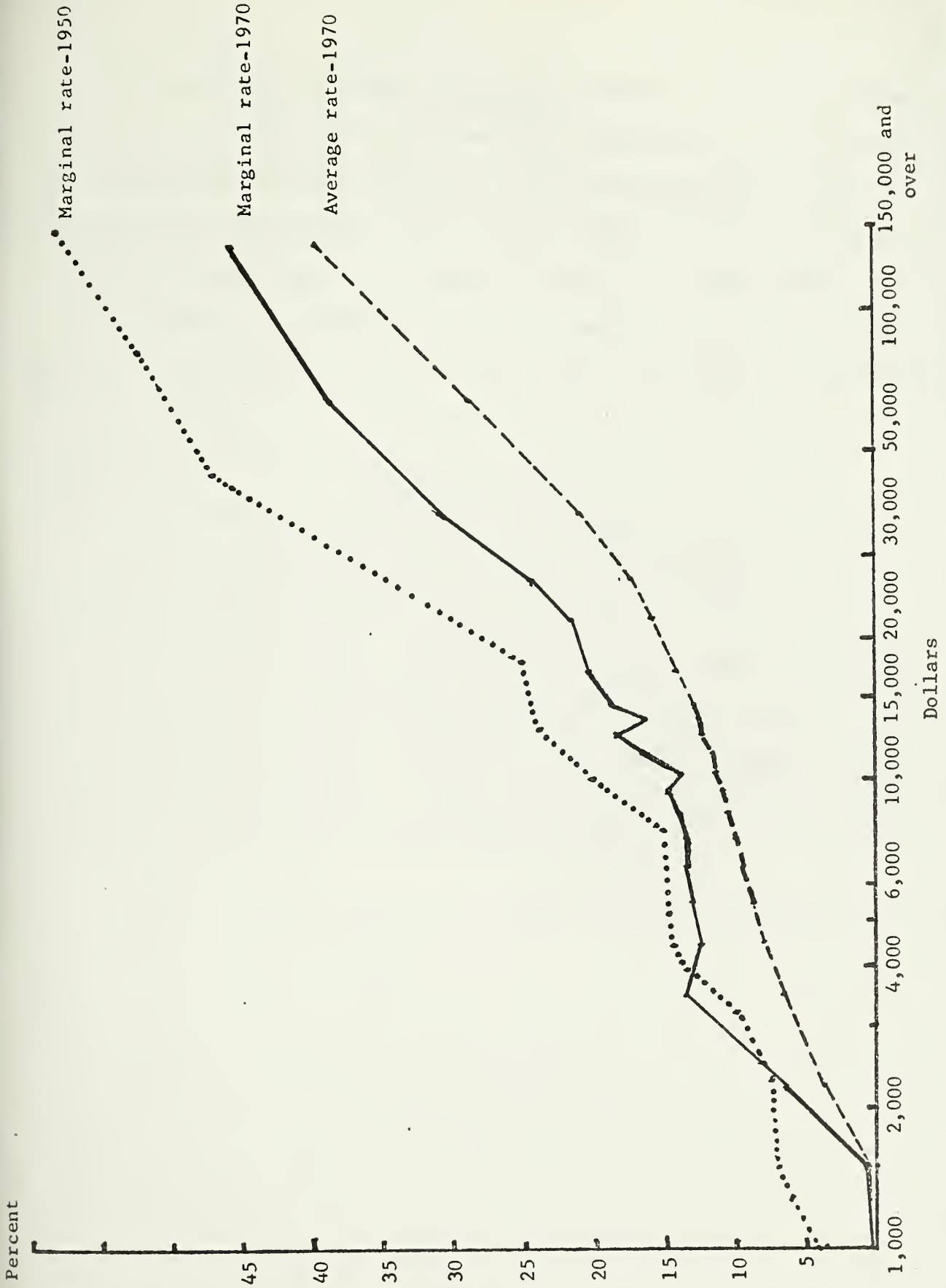
Changes in Tax Rates

The marginal tax rates by income class were lower in 1970 than they were in 1950, except for the \$4,000 class (see figure 1, page 9). The decline in rates increases at higher incomes. At \$30,000, the 1950 marginal rate was about 37 percent compared to the 1970 rate of 24.3 percent.

In recent years, new investment schemes have been developed to avoid taxes and shift investment costs to the Federal Government. These programs lower the effective tax rates because part of the tax base is exempted. If the Federal personal income tax is based on equimarginal sacrifice, we may conclude that Congress has decided money income has a more equal utility for each income class than in the past, because higher incomes are taxed at relatively lower rates. In addition, property income receives more favorable treatment than salaries and wages.

Income Distribution

In actual use, the BE multiplier would be applied to the benefits received by various classes of beneficiaries. If total welfare equivalent income attributed to the project was higher than total monetary benefits, the project would be considered to enhance general welfare because it transferred income from the average taxpayer to poorer taxpayers. The reverse would be true if total welfare equivalent income were less than total



Source: U.S. Treasury Department, Internal Revenue Service, Statistics of Income 1950 and 1970

monetary benefits. However, an analysis of Table 1 reveals that the summation of: 1) the marginal BE income multipliers times money income by class is 6 percent higher than total income, and 2) the average income multiplier times the money income by class is 18 percent higher than total income. These results are primarily because of the high BE multiplier for the "\$1,000 to \$2,000" income class. This difference would be higher yet if the "less than \$1,000" income class of 6 million people with its BE multiplier of over 1,000 was included.

If project benefits were distributed proportionally to the number of taxpayers rather than proportionally to incomes as above, the total welfare equivalent income would be nearly three times the dollars distributed. There are arguments for and against using either of the two distributions above to represent a neutral distribution of benefits with respect to welfare. Actually, there is no objective measure of the utility of an individual's marginal income. But if utilizing the method developed here any estimate of the welfare-equivalent income for a project should be divided by 1.06 or 1.18 for marginal and average rates, respectively, to correct for the income distribution bias.

A CASE STUDY

The fourth and final objective was to apply procedures developed to an actual watershed study area to explore methods of identifying income levels of beneficiaries in relation to flood control benefits. In applying the procedures, problems and methodology were tested. Also, limitations of the methods became more clear. These limitations and alternative methods are discussed when appropriate.

Description of Area

The Pine Creek Watershed Area, Contra Costa County, California, was selected to develop and test the methods for identifying commercial and industrial beneficiaries. The watershed work plan and economic appendix were used as a guide (1) (7) but since the work plan did not identify individual beneficiaries, no attempt was made to link work plan flood damage values with beneficiaries. Instead, two examples were developed to illustrate the procedures for identifying beneficiaries and estimating their income levels.

The Pine Creek Watershed Area begins above the heavily populated San Francisco Bay Area suburbs of Walnut Creek and Concord and includes parts of both communities. At the time of the study, the area's farmland was being rapidly converted to housing and business uses and a significant portion of the commercial and industrial properties were located in the flood plain. The wide variety and growth of businesses made the area suitable for this study.

Procedures

Figure 2 graphically illustrates the procedure to identify beneficiaries (Part A) and to estimate income levels (Part B).

Part A of the schematic diagram shows the sources and information needed to determine the amount of benefits for each kind of property and organization. Individual properties were located on a synthetic storm map that showed areas flooded at various depths of water. Probable locations of future developments in the flood plain were obtained from county and city planners. Parcel books of county assessors contained maps showing lot sizes, owners' names, addresses, and identification numbers.

With the lots sketched on the flood plain map and a listing of the real property owners obtained from the assessor's records, a field survey was made. In addition to the usual information obtained by SCS in their field inventory, the following was obtained: name of business, type of business, business organization (corporation, partnership, or proprietorship), and name of property owner by type of property. The added information was needed to link types of business and property to their owners.

A parcel of land listed under a single name may be associated with only one business or with several, such as office complexes or shopping centers. The landowner usually owns the structures, which are also listed on the real property tax rolls. In a majority of cases, the business is owned by other parties, who lease the real property.

The business owners were identified by the business name and address in the assessor's rolls where personal property values were listed. In States where personal property is not taxed, other evaluation methods would have to be employed. For example, Census of Business and sales tax reports could be

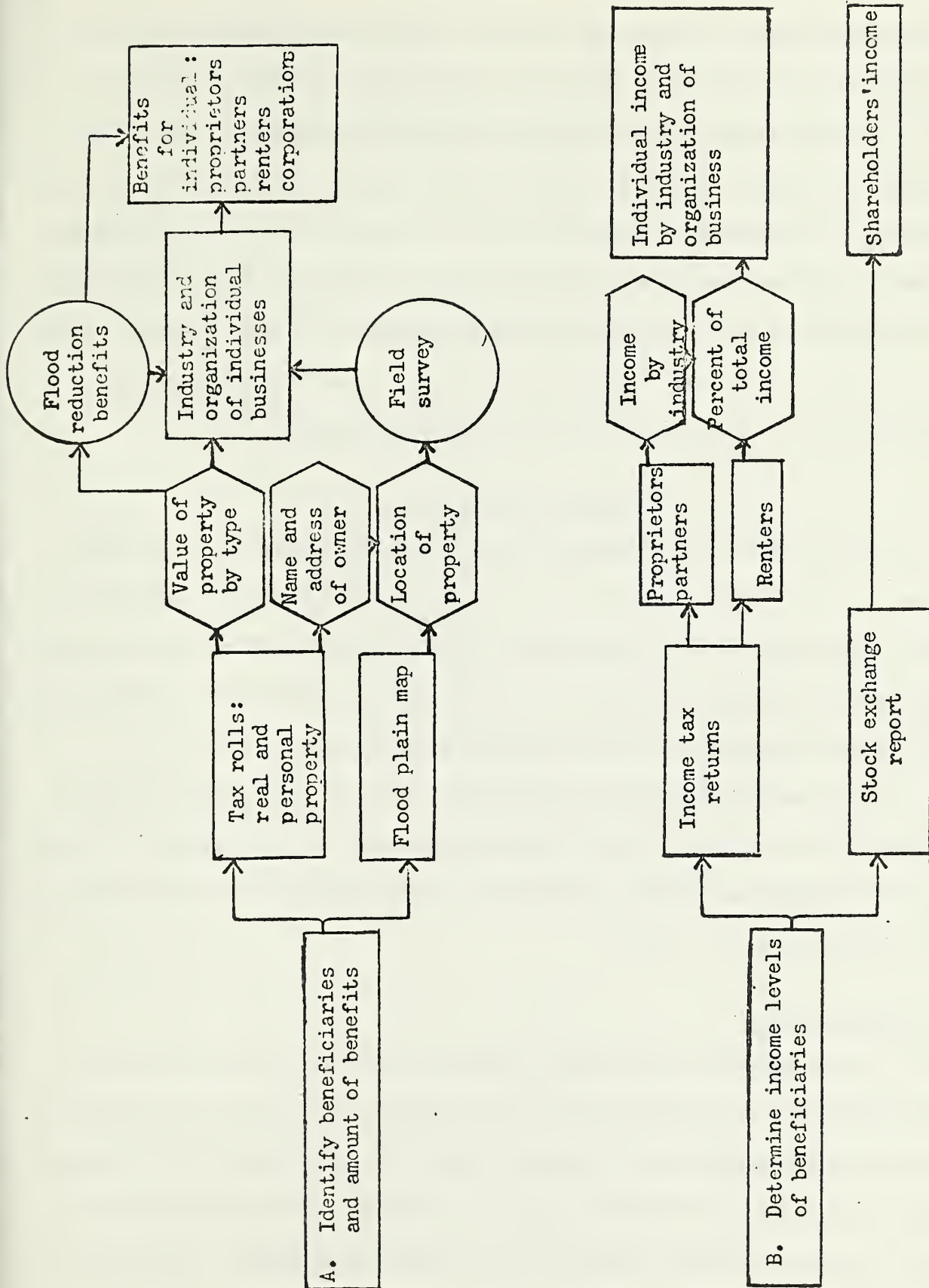


Figure 2--Diagram of procedures to identify beneficiaries of flood reduction project, by income levels of property owners.

used to estimate the value of inventory. The value of fixtures could be estimated as a percent of the value of structures by type of business.

Personal interviews at each establishment provided the name of the owner, and whether the business was a partnership, proprietorship, or corporation. The names of the real property owners had already been obtained from the assessor's rolls. In this study, the actual owners of all damageable property in the flood plain were determined, and their personal income levels were estimated. However, in practice, it may not be appropriate or necessary to detail each individual property ownership.

Types of Businesses

Nine categories of business activities were identified in the study area: 1) old light industrial; 2) newly constructed light industry; 3) auto oriented retail; 4) old service and entertainment; 5) new service and entertainment; 6) shopping centers; 7) office complexes, motels, and restaurants; 8) regional commerce; and 9) research and development.

Two examples illustrate the methods developed. The industrial area example shows how the value of future development was calculated. The complex ownership and variety of businesses that may be encountered is shown in the shopping center example.

Industrial Area

The research and development industrial area in the flood plain was half developed at the time of the study. The future value of flood protection was estimated from the property values per acre on the fully developed area. The projected future acreage of the industrial area times the value per acre gave the total damageable value after development. Buildings on

the four developed lots were valued at \$9.8 million by the county assessor and had a total area of 409,213 square feet, according to the county appraiser. Thus, the average damageable value was about \$25 per square foot. Buildings averaged about 5,600 square feet per acre, so the average value per acre was about \$134,000. The assessed personal property value averaged \$104,000 per acre. Estimates of direct flood damage were obtained by using table 4 in TSC Technical Note-Watershed PO-4 (8, p. 21).

Shopping Center

A shopping center was located in the flood plain. The tax rolls showed that an investment company (a corporation) owned the land, buildings, and other improvements. All flood protection benefits to real property would accrue to the stockholders.

The contents of the buildings were owned by the lessees, who were either corporations, partnerships, or proprietors. The 21 businesses included a bank, a large grocery store, a service station, and small specialty shops. Each business was identified by the occupied space, business organization, name of business, and kind of business. The value of contents (inventory and fixtures) was obtained from personal property tax rolls.

Other Benefits

Indirect benefits in the Work Plan were estimated as a flat percentage in lieu of calculating actual wages and volume of business lost. A more specific method would be needed if indirect benefits were distributed to individual beneficiaries. Calculating indirect benefits was beyond the scope of this study. However, the level of income for the group was estimated for the industrial area in a following section.

Income Levels of Beneficiaries

The average income for all taxpayers in an area was not specific enough to evaluate projects that affect only a minor portion of an area. On the other hand, a survey of individuals owning property in the flood plain is costly and the rate of response is likely to be low. In this study, regional and State income tax data were used to estimate the income of beneficiaries by type and organization of business.

Federal income tax statistics give returns by sources of income, distributed by income class for the Nation, and the sources of income, without income classes for the State (9) and (10). These data were used to estimate the total income of persons receiving business income. In using tax statistics, it was assumed that the flood protection benefits added directly to property income, and that the statistical reporting area represented the flood plain area.

Stockholders' Income

Flood protection benefits accruing to corporations are ultimately distributed to stockholders. Generally, the stockholders do not reside in the flood plain or watershed area. Partnerships, proprietorships, and professional businesses are primarily locally owned, with the consequent local benefits.

Corporation benefits accrue to shareholders in direct proportion to the shares owned. Data from a study by the New York Stock Exchange, "Shareownership -- 1970," provide the number of individual shareholders in the U.S. by value of portfolio and income class, as shown in table 2, and the total value of portfolios. For this study, the average value of shares owned by income class was estimated and then the average income per shareholder was estimated.

Table 2-- Number of individual shareholders and value of portfolios,
by household income class, United States, 1970

Household income	Value of portfolios					
	Under \$5,000	\$5,000 to \$9,999	\$10,000 to \$25,000	\$25,000 to \$50,000	Over \$50,000	Total
	<u>Shareholders (1,000)</u>					
Under \$10,000	4,907	1,709	1,375	608	211	8,810
\$10,000 to \$14,999	4,609	1,944	1,503	522	423	9,001
\$15,000 to \$24,999	2,390	1,977	2,101	902	902	8,272
\$25,000 and over	603	768	874	794	1,398	4,437
Total shareholders	12,509	6,398	5,853	2,826	2,934	30,520

Source: (3)

In 1970, individuals owned about two-thirds of the shares recorded; institutions and brokers owned the rest. It was not possible to obtain information on institutional income, so that value was not included in this study.

The average value for the "over \$50,000" portfolio was obtained as the difference between 1) the sum of the products of mid-point values of portfolios in table 2 and the respective number of shareholders in the class, and 2) the total value of shares, as shown below:

Portfolio value (mean)	\$ 2,500	\$7,500	\$17,500	\$37,500
Number in class (thousands)	12,509	6,398	5,853	2,826
Total value (billions)	\$31	\$48	\$102	\$106

The estimated total value of portfolios in the under \$50,000 class, subtracted from the total value of portfolios (\$1,065 billion minus \$287 billion), leaves \$778 billion in the "over \$50,000 class," or an average of \$265,200 per shareholder. Using this value, the percent of shares by income class was estimated, as shown in table 3.

Table 3-- Total value of stocks, by income class and benefit equivalents
United States, 1970

Income class	:	Total value	:	Share of total value	:	Benefit equivalent <u>1/</u>
	:	:	:	:	:	:
	:	<u>Billion</u>	:	<u>Percent</u>	:	:
Under \$10,000	:	\$128	:	12.0	:	.91
\$10,000 to \$14,999	:	184	:	17.3	:	.75
\$15,000 to \$24,999	:	330	:	31.0	:	.64
\$25,000 and over	:	<u>423</u>	:	<u>39.7</u>	:	.35
Total	:	\$1,065	:	100.0	:	.58

1/ From table 1, marginal tax rate BE multiplier.

The benefit equivalents (BE) in table 3 were weighted by the value of shares in each income class to obtain the average BE of .58 for all stockholders.

The low BE implies that welfare benefits are not as great as dollar benefits when project benefits accrue to corporations.

With a B/C ratio of 1.00, the welfare B/C is only .58. If institutions were included as stockowners, the weighted BE average would be even lower because institutions probably have much higher incomes than the average stockholder.

Real Property Owners' Income

A considerable amount of real property used in business is owned by investors, and there is an upward trend toward separation of property and business ownership.

The value of flood plain property was determined from assessors' records. After finding the landowners' names in the plat book, the alphabetical index indicated other real property which he owned in the county. However, an individual might have many other assets and other income besides real property. If the value of all of an individual's property were known, a rate of return such as the project discount rate, prime bank rate, U.S. bond rate, or rates for other common investment opportunities could be assumed for estimating his income. However, because this method would not account for other nonproperty income of property owners, it was not used in this study.

Tax data on rental incomes as well as for proprietor and partnership incomes are available, but there are several reasons that it cannot be used very well: 1) Proprietors and partners have a much greater stake in a given business than investors, because their labor as well as their capital is involved. 2) It is difficult to relate the value of an individual's property to his total income. 3) Tax data cover all rental income, including

housing as well as commercial and industrial property. U.S. tax data show that rental income is only a small portion of an individual's income. The average rental income for the 5 million U.S. returns with rental income was \$447. About 43 percent of these returns show losses from rental property (10, table 4).

The average income of individuals with rental income was calculated from U.S. tax data. The number of returns with rental income in each income class was multiplied by average per capita income for the class as shown in table 1. For 1970, returns showing rental income averaged \$14,769, or 50 percent above the average for all returns. The average and marginal BE multipliers are .85 and .75 respectively for this income class. Using the marginal BE multiplier (.75) welfare equivalent income would be 25 percent less than if the benefits went to individuals with average incomes even though average rental income was very small.

Proprietors' and Partners' Incomes

A majority of businesses are operated by proprietors who own their inventories, and may or may not own other business properties. In 1970, there were about half as many partnerships as proprietorships in California and an even smaller share of businesses operated by managers. Managed businesses are usually much larger than the average business, and are usually national in scope. They may dominate the business in a given area. Only a field survey of the flood plain will determine this relationship.

Incomes from proprietorships and partnerships are reported by the Internal Revenue Service in their series, Statistics of Income, including business profits, wages, salaries, and investment income. Many returns include income of spouses. The level of adjusted gross income was deemed

the appropriate income level of business beneficiaries for this study, rather than income from business only.

Table 4 shows net business profits by adjusted gross individual income levels for the United States. Average net profit for each income level was divided into average gross income to provide a ratio. This ratio, applied to business income, provides gross income based on the national relationships. For example, a proprietorship with \$3,600 income falls into the \$11,000 to \$13,000 gross income class and has a ratio of 3.129.

The income of an individual proprietor or partner is not available. However, we can estimate welfare change occasioned by a transfer of tax dollars to business owners by comparing the average gross taxable income of all business operators with the average for all returns. The average adjusted gross income of proprietors was \$11,960 (number in income class times average adjusted gross income for class, divided by total U.S. returns). Partners' income averaged \$21,687.

The welfare indicator, the BE multiplier, would be .75 for proprietors' benefits and .62 for partners' benefits, based on U.S. averages. Data for regional comparisons were not available.

Because of the wide variation in profits and income for business firms, these averages may not represent a particular area. Other data on income, by type of firm for a local area, would be preferred. However, only national tax data provides total income (including business and rents) by income class. Regional income by type and organization of business is available and was used to estimate income from partnerships and proprietorships. Total income per return was estimated from the U.S. relationship.

Table 4--Net profit to partners and proprietors, and relationship to average gross income by income class, United States, 1970 ^{1/}

Adjusted gross income	Proprietorships				Partnerships			
	Returns :		Net profit (loss) :		Returns :		Net profit (loss) :	
	Number	Total \$1,000	Average Dollars	Ratio ^{2/}	Number	Total \$1,000	Average Dollars	Ratio ^{2/}
UNDER 2,000	702,838	(687,197)	(978)	0	120,6C1	(844,987)	(700)	--
2,000 under	340,100	396,471	1,164	2.137	59,313	37,066	625	3.981
3,000 "	345,919	614,137	1,775	1.976	75,267	101,165	1,344	2.610
4,000 "	386,913	840,697	2,173	2.074	74,620	122,050	1,636	2.754
5,000 under	370,806	902,897	2,435	2.257	84,507	87,176	1,032	5.364
6,000 "	359,603	1,005,936	2,797	2.321	75,710	141,995	1,876	3.461
7,000 "	370,788	1,069,392	2,884	2.599	89,061	235,282	2,642	2.837
8,000 "	345,400	1,061,341	3,073	2.763	93,361	286,380	3,067	2.768
9,000 "	326,124	1,024,421	3,141	3.024	75,753	236,497	3,122	3.942
10,000 under	303,781	1,060,397	3,491	3.004	83,266	235,298	2,826	3.712
11,000 "	287,437	1,055,131	3,671	3.129	77,890	217,439	2,792	4.114
12,000 "	249,382	1,003,972	4,026	3.102	65,823	252,633	3,838	3.254
13,000 "	207,416	877,761	4,232	3.187	65,748	259,834	3,952	3.413
14,000 "	179,352	885,199	4,936	2.935	66,156	265,289	4,010	3.612
15,000 under	565,403	3,598,283	6,364	2.681	236,552	1,023,521	4,327	3.944
20,000 "	278,489	2,837,257	10,188	2.170	159,083	940,838	5,914	3.738
25,000 "	157,508	2,229,548	14,155	1.918	104,364	785,465	7,526	3.608
30,000 "	252,725	5,571,256	22,045	1.686	218,760	2,533,204	11,580	3.210
50,000 "	108,786	4,192,503	38,539	1.708	141,152	2,820,949	19,985	3.294
100,000 and over	21,215	1,014,799	47,834	3.867	38,019	1,162,865	30,586	6.048

^{1/} Source: (10).

^{2/} Ratio equals average adjusted gross income divided by net profit.

Table 5 shows net profits by type of businesses in California (9). Proprietorship returns are available by SMSA; these data might be more representative of the study area than the State averages. However, only State data were available for partnerships.

Business income was relatively low, averaging \$4,093 profit per proprietor and \$2,205 per partner (table 5). Two partnership categories -- real estate and finance -- account for the low average for that group. They made up 57 percent of all partnerships in California, and averaged only \$756 and \$530 annually per partner, respectively in 1969.

To estimate the income level of a proprietor or partner, the average income by type of business (table 5) is multiplied by the total income ratio in table 4. For example, the average manufacturing proprietor netted \$4,156. The ratio of total income to proprietor income was about 3.15, giving a total income of about \$13,000.

Area Income

If benefits were widely distributed or relatively minor in a business area, average area income might adequately indicate welfare impacts. Welfare impacts to a geographical region rather than to individuals can be estimated by comparing average incomes in the project area with average national incomes. Average income data cannot indicate whether high or low income groups are benefited within an area. However, they do measure the transfer of funds from all taxpayers who on the average have a benefit equivalent of one to an area where the average benefit equivalent is greater or lesser than one.

National tax data show that the California average income was 7.2 percent higher than the U.S. average in 1969; Contra Costa County (the study

Table 5 -- Number of businesses and net profits of proprietorships and partnerships, by industry, California, 1969 ^{1/}

Industry	Partnerships			Proprietorships		
	Partners :		Net Profit : Total : Average	Businesses :		Net Profit : Total : Average
	Number	--Thousand dollars--		Number	--Thousand dollars--	
All industries	490,873	1,082,325	2,205	868,524	3,555,233	4,093
Contract construction	12,856	107,575	8,368	62,402	304,005	4,872
Manufacturing	12,612	70,770	5,611	27,984	116,295	4,156
Transportation	4,397	20,468	4,655	22,511	85,101	3,780
Wholesale trade	10,712	81,536	7,612	38,696	204,478	5,284
General merchandise stores	2,252	6,157	2,734	37,728	8,257	219
Food stores	6,286	31,328	4,984	14,744	75,341	5,110
Automotive dealers and service stations	7,524	30,402	4,041	26,165	148,707	5,683
Real estate	184,594	139,626	756	60,424	203,820	3,373
Apparel, furniture, and equipment	5,866	33,818	5,765	20,935	95,136	4,544
Eating and drinking places	11,903	37,980	3,191	35,450	126,069	3,556
Other retail trade	12,233	59,356	4,852	31,923	123,092	3,856
Finance and insurance	95,334	50,561	530	25,649	159,955	6,236
Hotels and other lodgings	6,917	7,357	1,064	10,758	5,664	527
Personal services	7,326	24,175	3,300	58,790	148,791	2,531
Business services	14,367	16,258	1,132	55,367	173,090	3,126
Automobile parking, repair, and services	8,135	24,709	3,037	19,781	61,806	3,125
Medical and health services	12,891	293,223	22,746	50,887	1,094,790	21,514
Legal services	8,179	251,209	30,714	11,334	149,757	13,213
Other services	9,631	76,511	7,944	66,507	194,432	2,923

^{1/} Source: (9)

area) had an average income 11.8 percent above the California average, or 19.8 percent greater than the national average (10). The average county income fell into the \$10,000-\$11,000 class, with an average benefit equivalent rate of .93. Consequently, a transfer of national funds into the county would lower the national welfare equivalent income. The welfare benefits were less than the monetary values based on average area income. If the area benefits were not distributed proportionally to income, benefits calculated on an area basis would not apply.

Application of BE Multipliers

The first step in estimating welfare equivalent income was the identification of beneficiaries by type and organization of business. Property protection benefits in dollars were calculated for all real and personal property. The next step concerned estimating the income levels of each beneficiary. Finally, the appropriate BE (benefit equivalent) multiplier would be applied to the benefits based on the income level of the beneficiary.

Shopping Center Example

The land and buildings of the shopping center were owned by an investment corporation. Damage reduction benefits for buildings, lots, and landscaping would accrue to stockholders whose BE multiplier was .58 (table 3). Damage to building contents would be borne by corporate business, such as Safeway and Bank of America; and at the other extreme, small businesses owned and operated by proprietors. The BE multiplier for corporations for content damage would be .58; the other business would have multipliers based on average income, by type of business.

Two businesses of the 21 in the shopping center were insurance companies. Table 5 shows the average income was \$6,236 for proprietors of insurance and finance companies. Table 4 indicates these proprietors would be in the over \$15,000 income class, and Table 1 shows the BE multiplier (marginal rate) to be between .72 and .67. In this manner, flood damage benefits would be converted to "welfare equivalent" income to obtain a measure of welfare change from the flood reduction project.

Industrial Area Example

The other case study example was composed entirely of corporations. All property protection benefits would go to stockholders, whose BE multiplier would be .58. Nonproperty or indirect benefits would go to a wide variety of employees such as managers, foremen, office workers, and laborers. In this instance, the average area income of \$10,000 to \$11,000 might be used. The BE multiplier would be .93.

EVALUATION OF PROCEDURES

Identification of Beneficiaries and Their Income Levels

The first part of the evaluation, identifying beneficiaries and the amount of their benefits, was adapted to current SCS procedures. Little extra time or expense would be required to include this in project planning.

Although the names of property owners by kind of property owned was easy to obtain, individuals' incomes could not be obtained without actually interviewing each beneficiary. Many property owners as well as business men have other properties outside the study area. They may also have other sources of income, and they may not be willing to give this information.

Another reason for not detailing incomes of current owners is that properties change hands over the life of a project. This is especially true where properties are being converted to higher uses.

Using average taxable income by type and organization of business reduces the above problem. The critical assumption is that the averages used represent the flood plain. For small numbers of firms, the chance of error would, of course, be very great. However, flood reduction benefits are related to type of business and number of firms in the flood plain. Listing the business would indicate the distribution of project benefits.

Other positive contributions to evaluating income levels are classifying beneficiaries as stockholders, partners, proprietors, and renters. These groups have significantly different income levels. Taken together, these average figures for kind of business and distribution of ownership will serve to indicate income levels of project beneficiaries.

Welfare Equivalent Income

Since flood protection of rural lands is a major purpose of the Small Watershed Program, one could expect welfare equivalent income from the program to be greater than one. However, the incomes of landowners as a class, who are major beneficiaries of the program, are significantly greater than the average income in many rural areas.

While the Small Watershed Program is not a welfare program, it may have some significant effects on welfare. Care must be exercised in interpreting the results of computing welfare equivalent incomes on the basis of the limitations of the BE multiplier indicated previously. Additionally, estimates of beneficiaries' incomes may be very rough, especially for property owners who are the recipients of the major share of benefits. Applying highly precise multipliers from rough estimates of income levels gives unwarranted precision to welfare measurement.

ANNOTATED REFERENCES

1. Contra Costa County Flood Control and Water Conservation District, and Soil Conservation District, Pine Creek Watershed Work Plan. Contra Costa County, California 1969

This plan was selected as a case study because the flood plain included a wide variety of commercial and industrial properties.

2. Jansma, J.D., and N.B. Gingrich, A Methodology for Estimating the Income Distribution Impacts of PL 566 Projects, mimeographed report for the SCS, USDA Washington, D.C. June 1972.

Federal income tax rates were used to measure "benefit equivalents" of flood damage reduction values for farmers.

3. New York Stock Exchange. "Shareownership - 1970," New York, N.Y.

A census of shareowners of U.S. Common stock showed numbers by income levels but did not give number of shares or value by shareowner.

4. Stanford Research Institute. A Study of Procedures in Estimating Flood Damage to Residential, Commercial, and Industrial Properties in California. SRI project Nos. I-2541 and I 2880 prepared for SCS, Menlo Park, California, January 1960.

This study establishes a statistical relationship between factors causing flood damages and value of properties in several areas of California. These average damage values were applied to property values in the Pine Creek case study area.

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6. U.S. Department of Agriculture, Soil Conservation Service. "Economics Guide for Watershed Protection and Flood Prevention" Washington, D.C., March 1964.

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