

*The
Reclamation
Program*

1948-54

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UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

DIVISION OF INFORMATION
BUREAU OF RECLAMATION
Region I - Boise, Idaho

The Reclamation Program

1948-54

UNITED STATES DEPARTMENT OF THE INTERIOR

J. A. KRUG, *Secretary*

BUREAU OF RECLAMATION

MICHAEL W. STRAUS, *Commissioner*



DECEMBER 1947

THE 1948-54 PROGRAM is subject in all its aspects to congressional approval. Also, it is based on information and economic conditions on June 30, 1947. Additional information obtained as a result of investigations still going forward on potential but unauthorized projects, or a change in the general economic situation, will make revisions necessary.

Water supplies in the West are limited, and insufficient to satisfy all local or State needs. Since the States needing water for developing their natural resources have not yet agreed on how it should be divided among them, future State actions will affect the program. A number of estimates have been included that have required arbitrary decision in order to make a complete report and present a picture of the land and water situation in the 17 arid and semiarid States west of the Mississippi River; these estimates are unquestionably subject to adjustment.

Localities vitally interested in multipurpose water development and its many benefits are cautioned not to let their desires lead them to assume, or to expect that this program, in whole or in any of its parts, will be executed as presented.

PREFACE

COMMITTEE ON PUBLIC LANDS
HOUSE OF REPRESENTATIVES
OFFICE OF THE CHAIRMAN
Washington, D. C., June 19, 1948

Mr. MICHAEL W. STRAUS,
*Commissioner, Bureau of Reclamation,
Department of the Interior,
Washington 25, D. C.*

DEAR MR. STRAUS: At the beginning of the Eightieth Congress the Public Lands Committee found it extremely useful at a special hearing to receive a review of the Reclamation program and to discuss emergent problems and future plans.

It is my thought that when the new Congress convenes the Public Lands Committee again should review the Reclamation program and have presented to it the basic 7-year program that the Bureau and the Department of the Interior have under consideration for western water resource and land development.

With this thought in mind, it would be most helpful if material which I am informed that the Bureau of Reclamation has assembled on water and land resources of the 17 Western States could be prepared in advance of the convening of the Eighty-first Congress for presentation to the members of the committee. I refer particularly to material relating to the immediate and potential irrigation and power developments of the West, such as would be needed in order to lay a firm foundation for a long-range plan of Reclamation construction.

This information would be of special value if it could be consolidated and summarized and presented in a document.

I am aware, of course, that investigations in the field by Reclamation bring to light additional facts and possibilities that require periodic revision of these data but I believe that such re-

visions do not reduce the current value of the programs as they are being considered at any particular time.

Will you please advise me whether it will be possible to present such data in appropriate printed form for the use of the committee and others before the Congress reconvenes. It will be most helpful if you can have this material available.

Sincerely,

RICHARD J. WELCH,
Chairman.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
Washington 25, D. C., July 7, 1948

Mr. RICHARD J. WELCH,
*Chairman, Committee on Public Lands,
House of Representatives,
Washington, D. C.*

MY DEAR MR. WELCH: The Bureau of Reclamation is glad to present a multiyear program for developing land and water resources in the West, in consolidated and summarized document form as requested by your letter of June 19, 1948.

The program is being assembled from material in the field as of June 30, 1947, and covers a period of seven fiscal years, extending from July 1, 1947, to June 30, 1954.

It includes approximately 250 projects or units of projects. About 65 would have irrigation facilities only. The remainder would be multi-purpose projects embracing other benefits or water use such as flood control, hydroelectric power, and municipal water supply.

The projects and units considered for the program will be inventoried in the printed document; it will comprise both authorized projects

and potential but unauthorized projects, with the understanding, of course, that the unauthorized potential projects must receive further investigation before final recommendation to Congress. The inventory will therefore comprise more projects and units than proposed for construction, to allow for defections upon full investigation.

The program itself has been placed on an annual basis, and the printed document will schedule an orderly, progressive, year-by-year advance in the development of our land and water resources on a scale that will lead to substantial accomplishment by 1954. A comparable annual total of the appropriations required, and of the gross crop values to be anticipated, will also be included.

In order to be of maximum assistance to the committee and other Members of Congress, the document will present this material in concise, graphic form together with brief introductory information on the general aspects of western water conservation and broad, over-all data affecting the proposed development program.

The comment in your letter of June 19, that you are aware of the fact that our investigations in the field continually bring to light additional facts and possibilities which require periodic revision of such data is appreciated. The Bureau would be reluctant to publish this program only to find itself strait-jacketed later by obsolete data. Also, it believes that a more detailed presentation of a more current program should be made to the Congress as soon as time permits, and that such a multiyear construction program should be presented to the Congress periodically with the most up-to-date information available.

The material in this document should prove valuable to bureau and departmental administrative personnel as well as Reclamation water users and other persons concerned with or interested in Reclamation activities, in addition to being useful to your committee and other Members of Congress. It is planned to issue enough copies to meet this demand.

Sincerely yours,

MICHAEL W. STRAUS,
Commissioner.

LETTER OF TRANSMITTAL

AUGUST 5, 1948.

MY DEAR MR. SECRETARY: I am pleased to submit the following report entitled "Reclamation Program, 1948-54."

The report is to be issued as a printed document, in response to a request from the Chairman of the Public Lands Committee, House of Representatives. It is a consolidation of regional data on our undeveloped land and water resources assembled in the field by Reclamation engineers, economists and other specialists, and a multiyear program for the development of those resources.

To aid in appraising the desirability of such a plan of development much of the data amassed in the field has been compressed into a series of charts and tables. They show how our undeveloped land and water resources can be transformed into permanent economic national assets, with a perennial and increasingly larger contribution to our national strength.

Substantial appropriations would be required for the program, as follows:

Fiscal year:

1948	\$204,200,000
1949	312,700,000
1950	535,400,000
1951	622,000,000
1952	715,500,000
1953	781,900,000
1954	720,200,000

But the benefits would be substantial, too, and permanent. A huge increase in crop and livestock production would result as well as an enlargement of electric power facilities now critically needed in the West. There would be other benefits also, such as flood control, municipal water supplies and recreational facilities which result from Reclamation multipurpose construction work. One benefit that in itself indicates the impressiveness of the probable returns is the crop production.

Estimated on a conservative 1939-44 price base the gross value of all crops grown by farmers supplied with irrigation water by Reclamation works could be increased nearly \$406,000,000 annually. (This figure would be substantially larger after 1954 as crop returns from Reclamation construction are usually not completely realized until after full development or about 10 years.) Not all this increase would be due to programed construction, as over half the land receiving water has an appreciable income from dry farming and partial irrigation.

On the same price base the cumulative 1948-54 gross value of crops grown on all Reclamation projects including those already in operation as well as those brought into production during the program could reach an estimated total of more than \$3,000,000,000.

In citing these estimates I have used the word "could" rather than "should" or "would." That our undeveloped and wasting resources in the West should be developed as quickly as practicable is common agreement, but in principle only—interpretations of the practicable rate and extent of development differ. Nor was "would" used; the scope of the Reclamation program is determined yearly by Congress which appropriates the necessary funds for each fiscal year for the next year's work, and which, on occasion, modifies Reclamation laws and practices, and thereby, the criteria governing operations. Consequently, the Bureau cannot lay out, with any assurance of its completion, a definite construction schedule with its ensuing benefits for a long-range program. Because of this the program is admittedly hypothetical.

Furthermore, before funds are appropriated for building a project it must be officially authorized for construction by Congress. A number of unauthorized projects are included in the attached program; on more detailed investigation

it may develop that one or more are financially infeasible in view of construction costs and the reimbursable nature of Reclamation irrigation construction.

Other parts of the report also are subject to revision as more up-to-date information is received in the field; and the program as a whole is predicated on present economic and international conditions. Nevertheless, the work of Reclamation's many employees in assembling and consolidating the data is a valuable contribution. Long-range programming is essential to orderly, economical construction. This material provides the ground work for any and all long-range programming of Reclamation construction activities, on a genuinely comprehensive basis.

Reclamation construction activities, evolving through the years from a project-limited scope of operations to a basin-wide conception, must be predicated in the future on interregional, Nation-wide considerations if we are to attain the widest and therefore the wisest use and conservation of our land and water resources.

Finally, the information assembled in this report can provide the framework for whatever long-range course of action is recommended by Congress in developing our natural resources and strengthening our national economy, with benefit to all.

Michael W. Straus

Commissioner.

Fiscal year		Total	
1946	25,000,000	1946	25,000,000
1947	25,000,000	1947	25,000,000
1948	25,000,000	1948	25,000,000
1949	25,000,000	1949	25,000,000
1950	25,000,000	1950	25,000,000
1951	25,000,000	1951	25,000,000
1952	25,000,000	1952	25,000,000
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1972	25,000,000	1972	25,000,000
1973	25,000,000	1973	25,000,000
1974	25,000,000	1974	25,000,000
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2004	25,000,000	2004	25,000,000
2005	25,000,000	2005	25,000,000
2006	25,000,000	2006	25,000,000
2007	25,000,000	2007	25,000,000
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2010	25,000,000	2010	25,000,000
2011	25,000,000	2011	25,000,000
2012	25,000,000	2012	25,000,000
2013	25,000,000	2013	25,000,000
2014	25,000,000	2014	25,000,000
2015	25,000,000	2015	25,000,000
2016	25,000,000	2016	25,000,000
2017	25,000,000	2017	25,000,000
2018	25,000,000	2018	25,000,000
2019	25,000,000	2019	25,000,000
2020	25,000,000	2020	25,000,000
2021	25,000,000	2021	25,000,000
2022	25,000,000	2022	25,000,000
2023	25,000,000	2023	25,000,000
2024	25,000,000	2024	25,000,000
2025	25,000,000	2025	25,000,000
2026	25,000,000	2026	25,000,000
2027	25,000,000	2027	25,000,000
2028	25,000,000	2028	25,000,000
2029	25,000,000	2029	25,000,000
2030	25,000,000	2030	25,000,000

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SUMMARY AND ANALYSIS OF REGIONAL STUDIES

The continental United States has a land area of about 1,900,000,000 acres. More than half the area—1,160,000,000 acres—is in 17¹ of the 22 States west of the Mississippi River. These 17 States comprise what is called the West, extending from the tier of States on the 100th meridian to the Pacific Ocean, and from Mexico to Canada, each an air line distance of nearly 2,000 miles.

The West has an infinitely varied terrain—plains, plateaus, rolling hills, mountains, gorges and desert—but one predominant characteristic of climate: Dryness. There is a scarcity of rain and snow throughout most of the area. Except for an isolated section in the northwest corner along the Pacific coast there is generally not enough precipitation for growing crops and, in many sections, because the scant water supply has not been stored and made available for use, hardly enough for the maintenance of civilized life.

Consequently, this vast area has today only a fifth of the country's population, a fourth of its farms and a still smaller proportion of its industry. Despite tremendous natural wealth in land, minerals and forest, the West remains largely undeveloped.

The wealth of minerals in the West is an example of its immense untapped resources. Aside from great reserves of industrial fuels such as coal, petroleum, and natural gas and the promise of substantial metallurgical coke production, the West has the largest known magnesite deposits in the world, the country's only commercially valuable manganese, almost all the high-grade phosphate reserves in the United

States, a world monopoly of helium, and large deposits of gold, silver, copper, lead, zinc, and a multitude of other metallic and nonmetallic minerals. Especially important in view of world interest in atomic energy is its uranium, radium, and other radioactive deposits.

But the greatest treasure in the West is not minerals but water. Water is the prerequisite of all civilized development. Minerals in themselves rarely build the towns and cities that offer myriad opportunities for livelihood, create business and industry, and add their vital force to the strength of the Nation. Towns and cities in the final analysis must have an agricultural hinterland in order to exist—a hinterland of farms that produce the essentials of life such as food, shelter, and clothing, which can issue only from a union of land and water.

Making full use of the limited water resources in the West is the first step in its full economic development.

The scarcity of water in the West, and the need for developing and conserving all possible, is the basic fact underlying all the regional data. In transmitting field information for the 1948-54 program one of the Bureau's regional directors summed up the situation as follows:

Since the water supply in region 4 is not sufficient to serve all the irrigable land, the quantity of water available will be the primary factor in determining the extent of irrigation and other development. Because water supplies are so limited and so critically needed, nothing short of full practical development of all water resources in due course of time can be anticipated.

Regional surveys show that the 17 Western States have about 400,000,000 acre-feet of stream run-off annually, but only about a fifth of the run-off—74,600,000 acre-feet—has been devel-

¹ Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming.

oped and put to use. Under Reclamation repayment requirements for irrigable land, and with our present technical knowledge and facilities, only a third of the run-off—135,100,000 acre-feet—is now considered susceptible of development. The remainder is not in the right places, creating an unpleasant paradox of simultaneous surpluses and critical shortages in western water supplies.

The map of water resources on page 12 illustrates the unbalanced nature of stream run-off in the Western States, which further aggravates the distressing general shortage of water.

Only 3 out of every 100 acres of land in the West—37,960,000 out of a total of 1,168,000,000 acres—can be irrigated to produce farm crops, with the water supply what it is.

Already under irrigation are 21,120,000 acres, leaving only 16,840,000 acres possible of development.

Regional studies also show that 8,920,000 acres or over 40 percent of the acreage already under irrigation still lacks a full season's supply of water to grow crops.

Developing the water resources of the West to their fullest extent so that the West can come into its full economic stature, contributing all its natural wealth to the Nation, is an American-size problem.

In overcoming the localized lack of balance in the water supply, which is an especially troublesome aspect of the problem, some small beginnings have already been made. Water has been moved from places of less need to greater. But State interests and other factors enter the picture and complicate it. Nevertheless, water will have to be exported and imported from State to State and region to region, to make fullest use of the scant supply, as indicated by the following comment received from one of the regions:

Since little study has been given to the possibilities of importing water into the region, the peculiar problems involved are not clearly defined. Of fundamental importance, however, would be the protection of present water rights and uses in the exporting basin as well as the assurance of future expansion of use within that basin. Just as the magnitude of projects now being planned and constructed was beyond the dreams of planners a few generations ago, it is possible that the future will demand projects on a scale not now seriously considered. It is

not unreasonable to think that some day the fertile but arid lands in parts of region 4 will be irrigated with water brought great distances from areas where surplus water exists.

The Bureau of Reclamation's 1948-54 program for the conservation and development of western water resources would irrigate 2,036,000 acres of arid land within 7 years, creating about 24,000 new farms. It also proposes to provide a sorely needed additional supply of water to 3,607,000 acres of land consisting of nearly 66,000 farms now irrigated but short of water.

This would increase the acreage receiving a full supply of irrigation water from Reclamation works from 2,448,000 to 4,484,000 acres, and the acreage supplied with supplemental water from 2,555,000 acres to 6,165,000 acres.

By years the proposed new and supplemental acreage development would be:

YEAR	ACREAGE	
	New	Supplemental
1948.....	142,000	48,000
1949.....	183,000	12,000
1950.....	137,000	144,000
1951.....	106,000	499,000
1952.....	343,000	889,000
1953.....	489,000	1,067,000
1954.....	636,000	948,000
Total.....	2,040,000	3,610,000

By regions the new and supplemental acreage proposed for development under the program is as follows:

Region 1.....	805,000	717,000
Region 2.....	355,000	1,300,000
Region 3.....	97,000	39,000
Region 4.....	40,000	148,000
Region 5.....	267,000	1,036,000
Region 6.....	301,000	57,000
Region 7.....	171,000	310,000

Based on 1939-44 prices the estimated gross value of crop production on Reclamation projects during the 7 years of the program would total \$3,364,000,000. The incremental increase over the 1947 value during the period would total \$1,113,500,000.

This development requires a sizable investment, totaling \$3,891,900,000 for the 7 years (an average of over \$500,000,000 a year), and ranging from \$204,200,000 the first year to as much as

\$781,900,000 for 1953. The question might arise: Why so much money, and so quick a development?

Even if the world situation and need for national strength is ignored, this rate of development might be considered disturbingly slow. In region 4, for example, it was estimated that at the 1948-54 rate 133 years would elapse before the water supply would be fully utilized; but the belief was expressed that the demand for food and other economic benefits, together with constantly improving construction methods, would expedite development so that full utilization of the water could be realized in less than 100 years.

Not all regions expected to require a whole century for full development. Region 1 estimated the time required for final development at from 35 to 40 years. A rough over-all average for all the regions would be about half a century.

The regional studies indicated that water is available for the ultimate irrigation of 14,800,000 more acres of new land in addition to the 2,040,000 acres proposed under the 1948-54 program. This ultimate new-land figure does not include range land susceptible of irrigation for pasture, on which insufficient information is available.

Including new acreage proposed for development under the 1948-54 program, the following are the potential ultimate new acreage developments, by region:

Region 1.....	3,950,000
Region 2.....	4,000,000
Region 3.....	220,000
Region 4.....	1,460,000
Region 5.....	1,410,000
Region 6.....	3,450,000
Region 7.....	2,350,000

Multipurpose irrigation construction brings other benefits such as flood control, municipal water supplies, fish and wildlife conservation, the creation of new recreational areas, and the generation of hydroelectric power. Power generation merits separate discussion, in that it pays the major part of the construction cost of Reclamation projects.

Linked with the development of the land in the West is the development of water power. This inexhaustible source of electrical energy constitutes one of the most vital water resources in the Western States. Not all the reclaimed lands lie

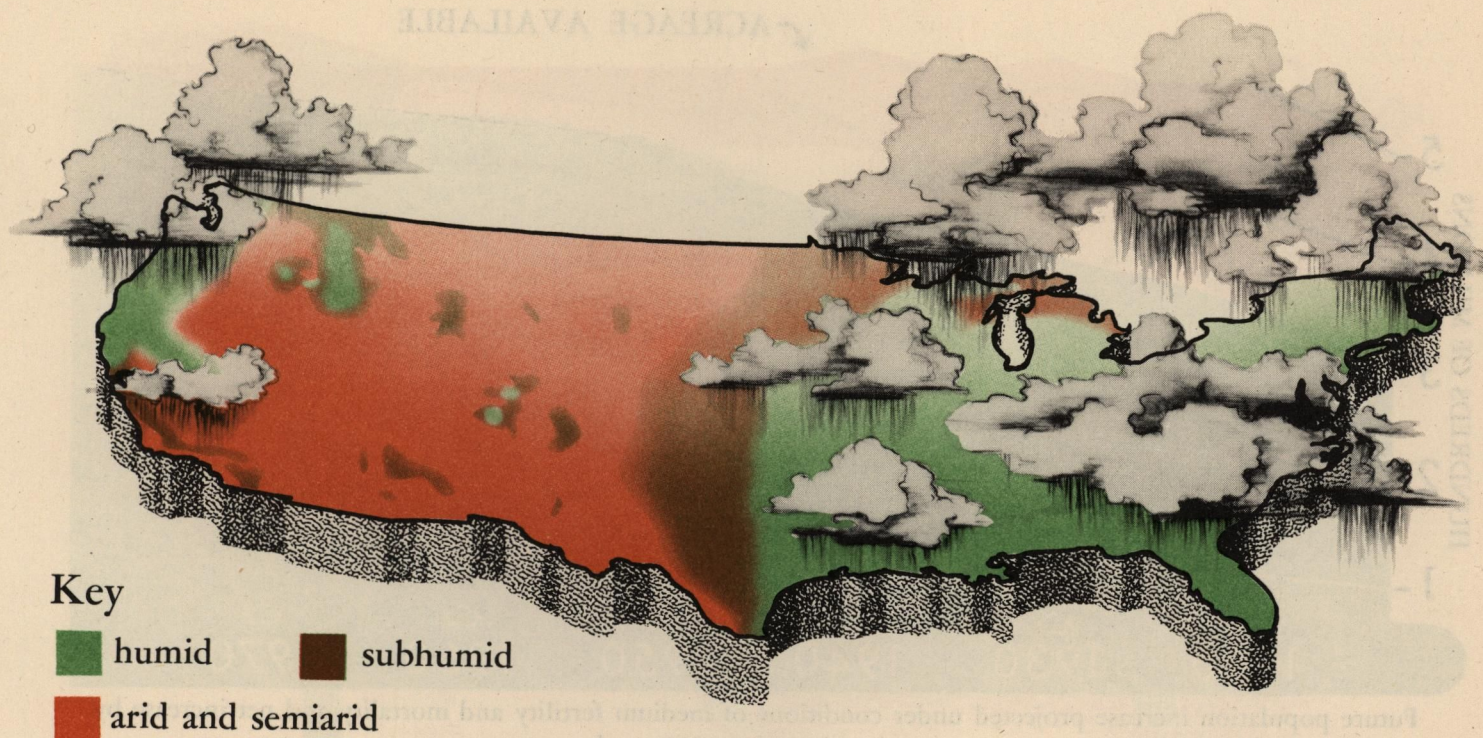
below reservoirs. In many cases water must be lifted to lands at higher elevations. The answer is pumping, and pumping is usually done by means of electrical energy developed at the same reservoir. But this is not the sole reason for the development of power at these reservoirs. Over and above these power requirements directly connected with irrigation, there usually remains a surplus of power developed at these reservoirs available for the development of the vast mineral resources of the West along with its industries. Low-cost electrical energy to run the farm machinery and furnish the future farm home with the ordinary conveniences of modern living is indispensable. Nor is this the whole story, for these water-power plants can be used instead of fuel-burning plants that consume nonreplaceable natural resources of coal and oil. For example, the power plants on Bureau of Reclamation projects today produce electrical energy that would consume at least 25,000,000 barrels of oil each year if modern fuel-burning plants were required to supply this same energy.

By 1954 estimated demands for electrical energy from Bureau power systems will have reached a point where to supply this energy from fuel-burning plants would tap oil reserves to the extent of 60,000,000 to 70,000,000 barrels of oil annually. This quantity of fuel can be conserved largely by harnessing water resources. To achieve the optimum development in the production of electrical energy from our water resources, construction of power-plant facilities at reservoirs must be accompanied by the construction of transmission lines for interconnecting and coordinating the output of the various isolated plants into a smooth working system capable of utilizing every kilowatt-hour of energy from each plant, otherwise large quantities of useful energy will be wasted. Furthermore, if the power is to be used for the benefit of the people of the West, it must be moved over transmission lines to areas where it is needed. Transmission lines must be constructed to the pumping stations and to areas of agricultural, mineral, and industrial developments for further distribution by others. Revenues derived from the sale of electrical energy from power systems developed in this manner repay the investment in power with

interest within a specified number of years and provide annual funds for operation, maintenance, and replacements. In addition, these power revenues repay a large portion of the irrigation investment and this not only aids the farmer in repaying the Government's investment in irrigation facilities, but also makes feasible the

whole program of multipurpose development. It is estimated that in the future, a minimum of 75 percent of the revenues required to repay the reimbursable investment in large multipurpose projects must come from power revenues if such projects are to be feasible from a financial standpoint.

DISTRIBUTION OF RAINFALL



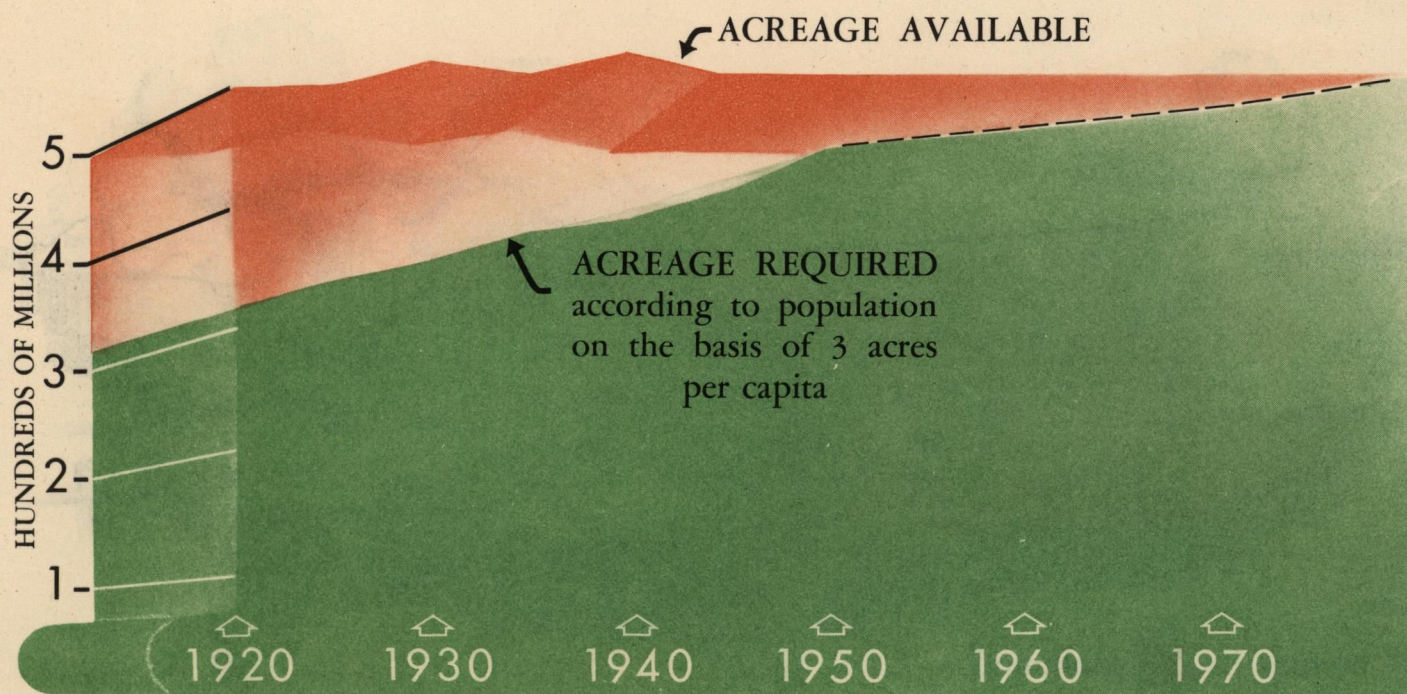
THIS SIMPLIFIED ILLUSTRATION shows the need for irrigation in the West to supplement or substitute for natural rainfall. The East has plenty of rain for farming and for its city reservoirs and the countryside remains green all summer, but in the West except for a few areas the earth is brown-dry. Every drop of precipitation is precious, to be caught and stored for growing crops and other vital human needs. Water is the West's lifeblood and the annual precipitation is its blood count.

The climatic cleavage between the East and arid West is so fundamental that even the most mobile life—the birds—respect it. The Audubon Bird Guide states: "The line dividing eastern from western North America is taken as the eastern edge of the semiarid Great Plains, where the tall-grass prairie country meets the drier,

short-grass plains. In the United States it corresponds approximately with the 100th meridian running north through central Texas, western Oklahoma and Kansas, central Nebraska, and the Dakotas . . . The line roughly marks the westward range limit of many of the most typical birds of the humid East . . ."

An understanding of this climatic difference is required for an appreciation of what conservation and development of its water resources means to most of the West. Without this conservation the West will not prosper and grow in strength, and neither will the East—both halves are interdependent. One half cannot suffer economic atrophy without weakening the other. Also, conversely one cannot grow and develop without materially benefiting the other and the entire country.

UNITED STATES POPULATION and FOOD SUPPLY



Future population increase projected under conditions of medium fertility and mortality and net increase by immigration of 100,000 yearly.

FOR EVERY TWO MOUTHS to feed and bodies to clothe a quarter of a century ago there are three today. Meanwhile the land available in the United States for growing crops has remained at the same level, about half a billion acres.

This does not imply that Americans will go hungry next year or even 10 or 20 years from now. United States farm output has been stepped up by the use of machinery, fertilizer, and other aids. That is why the pinch is not felt today. But it is no guarantee against food shortages to come, as they inevitably will if the population continues to grow more than a million a year and production fails to keep pace with need.

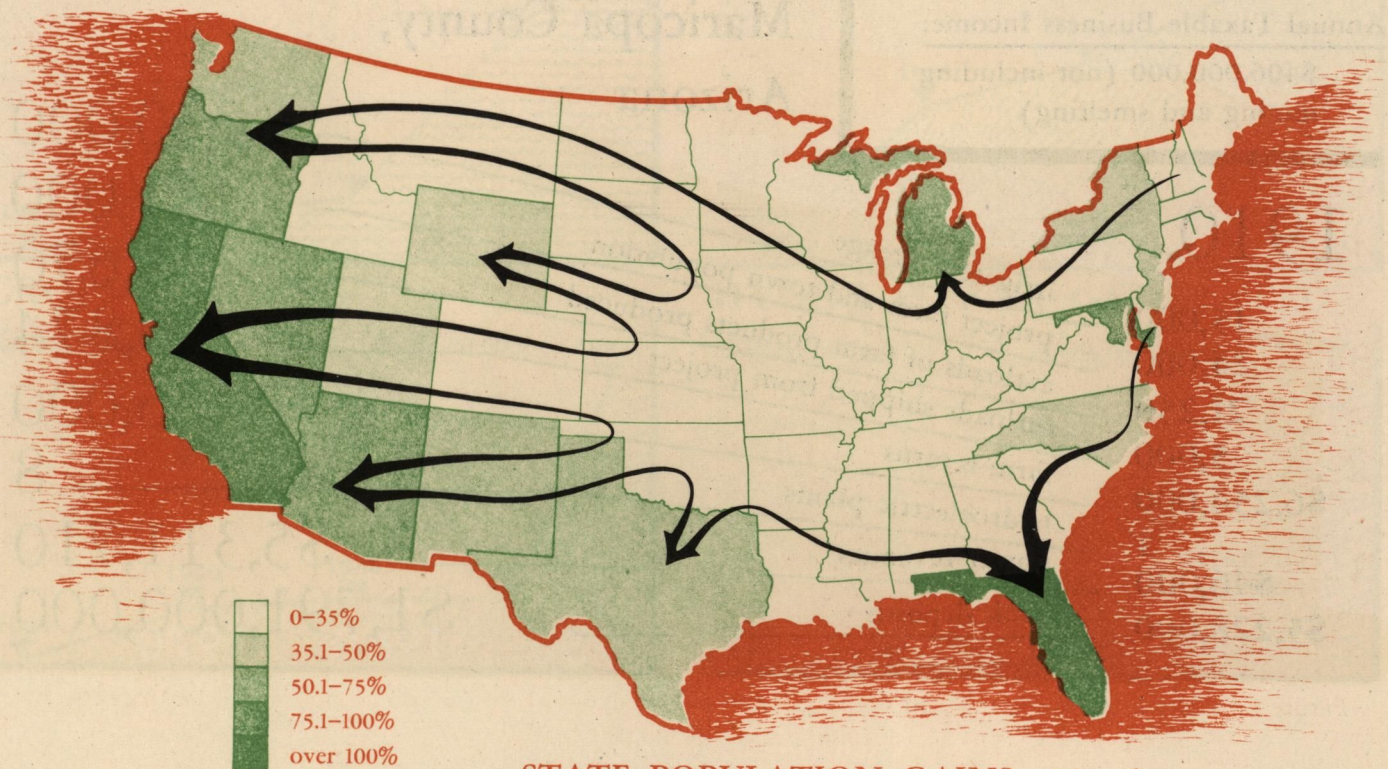
The graph above is not intended as a bogey. However, it illustrates a situation that deserves attention. The Bureau of Agricultural Economics of the United States Department of Agriculture has stated: "American agriculture, after a century and a half of rapidly expanding acreage, now finds that it has reached the limits,

practically speaking, of its land resources."

The lower line in the graph, "Acreage Required," is based on today's Department of Agriculture formula of 3 acres per capita to feed and clothe the population. No adjustment is made for improved farming that has increased production in recent decades and if continued will probably lower the per capita requirement.

The upper line, "Acreage Available," is the United States census estimate of all land physically available for growing crops including "plowable pasture," a large part of which would be impractical or uneconomical to put in cultivation. It also includes eroded, erodible and marginal land better left for other purposes; the Department of Agriculture says that 180,000,000 acres are subject to damage, perhaps permanent, if continuously cropped. On the other hand, the projection of this line into future years at the same level does not allow for the millions of acres susceptible of reclamation through irrigation and drainage, and conversion to beneficial use.

POPULATION TREND —WESTWARD



STATE POPULATION GAINS 1920-47
(National Average, 35%)

SINCE THE DAWN OF HISTORY the movement of people in search of a better life has been west. From Asia they pressed into and across Europe, sailed the wide Atlantic, spread through America and pressed on to the Pacific.

In the United States a westward movement of population that has never halted was intensified by the war. From 1940 to 1947 the Pacific and Mountain States gained over 28 percent—nearly 10 times as much as in the rest of the country.

Some 10,000,000 or more persons may be added to the Nation by 1960, and 20,000,000 by 1970. With the development of Western agricultural and industrial facilities, no other area has the same economic opportunity. In the West they will find jobs, a good living and security—provided that Western land and water resources are

developed to create new farms, new factories, new jobs and homes.

Western development—key to the Nation's prosperity—means reclamation, and reclamation means western development.

In the President's annual message on the state of the Union, January 7, 1948, he declared: "We must expand our reclamation program to bring millions of acres of arid land into production, and to improve water supplies for additional millions of acres. This will provide new opportunities for veterans and others, particularly in the West, and aid in providing a rising living standard for a growing population."

The United States is a dynamic economy. Only a constantly expanding agriculture and industry can support the steadily rising standard of living which fulfills American ambitions, satisfies American desires and keeps America strong.

GROWTH of an irrigation project*

Current Annual Federal Tax Revenue:

\$66,000,000

Annual Taxable Business Income:

\$406,000,000 (not including
mining and smelting)

*Salt River Valley,
Maricopa County,
Arizona

1947

1910

15,000	irrigated acreage	230,000
24,000	project farm and town population	251,000
21,250	carloads of farm products produced	68,670
5,000	carloads shipped from project	35,874
\$6,254,000	farm returns	\$51,426,000
1	hydroelectric plants	8
\$46,000	power revenues	\$5,311,710
\$5,228,000	bank deposits	\$1,791,000,000

HORATIO ALGER'S THEME on a truly magnificent scale, not the rise to wealth and success of an individual, but of an entire community—a community of a quarter of a million people—is found in the amazing story of the irrigation development of the Salt River Valley in south central Arizona.

The city of Phoenix is in the center of the development. At the turn of the century Phoenix was a village in the desert. Today it is a metropolis and the pulsing heart of one of the most highly developed agricultural areas in the United States.

For example, from 1936 to 1945 south central Arizona farmers grossed over a billion dollars. And in 1946 the taxable business income from retail and restaurant sales, manufacturing, rents, and utility operations in the project area and nearby towns totaled over \$400,000,000. The same year, from Maricopa County alone, Federal income tax payments were an estimated \$66,000,000.

Water is the secret of this success story. Arizona's sun is warm and its soil is fertile—but the earth is dry

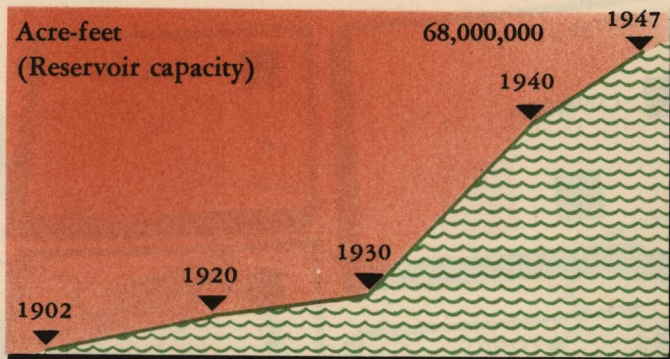
as bone. Rainfall averages less than 10 inches a year. Even before the white man came, Indians knew that crops wouldn't grow without irrigation, and that when the water supply failed their plants would wither and die. Irrigation in the Salt River Valley was begun by white settlers about 1867 and also depended on direct diversion of an unregulated river—much too variable for satisfactory irrigation development.

In 1910, on the Salt River Reclamation project the first storage facilities were completed for irrigation operations, together with a small hydroelectric power plant. The growth of the area thereafter as illustrated in the chart above was phenomenal.

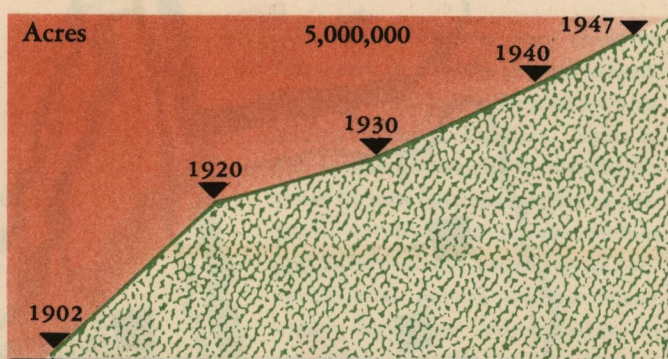
Expenditures by the Bureau of Reclamation in constructing the project totaled \$21,000,000, of which \$14,000,000 has been repaid, with the remainder payable in long-time installments. Additional expenditures by the Salt River Valley Water Users' Association, which assumed operation of the project in 1917, have totaled about \$23,000,000. Total investment Federal and private: \$44,000,000.

RECLAMATION RESULTS

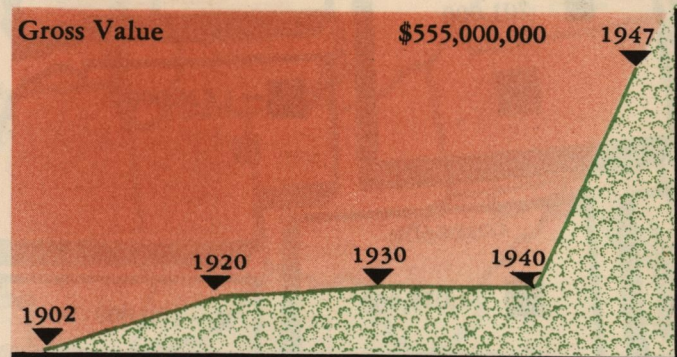
WATER CONSERVED



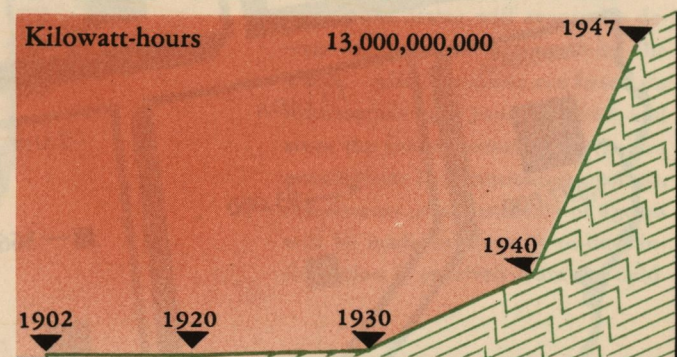
LAND IRRIGATED



CROPS GROWN



HYDRO POWER GENERATED



MORE THAN 5,000,000 Americans benefit directly from Reclamation activities, and tens of millions of others benefit indirectly.

Over 3 out of every 100 persons in the United States use the water or electric power generated by the water stored or diverted by Reclamation dams. They irrigate their farms and gardens; drink, wash and bathe; live in electrically lighted and powered homes (in many cases cooled or heated according to season) with refrigerators, ranges, food mixers, vacuum cleaners, quick freezers, radios, clocks, and other modern necessities; or work in hundreds of factories or processing plants illuminated and powered with hydroelectric energy created by western multipurpose Reclamation projects.

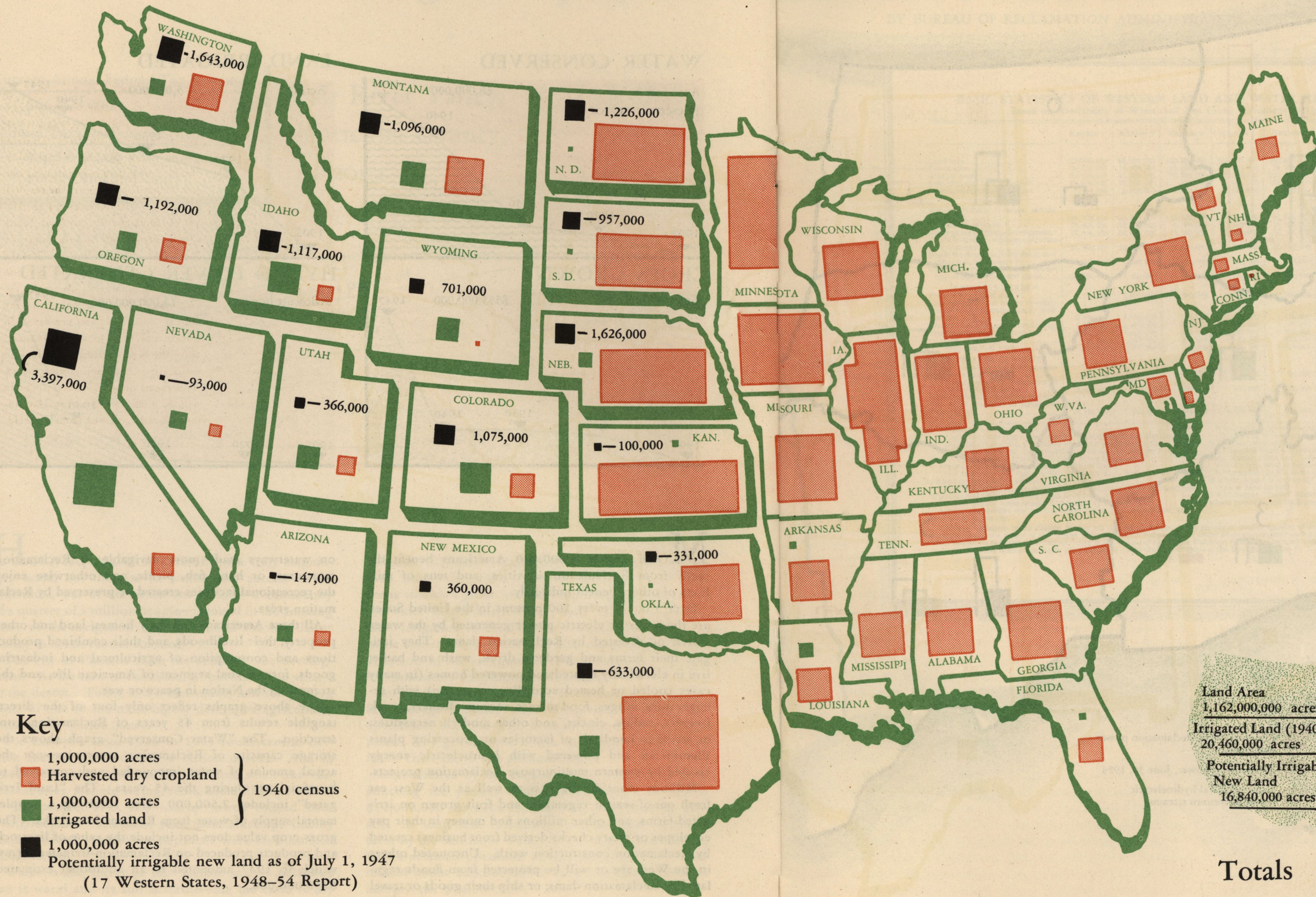
Millions more in the East as well as the West eat fresh out-of-season vegetables and fruit grown on irrigated farms, and other millions find money in their pay envelopes or salary checks derived from business created by Reclamation construction work. Uncounted others in the West are or will be protected from floods regulated by Reclamation dams; or ship their goods or travel

on waterways made more navigable by Reclamation structures; or hunt, fish, picnic, and otherwise enjoy the recreational facilities created or preserved by Reclamation areas.

All these Americans and their homes, land and other property, their livelihoods, and their combined productions and consumption of agricultural and industrial goods, form a vital segment of American life, and the strength of the Nation in peace or war.

The above graphs reflect only four of the direct, tangible results from 45 years of Reclamation construction. The "Water Conserved" graph shows the storage capacity of Reclamation reservoirs—not the actual amount of water impounded and converted to beneficial use during the 45 years. The "Land Irrigated" includes 2,500,000 acres receiving a supplemental supply of water from Reclamation works. The gross crop value does not include the value of livestock and products produced on Reclamation-irrigated farms, which in 1947 amounted to an additional estimated \$150,000,000.

LAND USE AND IRRIGATION POSSIBILITIES



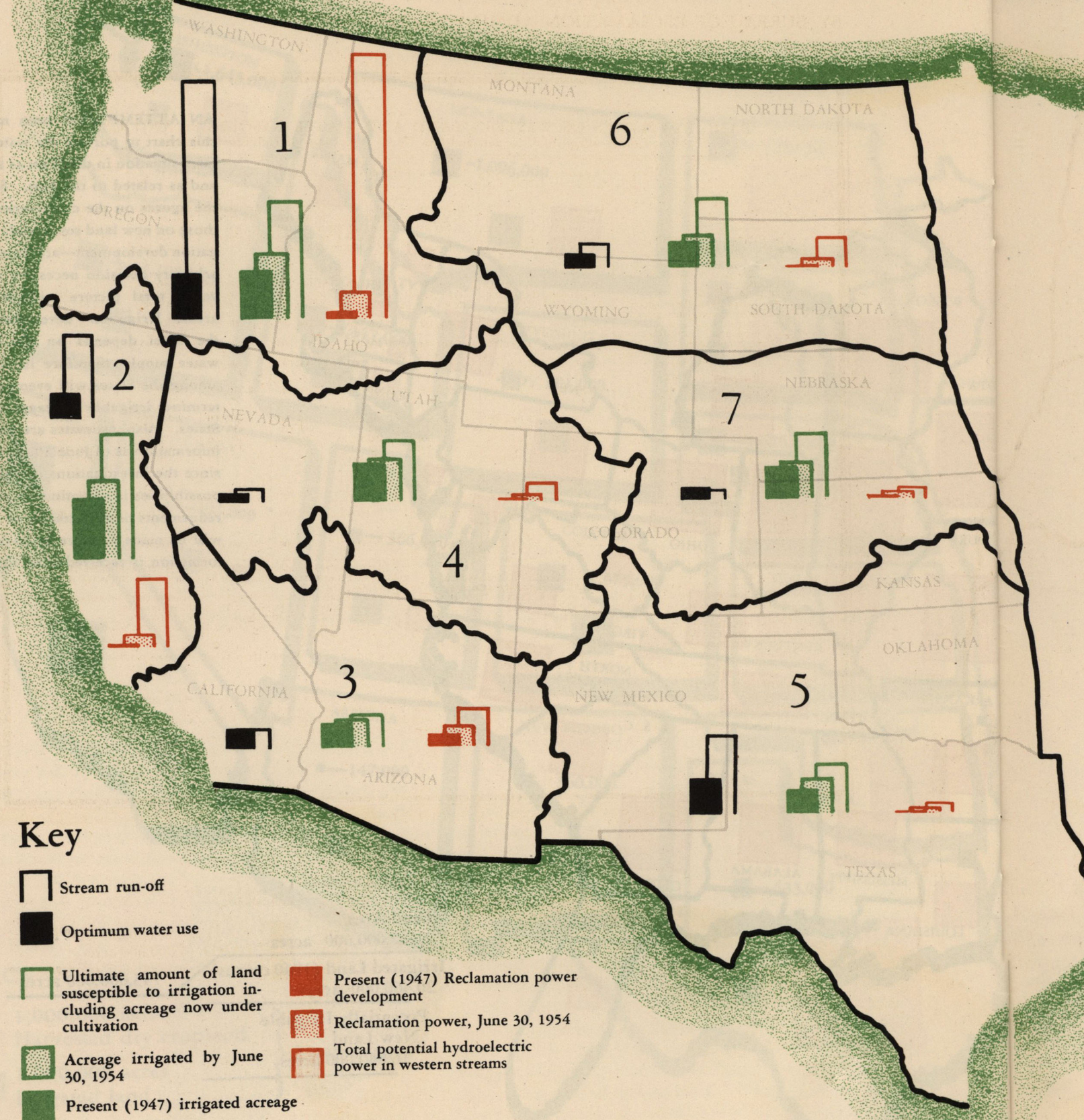
AN ATTEMPT has been made in this chart to portray the water-land-farm situation in the West as a whole and as related to the East. Some of the figures on the chart—specifically those on new land susceptible of irrigation development—are the result of arbitrary decision necessary to convey a total picture without blank areas. Irrigation development in the West depends on the limited water supply, therefore its division among the States will eventually determine irrigable acreages in the States. Also, estimates are based on information as of June 30, 1947, and since the investigations of irrigation possibilities is a continuous process, refinements or adjustments of figures will be made as more up-to-date information is received from the field.

Totals

Land Area	1,162,000,000 acres
Irrigated Land (1940 census)	20,460,000 acres
Potentially Irrigable New Land	16,840,000 acres
Total Potentially Irrigable New Land	743,000,000 acres

WESTERN WATER RESOURCES AND USE

BY BUREAU OF RECLAMATION ADMINISTRATIVE REGIONS



Key

- Stream run-off
- Optimum water use
- Ultimate amount of land susceptible to irrigation including acreage now under cultivation
- Present (1947) Reclamation power development
- Reclamation power, June 30, 1954
- Total potential hydroelectric power in western streams
- Acreage irrigated by June 30, 1954
- Present (1947) irrigated acreage

BASIC STATISTICS OF WESTERN LAND AND WATER RESOURCES AND USE

Based on Availability of Water, and Not Under Conditions of Unlimited Supply

	REGION 1	REGION 2	REGION 3	REGION 4	REGION 5	REGION 6	REGION 7	Total, 7 Regions, 17 States
ACRES								
Land area.....	178,000,000	65,000,000	125,000,000	162,000,000	300,000,000	200,000,000	137,000,000	1,168,000,000
Forest area.....	90,000,000	14,000,000	15,200,000	21,400,000	19,000,000	20,000,000	4,000,000	183,600,000
Grazing area.....	32,400,000	31,500,000	70,700,000	142,000,000	221,000,000	131,000,000	27,900,000	656,500,000
Area that can be dry-farmed.....	16,000,000	13,000,000	420,000	880,000	60,000,000	33,000,000	99,800,000	243,100,000
Area susceptible of irrigation.....	8,050,000	9,000,000	2,200,000	4,650,000	3,570,000	5,720,000	4,770,000	37,960,000
ACRE-FEET								
Water available (average annual run-off).....	205,000,000	68,500,000	15,100,000	11,100,000	64,000,000	20,000,000	9,500,000	393,200,000
Present use of water.....	26,000,000	10,500,000	8,500,000	4,800,000	16,500,000	4,500,000	3,800,000	74,600,000
Needs under optimum development.....	37,200,000	21,400,000	15,100,000	9,350,000	30,100,000	12,300,000	9,650,000	135,100,000
Needs for irrigation alone, optimum development.....	36,000,000	20,000,000	13,300,000	9,200,000	24,000,000	11,900,000	9,150,000	123,550,000
Needs for domestic, industrial, and other use, optimum.....	1,200,000	1,400,000	1,800,000	150,000	6,100,000	400,000	500,000	11,550,000
Unusable or unused water under optimum development plans.....	167,800,000	47,100,000	(12)	1,750,000	33,900,000	7,700,000	1,600,000	258,100,000
IRRIGABLE ACRES ¹⁴								
Present developed area.....	4,100,000	5,000,000	1,980,000	3,190,000	2,160,000	2,270,000	2,420,000	21,120,000
Area susceptible of future development with full water supply (new land).....	3,950,000	4,000,000	220,000	1,460,000	1,410,000	3,450,000	2,350,000	16,840,000
Area in need of supplemental water.....	1,570,000	2,400,000	690,000	940,000	1,290,000	430,000	1,630,000	8,920,000
Area programmed for 1948-54.....	1,520,000	1,660,000	140,000	190,000	1,300,000	360,000	480,000	5,650,000
Full water supply.....	800,000	360,000	100,000	40,000	270,000	300,000	170,000	2,040,000
Supplemental water.....	720,000	1,300,000	40,000	150,000	1,030,000	60,000	310,000	3,610,000
KILOWATTS OF POWER								
Capacity installed on Reclamation projects June 30, 1947.....	694,987	154,000	1,241,750	6,050	24,300	12,200	60,200	2,223,487
Additional capacity programmed for installation 1948-54.....	1,914,500	880,500	545,500	199,500	56,000	439,600	288,850	4,324,450
Hydro potential (based on amount of water available 50 percent of the time).....	22,560,000	5,660,000	3,050,000	1,560,000	510,000	2,380,000	700,000	36,420,000

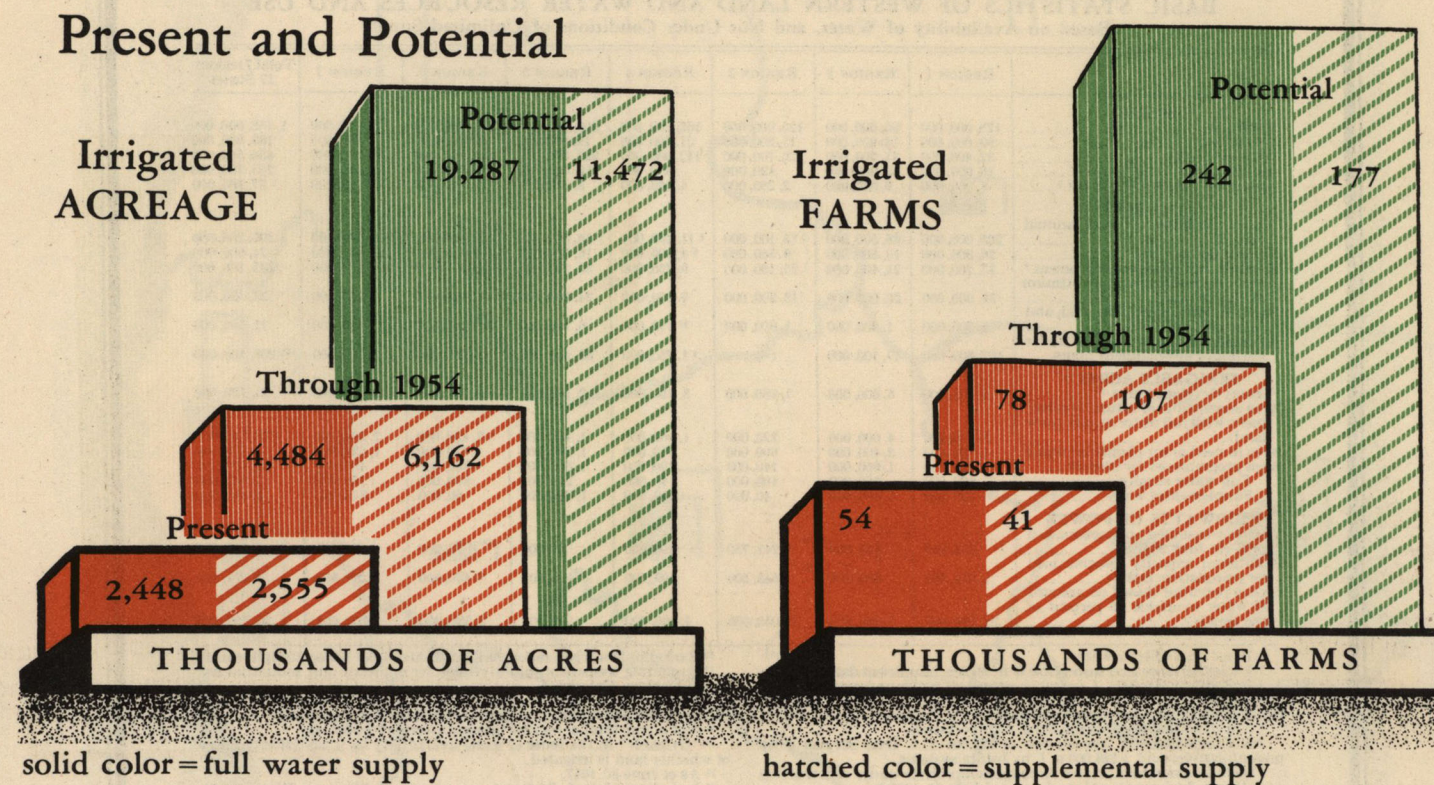
¹ Based on available water.
² Excluding range land susceptible of irrigation; insufficient data available.
³ Including 3,000,000 a. f. (roughly estimated) usable underground water.
⁴ Including water for transmountain diversion to Region 7 but not water to go to Region 3 under Colorado River Compact.
⁵ Not including possible 500,000 a. f. importation.
⁶ Not including the importation of 422,000 a. f. from Region 4 by present systems and 1,228,000 a. f. by future systems.
⁷ Including requirements for Reclamation projects under construction or authorized for construction; data as of June 30, 1947.
⁸ Not including water exported and used by other regions.
⁹ Including present use plus reservoir losses (by evaporation, etc.) chargeable to the use.
¹⁰ Excluding power generation, navigation, and other nonconsumptive uses.
¹¹ Excluding transmountain diversion for domestic and industrial use (e. g., Denver, Colorado).
¹² Probably small amount unconsumed but used to carry off salts and other wastes; excluding 1,500,000 a. f. Mexican Treaty water.
¹³ Not a true total of regions because of export water, etc.
¹⁴ "Irrigable" in the sense of water availability for irrigation regardless of whether land is irrigated.
¹⁵ As of June 30, 1947.
¹⁶ Including United States Army plants in Missouri River Basin whose power is sold by Bureau.

NOTE: Ultimate water supply figures are subject to change, and a greater or smaller amount of water may be diverted than indicated. For example, until the terms of the Upper Colorado Basin compact (now under State negotiation) are known, the water to be exported from Region 4 to 7 cannot be definitely established; some of the waters of the Upper Colorado River may be used within the Upper Colorado Basin (Region 4), or diverted to the Bonneville Basin (also Region 4), or to the eastern slope of the Rockies (Region 7).

Scale

WATER—50,000,000 acre-feet
 LAND—5,000,000 acres
 POWER—5,000,000 kilowatts

RECLAMATION LAND DEVELOPMENT



THE LAND receiving either a full or supplemental supply of irrigation water from Reclamation works in 1947 totaled more than 5,000,000 acres.

Proposed construction under the 1948-54 program would more than double the area supplied with water from Reclamation works by the end of fiscal year 1954.

The program would increase the area furnished a full water supply from 2,448,000 acres to 4,484,000 acres. This would mean that more than 2,000,000 acres of dry land—a great deal of it far too dry to be considered anything other than an arid waste—would be converted to flourishing, wealth-producing farms, adding their produce and their income to the combined production and income of the Nation.

It is estimated that the development of these 2,000,000 acres would create about 24,000 new family-size irrigation farms, with a population of around 75,000 to 100,000.

The program would also increase the area furnished with a supplemental supply of water (thus making

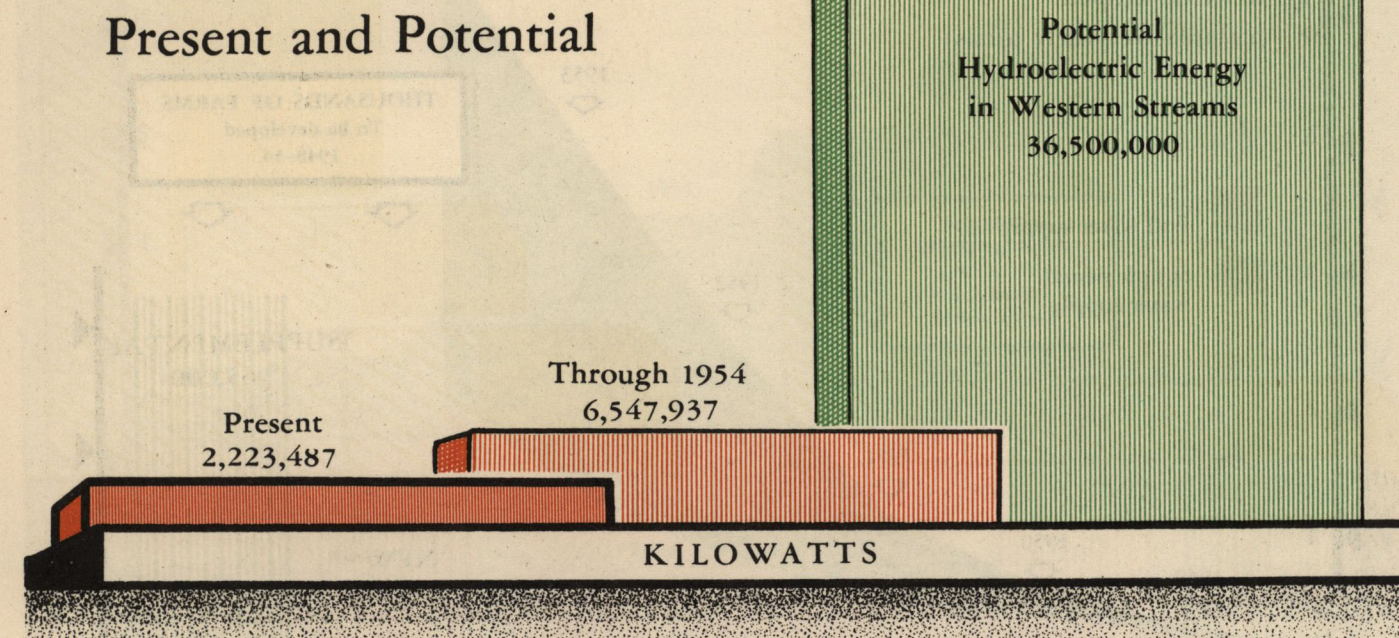
enough water available for irrigating the crops the entire season) from 2,555,000 to 6,162,000 acres. The number of farms provided with this supplemental supply of water would be increased from 41,136 to 107,136.

Without this supplemental water many of these farms would eventually cease operations and return to the desert, or at best revert to dry-land farming on a poverty scale, with public relief and the poorhouse the ultimate destination of their present occupants if they continued to try to wrest a livelihood from the land.

The potentially irrigable undeveloped new land in the 17 Western States on June 30, 1947, was 16,839,000 acres. Proposing the irrigation of 2,036,000 acres, the program would leave 14,803,000 acres still undeveloped—work for future years.

When the land still undeveloped on July 1, 1954, is provided with irrigation water the number of farms receiving a full season's supply from Reclamation works will increase to nearly a quarter of a million.

RECLAMATION POWER DEVELOPMENT



ELECTRIC GENERATING CAPACITY installed in 33 power plants on Reclamation projects on June 30, 1947, totaled 2,223,487 kilowatts. Under the 1948-54 program the installation of additional generators in power plants now operating and the construction of new power plants would increase this capacity to 6,547,987 kilowatts.

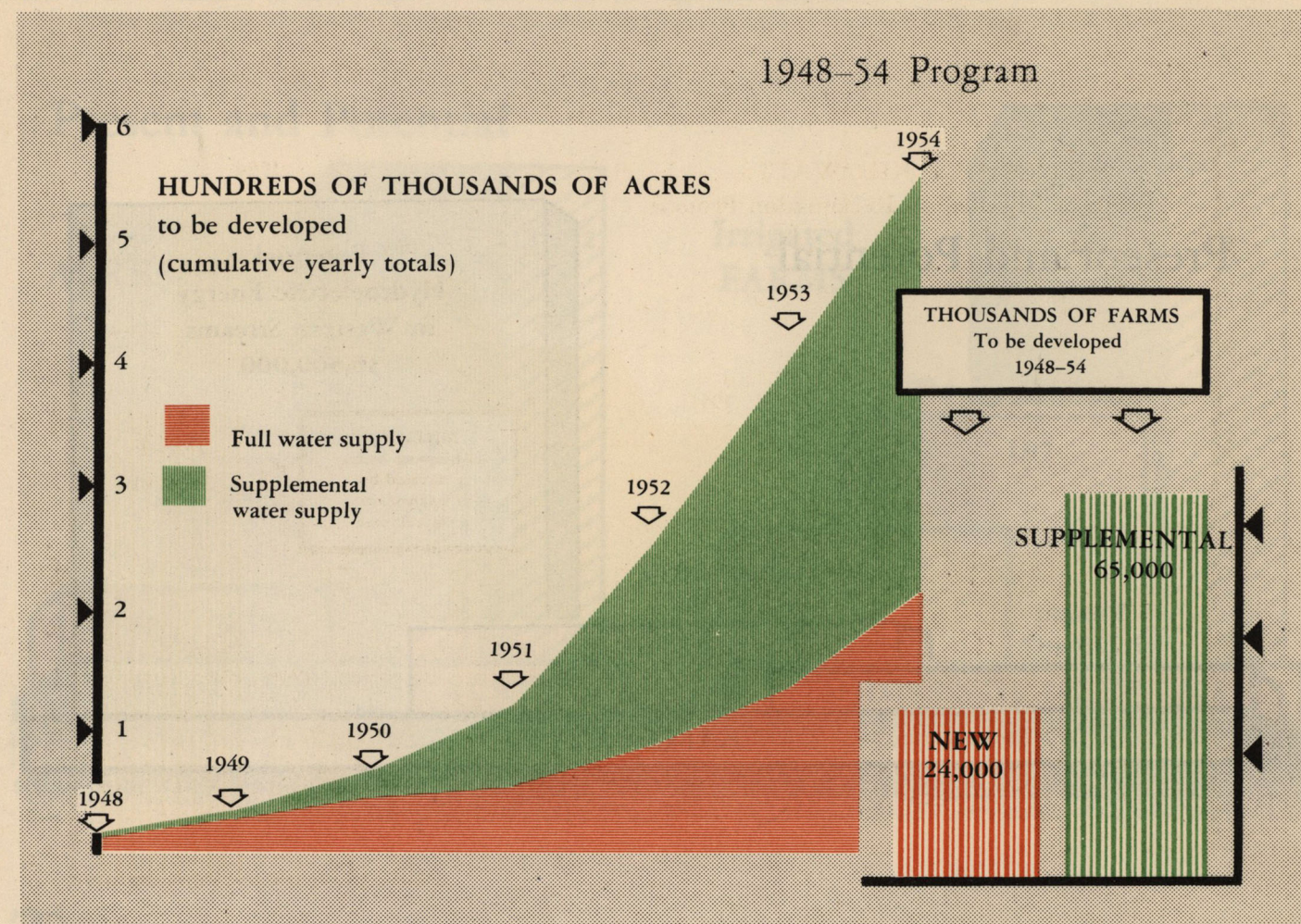
Still remaining undeveloped in western streams after June 30, 1954, provided that no other hydro developments are made by private companies or States or other agencies while Reclamation construction is going forward during the 7 years of the program, would be about 30,000,000 kilowatts of hydroelectric energy.

This rich, unused natural resource of hydroelectricity is now wasting itself into the air and sea without benefit to the country. It is true that some of the streams con-

taining this great unused potential for a higher living standard and the comforts of modern life are not otherwise wasted—they supply water to towns and cities, form waterways for commerce and travel, irrigate crops, offer boating, fishing, and bathing pleasures to the public and, with the hydro plants that may already be operating on them, give light and power to homes and offices and factories.

But development of this natural resource of hydroelectricity—development to the fullest extent possible—would not at all lessen the total of the other combined uses. Water used for the generation of hydroelectricity can be used over and over again; nothing is ever taken out of it except the magic of electricity. Natural resources are exhaustible through use; hydroelectricity is not; it is a cake that can be eaten and still be had.

ESTIMATED LAND DEVELOPMENT



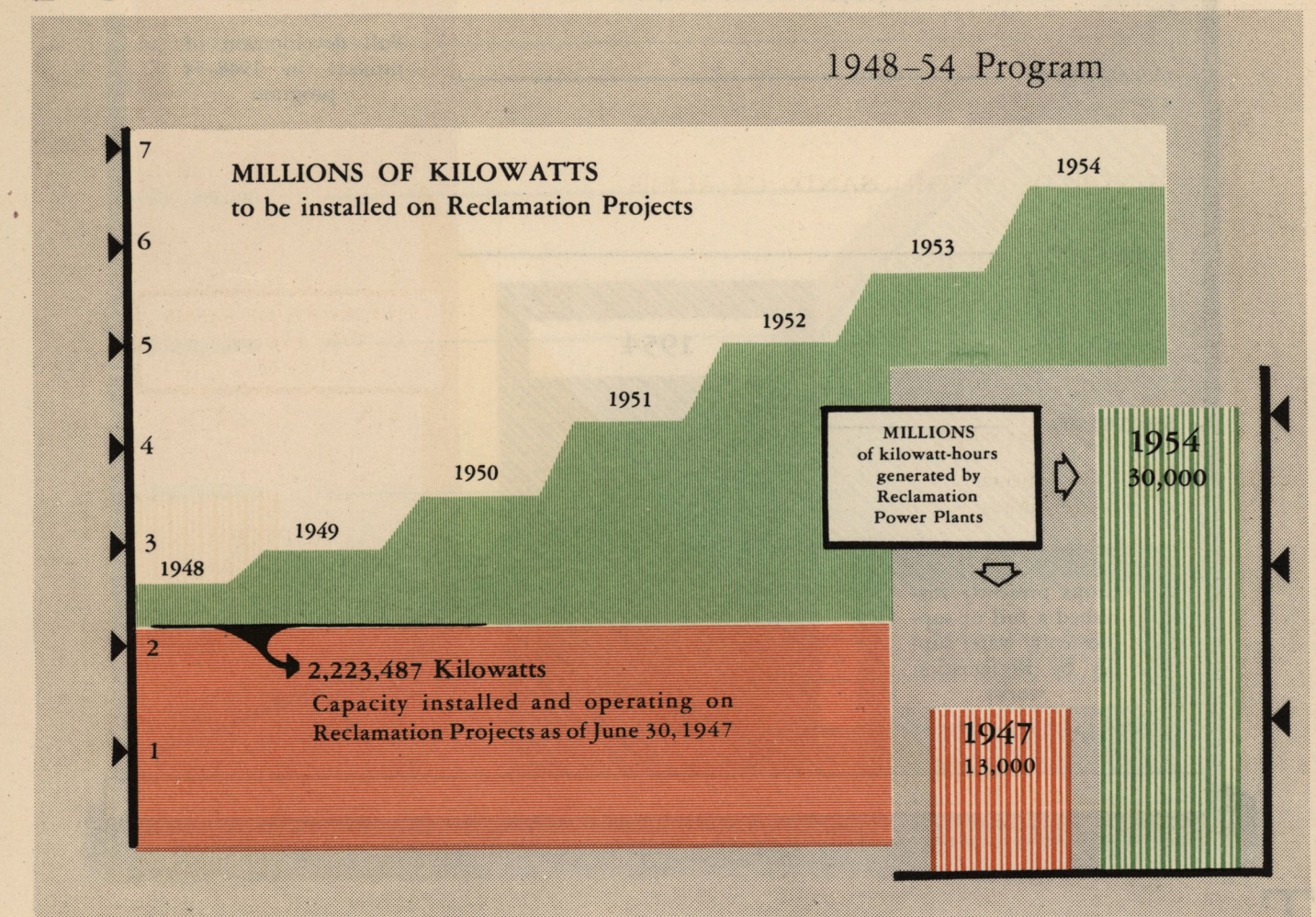
THE PRIMARY CONSIDERATION in projecting a multiyear Reclamation construction program is the determination of the year in which the new acreage, power and other benefits of Reclamation are needed in the area. This is an economic determination, from which the engineer then estimates the time required for necessary field surveys and design of the physical works that will produce those benefits, and for their efficient and economical construction.

The need for the development of western water resources into land, power and other Reclamation benefits is a present, and pressing, one.

The program proposes the introduction of 2,020,000 acres of new irrigable acreage during the seven fiscal years 1948 through 1954. Also, the program would provide a supplemental water supply to 3,610,000 acres now irrigated but lacking a full season's supply of water to grow crops.

In making irrigation water available to 2,020,000 acres of dry land about 24,000 new farms would be created—with 24,000 new farm homes and 24,000 permanent, stable livelihoods. These in turn would create an immediate need for services, materials and equipment that, judging from past experience, would sooner or later establish entire new communities on or near the irrigation areas with a population two to three times the new farm population. The urban population in turn would require all kinds of goods and create more business, not only in agricultural and manufactured products but also for services such as utilities; simultaneously shops and stores and processing plants would be established in the new towns and cities, to supply not only the new rural and urban population, but also that of outside areas in the country, and to buy from those outside areas in turn; and so the small initial economic creation forms a substantial, constructive, vitalizing force in the national economy.

ESTIMATED POWER DEVELOPMENT



THE 1948-54 PROGRAM proposes the installation of 4,324,450 kilowatts of generating capacity in power plants constructed or to be constructed on Reclamation projects. This would increase the present installed capacity of plants on Reclamation projects from 2,223,487 to 6,547,937 kilowatts.

The new capacity installed during the 7 years would increase the present annual generation from 13,000,000,000 kilowatt-hours (calendar year 1947) to over 30,000,000,000 kilowatt-hours.

The proposed year-by-year installation would be as follows:

	Kilowatts
1948.....	514,000
1949.....	250,000
1950.....	560,050
1951.....	800,900
1952.....	647,900
1953.....	830,100
1954.....	721,500

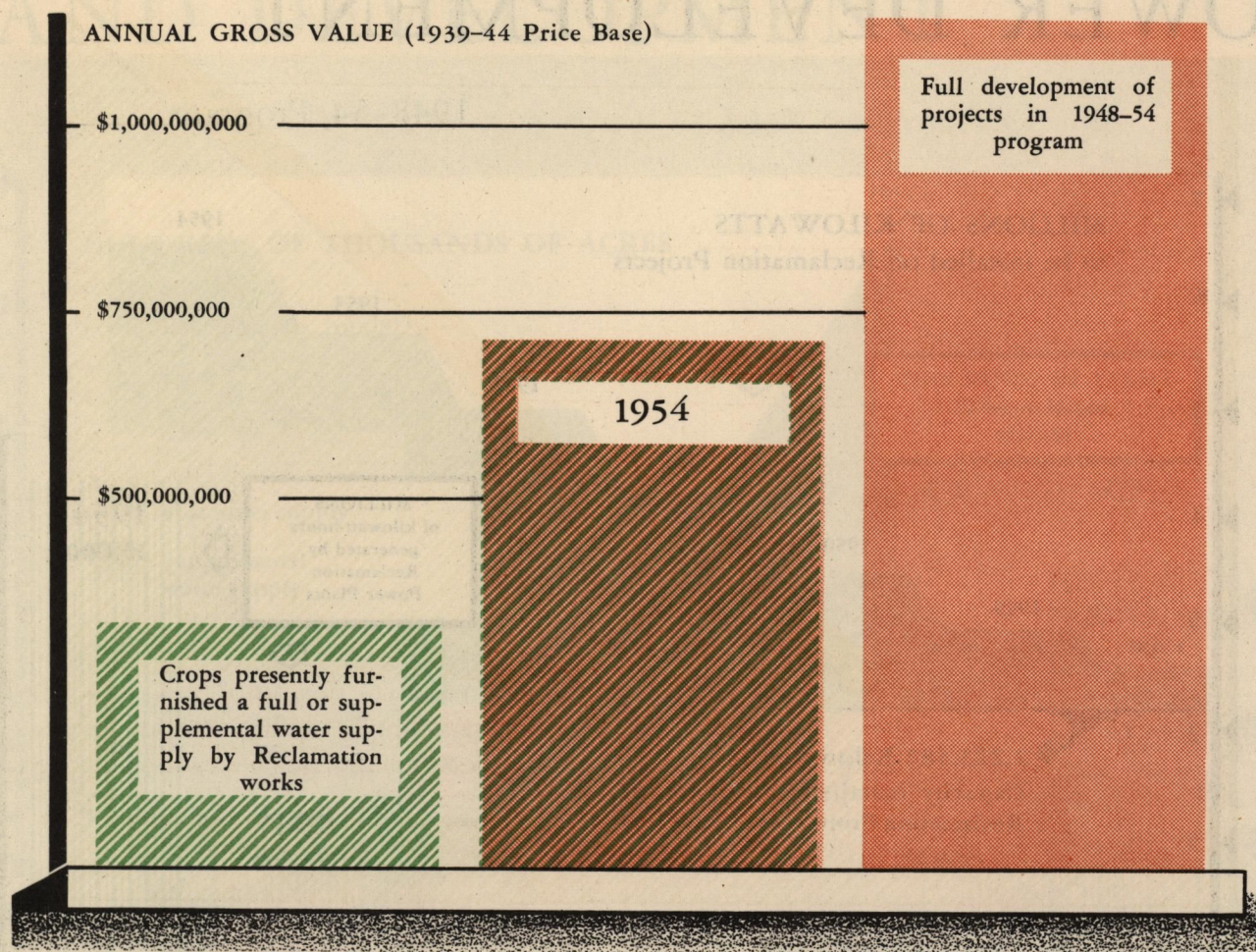
Cumulatively the installed generating capacity on Reclamation projects would be increased as follows:

	Kilowatts
1948.....	2,737,487
1949.....	2,987,487
1950.....	3,547,537
1951.....	4,348,437
1952.....	4,996,337
1953.....	5,826,437
1954.....	6,547,937

By regions, the installed capacity on Reclamation projects on July 1, 1947, and the total capacity on June 30, 1954, including programed additions, would be:

	Kilowatts	Kilowatts
Region 1.....	694,987	2,609,487
Region 2.....	154,000	1,034,500
Region 3.....	1,241,750	1,787,250
Region 4.....	6,050	205,550
Region 5.....	24,300	80,300
Region 6.....	42,200	481,800
Region 7.....	60,200	349,050

ESTIMATED CROP PRODUCTION



THE ESTIMATED GROSS VALUE of farm crops grown on irrigated land furnished with either a full or supplemental water supply by Bureau of Reclamation works was \$555,000,000 in 1947, at current prices.

In order to set a value on farm crop production resulting from the 1948-54 program, the price average of 1939-44 was applied to this figure and to all estimates of anticipated values during the 7 years of the program.

On this 1939-44 price base the 1947 gross value of crop production would be \$321,000,000. This would increase under the program as follows:

1948.....	\$332,000,000
1949.....	340,000,000
1950.....	358,000,000
1951.....	417,000,000
1952.....	538,000,000
1953.....	653,000,000
1954.....	727,000,000

Cumulatively these annual gross crop values for the 7 years of the program would total \$3,364,000,000.

These figures include estimated returns from crops

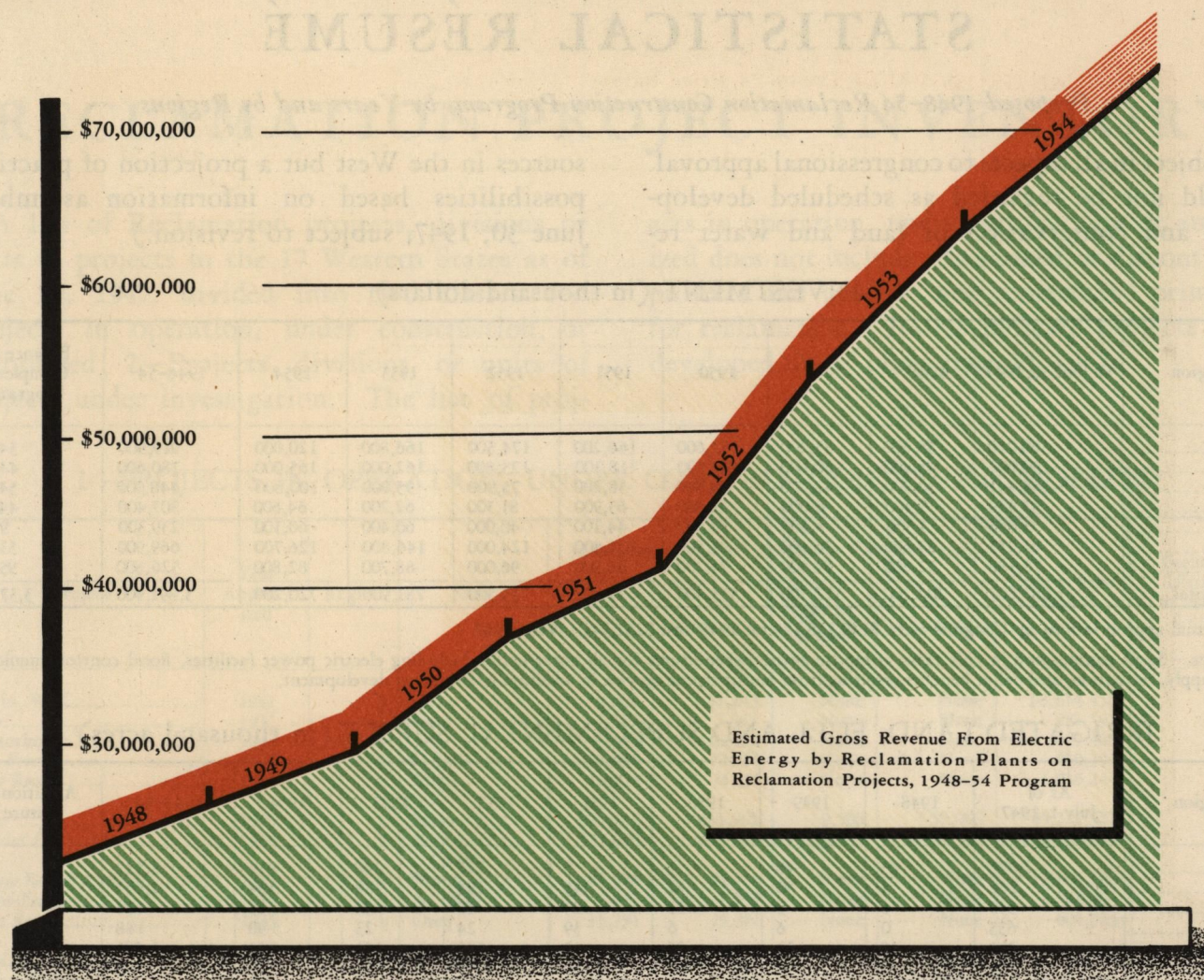
grown on project land already under irrigation as a result of past Reclamation activities in the West, as well as the returns from crops on land that would be irrigated in the future as a result of construction work during the 7-year program. That is, they include the \$321,000,000 base figure for 1947 on a 1939-44 price basis.

The cumulative increased annual gross crop values during the 7 years of programed construction would total \$1,113,000,000. Annual increments over the 1947 gross value would be as follows, in round figures:

1948.....	\$10,000,000
1949.....	18,000,000
1950.....	36,000,000
1951.....	95,000,000
1952.....	216,000,000
1953.....	331,000,000
1954.....	406,000,000

Still larger annual increments would result in succeeding years as the newly irrigated lands reach full development.

ESTIMATED POWER REVENUE



THE GROSS REVENUE from power generated by hydroelectric plants on Reclamation projects during the fiscal year 1947 amounted to \$22,472,000.

Under the 1948-54 program of proposed construction of multipurpose irrigation works by the Bureau of Reclamation, this revenue would increase to about \$64,000,000—nearly three times the annual revenue for 1947.

The annual revenue figures during the program's 7 years would be as follows:

1948.....	\$23,000,000
1949.....	26,000,000
1950.....	30,000,000
1951.....	37,000,000
1952.....	43,000,000
1953.....	54,000,000
1954.....	64,000,000

The total cumulative gross revenue income for the 7 years would reach \$278,000,000.

Although this appears to be a sizable immediate return from the power part of the programed multi-

purpose construction, it reflects very inadequately the magnitude of the power receipts that can be expected upon full development of the plants included in the program. It takes years to build a fair-sized power plant and many will have just barely begun to generate electricity in 1954, the last year of the 7-year program of construction.

Receipts from the sale of electric energy are collected by the Bureau of Reclamation and paid into the United States Treasury. These receipts are an important factor in determining the financial feasibility of Reclamation-built multipurpose water conservation projects. Before a project is recommended for construction, the Bureau must ascertain whether it will pay for itself over a stated period of time; that is, whether receipts from irrigation water, electric energy and municipal water, plus nonreimbursable allocations to other benefits such as flood control and navigation will equal the construction cost. Without the return from power most multipurpose projects would be financially infeasible, and would not be built.

STATISTICAL RÉSUMÉ

Proposed 1948-54 Reclamation Construction Program, by Years and by Regions

(Subject in all aspects to congressional approval. Should not be regarded as scheduled development and conservation of land, and water re-

sources in the West but a projection of practical possibilities based on information assembled June 30, 1947, subject to revision.)

INVESTMENT (in thousand dollars)

Region	To June 30, 1947	1948 ¹	1949 ¹	1950	1951	1952	1953	1954	1948-54	Balance to Complete Program
1-----	360,020	56,600	83,200	152,600	166,200	174,500	166,800	120,000	919,900	348,100
2-----	190,002	43,400	60,800	107,300	118,300	123,800	162,000	165,000	780,600	442,400
3-----	265,441	30,900	42,700	64,500	38,200	75,900	95,000	100,800	448,000	543,000
4-----	57,449	5,400	6,000	24,000	63,900	81,300	62,200	64,600	307,400	445,600
5-----	71,056	7,500	8,500	18,500	44,100	40,000	60,400	60,300	239,300	97,700
6-----	61,253	27,600	46,600	93,800	104,400	124,000	146,800	126,700	669,900	539,100
7-----	78,386	32,800	64,900	74,700	86,900	96,000	88,700	82,800	526,800	957,200
Total-----	1,083,607	204,200	312,700	535,400	622,000	715,500	781,900	720,200	3,891,900	3,373,100

¹ Actual appropriations by Congress were \$149,136,129 for 1948 and \$251,541,139 for 1949.

NOTE.—Sums enumerated in this table comprise entire expenditures for all construction including electric power facilities, flood control, municipal water supply, recreation, and other benefits resulting from multipurpose works, in addition to irrigation development.

IRRIGATED LAND, FULL AND SUPPLEMENTAL SUPPLY (in thousand acres)

Region	As of July 1, 1947	1948	1949	1950	1951	1952	1953	1954	1948-54	Additional Future
1-----	2,076	63	46	5	5	227	240	936	1,522	398
2-----	262	3	50	81	345	194	788	194	1,655	1,021
3-----	930	6	5	17	23	19	33	33	136	779
4-----	635	0	6	6	39	24	23	90	188	627
5-----	212	59	29	86	3	588	343	195	1,303	273
6-----	515	20	39	62	50	55	63	69	358	2,674
7-----	373	39	20	24	140	125	66	67	481	2,506
Total-----	5,003	190	195	281	505	1,232	1,556	1,584	5,643	8,278
Cumulative totals-----		5,193	5,388	5,669	6,274	7,506	9,062	10,646		18,924

NOTE.—The annual acreage increments for 1948 through 1954 represent land that would be served by Reclamation works as a result of funds invested as enumerated in table 1. The "Additional Future" land would result from the investment of further funds listed under "Balance to Complete Program" in table 1; it refers to projects comprising the program and does not include any potentially irrigable land which might be served with water as a result of project construction begun after June 30, 1954.

ESTIMATED ANNUAL GROSS CROP VALUES, 1939-44 PRICE BASE (in thousand dollars)

Region	For 1947	Annual Increment Over 1947							1948-54	Additional Future Annual
		1948	1949	1950	1951	1952	1953	1954		
1-----	130,203	2,376	3,552	5,272	6,124	9,418	15,342	23,048	65,132	53,103
2-----	28,046	210	3,810	12,210	52,410	72,510	164,780	186,170	492,100	90,094
3-----	83,351	340	660	2,886	5,756	10,198	15,456	19,609	54,905	56,370
4-----	23,345	103	228	268	2,007	2,934	4,125	7,184	16,849	21,918
5-----	28,129	3,005	4,330	7,776	7,960	87,664	92,307	124,538	327,580	18,020
6-----	11,992	1,020	1,632	2,868	4,149	6,085	7,934	9,684	33,372	69,867
7-----	16,436	3,141	3,806	4,991	17,012	27,561	31,515	35,605	123,631	127,265
Total-----	321,502	10,195	18,018	36,271	95,418	216,370	331,459	405,838	1,113,569	436,637
Total annual-----		331,697	339,520	357,573	416,920	537,872	652,961	727,340		1,063,977

NOTE.—The actual gross crop value on land served from Reclamation works was estimated at \$555,420,804 in 1947.

RECLAMATION PROJECT INVENTORY

A list of Reclamation projects, divisions or units of projects in the 17 Western States as of June 30, 1947, divided into two classes: 1—Projects in operation, under construction, or authorized; 2—Projects, divisions, or units of projects under investigation. The list of proj-

ects in operation, under construction or authorized does not include abandoned or discontinued projects and projects not constructed primarily for reclamation. Italics indicate projects fully developed under plans June 30, 1947.

1—PROJECTS IN OPERATION, UNDER CONSTRUCTION, OR AUTHORIZED

Project	Year Authorized	Region	State	IRRIGABLE ACREAGE ¹		POWER CAPACITY (kW.)		Cost to June 30, 1947	Estimated Ultimate (in thousand dollars)
				1947	Ultimate ²	1947 Installed	Ultimate		
Austin, W. C.	1941	5	Okla.	9,600	51,243	None	None	\$8,874,438	\$13,041
Baker	1931	1	Oreg.	7,312	7,312	None	None	281,591	282
Balmorhea	1944	5	Tex.	None	10,400	None	None	417,420	440
Belle Fourche	1904	6	S. Dak.	72,431	72,431	None	None	4,630,391	4,705
Bitter Root	1930	1	Mont.	16,555	16,555	None	None	1,036,244	1,036
Boise ³	1905	1	Idaho-Oreg.	325,368	433,961	9,500	⁴ 50,000	45,221,521	64,877
Boulder Canyon ⁵	1928	3	Ariz.-Nev.-Calif.	523,000	801,500	1,034,800	1,322,300	184,282,626	245,809
Buffalo Rapids 1 and 2	1937	6	Mont.	22,926	22,926	None	None	2,836,182	3,274
Buford-Trenton	1939	6	N. Dak.	7,851	7,851	None	None	1,318,405	1,441
Burnt River	1935	1	Oreg.	15,291	15,291	None	None	601,025	601
Carlsbad	1906	5	N. Mex.	25,485	25,485	None	None	3,992,734	3,993
Central Valley	1935	2	Calif.	106,465	1,042,000	154,000	⁶ 694,000	188,857,504	411,085
Colorado-Big Thompson	1937	7	Colo.	None	615,000	21,600	175,900	36,276,698	131,851
Columbia Basin	1935	1	Wash.	None	1,029,500	668,000	1,974,000	216,721,023	663,629
Davis Dam	1941	3	Ariz.-Nev.	None	None	None	225,000	19,128,143	104,218
Deschutes	1937	1	Oreg.	60,599	101,104	1,500	1,500	8,280,892	12,119
Eden ⁷	1940	4	Wyo.	None	20,000	None	None	283,744	3,712
Fort Peck ⁸	1938	6	Mont.	None	None	35,000	85,000	1,119,643	14,500
Frenchtown	1935	1	Mont.	4,935	4,935	None	None	273,603	274
Fruitgrowers	1938	4	Colo.	2,662	2,662	None	None	200,740	201
Gila	1928	3	Ariz.	5,767	115,000	None	None	12,357,220	55,144
Grand Valley	1912	4	Colo.	48,470	48,470	3,000	3,000	5,095,621	5,096
Humboldt	1935	4	Nev.	38,889	63,889	None	None	1,293,741	1,294
Hungry Horse	1944	1	Mont.	None	None	None	300,000	1,962,791	93,500
Huntley	1905	6	Mont.	32,508	32,508	None	None	1,559,590	1,560
Hyrum	1933	4	Utah	6,261	6,261	None	None	941,884	942
Intake	1944	6	Mont.	842	842	None	None	83,275	83
Kendrick	1933	7	Wyo.	2,208	35,000	32,400	32,400	18,838,029	24,000
Kings River	1940	2	Calif.	None	700,000	None	205,000	92,000	44,773
Klamath	1905	2	Oreg.-Calif.	157,616	157,616	None	None	8,850,296	12,332
Lewiston Orchards	1946	1	Idaho	None	3,490	None	None	45,438	1,681
Lower Yellowstone	1904	6	Mont.-N. Dak.	57,200	57,200	None	None	3,685,433	3,685
Mancos	1940	4	Colo.	None	8,200	None	None	1,084,066	3,245
Milk River ⁹	1903	6	Mont.	127,892	129,392	None	None	8,752,167	8,763
Minidoka	1904	1	Idaho	1,033,130	1,056,738	13,400	13,400	23,444,506	27,955
Mirage Flats	1940	7	Nebr.	12,000	12,000	None	None	2,688,712	2,983
Missoula Valley	1944	1	Mont.	None	2,100	None	None	238,783	269
Missouri Basin	1944	6, 7	7 States	None	5,307,000	None	2,000,000	19,497,720	2,131,972

1—PROJECTS IN OPERATION, UNDER CONSTRUCTION, OR AUTHORIZED—Continued

Project	Year Authorized	Region	State	IRRIGABLE ACREAGE ¹		POWER CAPACITY (KW.)		Cost to June 30, 1947	Estimated Ultimate (in thousand dollars)
				1947	Ultimate ²	1947 Installed	Ultimate		
<i>Moon Lake</i>	1935	4	Utah	72,608	72,608	None	None	\$1,600,360	\$1,600
<i>Newlands</i>	1903	4	Nev.	69,100	69,100	1,500	1,500	7,947,282	7,947
<i>Newton</i>	1940	4	Utah	2,225	2,225	None	None	584,389	726
<i>North Platte</i>	1903	7	Nebr.-Wyo.	375,548	375,548	6,200	6,200	19,564,133	19,564
<i>Ogden River</i>	1933	4	Utah	20,842	20,842	None	None	4,422,065	4,755
<i>Okanogan</i>	1905	1	Wash.	5,343	5,343	None	None	1,452,129	1,452
<i>Orland</i>	1907	2	Calif.	19,796	19,796	None	None	2,448,669	2,449
<i>Owyhee</i>	1924	1	Idaho-Oreg.	116,605	116,605	None	None	18,625,437	19,000
<i>Palisades</i>	1941	1	Idaho-Wyo.	None	650,000	None	60,000	988,848	53,950
<i>Paonia</i>	1939	4	Colo.	None	14,800	None	None	117,006	3,030
<i>Parker</i>	1935	3	Ariz.	None	None	120,000	120,000	22,954,318	23,518
<i>Pine River</i>	1937	4	Colo.	34,189	34,189	None	None	3,370,863	3,558
<i>Provo River</i>	1935	4	Utah	46,365	46,365	None	None	13,685,364	26,601
<i>Rapid Valley</i>	1939	6	S. Dak.	None	6,000	None	None	962,933	978
<i>Rathdrum Prairie</i> ¹⁰	1944	1	Idaho	3,109	4,159	None	None	371,802	481
<i>Rio Grande</i>	1905	5	N. Mex.-Tex.	173,326	173,326	24,300	24,300	10,897,510	13,493
<i>Riverton</i>	1919	6	Wyo.	42,113	101,542	1,600	1,600	7,179,170	18,415
<i>Salt River</i>	1903	3	Ariz.	380,553	380,553	70,950	70,950	20,244,680	20,245
<i>San Luis Valley</i>	1940	5	Colo.	None	466,000	None	None	603,596	44,696
<i>Sanpete</i>	1933	4	Utah	12,717	12,717	None	None	374,540	375
<i>Scopfield</i>	1943	4	Utah	15,609	15,609	None	None	883,559	939
<i>Shoshone</i>	1904	6	Wyo.-Mont.	87,148	149,148	5,600	10,600	15,639,022	21,470
<i>Strawberry Valley</i>	1905	4	Utah	47,149	47,149	1,550	1,550	3,507,423	3,507
<i>Sun River</i>	1906	6	Mont.	96,785	96,785	None	None	9,791,353	10,077
<i>Truckee Storage</i>	1935	4	Nev.-Calif.	28,811	28,811	None	None	1,093,328	1,093
<i>Tucumcari</i>	1938	5	N. Mex.	8,871	45,000	None	None	11,503,045	16,730
<i>Umatilla</i>	1905	1	Oreg.	33,608	33,608	None	None	6,618,635	6,619
<i>Uncompahgre</i>	1903	4	Colo.	98,067	98,067	None	None	8,976,443	8,976
<i>Vale</i>	1926	1	Oreg.	32,000	32,000	None	None	4,858,906	4,859
<i>Valley Gravity</i>	1941	5	Tex.	None	700,000	None	None	994,198	129,628
<i>Weber River</i>	1927	4	Utah	91,725	91,725	None	None	2,725,885	2,726
<i>Yakima</i> ¹¹	1906	1	Wash.	436,821	461,821	2,587	12,587	42,548,344	49,009
<i>Yuma</i>	1904	3	Ariz.-Calif.	68,948	68,948	1,600	1,600	10,275,466	10,275

¹ Includes acreage provided or to be provided with a supplementary water supply from Reclamation works, also acreage farmed by special and Warren Act contractors for Reclamation water.

² On operating projects, includes future extensions of acreage whether authorized or not unless itemized separately in projects, divisions or units of projects listed as under investigation.

³ Including Anderson Ranch and Payette.

⁴ Only 27,000 authorized.

⁵ Including All-American Canal and Colorado River front work and levee system.

⁶ Three plants only.

⁷ Work suspended.

⁸ Power facilities constructed and operated by Corps of Engineers.

⁹ Including Dodson unit but not Saco Divide which is included in the Missouri Basin project.

¹⁰ Including Post Falls and Hayden Lake but not Cabinet Gorge (see Rathdrum Prairie, Under Investigation).

¹¹ Including Roza division.

2—UNDER INVESTIGATION

The following 276 irrigation possibilities and other Reclamation developments were considered in drawing up the 1948-54 program. Not all projects listed would necessarily be constructed either during the 7-year period of the program or even ultimately, as the investigation of land and water resources in the West is a continuous process governing final determination of the projects to be recommended to Congress for construction. Regional acreage and power totals comprise only projects for which estimates were available as of June 30, 1947. Drainage basin is shown in parentheses.

REGION 1.—105 projects, divisions or units; total estimated acreage 3,150,000, electric power 2,600,000 kilowatts.

Applegate Valley (Northern Pacific), Oreg.
Arlington (Columbia), Oreg.
Baker, Upper unit (Columbia), Oreg.

Baker, Wolf Creek unit (Columbia), Oreg.
Big Lost River (Columbia), Idaho.
Birch Creek (Columbia), Idaho.
Bitterroot Valley (Columbia), Mont.
Blackfoot River Storage (Columbia), Mont.
Boise, Payette division, Payette Heights unit (Columbia), Idaho.
Bruneau (Columbia), Idaho.
Bruneau River (Columbia), Idaho.
Butter Creek (Columbia), Oreg.
Camas Creek (Columbia), Idaho.
Cambridge Bench (Columbia), Idaho.
Canby (Columbia), Oreg.
Challis (Columbia), Idaho.
Chambers Prairie (Northern Pacific), Wash.
Cottage Grove (Columbia), Oreg.
Council (Columbia), Idaho.

Crockett (Columbia), Idaho.
 Crooked River (Columbia), Oreg.
 Dalles, East unit (Columbia), Oreg.
 Dalles, West unit (Columbia), Oreg.
 Dayton (Columbia), Wash.
 Deschutes, Benham Falls reservoir (Columbia), Oreg.
 Donlan (Columbia), Mont.
 Entiat River (Columbia), Wash.
 Eugene (Columbia), Oreg.
 Eureka Flats (Columbia), Wash.
 Evans Valley (Northern Pacific), Oreg.
 Flathead Valley extension (Columbia), Mont.
 Foster Creek (Columbia), Wash.
 Glenwood (Columbia), Wash.
 Goose Lake (Lahontan), Oreg.
 Grande Ronde (Columbia), Oreg.
 Greater Wenatchee (Columbia), Wash.
 Greater Wenatchee, East unit (Columbia), Wash.
 Green-Puyallup (Northern Pacific), Wash.
 Hall Creek (Columbia), Wash.
 Hells Canyon (Columbia), Oreg.-Idaho.
 Hornet Creek (Columbia), Idaho.
 Illinois Valley (Northern Pacific), Oreg.
 Independence (Columbia), Oreg.
 John Day (Columbia), Oreg.
 Jordan Valley (Columbia), Oreg.
 Kalispell (Columbia), Mont.
 Kettle River (Columbia), Wash.
 Kleinschmidt Flat (Columbia), Mont.
 Lemhi Valley (Columbia), Idaho.
 Libby (Columbia), Mont.
 Little Blackfoot-Cottonwood (Columbia), Mont.
 Little Lost River (Columbia), Idaho.
 Lolo Creek (Columbia), Mont.
 Long Tom, East (Columbia), Oreg.
 Long Tom, West (Columbia), Oreg.
 Mackay (Columbia), Oreg.
 Mann Creek (Columbia), Idaho.
 Marysville-Arlington (Northern Pacific), Wash.
 Medicine Lodge (Columbia), Idaho.
 Merlin (Northern Pacific), Oreg.
 Mesa (Columbia), Idaho.
 Milton-Freewater (Columbia), Wash.-Oreg.
 Minidoka, North Side (Columbia), Idaho.
 Molalla (Columbia), Oreg.
 Mountain Home, East unit (Columbia), Idaho.
 Mountain Home, Payette division (Columbia), Idaho.
 Nespelem River (Columbia), Wash.
 Nevada North Side (Columbia), Mont.
 North Bench (Columbia), Idaho.
 Pahsimeroi (Columbia), Idaho.
 Paradise (Columbia), Mont.
 Paulina (Columbia), Oreg.
 Pendleton (Columbia), Oreg.
 Pend Oreille (Columbia), Idaho.
 Post (Columbia), Oreg.
 Racetrack Creek (Columbia), Mont.
 Raft River (Columbia), Idaho.
 Rathdrum Prairie (Columbia), Wash.-Idaho.
 Rock Creek (Columbia), Idaho.
 Rock Island Gorge (Columbia), Mont.
 Rogue River (Northern Pacific), Oreg.
 Roosevelt (Columbia), Wash.
 Salem (Columbia), Oreg.
 Sanpoil River (Columbia), Wash.
 Sequim (Northern Pacific), Wash.
 Squaw Creek (Columbia), Oreg.
 Sunset Valley (Columbia), Mont.
 Talent (Northern Pacific), Oreg.
 Teton Basin (Columbia), Idaho.
 Tualatin (Columbia), Oreg.
 Umatilla Rapids, Cold Springs unit (Columbia), Oreg.
 Umatilla Rapids, Horse Heaven unit (Columbia), Wash.
 Upper Burnt River (Columbia), Oreg.
 Upper Horse Heaven (Columbia), Wash.
 Upper John Day (Columbia), Oreg.
 Upper Star Valley (Columbia), Wyo.
 Vale, Bully Creek extension (Columbia), Oreg.
 Walla Walla (Columbia), Wash.
 Wapinitia (Columbia), Oreg.
 Willamette Flood Plain (Columbia), Oreg.
 Willow Creek (Columbia), Oreg.
 Wood River (Columbia), Idaho.
 Yakima, Kennewick division (Columbia), Wash.
 Yakima, supplemental storage (Columbia), Wash.
 Yamhill (Columbia), Oreg.

REGION 2.—30 projects, divisions or units; total estimated acreage 1,700,000,
 electric power 1,600,000 kilowatts.

Bidwell Bar (Central Valley), Calif.
 Black Butte (Central Valley), Calif.
 Browns Valley (Central Valley), Calif.
 Butte Valley (Central Pacific), Calif.
 Clikapudi (Central Valley), Calif.
 Deer Creek (Central Valley), Calif.
 Feather-Yuba Ridge (Central Valley), Calif.
 Folsom (Central Valley), Calif.
 Fresno-Chowchilla (Central Valley), Calif.
 Georgetown Divide (Central Valley), Calif.
 Greenville (Central Valley), Calif.
 Hayfork Valley (Central Pacific), Calif.
 Kaweah River (Central Valley), Calif.
 Kern River (Central Valley), Calif.
 Klamath Marsh (Central Pacific), Oreg.
 Nashville (Central Valley), Calif.
 New Bullards Bar (Central Valley), Calif.
 New Hogan (Central Valley), Calif.
 New Melones (Central Valley), Calif.
 Rollins (Central Valley), Calif.
 Sacramento River canals (Central Valley), Calif.
 San Luis West Side (Central Valley), Calif.
 Santa Barbara County (Southern Pacific), Calif.
 Silver Creek (Central Valley), Calif.
 Sly Park (Central Valley), Calif.
 Sprague River (Central Pacific), Oreg.
 Swan Lake (Central Pacific), Oreg.
 Trinity River Diversion (Central Pacific), Calif.
 Tule River (Central Valley), Calif.
 Yolo-Lake County (Central Valley), Calif.

REGION 3.—18 projects, divisions or units; total estimated acreage 900,000,
 electric power 1,830,000 kilowatts

Bill Williams (Lower Colorado), Ariz.
 Bridge Canyon (Lower Colorado), Ariz.
 Central Arizona (Lower Colorado), Ariz.
 Chino Valley (Lower Colorado), Ariz.
 Dixie (Lower Colorado), Utah-Ariz.
 Fort Mohave (Lower Colorado), Nev.
 Gila, Wellton-Mohawk division (Lower Colorado), Ariz.
 Hassayampa (Lower Colorado), Ariz.
 Holbrook, Forks unit (Lower Colorado), Ariz.
 Holbrook, Joseph City unit (Lower Colorado), Ariz.
 Las Vegas Pumping (Lower Colorado), Nev.
 Moapa Valley (Lower Colorado), Nev.
 Palo Verde Mesa (Lower Colorado), Calif.
 Pilot Knob (Lower Colorado), Calif.
 Salt River Power (Lower Colorado), Ariz.
 Snowflake (Lower Colorado), Ariz.
 Victor (Lahontan), Calif.
 Winslow (Lower Colorado), Ariz.

REGION 4.—51 projects, divisions or units; total estimated acreage 2,100,000,
 electric power 1,300,000 kilowatts

Animas-La Plata (Upper Colorado), Colo.-N. Mex.
 Bluff (Upper Colorado), Utah
 Bear River, Cutler-Oneida unit (Bonneville), Idaho-Utah
 Bear River, Glendale-Mapleton unit (Bonneville), Idaho-Utah
 Bear River, South Cache unit (Bonneville), Utah
 Carracas (Upper Colorado), Colo.
 Carson River (Lahontan), Nev.-Calif.
 Central Utah (Bonneville), Utah-Colo.
 Collbran (Upper Colorado), Colo.
 Colorado River Storage (Upper Colorado), Ariz.-Colo.-N. Mex.-Utah-Wyo.
 Colorado River Storage, Glen Canyon unit (Upper Colorado), Ariz.-Utah
 Dolores (Upper Colorado), Colo.-Utah
 Dulce-Chama-Navajo (Upper Colorado), Colo.-N. Mex.
 Emery County (Upper Colorado), Utah
 Florida (Upper Colorado), Colo.-N. Mex.
 Gooseberry (Upper Colorado), Utah
 Gunnison River (Upper Colorado), Colo.
 Gunnison River, Grand Mesa unit (Upper Colorado), Colo.
 Gunnison River, Smith Fork unit (Upper Colorado), Colo.
 Hammond (Upper Colorado), N. Mex.
 Henrys Fork (Upper Colorado), Wyo.-Utah
 Hunter Mesa (Upper Colorado), Colo.
 Jensen (Upper Colorado), Utah
 Little Snake River, Savery-Pot Hook unit (Upper Colorado), Colo.-Wyo.
 Lyman (Upper Colorado), Wyo.
 Malad Valley (Bonneville), Idaho
 Minnesota (Upper Colorado), Colo.

Nucla (Upper Colorado), Colo.
 O'Neal Park (Upper Colorado), Colo.
 Opal (Upper Colorado), Wyo.
 Pine River extension (Upper Colorado), Colo.-N. Mex.
 Preston Bench (Bonneville), Idaho
 Provo River extension (Bonneville), Utah
 San Miguel (Upper Colorado), Colo.
 Saucer Valley (Upper Colorado), Colo.
 Silt (Upper Colorado), Colo.
 South San Juan (Upper Colorado), N. Mex.
 Sublette, Daniel unit (Upper Colorado), Wyo.
 Sublette, Elkhorn unit (Upper Colorado), Wyo.
 Sublette, Fontenelle unit (Upper Colorado), Wyo.
 Sublette, LaBarge unit (Upper Colorado), Wyo.
 Sublette, Paradise unit (Upper Colorado), Wyo.
 Sublette, Seedska-dee unit (Upper Colorado), Wyo.
 Sublette, West Side unit (Upper Colorado), Wyo.
 Truckee Storage extension (Lahontan), Nev.-Calif.
 Vernal (Upper Colorado), Utah
 Walker River (Lahontan), Nev.-Calif.
 Weber Basin (Bonneville), Utah
 West Divide (Upper Colorado), Colo.
 West Paradox (Upper Colorado), Colo.
 Yampa River (Upper Colorado), Colo.-Wyo.

REGION 5.—68 projects, divisions or units; total estimated acreage 1,200,000, electric power 330,000 kilowatts

Amarillo municipal water (Arkansas), Tex.
 Belton (Gulf), Tex.
 Big Creek (Gulf), Tex.
 Big Sandy (Gulf), Tex.
 Black Mesa (Arkansas), N. Mex.
 Bluewater (Rio Grande), N. Mex.
 Brownwood (Gulf), Tex.
 Bueyeros (Arkansas), N. Mex.
 Canton (Arkansas), Okla.
 Capulin (Arkansas), N. Mex.
 Concan (Gulf), Tex.
 Cordova Bend (Gulf), Tex.
 Cottonwood (Gulf), Tex.
 Cotulla (Gulf), Tex.
 Dry Creek (Gulf), Tex.
 Eagle Pass (Rio Grande), Tex.
 Englewood (Arkansas), Okla.-Kans.
 Fort Cobb (Red), Okla.
 Fort Chadbourne (Gulf), Tex.
 Fort Gibson (Arkansas), Okla.
 Fort Griffin (Gulf), Tex.
 Fort Stockton (Rio Grande), Tex.
 Fort Sumner (Rio Grande), N. Mex.
 Fort Supply (Arkansas), Okla.
 Fort Supply Pumping (Arkansas), Okla.
 Foss (Red), Okla.
 Fowlerton (Gulf), Tex.

Hardesty (Arkansas), Okla.
 Harris County (Gulf), Tex.
 Inspiration Point (Gulf), Tex.
 Jim Ned (Gulf), Tex.
 Junction (Gulf), Tex.
 Kenton (Arkansas), Okla.
 La Pryor (Gulf), Tex.
 Laredo (Rio Grande), Tex.
 Laverne (Arkansas), Okla.
 Mangum (Red), Okla.
 Marble Falls (Gulf), Tex.
 Menard (Gulf), Tex.
 Meridian (Gulf), Tex.
 Miami (Arkansas), N. Mex.
 Miami-Fairland (Arkansas), Okla.
 Middle Rio Grande (Rio Grande), N. Mex.
 Mora (Arkansas), N. Mex.
 Mountain View (Red), Okla.
 Palo Duro (Arkansas), Tex.-Okla.
 Pauls Valley (Red), Okla.
 Presidio (Rio Grande), Tex.
 Pryor-Choteau (Arkansas), Okla.
 Quihi (Gulf), Tex.
 Quitaque (Red), Tex.
 Red Bluff (Rio Grande), Tex.
 Refugio (Gulf), Tex.
 Robert Lee (Gulf), Tex.
 Sabinal (Gulf), Tex.
 Saddle Mountain (Red), Okla.
 San Angelo (Gulf), Tex.
 Sanford (Arkansas), Tex.
 San Juan-Chama Diversion (Rio Grande), Colo.-N. Mex.
 San saba (Gulf), Tex.
 Santa Isabel (Rio Grande), Tex.
 Seymour (Gulf), Tex.
 Springer (Arkansas), N. Mex.
 Tascosa (Arkansas), Tex.
 Turkey Creek (Gulf), Tex.
 Vermejo (Arkansas), N. Mex.
 Victoria (Gulf), Tex.
 Zapata (Rio Grande), Tex.

REGION 6.—In addition to investigations of phase C units of the Missouri Basin project (see under 1—Under Construction or Authorized for Construction), investigations are under way in this region leading to the development of further areas in the Missouri River basin.

REGION 7.—4 projects; acreage and power not estimated

Blue-South Platte (Upper Colorado), Colo.
 Gunnison-Arkansas (Upper Colorado), Colo.
 South Pass (Upper Colorado), Wyo.
 Yampa-North Platte (Upper Colorado), Wyo.-Colo.