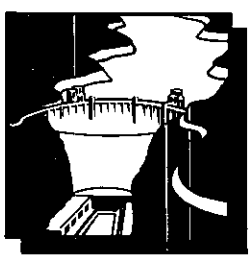

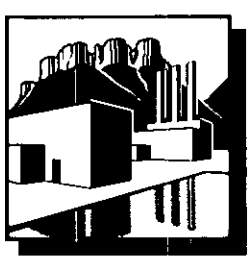

NEW CHALLENGE NEW DIRECTION:

THE WATER POLICY REPORT
OF THE WESTERN GOVERNORS' ASSOCIATION.

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Jo Clark
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WGA is an independent, non-partisan organization of sixteen western states, one Pacific commonwealth, and two territories.
Established in 1984, as a result of the merger between the Western Governors' Policy Office (WESTPO) and the Western Governors' Conference (WGC), its purpose is to strengthen the policymaking and management capacity of member states and their role in the federal system.
It serves the interest of the governors across a range of functional concerns, including energy, agriculture, water, natural resources, international trade, fiscal policy, economic development, and related issues.

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FOREWORD

by Governor Bruce Babbitt, Arizona

I am pleased to introduce this analysis of some current issues in western water development. Bearing in mind that "the West" is roughly half of the total area of the United States and that specific water issues and problems can vary significantly from state to state, this report nonetheless provides the best up-to-date view of western water facts, history, needs, constraints, benefits, and expenditures that I have read.

The discussion in the final section of the changing pressures and possible policy options confronting governors, other elected officials, and water managers lays out clearly the difficult decisions facing us all. The western governors will be discussing the implications of these findings with each other, with members of Congress, with groups from around the country, and with those who live in the West and have to live with the consequences of our decisions.

The major findings of the report are:

1. The West, partly because of its aridity and dependence on man-made storage and distribution systems, has become the most urbanized region of the country — an oasis society — with seventy-eight percent of its residents living in urban areas compared with seventy-four percent in the rest of the nation. However, ninety percent of western water is used for irrigated agriculture.
2. Western water systems differ from those in other parts of the country because of the limited amount of precipitation that falls, the seasonal and yearly variability, the uneven geographic distribution, the system of water law, and the role of the federal government which owns fifty percent of the land in the West.

   Western water development is similar to that of the rest of the nation in the concern for water quality and declining groundwater aquifers, the growing need for rehabilitation of existing systems, and the pressures of coping with a declining federal role in water development.
3. Western water systems are part of a national water development system which includes navigation, flood control, hydroelectric generation, municipal and industrial water supply, irrigation, recreation, fish and wildlife, and wastewater treatment. When expenditures for all these purposes are considered, total federal spending in the North, South, and West is virtually equal. Of all water development purposes, only users of hydropower, municipal and industrial supply, and irrigation are required to repay a significant portion of their costs. These are the principal purposes of western projects.
4. The national water system comprises about one quarter of the federal investment in civil public works, behind transportation and somewhat more than that spent for community development. Over time these investments have constituted a balanced program to promote the national interest. However, federal spending for all categories of public works has declined sharply over the last twenty-five years, leading to our well-publicized infrastructure deterioration.

5. During the ten year period from 1973-1983, tax revenues from western water projects exceeded total federal expenditures for western water development by a ratio of almost six to one. Sixty-three percent of those taxes were paid directly to the federal government. Direct economic outputs during this period are valued at $145 billion while indirect outputs are estimated to total $190 billion. In addition, western water development strengthens American agriculture, adds to energy independence, provides unique national recreational opportunities, reduces flooding, contributes to the quality of life in cities, and enhances wilderness values.

   Western water development also serves a number of national obligations — Indian water rights, Mexican and Canadian treaties, and meeting salinity levels for water delivered to Mexico.
6. The western water system is almost completed, with most of the basic framework of mainstem dams in place. However, to fully capture the benefits of that investment, some tributary dams and distribution facilities for both urban and rural use remain to be constructed. The federal government has an obligation to work with states to complete those projects which were authorized as part of a multi-state, multi-benefits package and are still considered high state priorities.

As interesting as these and the other findings in the report are, they deal with physical realities and the results of past actions. It is the final section, which examines some of the changing trends in water development financing and management, and the options we have to choose from, which should concern those of us who will shape water policy and development for the future. Pressures are growing and compounding an already complex situation. Western water is in transition — uses, values, demands, financing, even our water law and institutions, are evolving as we move from an era of unconstrained growth to one which has to focus more on equity, preservation, rehabilitation, conservation, and best use of limited resources.

The report presents four major issues and some options for each. In some cases, none of the options are completely satisfactory and some may be extremely difficult to implement, but choosing one may be unavoidable.

FINANCING

Water project financing will be much more difficult in the future. In addition to the decline in federal financing, state and local governments face the same problem the Congress does — too many competing demands for the available tax revenues. Bond markets face growing demands from both the public and private sectors for financing and even bonds for the most economic water projects may involve large amounts of capital, very long terms, and some uncertainty in revenue sources. Borrowing is not a substitute for a revenue source or an appropriation.

Some of the options for raising revenues for water development include:

1. *Increased user fees*, which could include full cost pricing, additional beneficiary charges, and depletion charges such as pump taxes. Although theoretical economic efficiency would be enhanced, social equity could be seriously disrupted, and with ninety percent of the water used by agriculture, the impacts on consumer prices, land uses, and small communities could be substantial.
2. *Increased hydro rates.* This option would expand the use of the traditional "cash register" for western water projects, but runs immediately into the reality that most western hydro power is sold, by law, at cost to "preference" customers — rural cooperatives, small municipalities, and others who are not well served by private utility markets.
3. *Increased private participation.* "Privatization" has appeal and will be used to construct more and more projects. However, the fact remains that most western water development is beyond the scale of private companies and often involves

some subsidization of certain users. Privatization also raises the question of loss of control, coordination, and capture of benefits from a public resource.

4. *State and local taxes.* General revenues often provide basic funding for non-federal western water needs — small or rural municipal supply, irrigation, rehabilitation, and other subsidized or "public good" purposes such as flood control, recreation, and environmental protection. However, most states do not have the ability to significantly increase appropriations for water development at the same time they are increasing outlays for education, health care and other programs in which federal support is being reduced.
5. *Continued federal financing.* Periodic authorizations and appropriations will continue to be made, particularly in election years, but most observers doubt that federal financing will ever return to the pattern of the '50's and '60's. Other commitments and priorities will claim available federal revenues first. At the same time, ongoing federal responsibilities remain — Indian water development, treaty obligations, multi-state projects, projects serving national purposes, and environmental protection. We need to be sure that the federal government lives up to those responsibilities and does not pass them on to states.

CONSERVATION/MANAGEMENT

An alternative to some financing demands, such as new project development, may be found in increased conservation and management to avoid new construction. The advantages of such steps are that a state may save water, avoid the costs of new storage, and avoid the costs of water treatment plants, new distribution lines, etc. The disadvantages are that with the hydrological connection between surface water, groundwater, and return flows and the multiple reuse of water in all western rivers, conservation benefits may not accrue to the conserver and downstream impairment may preclude conservation measures.

Options include:

1. Conducting the technical and legal analyses to optimize conservation throughout a river basin.
2. Allowing water to reach market prices and facilitating transfers. This, too, could free up large quantities of water. However, the major impact of such a step would be on irrigated agriculture, driving up the cost of production, reducing the amount of agriculture, and challenging our country's cheap food policy.
3. Accepting less than optimal water supply, including restrictions on time or frequency of water use, reduced reliability of quantity or quality of water supply, and statutory limits on growth.

INDIAN WATER RIGHTS

Indians have the judicially established but often unquantified right to enough water to fulfill the purposes of their reservation. These rights will often be substantial and may occur on rivers which are already fully appropriated. Because the Indian water rights derive from a U.S. Supreme Court decision and the existing appropriations derive from congressional acts which promoted western development and recognized the West's prior appropriation system, the nation and its federal government now have the obligation to treat all interests fairly in accommodating the additional claims.

Options include:

1. Providing the technical and financial assistance to tribes so that they have the necessary information to enter into negotiations for settlement.
2. Assuring that adjudications are decided in the context of the entire river basin — its hydrology, history, demographics, and existing and potential uses.
3. Determining whether tribes must use their water on reservation or may sell or lease it off reservation.
4. Where new supplies are unavailable, providing equitable compensation for those who lose their water — whether Indian or non-Indian.

INTERSTATE GROUNDWATER MANAGEMENT

As we increasingly tap our underground resources, we don't always have well developed systems to manage them, particularly on an interstate basis. Laws vary between states, surface and groundwater laws vary within a state, management responsibilities are fragmented, and many policy questions, such as the relationship of underground flows to surface compact deliveries or the relationship between surface uses and groundwater quality, have not been comprehensively addressed.

Options include:

1. Establishing a state-directed process for examining the issues and developing steps to resolve them.
2. Allowing the courts to continue to frame the options, as they have done recently in the *Sporhase* and *El Paso* decisions.
3. Working with Congress and federal agencies to establish national policy governing groundwater aquifers.

None of these issues is going to be resolved quickly or easily. Neither can they be avoided. In the case of an issue such as Indian water rights, all options may need to be pursued. In the groundwater case, I hope we can agree quickly that only one option, the first is desirable and proceed. In the case of financing, and the conservation alternative, virtually everyone will be affected. We need to establish a mechanism to explore more fully the potential, the ramifications, and the steps needed to implement the various options.

Speaking for my colleagues in the Western Governors' Association, we are resolved to seek solutions to these very difficult problems. We intend to exercise our leadership to preserve and enhance the outstanding system of water development which has enabled the West to develop and make its contribution to the nation. Our obligation is to the future.

INTRODUCTION

"What is the heart of the West? Where is the center from which the shaping force and power radiate? The answer is simple if we would only see and accept it. The heart of the West is a desert, unqualified and absolute."

— Walter Prescott Webb

There is no more essential commodity in the western United States than water. There is no more politically charged issue in the western United States than water development policy.

Without a grasp of these two basic realities, it is impossible to understand the controversy over western water.

The development of the West has been defined by the course of its rivers, and by federal policies designed to exploit this desert region's limited water resources.

But in the last decade this relationship has changed significantly. Budget constraints at the federal level, a major change in philosophy about the limits of federal activity, and increased competition for limited federal resources have caused water development activities in the West to slow significantly and the outlook to become clouded.

Meanwhile, demand for water to accommodate increased population and industrial growth, to maintain agricultural output, and sustain some stream flows continues inexorably.

As the situation has become more serious, the positions of some parties have become more strident. The subtleties of what is an extremely complicated public policy issue have been lost, and the debate too often has been reduced to simplistic slogans.

Opponents of continued federal support for western water development couch their arguments in terms of "boondoggles" and "porkbarrel projects."

Some proponents of continued development insist that every proposed project is "absolutely essential," and that western agriculture, western industry, the entire western way of life, is contingent on massive federal aid.

Instead of a valid discussion of alternative public policy approaches, all too often the dialogue has been reduced to an emotional battle pitting regional leader against regional leader.

One thing is for certain . . . no real progress can be made on this vital issue until serious dialogue has been restored, until some national consensus has been formulated.

Water is the West's oldest problem, but the solutions must change with the times.

The goal of this policy paper is to attempt to break the stalemate, and begin the process of consensus building by moving away from the old arguments, and taking a hard look at the realities that face us. Water in the West is a regional problem, but the consequences have implications for the entire nation's well-being.

Water is the West's oldest problem, but the solutions must change with the times.

I: WATER AND THE WEST

THE HARD REALITIES

The dynamism of the West obscures its fragility, its utter dependence upon uncertain supplies of water.

Earlier cultures thrived, or were destroyed, depending on their ability to overcome the vagaries of nature. Anthropologists have located massive water storage and distribution systems built by the Hohokam Indians of southern Arizona a thousand years ago; one canal was six feet deep, thirty feet wide, and thirty miles long.

Two hundred years later, Anasazi living in Chaco Canyon, New Mexico and Mesa Verde, Colorado, built irrigation, water supply, and flood control systems. When water supplies diminished, anthropologists speculate, the Anasazi, "the ancient ones", disappeared.

Cultures change, but conditions remain the same.

THE OASIS SOCIETY

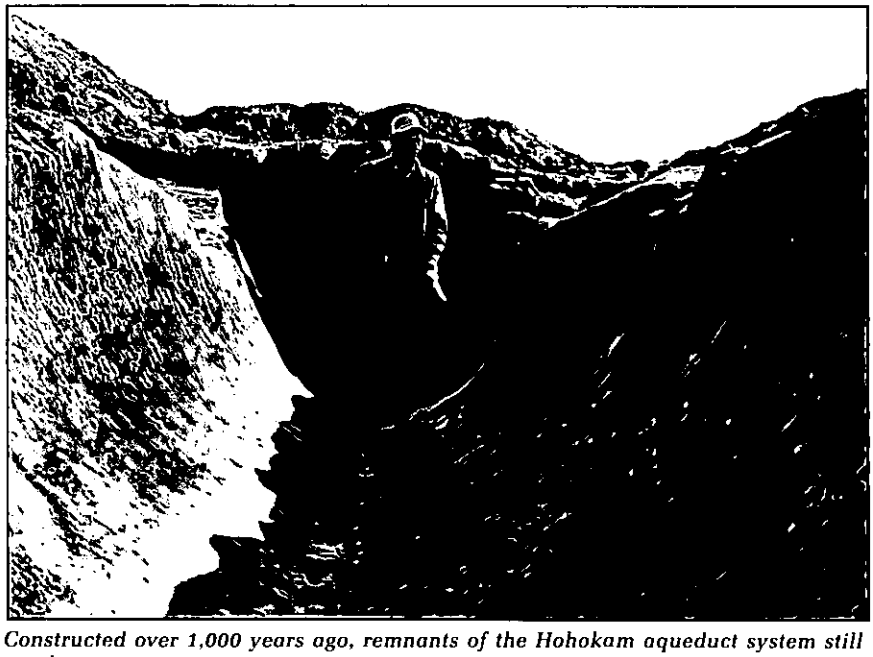
The West is the least densely populated section of the United States, and the most urbanized. Both facts are dictated by the limited availability of water.

An area of over one million square miles receives less than twenty inches of precipitation a year. Along the 100th meridian, the Great Plains average ten to twenty inches a year. Vast sections of Idaho, Wyoming, Utah, and Arizona average less than eight inches.

Phoenix, Denver, Albuquerque, and Salt Lake City have developed in areas where fifteen inches of precipitation or less is the norm.

By contrast, the eastern United States averages forty-four inches per year.

And, unlike the East, rainfall is erratic.



Constructed over 1,000 years ago, remnants of the Hohokam aqueduct system still survive.

It's erratic seasonally. Seventy percent of western streamflow originates from winter snowfalls which melt and run off rapidly in May, June, and July. A typical eastern river might experience a doubling of streamflow between the driest and wettest months. A typical western river would show a variation twenty times as great.

It's erratic in terms of annual precipitation. Over a sixty year period, the amount of annual streamflow in an eastern water system might vary by a factor of twenty-five. Western rivers monitored over the same time period show variation factors as high as eighty-five. In others words, the amount of water available from year to year from eastern water sources is relatively stable; the amount available from western sources is much more variable and unpredictable.

The West is the least densely populated section of the United States, and the most urbanized. Both facts are dictated by the limited availability of water.

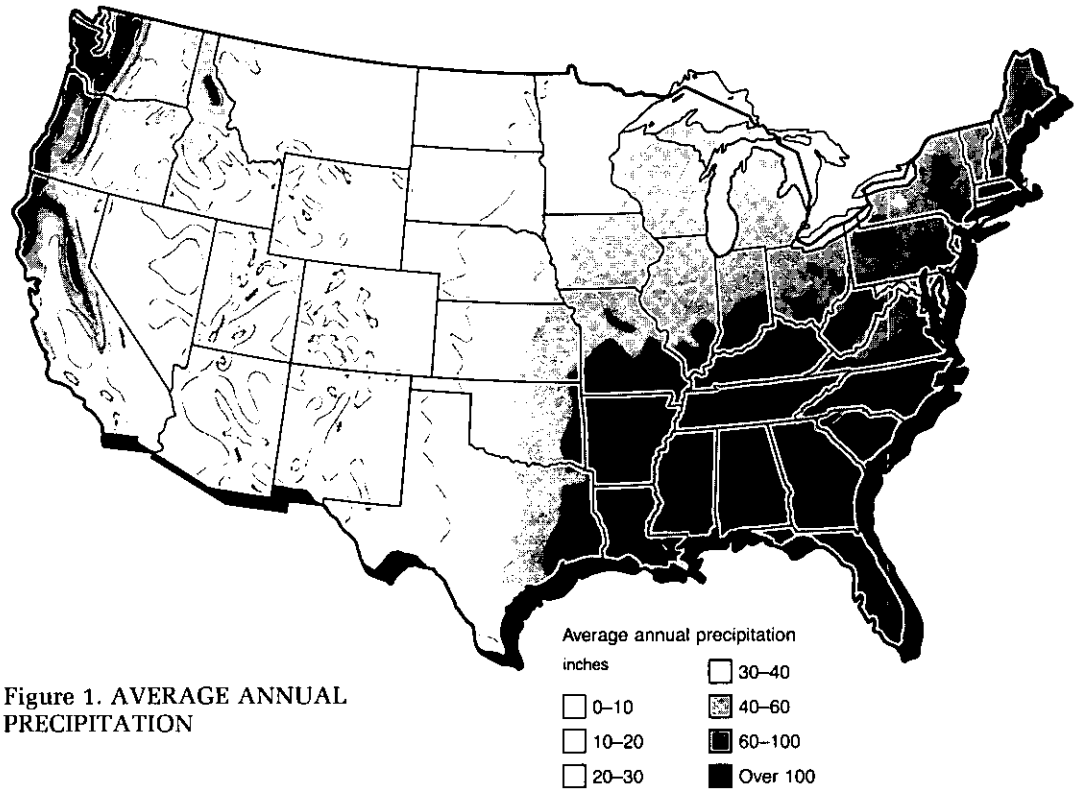


Figure 1. AVERAGE ANNUAL PRECIPITATION

Thus the West is confronted with mismatched supply and demand . . . where the water is, the people and farms aren't.

It's erratic in terms of geography. Parts of some states in the Pacific Northwest receive over 100 inches of precipitation annually, while other parts of the same states receive ten inches or less. Moreover, most precipitation falls on mountains, while the areas of greatest use are the cities and farmlands of the valleys and plains.

So while precipitation in the eastern United States is relatively abundant, predictable, and uniformly distributed, the West is not so fortunate.

The western half of the nation contains only thirty percent of the country's streamflow, and over two-thirds of that supply is concentrated in three states.

Thus the West is confronted with mismatched supply and demand . . . where the water is, the people and farms aren't.

Survival dictates that water must be collected, stored, and distributed to be available where and when it is needed.

VANISHING AQUIFERS

The West is caught in a vicious cycle. Because rainfall is sparse, farms and cities must depend more on available groundwater supplies. But because of the lack of precipitation, groundwater use may quickly exceed nature's ability to replace it.

California, Arizona, Idaho, and the High Plains states make extensive use of groundwater, and are encountering the same problems faced by many eastern states — overdrafting, land subsidence, saltwater intrusion, contamination, and increased pumping costs.

To put the matter in perspective, consider the usage patterns of the nation's largest aquifer, the Ogallala, which lies below seven states in the High Plains. Thirty years ago, 2,000 wells tapped into this water source. Today, the number has swelled to 70,000.

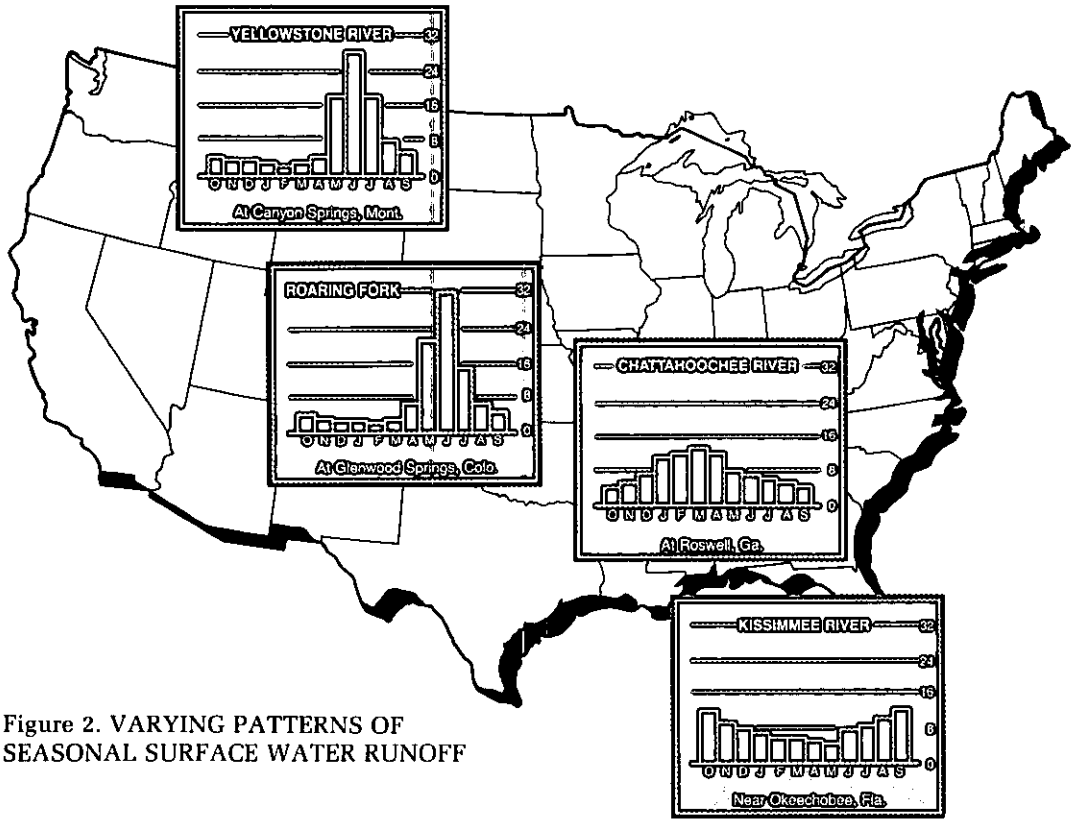


Figure 2. VARYING PATTERNS OF SEASONAL SURFACE WATER RUNOFF

Each year these wells draw the equivalent of twice the annual flow of the Colorado River from the aquifer. Pumping costs in parts of Texas have climbed from $1.50 per acre-foot to $60 per acre-foot in less than ten years. Demand is clearly outstripping available supplies.

The problem of water withdrawals is made more serious because of the manner in which water is used in the West.

Across the country, water usage on a per capita basis is relatively similar.

When one compares the amount of water consumed, that is, not returned to the water system, the western pattern is high.

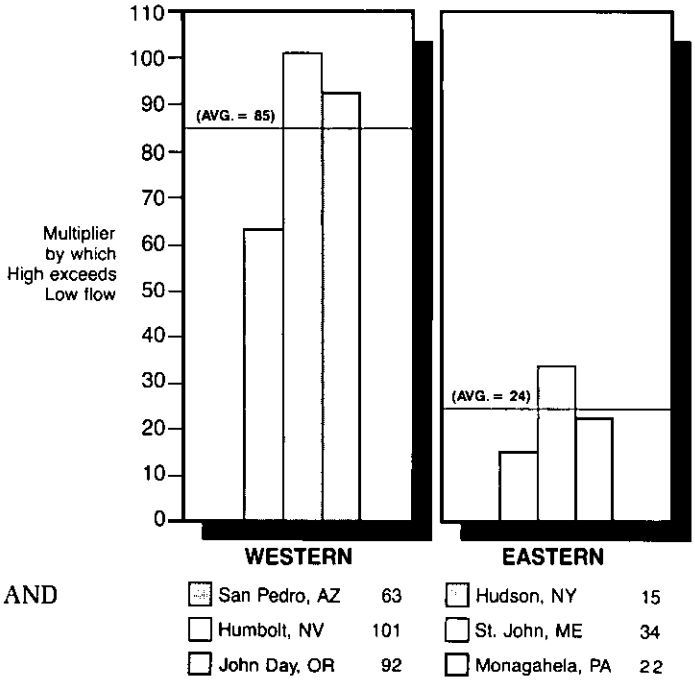


Figure 3. DIFFERENTIAL BETWEEN MAXIMUM AND MINIMUM STREAMFLOWS

Figure 4. STREAMFLOW VOLUME FOR MAJOR U.S. RIVERS

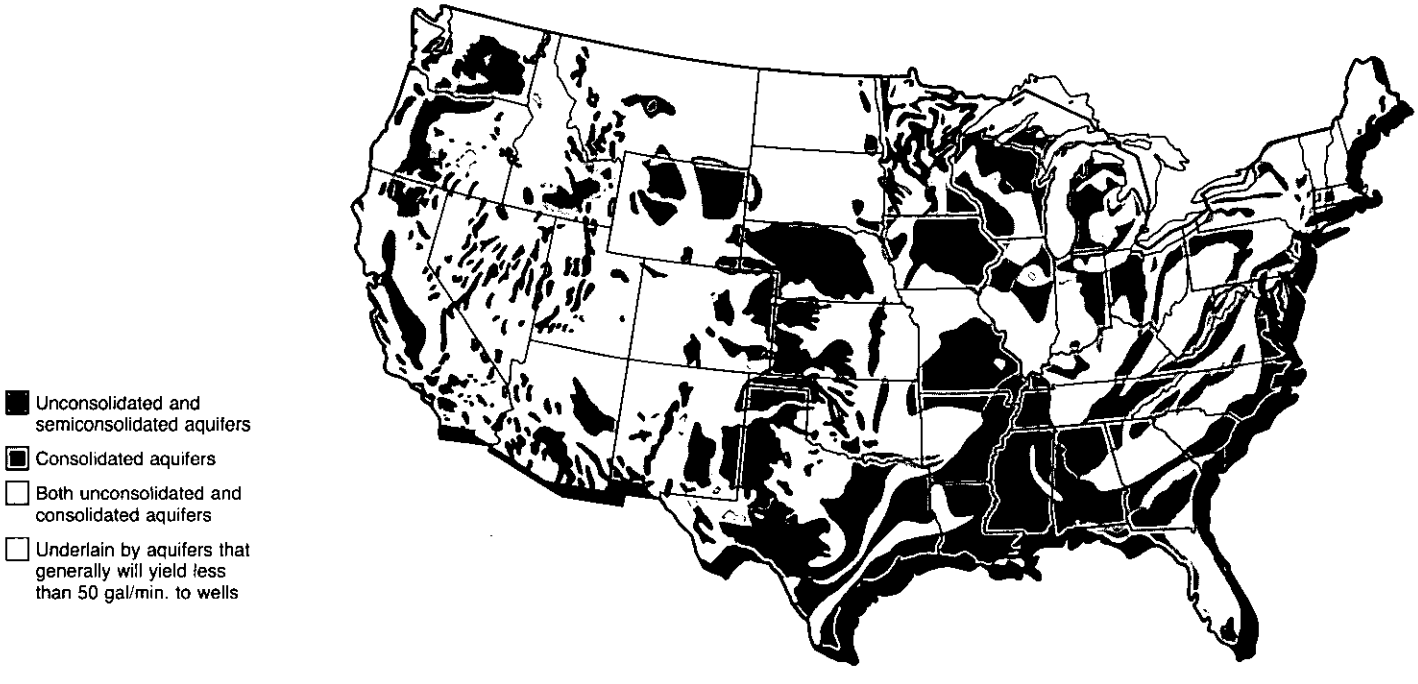


Figure 5. MAJOR AQUIFER SYSTEMS

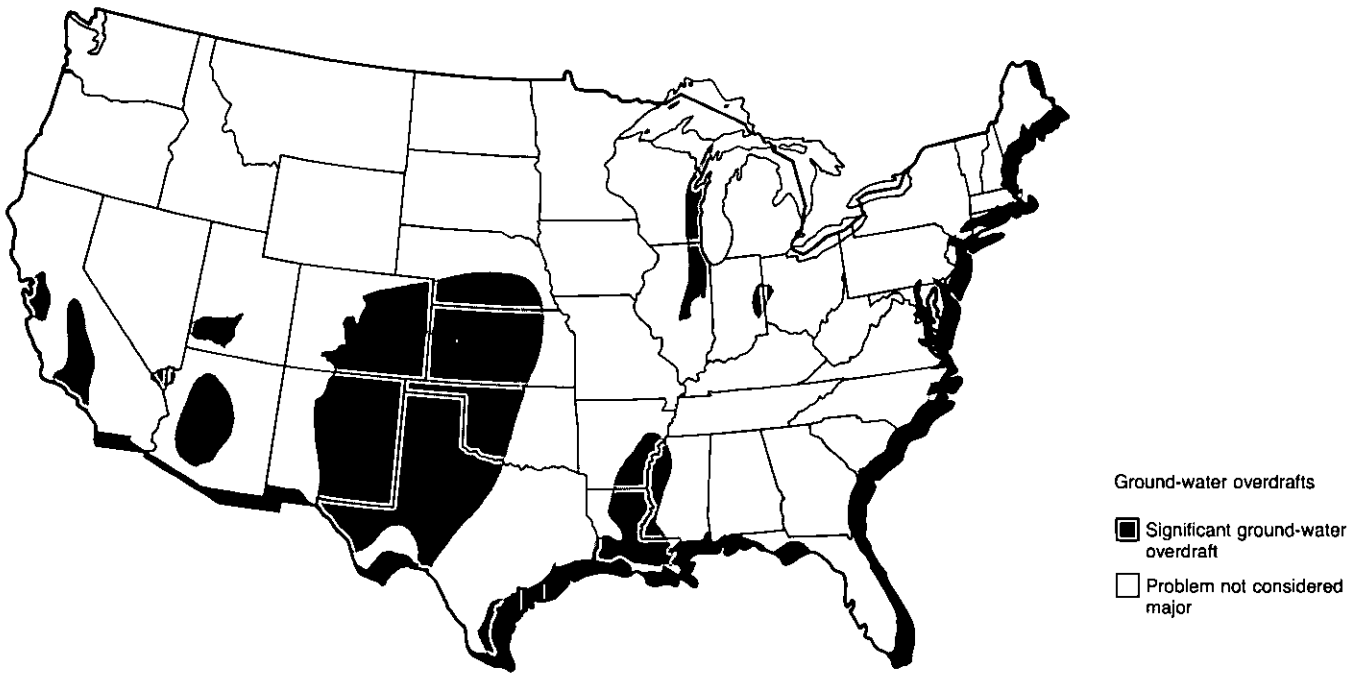


Figure 6. AREAS WITH MAJOR GROUNDWATER OVERDRAFTS

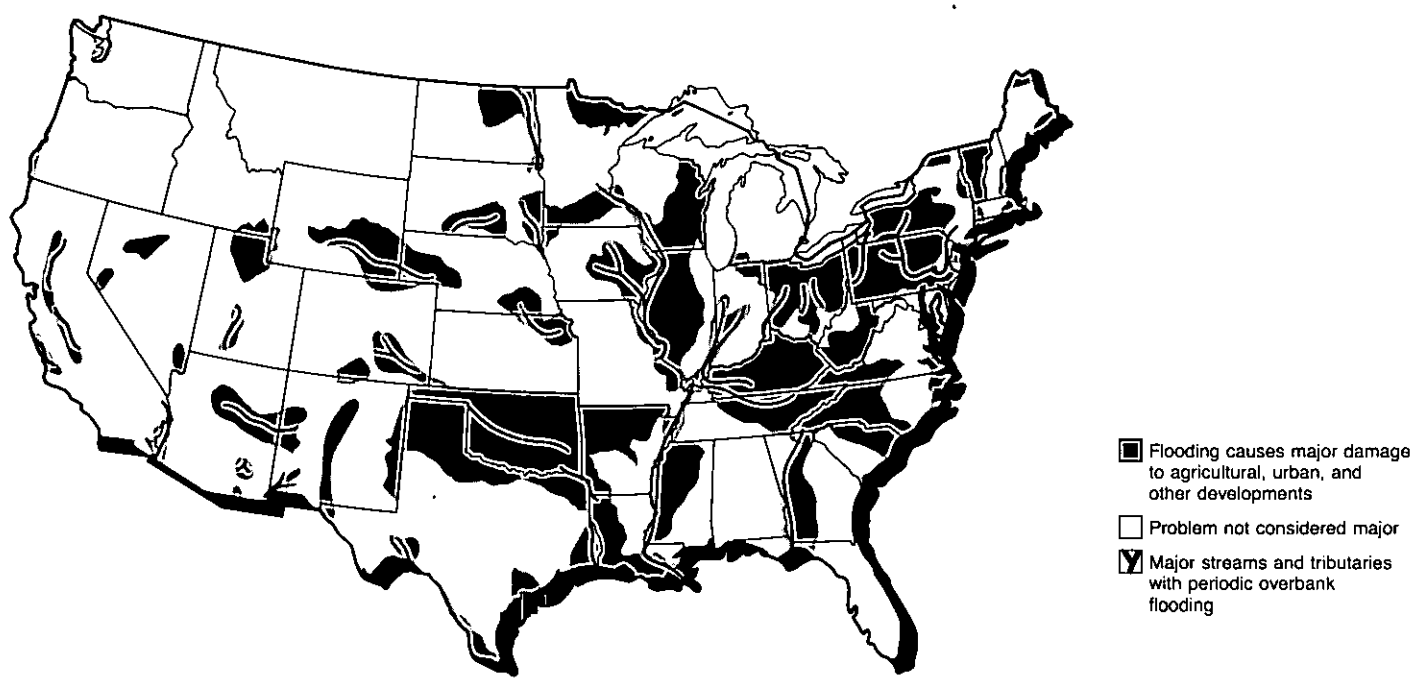


Figure 7. AREAS WITH MAJOR FLOODING PROBLEMS

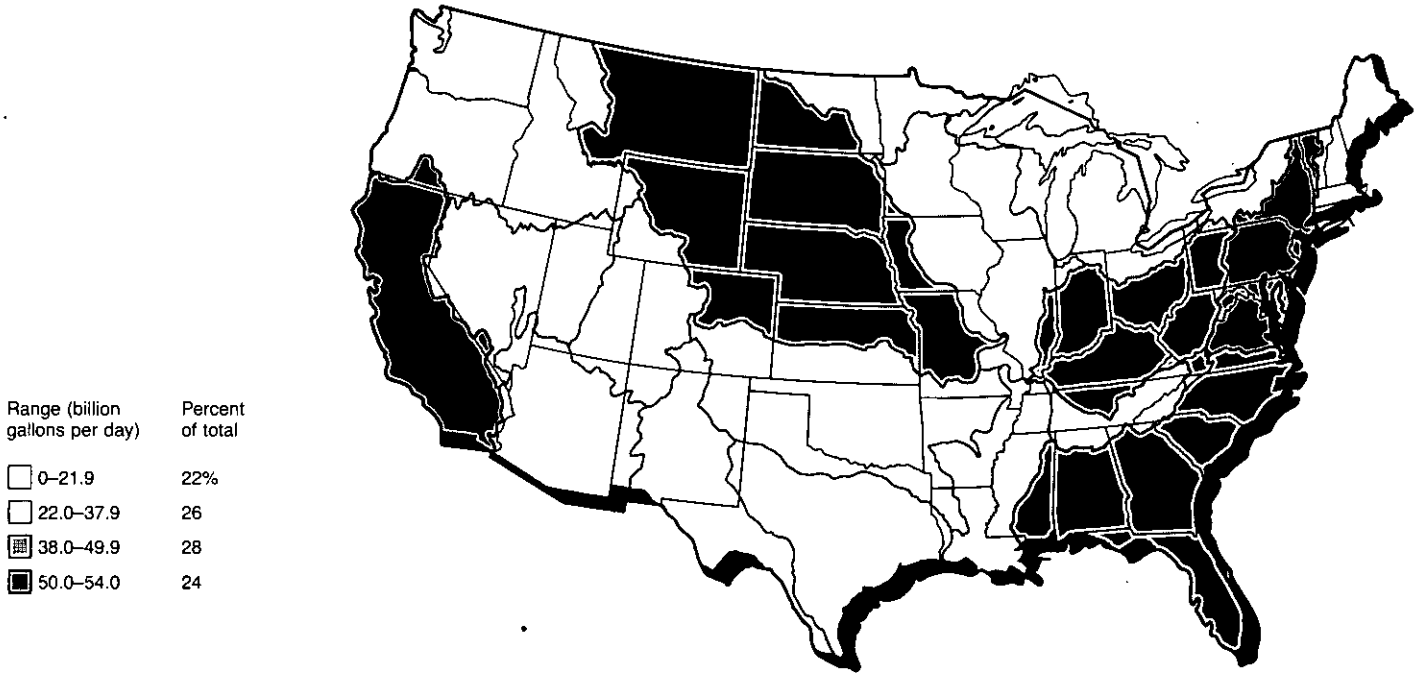


Figure 8. TOTAL OFFSTREAM WATER WITHDRAWALS

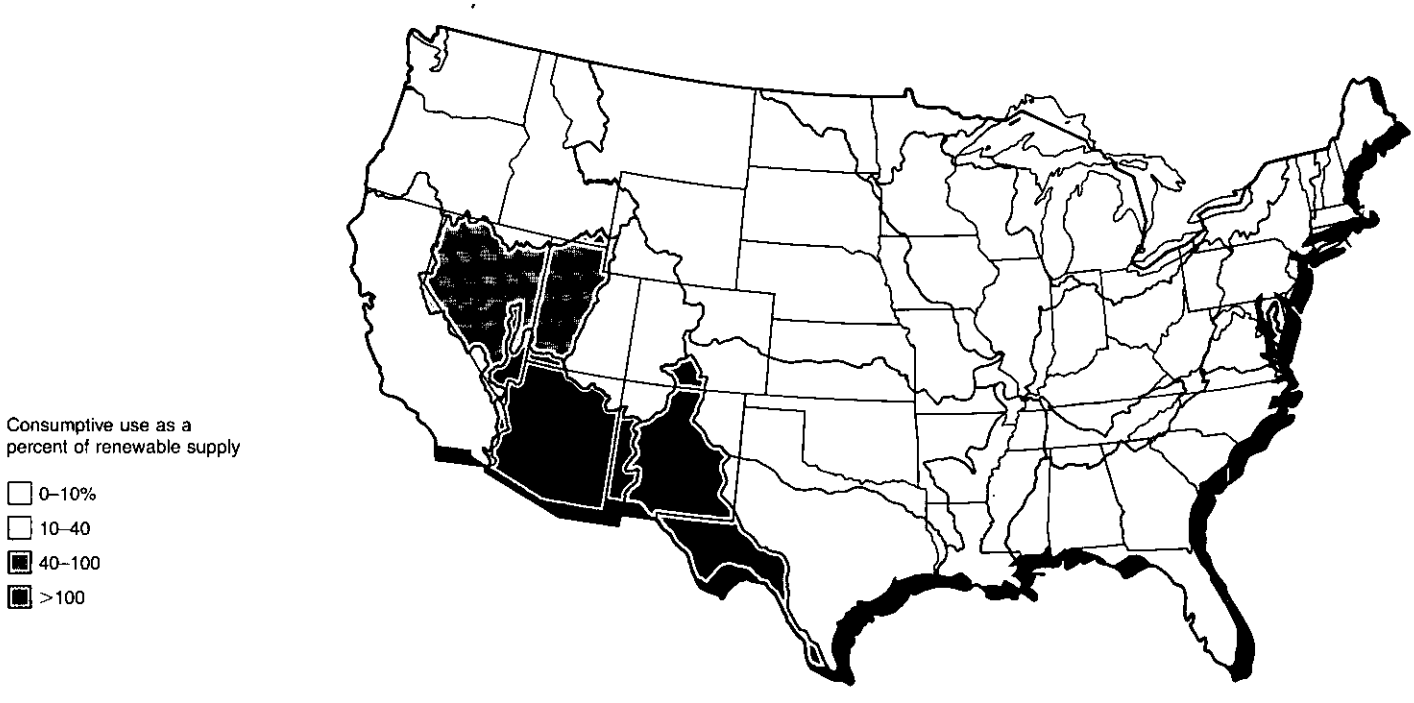
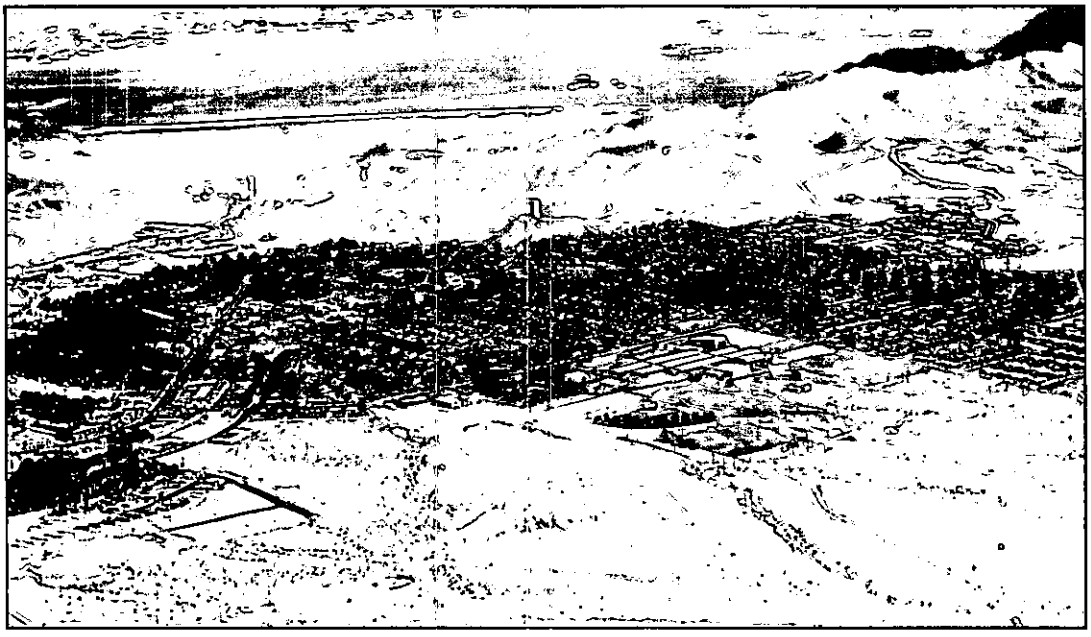


Figure 9. CONSUMPTIVE USE AS A PERCENTAGE OF RENEWABLE WATER SUPPLY



The relationship between water supply and population is evident in the development pattern of Boulder City, Nevada, along the shores of Lake Mead.

The reason is that the vast majority of water usage in the West goes for agricultural purposes. In the East, water is used primarily for industry. As a result, less than half the water withdrawn from western streams and aquifers is returned for other uses, while in the East, close to ninety percent of the water used is returned back to the original stream system.

So not only is there less water available in the West than in the East, but because of different patterns of use and consumption, there is less water available to be recycled back into the system.

DIFFERENT NEEDS, DIFFERENT LAWS

Given the differences in patterns of supply and demand, it is not surprising that eastern and western water law should vary as well. Nor should it be surprising that the prevailing legal structure plays a major part in controlling water development policy.

The East relies on the *riparian doctrine*. Those whose land adjoins a source of water may use it as long as the use is reasonable. They cannot divert it or transport it to land distant from the water.

Western law is based on the *doctrine of prior appropriation*. This allows users to divert and transport water over long distances, provided they have legal right to use the water. Without such legal right, no one can use the water, even if they live next to a lake or stream.

Those who have held their right the longest get to use the water first — "first in time, first in right" — which means that in a drought, senior rights take claim over junior ones to determine who has the use of available water.

Water rights thus have become very valuable commodities. They increase the value of everything else — farms, energy and natural resources, urban property.

Under western law, water rights are a property right which may be transferred or sold and are protected by a body of law.

A water right requires the owner to put the water to beneficial use as defined by state law; limits the water in amount, time of use and point of diversion; requires that the rights' owner use the water or lose his rights; and fixes the priority of right according to the date beneficial use began.

Any transfer or change of use is restricted by provisions that the change does not increase the amount of water used, nor does it impair the rights of other users.

Concern over impairment is a key legal issue in the West. Because of the scarcity of water, it must be re-used intensively. Water diverted to a municipal water supply, for example, will be discharged back

The prevailing legal structure plays a major part in controlling water development policy.

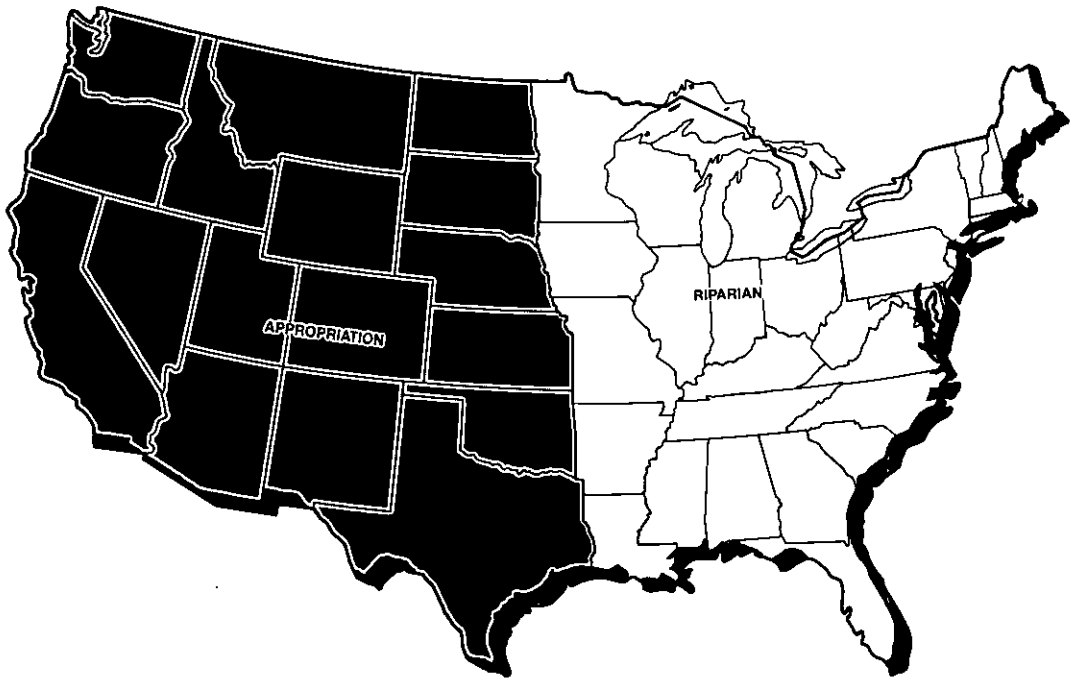


Figure 10. RIPARIAN AND
PRIOR APPROPRIATION STATES

THE UNION COLONY CASE: HOW WESTERN WATER DOCTRINE EVOLVED

In 1870, near Greeley, Colorado, Union Colony built a twenty-seven mile long canal running from the Cache le Poudre River to distant farm lands. Subsequent irrigators built similar systems, and by 1874 the Union Colony canal had run dry because upstream users had diverted all the water.

The following year, Colorado held its Constitutional Convention. Based on the Union Colony experience, the framers developed a prior appropriation system together with a designation of the order of beneficial use (domestic first, agriculture second, manufacturing last). This "Colorado doctrine" has become a widely copied model throughout the West.

to the river and used downstream for irrigation. A change in use upstream can have severe consequences for downstream users.

As a result, proposed new uses for water have to pass the tests of nonimpairment, and legal protection to existing water rights before they can be implemented.

THE FEDERAL ROLE

One other key factor separates the West from the East . . . the pervasive role of the federal government.

About fifty percent of *all* land in the West is owned and controlled by Washington. In Nevada and some other states, the proportion is much higher — up to eighty-seven per-cent.

This ownership includes most of the major watershed areas. The effect of federal ownership cannot be underestimated. Among other things, it:

- Makes it difficult for states to carry out state-wide programs;
- Makes state policies or management practices vulnerable to decisions made at various levels within federal agencies;
- Reduces the available tax and economic base of the western states, depriving the states of revenues that could

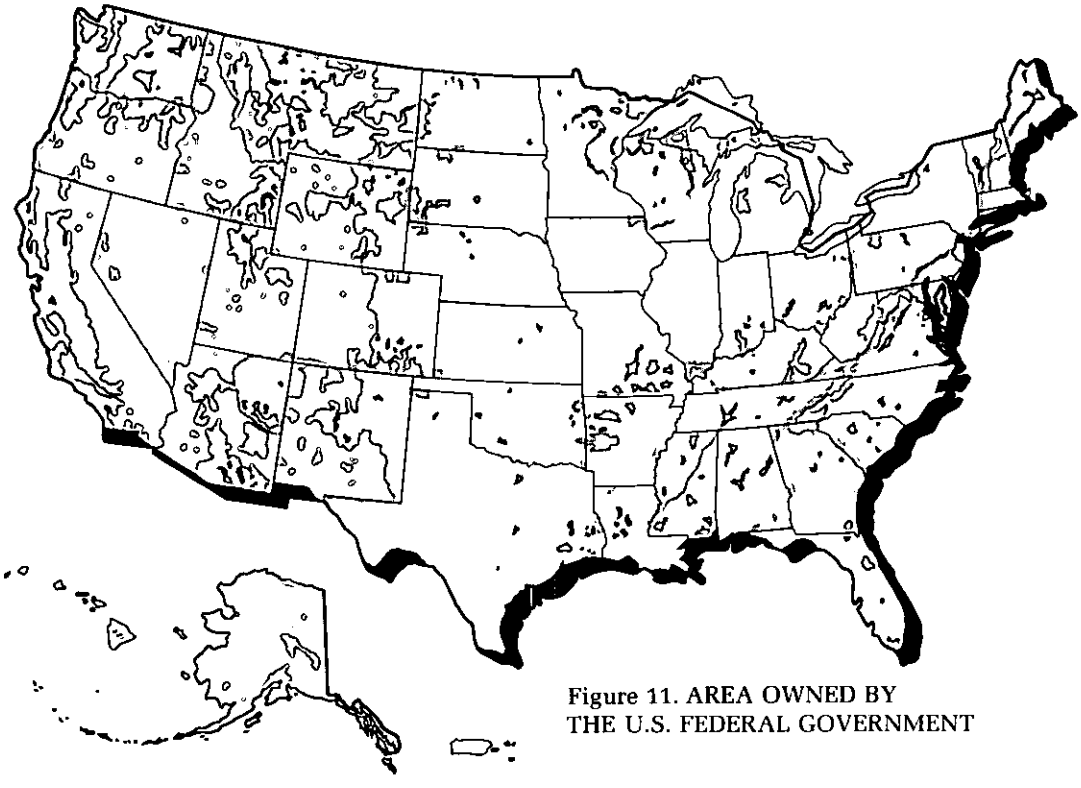


Figure 11. AREA OWNED BY
THE U.S. FEDERAL GOVERNMENT

be used to finance water projects directly.

In addition, the federal government owns an unspecified amount of water in the form of reserved water rights. For example, the federal government, by law, is trustee for all Indian water rights. All other federal reservations — national parks, national forests, military installations — are judged, by law, to have enough reserved water rights to fulfill the primary purpose for which the reservation was established.

Finally, the federal government, by its policies, determines the shape of western water system development. The government, through its planning, financing and regulatory functions, has the final say on what gets built, where it gets built, how it gets built, and whom it is supposed to serve.

Historically, the states played a passive role in these deliberations. But over the last three decades, the states have developed staff expertise and capacity to influence the federal government's direct project activities.

As state capacity continues to increase, and as the states assume a greater responsibility for financing water development, the traditional federal-state balance of power can be expected to shift accordingly.

RESTATING THE PROBLEM

For the West, scarcity of water is an overriding, ever-present concern. Will water be available in sufficient quantity to:

- Supply domestic and agricultural needs;
- Maintain hydroelectric generation;
- Support industrial production;
- Maintain streamflow levels;
- Preserve navigation depths;
- Meet river compact allocations.

Western policy makers have their options constrained by nature, by law, by the federal government, and by harsh economic realities. Every positive step in securing western water supplies must be arrived at by the most painstaking, delicate, and time-consuming process of compromise.

Projects must be analyzed in terms of their contributions to the entire basin system, and not just the immediate communities they serve.

THE GREAT RIVER SYSTEMS OF THE WEST

Three great rivers supply the needs of the West. Each is unique. In order to understand the nature of water development and storage programs, it is essential to understand the relationship between the great river basins and the societies that have evolved within them.

Western water projects have been designed, over the years, to increase the amount of water put to productive use in each great river system. As such, *projects must be analyzed in terms of their contributions to the entire basin system, and not just the immediate communities they serve.*

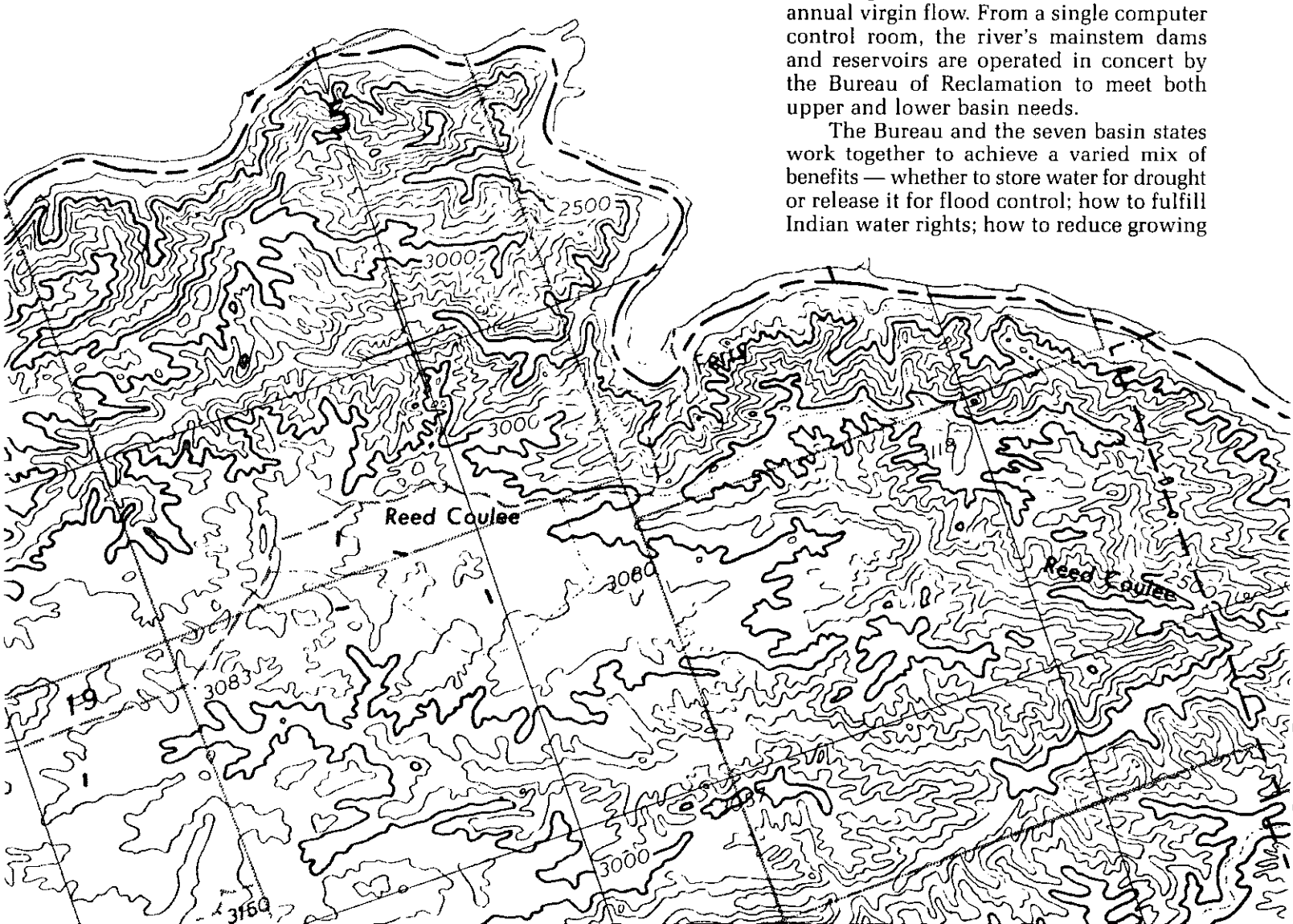
THE COLORADO

The Colorado River drains one-twelfth the land area of the continental United States. It is probably the most harnessed, regulated, legislated, negotiated, and litigated river in the world. So thoroughly used is the river that most years it dries up before completing its 1400 mile course from the Colorado Rockies to the Gulf of California.

Some seventeen million people, including residents of Denver, Albuquerque, Salt Lake City, Las Vegas, Phoenix, Tucson, Los Angeles and San Diego, are or will be served by the Colorado. It produces two billion kilowatt hours of electricity and irrigates three million acres.

One thirteenth the size of the Columbia River, seventeen times as muddy as the Mississippi, the Colorado falls two miles as it flows toward the sea. A reservoir system holds sixty million acre feet of water in storage — over four times the river's annual virgin flow. From a single computer control room, the river's mainstem dams and reservoirs are operated in concert by the Bureau of Reclamation to meet both upper and lower basin needs.

The Bureau and the seven basin states work together to achieve a varied mix of benefits — whether to store water for drought or release it for flood control; how to fulfill Indian water rights; how to reduce growing



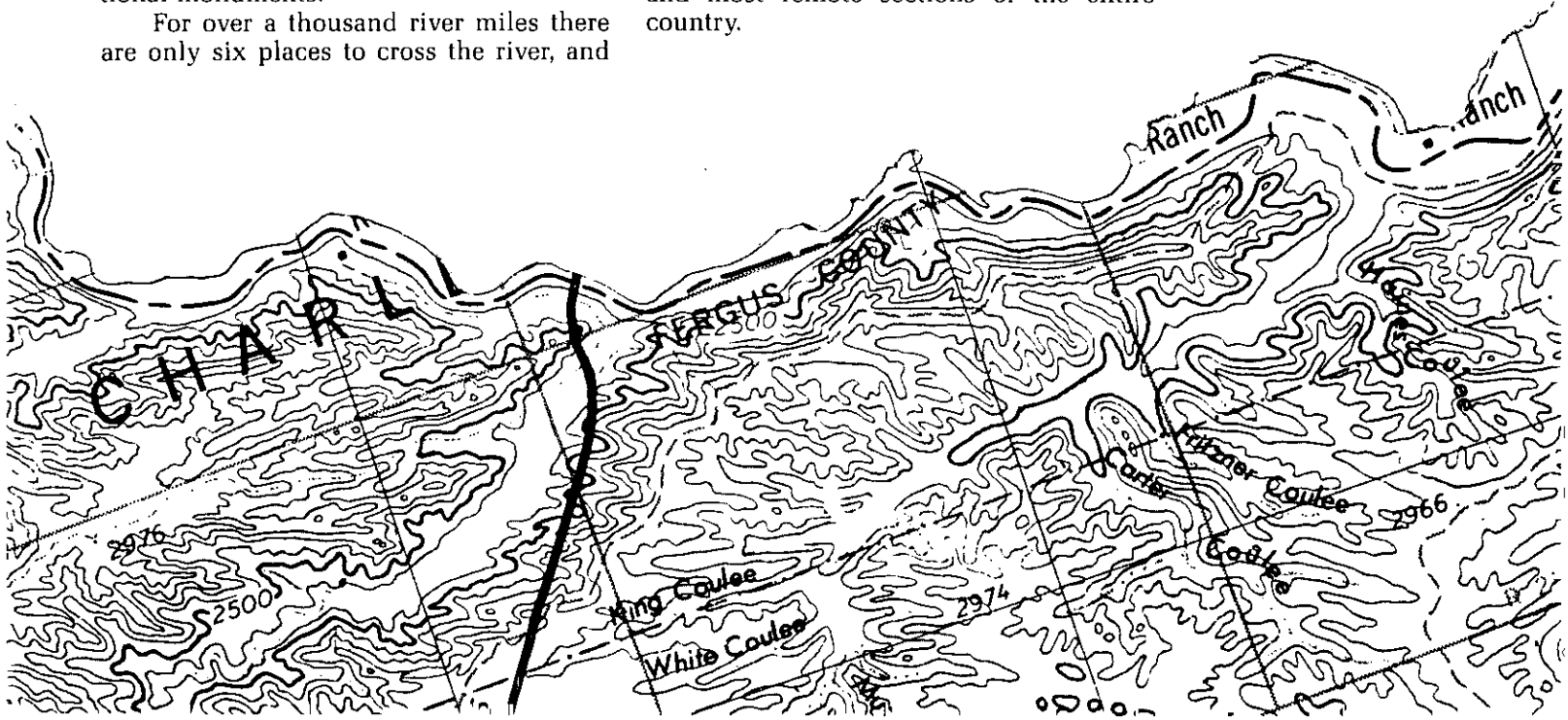
The Colorado River cuts its way through some of the most wild and beautiful regions of the country.

salinity; how to meet treaty obligations with Mexico; and how much power to generate.

But despite being a "push-button" river, the Colorado is one of the great reservoirs of wilderness in the United States. Approximately two-thirds of its drainage is in public ownership, including six national parks, national recreation areas, and national monuments.

For over a thousand river miles there are only six places to cross the river, and no major city served by its water is located on its banks.

The contrast between wilderness and use is exemplified by its most famous scenic stretch, the Grand Canyon. High above, one of the busiest tourist areas in the world; below, a river so sought after that the Park Service must ration the number of rafters; but within the canyon, some of the wildest and most remote sections of the entire country.



The Columbia River is one of the few western rivers important to navigation.

It is not an exaggeration to say that the development of the Columbia basin has been the major force in the overall development of the Northwest.

THE COLUMBIA

America's second largest river drains an area of 259,000 miles in both the United States and Canada.

Over the last fifty years the river, once one of the most unpredictable and damaging in the entire nation, has been harnessed through the use of dams and storage facilities.

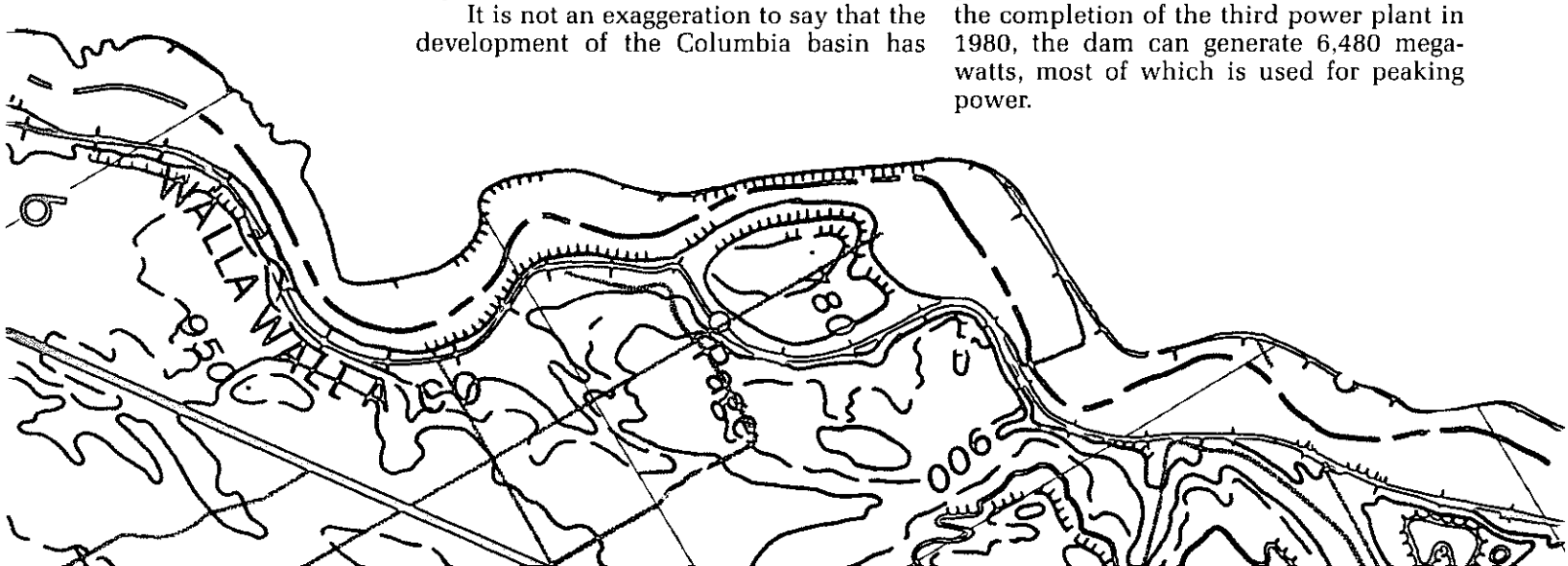
These projects have allowed the Columbia to become a major navigable waterway; have provided electricity to the cities of the Northwest and to the aluminum and phosphate industries; have provided flood control and irrigation for some of the nation's most productive agricultural areas; and have created a predictable water supply for the cities and industries of the region.

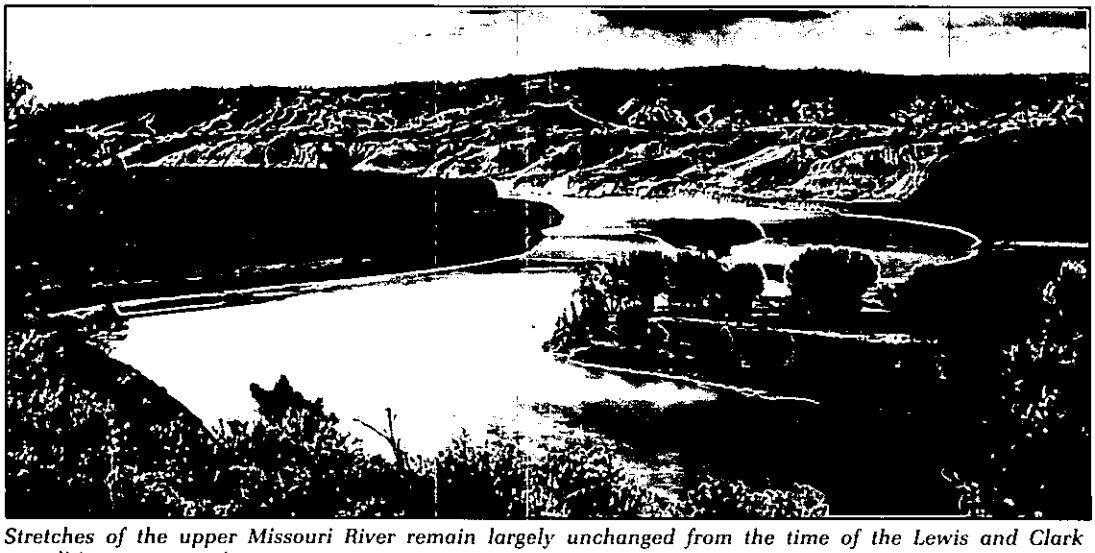
It is not an exaggeration to say that the development of the Columbia basin has been the major force in the overall development of the Northwest.

Much of the inland areas were marginal range land and unproductive deserts and sand dunes. The regional economy was based almost entirely on the lumber industry in the coastal mountains.

Starting with construction of the Grand Coulee Dam in 1933, the economic pattern of the region began to diversify and grow. Power generation was able to support industrial growth. In 1943, Congress passed the Columbia Basin Project Act, which led to the irrigation of 600,000 acres of farmland producing crops valued at $289 million annually.

The Columbia Basin Project was made possible by the largest operating power plant in the world — Grand Coulee. With the completion of the third power plant in 1980, the dam can generate 6,480 megawatts, most of which is used for peaking power.





Stretches of the upper Missouri River remain largely unchanged from the time of the Lewis and Clark expedition two centuries ago.

The total project, dams and irrigated acres, has generated $1.8 billion in power revenues, $3.6 billion in crops grown, and flood control savings of $162 million.

The secondary economic benefits, in terms of accelerating the development of the Northwest, are on a vastly larger scale. Because of these water management programs, relatively unproductive and uninhabited land has been tranformed into one of the most diversified economic regions of the nation.

THE MISSOURI

Originating on the Continental Divide in Yellowstone and Glacier National Parks, the Missouri River flows 2,400 miles to drain one-sixth the land area of the continental United States.

Precipitation in the basin ranges from forty inches in parts of the east to a low of five inches in the arid regions of Wyoming. This lack of predictable and adequate moisture has traditionally made farming a high risk venture.

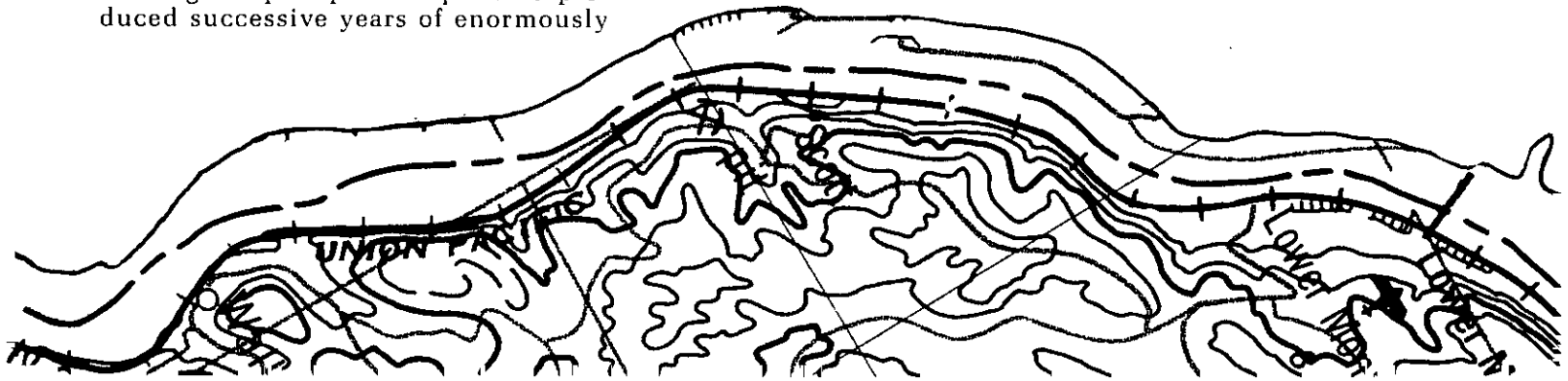
Between 1930 and 1940, virtually every year had below average rainfall, turning farms into dust bowls. By the mid-1940's, a change in precipitation patterns produced successive years of enormously damaging floods. In 1947, floods covered three million acres of farmland.

As a result of these experiences, the last four decades have seen major efforts to use water management technology to stabilize conditions in the Missouri River Basin.

In 1944, Congress enacted the Pick-Sloan Program for the Missouri Basin. The program was a compromise solution between the upstream states' concern for stored water to provide irrigation and industrial water, and the downsteam states' need for flood control and stabilized navigation.

Five mainstem dams were constructed to serve as reservoirs for water supply, flood control, and navigation improvement purposes. Despite the fact that the final legislation gave explicit preference to irrigation and industrial development over navigation uses, most of the flood control, hydro, and navigation benefits have been realized, while very little irrigation has been developed.

Correspondingly, the economic benefits have accrued largely to the downstream states. The upper Missouri Basin remains relatively underdeveloped.



II: THE HISTORIC INVESTMENT

Through the years, the focus of federal public works has changed, as has the very definition of what constitutes a public works expenditure.

HOW WE GOT HERE

One of the first acts passed by Congress was a 1789 authorization to construct a lighthouse on Cape Henry, Virginia.

Ever since, the federal government has embraced as a major priority the investment in public works to promote interstate commerce, strengthen the national defense, enhance the nation's economy, and protect the health and welfare of its citizens.

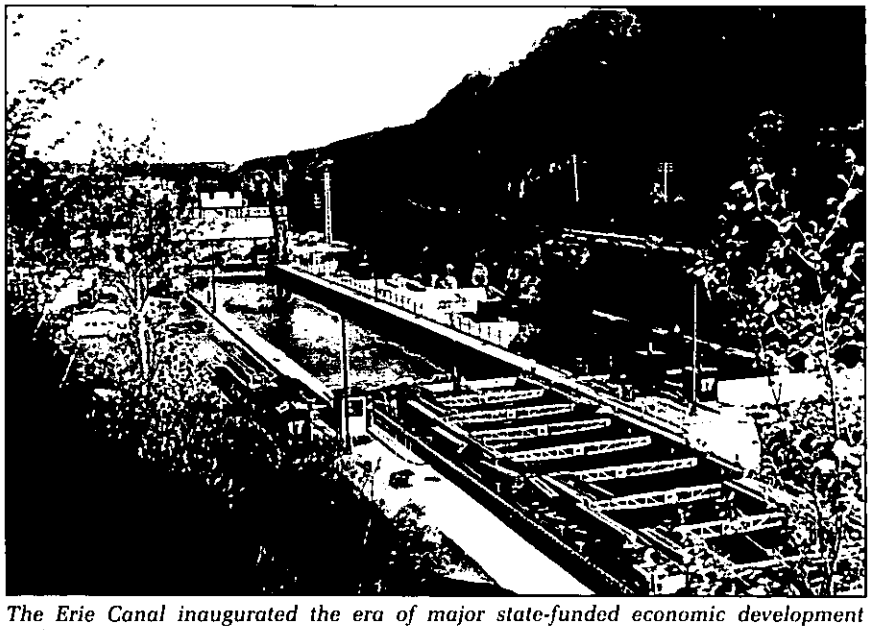
Through the years, the focus of federal public works has changed, as has the very definition of what constitutes a public works expenditure.

In the nation's first century, public works were developmental, designed to overcome such problems as vast distances, sparse settlement, inadequate communications, unknown terrain, and underdeveloped business and capital markets. The purpose of these expenditures was to "release private energies".

In 1817, with the construction of the Erie Canal by the state of New York, trade rivalries between states spurred them to undertake programs of public works by supporting railroad and canal construction, as well as banks, waterworks, and schools.

By the early 1900's, the federal role had become more restricted, focusing largely on rivers and harbors, lighthouse building, the new reclamation program, "military" roads, and the Panama Canal.

State and local governments, on the other hand, increased their public works outlays, shifting from projects to encourage private economic development to those which paid the social costs of development—waterworks and filtration systems, integrated sewer systems, school buildings, and paved roads to accommodate the automobile.



The Erie Canal inaugurated the era of major state-funded economic development projects.

During this era, public funds built city halls, court houses, fire stations, asylums, libraries, museums, ice plants, baths, ferries, parks and recreation facilities. As Mark Aldrich wrote in the 1980 *Study of Public Works Investment in the United States*, this building campaign was "impressive testimony to the range of projects which, at one time or another, Americans have thought to be public works."

The amount of money spent on water development programs is a relatively small proportion of the total federal outlay for public works.

FEDERAL PRIORITIES

Dams and water projects are enormous structures that capture the public's imagination. For many people, "public works" automatically conjures up images of Hoover and Grand Coulee Dams. But the amount of money spent on water development programs is a relatively small proportion of the total federal outlay for public works.

By far the greatest public works expenditures are devoted to national defense—in recent years, as much as sixty-four percent of the total national public works budget.

Of the amount spent for civil public works programs, by far the greatest emphasis is on transportation. Water development, including EPA's water expenditures, comprises only about one-fourth of the total civil public works budget.

With the onslaught of the Depression, the pattern of federal public works expenditures changed dramatically. The federal role in public works financing became dominant, the definition of public works was again broadened, and new justifications for public works, such as relief of mass unemployment, became accepted.

Massive amounts of money were spent on roads, waterworks, docks, wharves, airports, hospitals, works of art, and public housing.

World War II, and later the Korean War, induced vast expansion in a new kind of public works investment—federally financed industrial contruction. During the 1940's the U.S. built $17 billion of new industrial plants, $11 billion of which were sold at reduced rates to private companies after the war.

With the end of the Korean War, public works priorities have returned gradually to more emphasis on schools, highways, sewers, and waterworks construction.

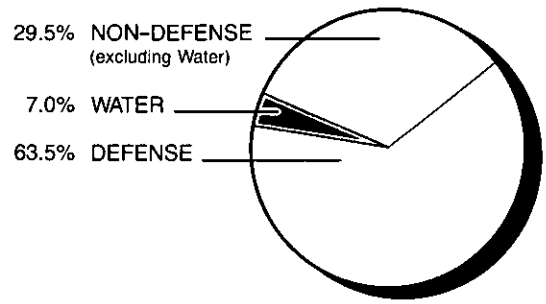


Figure 12. MAJOR AREAS OF FEDERAL PUBLIC WORKS EXPENDITURES (1956-82)

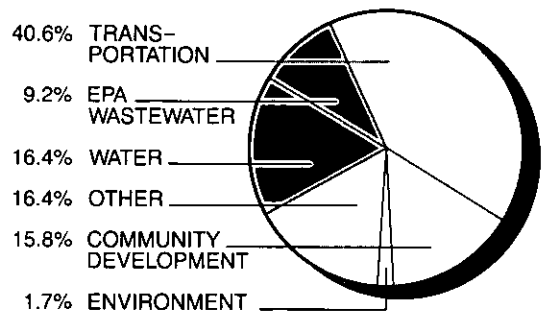


Figure 13. COMPONENTS OF THE CIVIL PUBLIC WORKS BUDGET (1956-82)

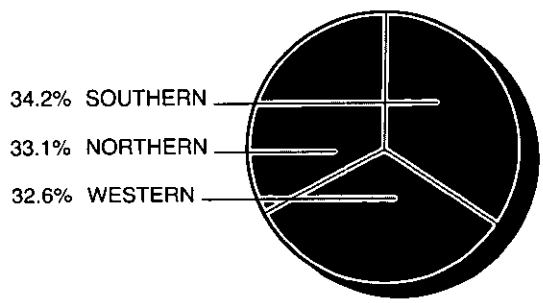


Figure 14. FEDERAL WATER EXPENDITURES BY REGION (1956-82)

Moreover, different parts of the nation rely on federal public works funding for different needs. On a per capita basis, every region of the nation devotes most of its public works spending on transportation. In the East substantial commitments are made to mass transit and economic development. In the West, far more resources are devoted to water development.

The federal investment in western water is part of a balanced program of national water development. The total amount of federal spending for water development, on a region by region basis, is almost equal.

The nation's largest water development project, providing flood control on the Mississippi and its tributaries, has cost the federal government approximately $4.5 billion—about one-third the total cost of all western reclamation projects.

The West has supplemented federal expenditures with state, local and private programs to meet its more pressing demands. Irrigation programs, for example, have been financed more through private and local sources than by federal expenditures.

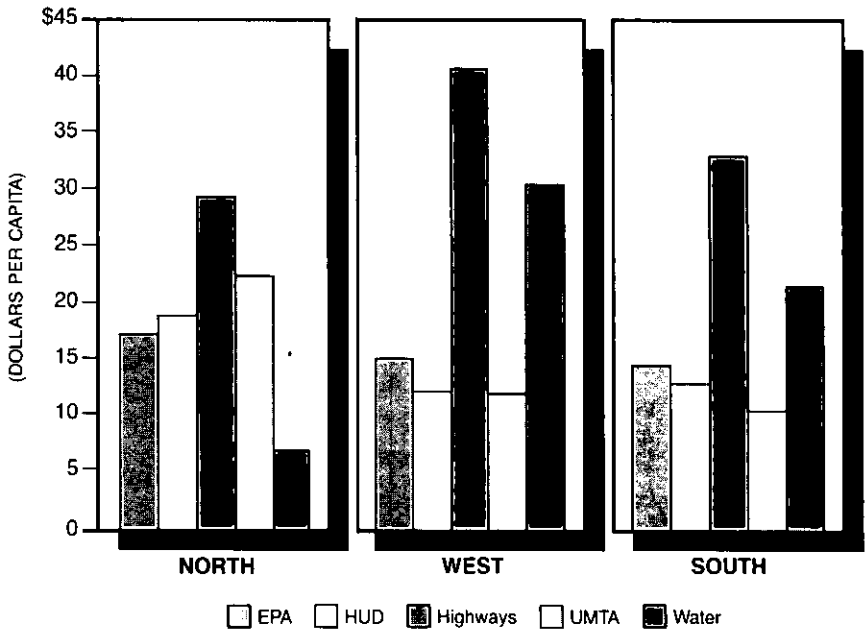


Figure 15. FEDERAL EXPENDITURES BY REGION AND TYPE (1982)

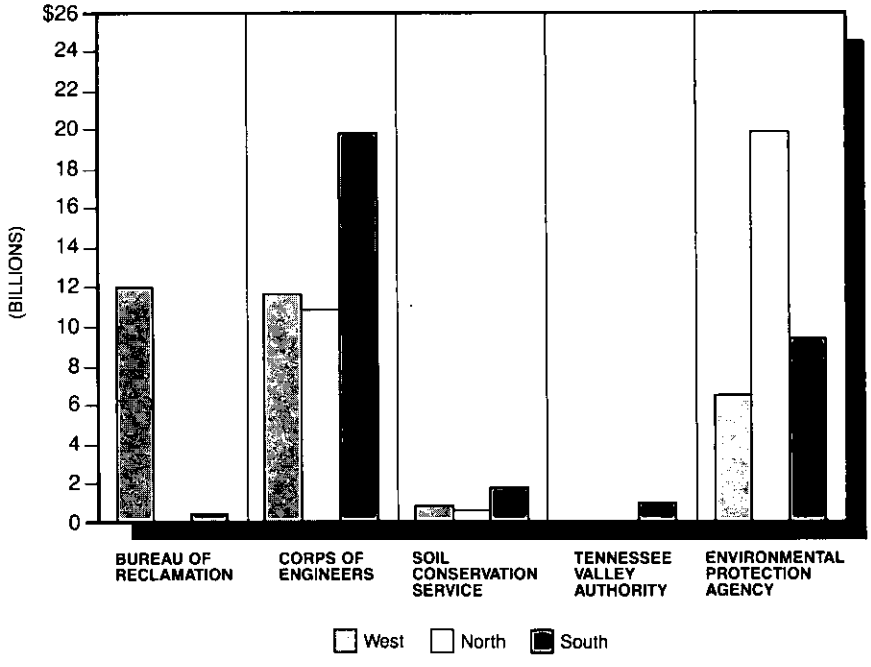
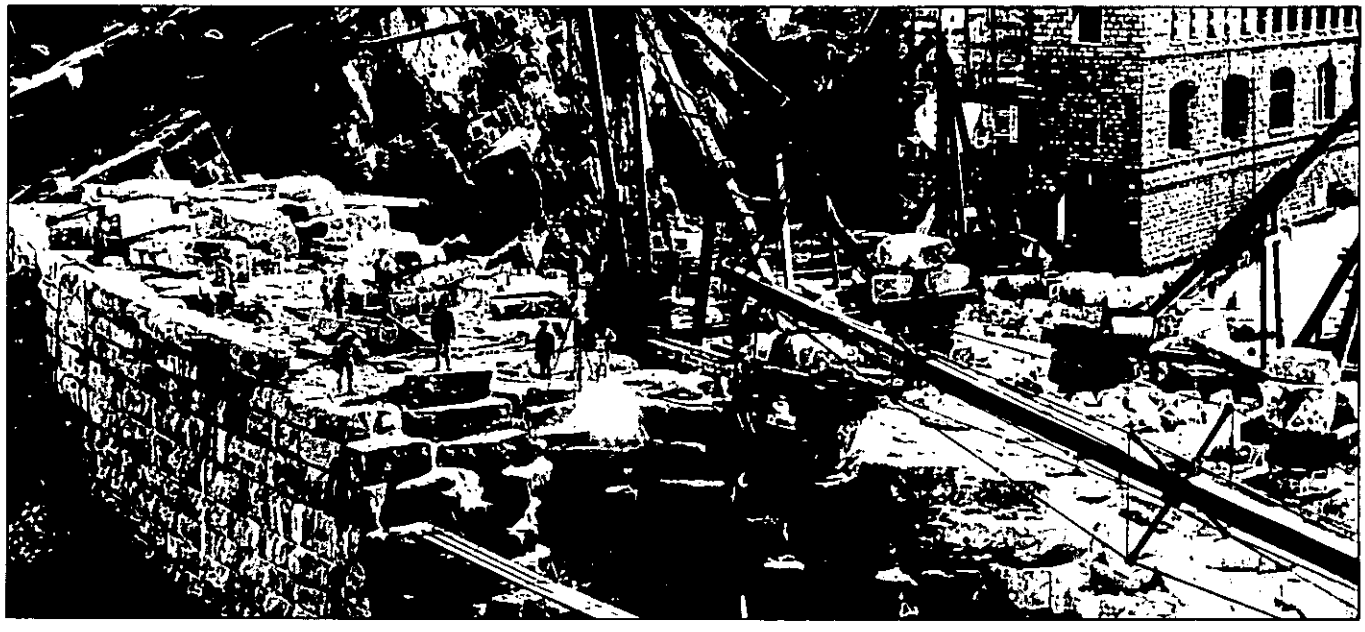


Figure 16. WATER AGENCY EXPENDITURES BY REGION



Arizona's Roosevelt Dam, under construction in 1908, was the first dam built by the Bureau of Reclamation.

THE EVOLUTION OF THE NATIONAL WATER PROGRAM

Water development has always been an integral part of the federal public works program. As early as 1784, President Washington urged surveying the nation's western waterways—the Ohio and Mississippi Rivers—to establish transportation routes linking the East and West.

In 1824, the first true rivers and harbors bill was enacted, appropriating $75,000 to improve navigation on the Ohio and Mississippi, and establishing the Corps of Engineers.

Following the Civil War, sixteen rivers and harbors bills passed in sixteen years. Part of the impetus was to promote a strong system of water routes which would not only provide cheap transportation but would also provide competition with the railroad industry.

In 1902, following a decade of drought, Congress passed the Reclamation Act, designed to supply irrigation water to seventeen western states to make their arid land productive. The reclamation program provided capital funds, engineering skills, and organizational structure to build the complex projects that transformed the West. In return, the nation benefited by the development of agricultural and natural resources, and the creation of new markets for eastern and southern manufactured goods.

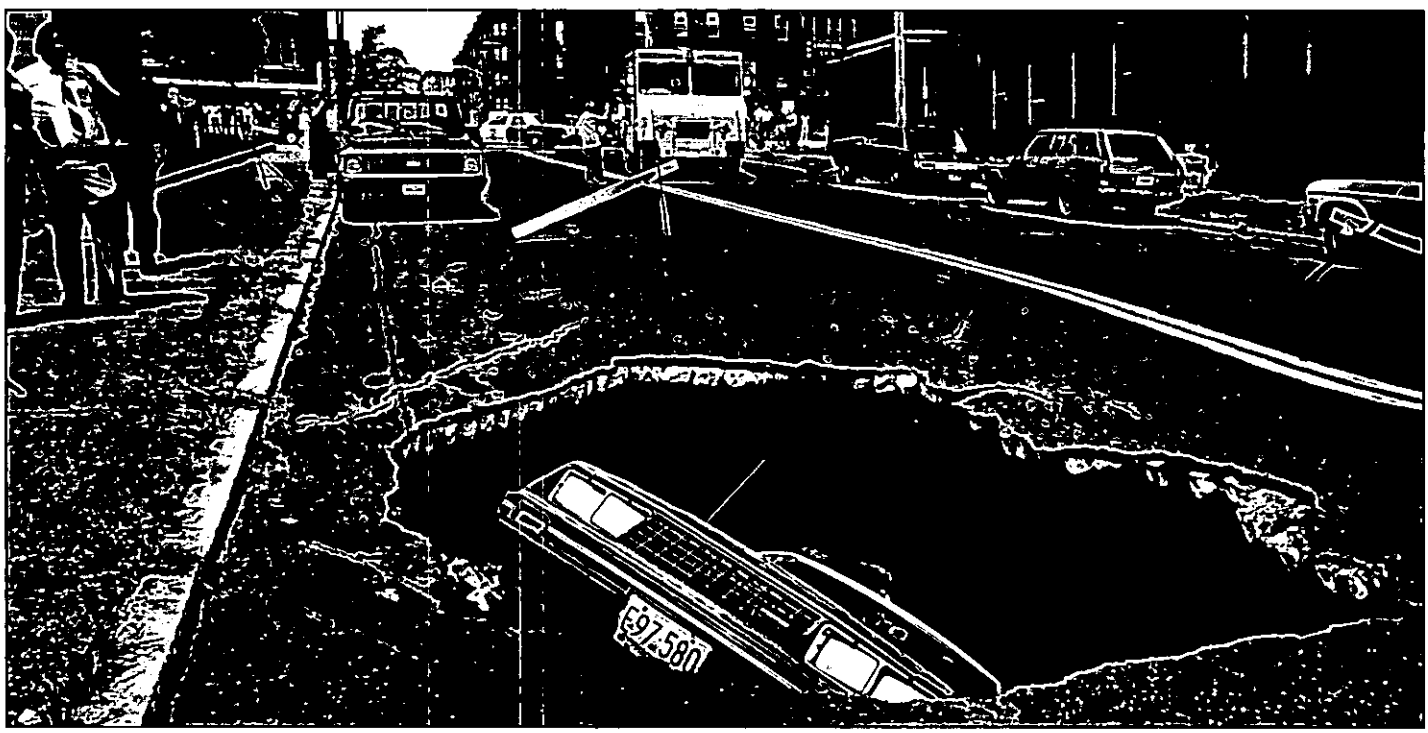
Fifteen years later, the Congress passed the first flood control legislation, authorizing $45 million for flood control between the mouth of the Ohio and the mouth of the Mississippi. Since then, the Corps of Engineers has built over 300 reservoirs whose primary benefit is flood control.

Federal funding for the development of hydroelectric power began in 1926, when the Corps of Engineers commenced operations at Wilson Dam and powerplant on the Tennessee River, requiring full payback from the sale of hydroelectric power.

With the election of Franklin Roosevelt came acceptance of the new concept of multi-purpose water projects, joining the use of hydroelectric generation to pay for the projects. A major series of projects—TVA, Grand Coulee, Bonneville, and the Pick-Sloan Program on the Missouri—was inaugurated to supply energy and provide jobs.

The success of these projects led to an expanded federal program, developing inland waterways, ports and harbors, irrigation, flood control, hydroelectric generation, municipal and industrial water supply, fish and wildlife protection, erosion control, water quality control, hurricane protection, and recreation.

Today, the Corps of Engineers, the Bureau of Reclamation, the Soil Conservation Service and the Tennessee Valley Authority are the major agencies in terms of amount of expenditures and project reponsibility for construction of water development projects. Since 1975, the Environmental Protection Agency budget has surpassed the others, financing water treatment plants nationwide.



Cutbacks in maintenance programs are causing serious problems across the country.

NEW PRESSURES; NEW PRIORITIES

"...The greater part of the decline reflects the growing habit of government at all levels to cut back on construction, rehabilitation, and maintenance in order to balance budgets, hold down the rate of tax growth and finance a growing menu of social services. While such approaches keep budgets in balance and meet near-term needs, they impose serious long-term costs. Public facilities wear out and become obsolete."

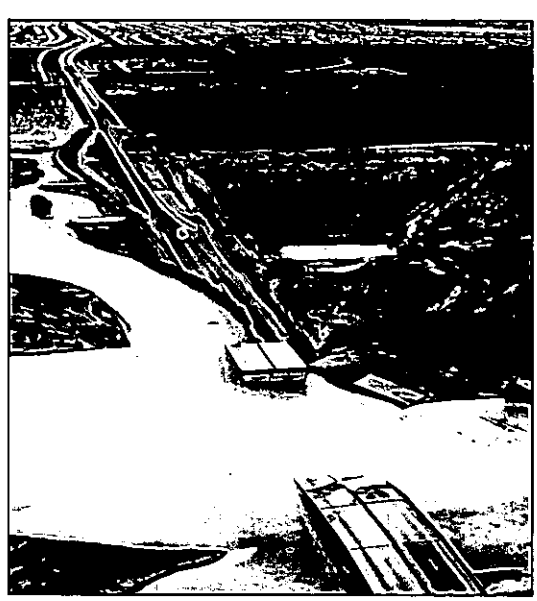
—*America in Ruins*

Despite the enormous level of federal public works expenditures in recent decades, *the gap between public expenditures and public needs is increasing.*

In the book *America in Ruins*, authors Choate and Walters outline the magnitude of the problem—a quarter of our interstate highway system is worn out and needs resurfacing; half of the communities in the U.S. have reached water treatment capacity; a large percentage of the nation's 43,500 dams are judged unsafe.

A more recent study, conducted by the National Infrastructure Advisory Committee to the Joint Economic Committee of Congress, concluded that the problem is national in scope, affecting all regions of the country, and that the shortfall between expenditures and needs could be as high as $400 billion over the next fifteen years.

At the same time, budgetary pressures are forcing both federal and local governments to reduce public works expenditures as a percentage of the total budget.



Flash floods and other natural disasters strain existing infrastructure-renewal programs.

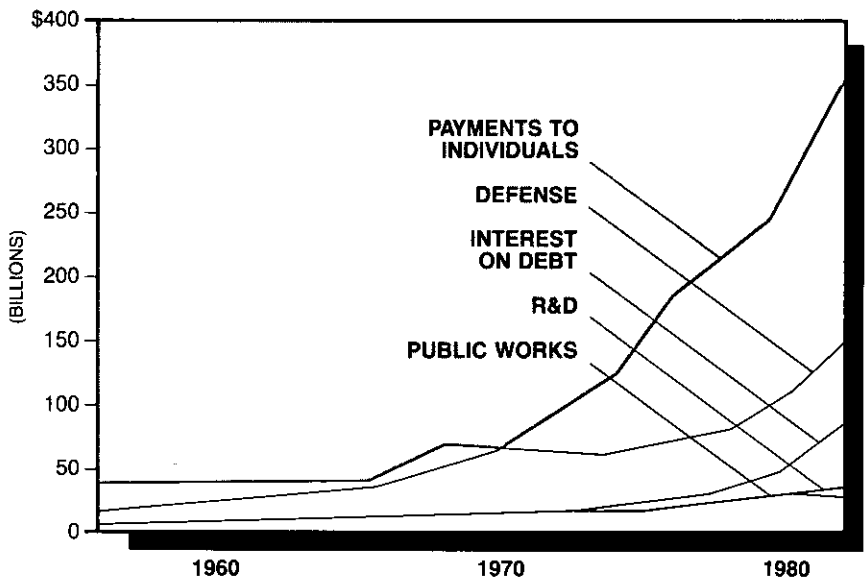


Figure 17. CHANGING FEDERAL EXPENDITURE PRIORITIES (1956-82)

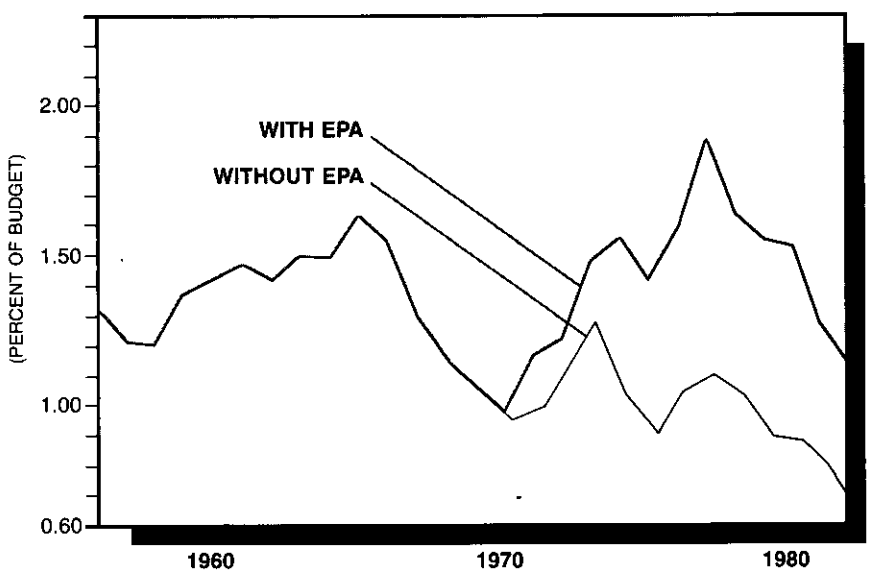


Figure 18. WATER APPROPRIATIONS AS A PERCENT OF THE U.S. BUDGET

While entitlement programs have grown consistently over the past twenty-five years as a percentage of federal spending, allocations for research and development funding and public works expenditures have been almost flat. Expressed in terms of constant dollars, R&D and public works spending has actually *declined* in recent years.

Water agency expenditures for development (not counting EPA) have shown a similar pattern of decline. From a peak in 1966, funding levels as a percent of the U.S. budget have dropped two-thirds. As a percentage of total public works expenditures, water development has declined dramatically. Of the funds allocated to water development, construction expenditures, as opposed to operations and administration, have declined by one-third in the last two decades.

While expenditures for water development have dropped, problems in the national water system have increased. In a recent issue of *National Wildlife*, an article titled "Running on Empty", cited a litany of water problems: contamination and depletion of aquifers; inefficient irrigation systems; antiquated metropolitan waterworks; continuing flood damages; increased water pollution.

The article asked "How have we let such problems arise?" and concluded, "We have taken our water for granted."

These problems are not confined to any one region of the country. Despite the differences between eastern and western water needs and consumption patterns, the overall interest in water development is becoming more similar:

- Both face serious concerns over surface water quality.
- Both face increasing levels of groundwater contamination.
- Both face decline of groundwater levels.
- Both face the problem of outdated and inadequate municipal water facilities.
- Both face the reduction of federal financing to meet their region's water development needs.

Eastern states, for the first time confronted with limited water resources, are contemplating features of appropriation law. Western states, in turn, must accommodate the riparian aspects of Indian water rights.

The East is finding that supplemental irrigation can protect crops in dry years. And both regions are experimenting with improved management techniques.

A convergence of interests is emerging.

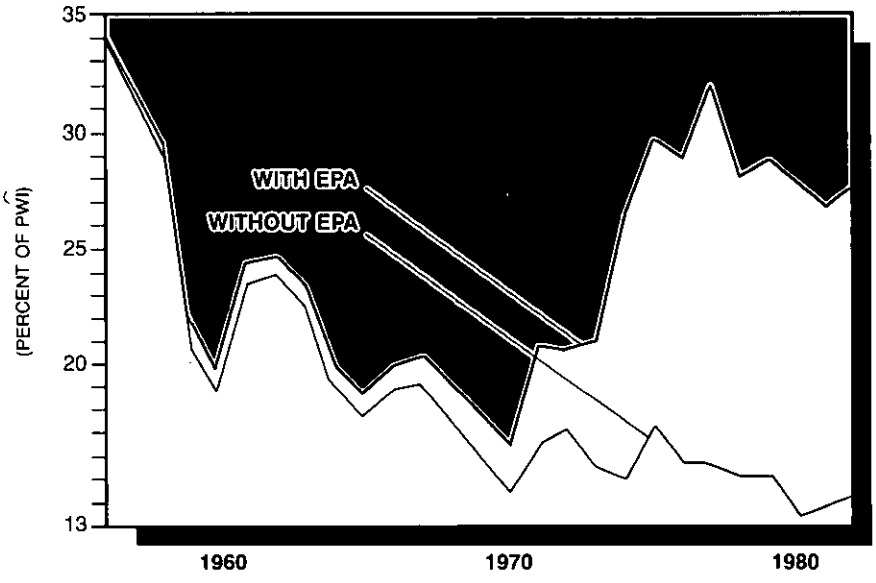


Figure 19. WATER APPROPRIATIONS AS A PERCENT OF PUBLIC WORKS EXPENDITURES

CONVERGING NEEDS

Solving water shortages has traditionally been considered a western issue—the West has spent well over 100 years dealing with the problem. Over the last few years, however, that situation has changed:

- Water in the Great Lakes is apportioned through a series of U.S. court decrees and an international agreement. The city of Chicago needs additional water supply—it cannot get it from the Great Lakes, it has had to mine its groundwater at a serious rate, and it is exploring the diversion of water from the southern part of the state, a move opposed by those who live there.
- Southern Florida, after years of "solving" its water problems through engineering, is now turning to planning and analysis which is focused on environmental protection, conservation, and other non-engineering priorities.
- Boston needs additional water and is seeking it from the western part of the state.
- New Jersey is facing environmental opposition to proposed dams on the Passaic River.

Westerners can readily identify with, and perhaps offer solutions for, the above problems. At the same time, eastern initiatives such as the Delaware River Basin Compact and the new plan being implemented on the Potomac offer models for cooperative management which the West can borrow from.

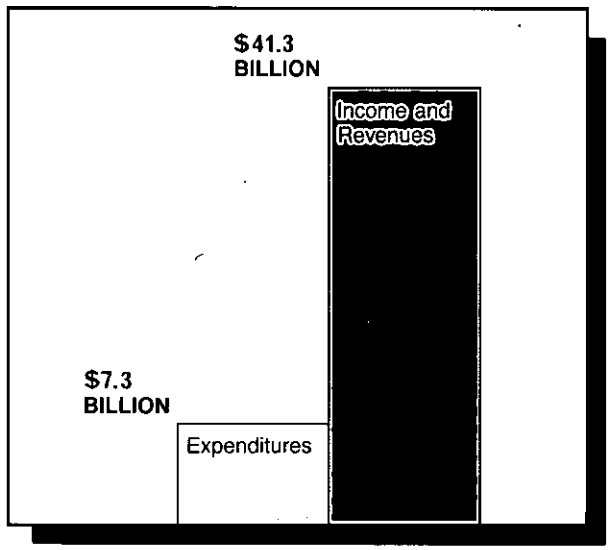


Figure 20. TEN YEAR BALANCE SHEET OF THE RECLAMATION PROGRAM (1973-82)

Expenditures	*(Millions)*
Investment:	
Construction Costs	$5,163.7
Operating and Maintenance Costs	1,170.0
Other Reclamation Spending:	
Research, Planning, Investigation	307.3
Administration	269.3
Emergency Fund and Loan Program	356.9
	$7,267.2

Income and Revenues	
Operating Income:	
Irrigation Water Rentals and Assessment	$ 237.9
Municipal and Industrial Water Sales	46.6
Electric Power Revenues	2,787.6
Tax Revenues:	
Federal Internal Revenues	25,953.0
State and Local Tax Revenues	12,319.0
	$41,344.1

Ratio of Income and Revenues to Expenditures - 5.69:1

WESTERN WATER DEVELOPMENT: A NATIONAL INVESTMENT

Western water development must be viewed as a *national* investment—the impacts extend far beyond the borders of the western states.

By any method of evaluation, the national investment has been remarkably successful:

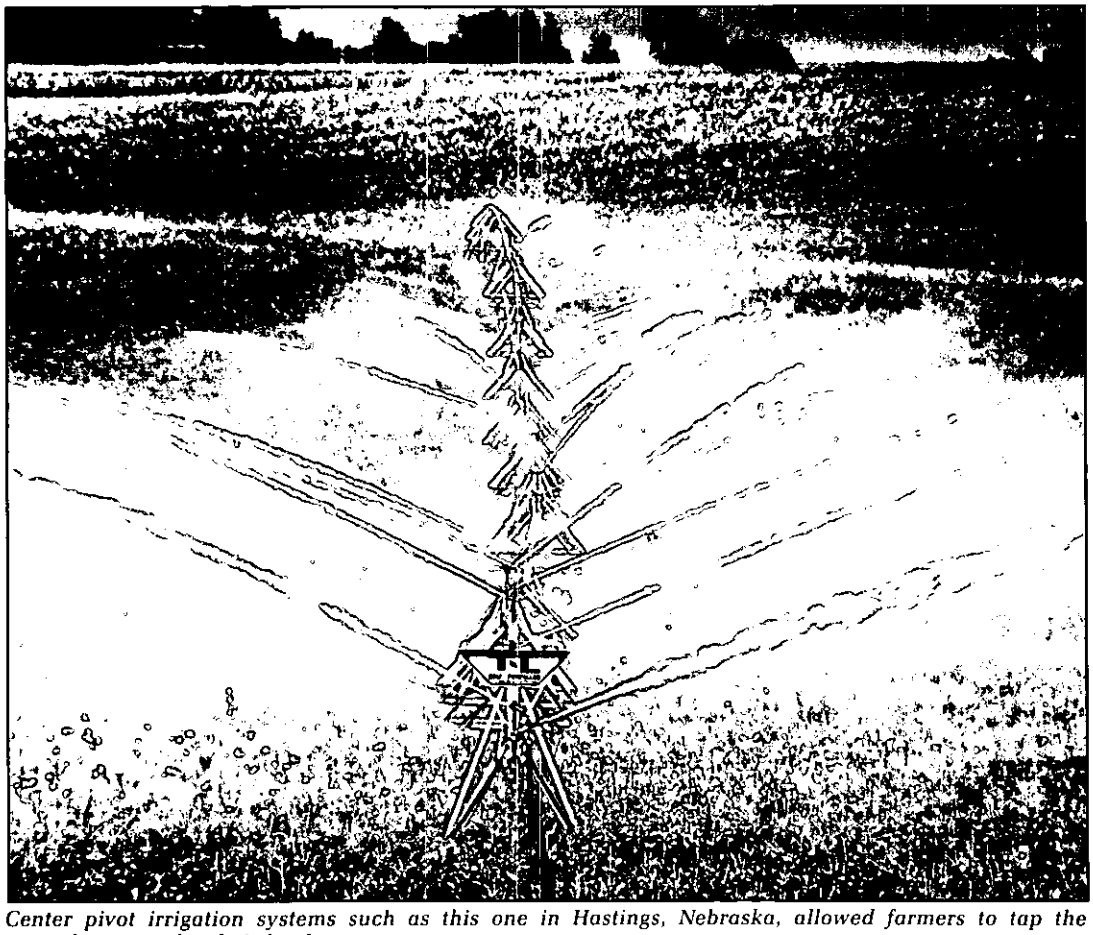
- Based on a model developed by researchers at the University of Denver, total income and revenues from western water projects during the period from 1973-83 *exceeded* total expenditures by a ratio of nearly *six to one*. Of the total revenues, sixty-three percent were paid as federal tax revenues.
- The model also shows that the value of direct economic outputs during this ten year period approached $145 billion. Indirect economic outputs—income and profits—totaled almost $190 billion.
- By 1980, the Corps of Engineers and the Bureau of Reclamation had spent a total of $55 billion on water projects. The replacement value of these investments is estimated to be $176 billion.

The return on investment in western water development has a demonstrated national benefit, not simply in the generation of federal tax revenues, but as a stimulus to all aspects of the national economy.

NATIONAL CONSTRUCTION BENEFITS

When a water development project is initiated in the West, the entire country plays a part in its construction. A series of studies conducted by the Bureau of Reclamation demonstrated that ninety-five percent of all major industrial groups and a wide variety of occupational groups are used in providing the materials, equipment, transportation, labor, and other services needed for construction.

Virtually every state in the Union provides the necessary materials and equipment. While the majority of purchases are



Center pivot irrigation systems such as this one in Hastings, Nebraska, allowed farmers to tap the groundwater under their lands.

Western agriculture plays a major role in American export policy as well. In 1980, the West provided forty percent of the value of agricultural exports nationwide.

made in the Rocky Mountain, Southwest and Far West regions, over twenty-five percent are provided by the Great Lakes, Plains and Mid-Eastern states.

When the benefits of indirect inputs, such as stimulation of new housing, agriculture, mining, manufacturing, retail and wholesale trade, are added to direct project requirements, it is clear that western water development provides substantial national economic stimulation.

STRENGTHENING AMERICAN AGRICULTURE

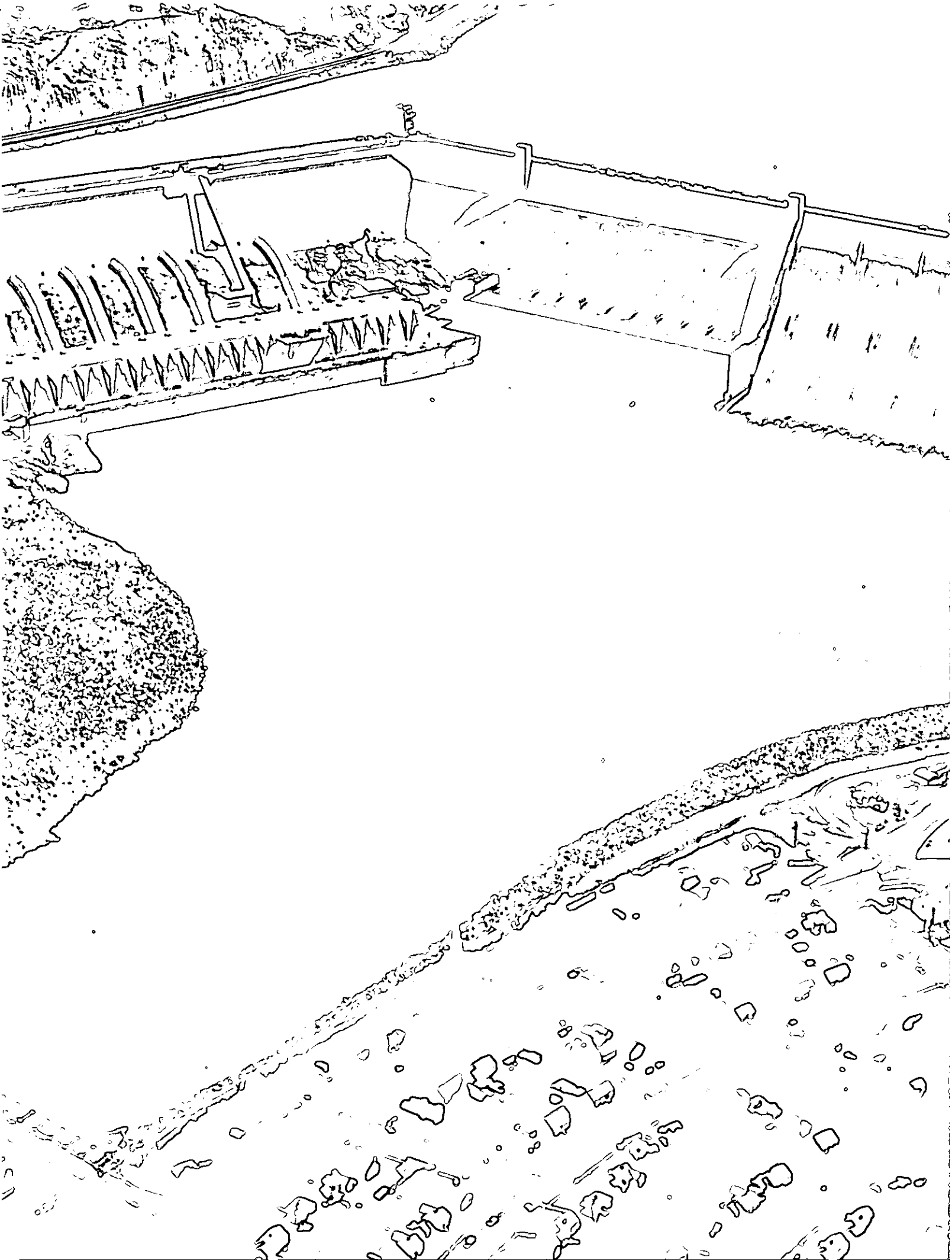
Ninety percent of the water consumed in the West goes to agriculture. The West's low humidity and cloud-free days, its areas with long growing seasons, and its large acreages are ideal for a wide variety of crops, nursery stock production, and grazing.

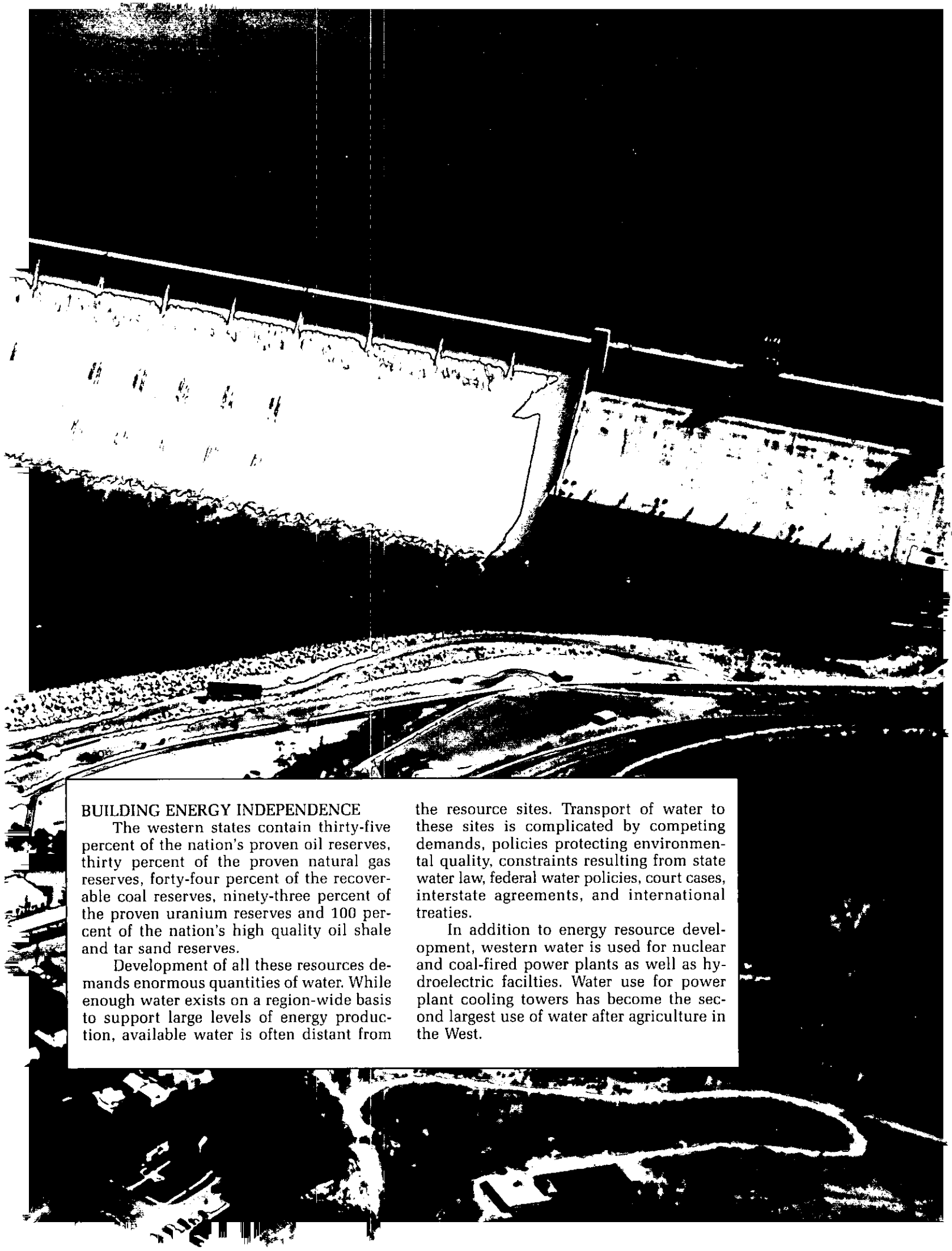
Of the farm and ranchlands in the West, twenty-five percent are irrigated, half from groundwater, the rest from surface supplies. Each pound of food produced requires an average of half a ton of water, while each pound of beef represents fifteen tons.

Irrigation insures that crops will be available, will be of high quality, and can be sold in stable markets, no matter what the vagaries of the weather. The stakes are enormous. In the period from 1973-77, the West provided fifty-five percent of the fresh fruits and vegetables marketed in forty-one major U.S. cities.

Western agriculture plays a major role in American export policy as well. In 1980, the West provided forty percent of the value of agricultural exports nationwide.

Agriculture provides diversification and long term stability to the West's boom and bust resource-based economy. But it too faces complex challenges.



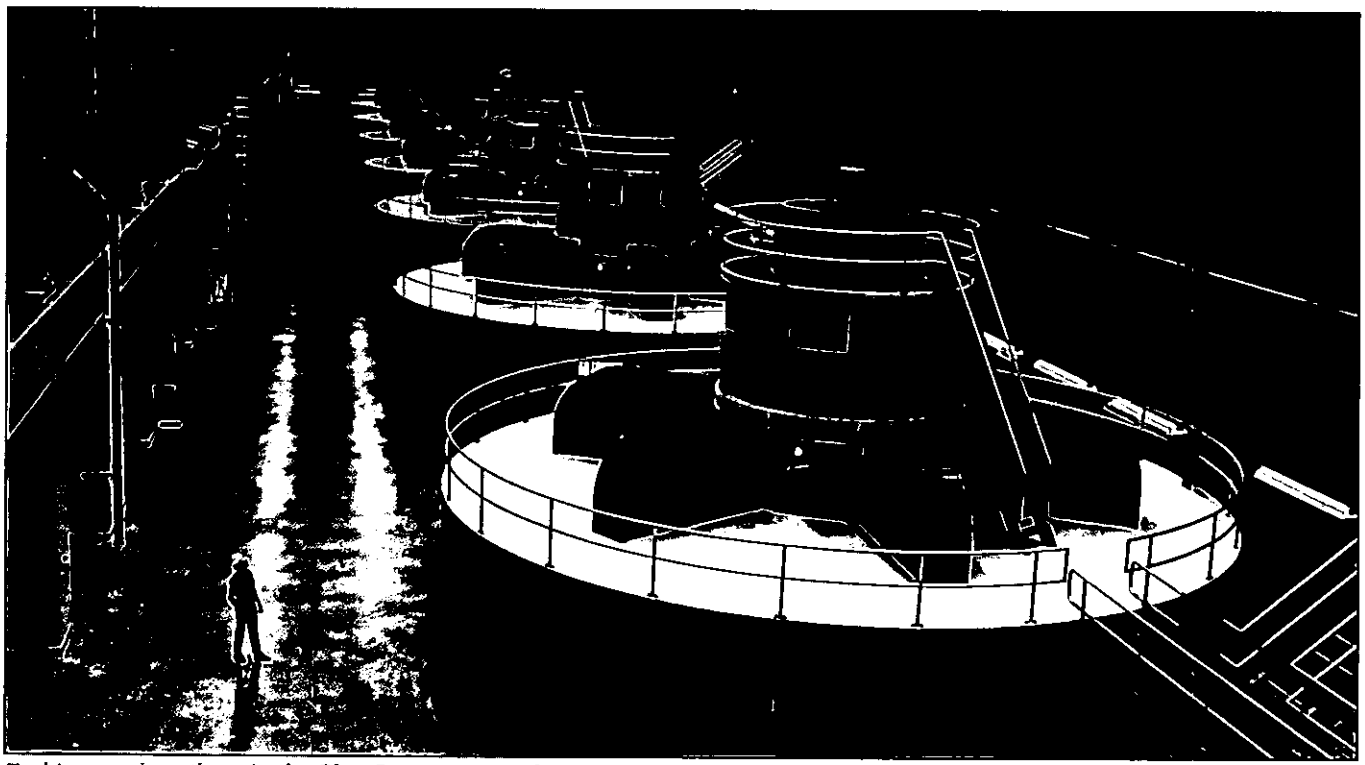


BUILDING ENERGY INDEPENDENCE

The western states contain thirty-five percent of the nation's proven oil reserves, thirty percent of the proven natural gas reserves, forty-four percent of the recoverable coal reserves, ninety-three percent of the proven uranium reserves and 100 percent of the nation's high quality oil shale and tar sand reserves.

Development of all these resources demands enormous quantities of water. While enough water exists on a region-wide basis to support large levels of energy production, available water is often distant from the resource sites. Transport of water to these sites is complicated by competing demands, policies protecting environmental quality, constraints resulting from state water law, federal water policies, court cases, interstate agreements, and international treaties.

In addition to energy resource development, western water is used for nuclear and coal-fired power plants as well as hydroelectric facilties. Water use for power plant cooling towers has become the second largest use of water after agriculture in the West.



Turbines such as these in the Glen Canyon Powerplant are often used for high-value peaking power.

HYDROPOWER

With its coal-fired and nuclear power plants, and its enormous hydroelectric infrastructure, the West has become a *net exporter* of electricity—over fifty per cent of the electricity it produces is transported over distances up to 1000 miles.

Much of this energy is generated by the seventy-five federal hydroelectric power plants that dot western rivers. These plants produce an average of over 100 billion kilowatt hours per year, enough electricity to serve the residential needs of almost forty million people.

Put another way, western hydropower saves the nation the equivalent of 180 million barrels of imported oil each year.

While it is true that most of the major sites have been developed and the remaining large sites are precluded from development because of environmental or economic considerations, the potential for further hydropower development still exists.

Options include:

- Increasing the existing capacity of hydroelectric plants. The cost estimates for uprating a hydro facility can be as low as $20-50 per kilowatt, as opposed to over $1000 per kilowatt for adding fuel-burning plants.
- Existing dams, built for other purposes, can be retrofitted with generating equipment. Over 500 applications to retrofit are currently pending before the Federal Energy Regulatory Commission.
- Existing hydroplants can be converted to use for peaking power. Since hydropower, unlike fuel-burning systems, can easily be turned on and off, hydropower lends itself to meeting daytime demand for extra electricity to run air conditioners, ovens and heaters. Using hydro to meet peak demands can reduce the need to build excess capacity into fuel-burning power plants just to meet peak loads.
- Pumped storage units can be developed by building new ones or converting existing facilities. Pumped storage entails the use of two reservoirs on the same stream, one above the other. During nighttime hours when demand is low, water is pumped to the higher storage reservoir, only to be released to the lower reservoir during the day in order to generate peaking power.

In addition to providing power, hydro projects provide revenues which serve as the "cash register" to repay the federal government for the entire project's construction costs.

River rafting on the Colorado and other major rivers has become one of the country's fastest-growing recreational pursuits.

The Bureau of Reclamation has experienced an increase in visitor days at its facilities from twenty million in 1958 to sixty-five million in 1981.

MEETING NATIONAL RECREATION NEEDS

Since the days of Theodore Roosevelt, the West has been viewed as the nation's primary recreation area. Each year, millions of Americans head West to sightsee, ski, fish, swim, sail, raft, and enjoy other outdoor pleasures. Since 1925, when Congress endorsed the concept of multiple-purpose planning, man-made water reservoirs have intentionally provided the opportunity for water-based recreation.

The Bureau of Reclamation has experienced an increase in visitor days at its facilities from twenty million in 1958 to sixty-five million in 1981.

Water projects benefit tourists, but they also provide stimulus to local and distant economies through the sale of boats, campers, trailers, fishing gear, food, and other equipment and supplies.

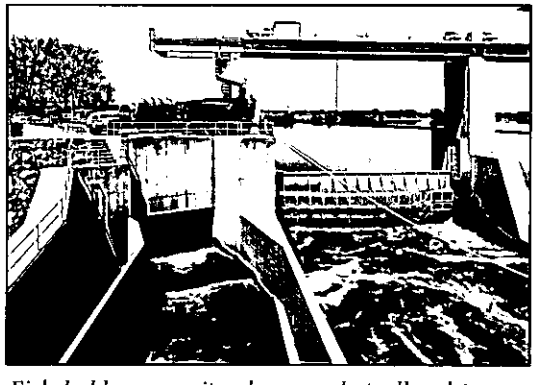
California, for example, reported eight million boating days last year, and fifteen million fishing days. One boating day is equal to $225 in economic benefits—a total of $1.8 billion in California in one year.

The Colorado Mountain Club estimates that the seven million tourists who vacationed in Colorado in 1983 spent an aggregate $4 billion in the state.

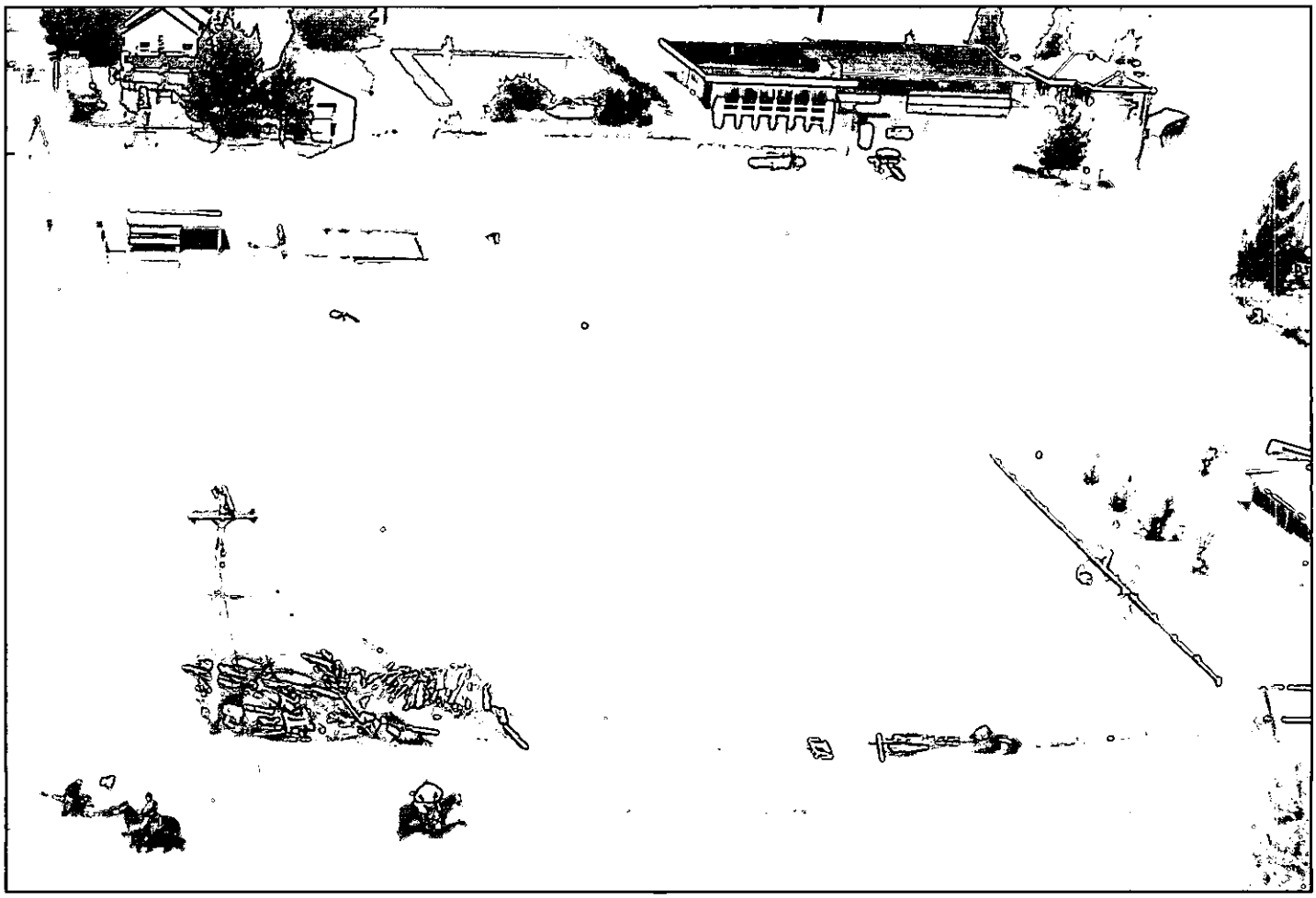
The benefits extend to wildlife as well. Dams and regulated river releases provide constant temperature, silt-free, stable river flows for a wider variety and larger number of fish.

Water project development includes the enhancement of wetlands and other natural environments. As a result, spawning and nesting areas have been developed, providing enjoyment for photographers, bird watchers, back packers, hunters, and fishermen.

Increasing demand for recreational opportunities is creating its own pressures for additional water development programs. To preserve the quality of the recreational experience, the nation will need to maintain adequate streamflows, protect environmental quality, open more reservoirs to recreation, add camping and boating facilities, and carefully plan for increased recreational use.



Fish ladders permit salmon and steelhead to pass around dams in their migration to spawning areas.



Spring flooding of the Sun River in 1964 completely inundated the town of West Great Falls, Montana.

From start to finish, an average of twenty-seven years is required to individually authorize and construct major water projects.

PREVENTING FLOODS

Each year, the Corps of Engineers calculates damages avoided because of the nation's flood control structures such as dams and levees. The figure for the most recent year, 1982, is $4.4 billion. The cumulative benefit is $107 billion.

But flood control creates other problems. Multi-purpose reservoirs are used to provide flood control, water supply, and hydroelectric power. An empty reservoir is best for flood control, while a full one best meets demands for water supply and electric generation.

The conflict is not merely theoretical. In 1983, heavy snows and full reservoirs on the Colorado forced large volumes of water (24 million acre-feet) to spill down the system. As a result, flooding occurred downstream, causing considerable economic loss.

In response, the Bureau released nine million acre feet to make room for anticipated 1984 floods. Heated debate is now occurring within the Colorado Basin about whether the Bureau should continue to release large volumes of water in future years for flood control. Should the weather turn dry, the upper basin states could lose over one year's water supply owed to the lower basin states because of an outdated estimate.

THE BOTTOM LINE

The benefits to the nation of western water projects are not only economic, but are enhancements to our quality of life. Western water development is best viewed not as a regional problem, but as a national investment.

MEASURING COSTS AND BENEFITS: THE APPROVAL PROCESS

Water project development is treated differently from most other federally-funded public works programs. Most public works are funded through agency budgets or block grants to state and local governments. By contrast, the Corps of Engineers and Bureau of Reclamation water projects are individually authorized, and funding is on an annual line-item basis.

From start to finish, an average of twenty-seven years is required to individually authorize and construct major water projects.

Two agencies, the Soil Conservation Service and the TVA, are granted authority to select and finance projects from within appropriated budgets and do not need individual authorizations or line-item appropriations.

But development in the West is largely dependent on the Bureau and Corps approval process, a process which provides ample safeguards against hasty decision-making.

Beginning in the 1940's, these agencies were singled out to develop cost/benefit analyses as part of their feasibility studies.

If a project couldn't demonstrate returns exceeding project costs, the project wouldn't be approved.

Although other public works programs are now required to conduct similar evaluations, few are subject to the same high standard of direct benefits exceeding costs.

There is no question that cost/benefit analysis forces hard evaluation and careful planning, but the emphasis placed on this type of analysis can be excessive.

For example, some types of benefits are more easy to quantify than others. Projects important to maintaining stream flows or providing wildlife habitat, or projects that bring water to economically depressed areas, are of unquestionable public value but are very difficult to evaluate.

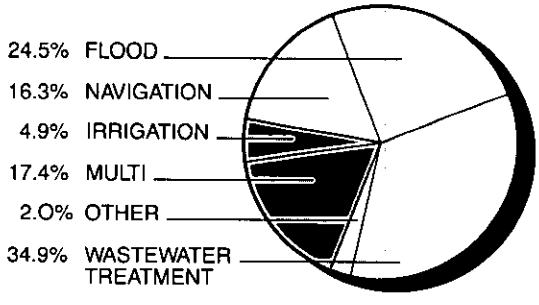


Figure 21. FEDERAL WATER EXPENDITURES BY FUNCTION (1956-82)

Western water projects lead the nation's public works programs in repaying their costs.

For over fifty years, western water projects have been required to repay over eighty percent of their construction costs and 100 percent of their operating and maintenance costs.

The Bureau of Reclamation, for example, has been in operation for eighty-two years. Of the total investment made in water development facilities, twenty-four percent has already been repaid. Repayment contracts for an additional sixty percent are in effect, with contracts pending for most of the remainder.

Different types of water development programs are subject to different payback requirements. Hydroelectric and municipal and industrial water supply are required to cover 100 percent of their costs, plus interest. Water for agricultural use must cover construction costs, but without interest.

Other functions, such as flood control, inland waterways, ports and harbors, and fish and wildlife preservation, are considered non-reimbursable expenses. Most other parts of the nation invest their water development dollars primarily in navigation and flood control projects not subject to federal payback.

Because western water development is largely focused on hydroelectric and agricultural uses, the West has repaid a far greater percentage of its water development costs than any other region.

CASE STUDY: THE HOOVER DAM

By the end of this decade, Hoover Dam will have repaid its original construction costs.

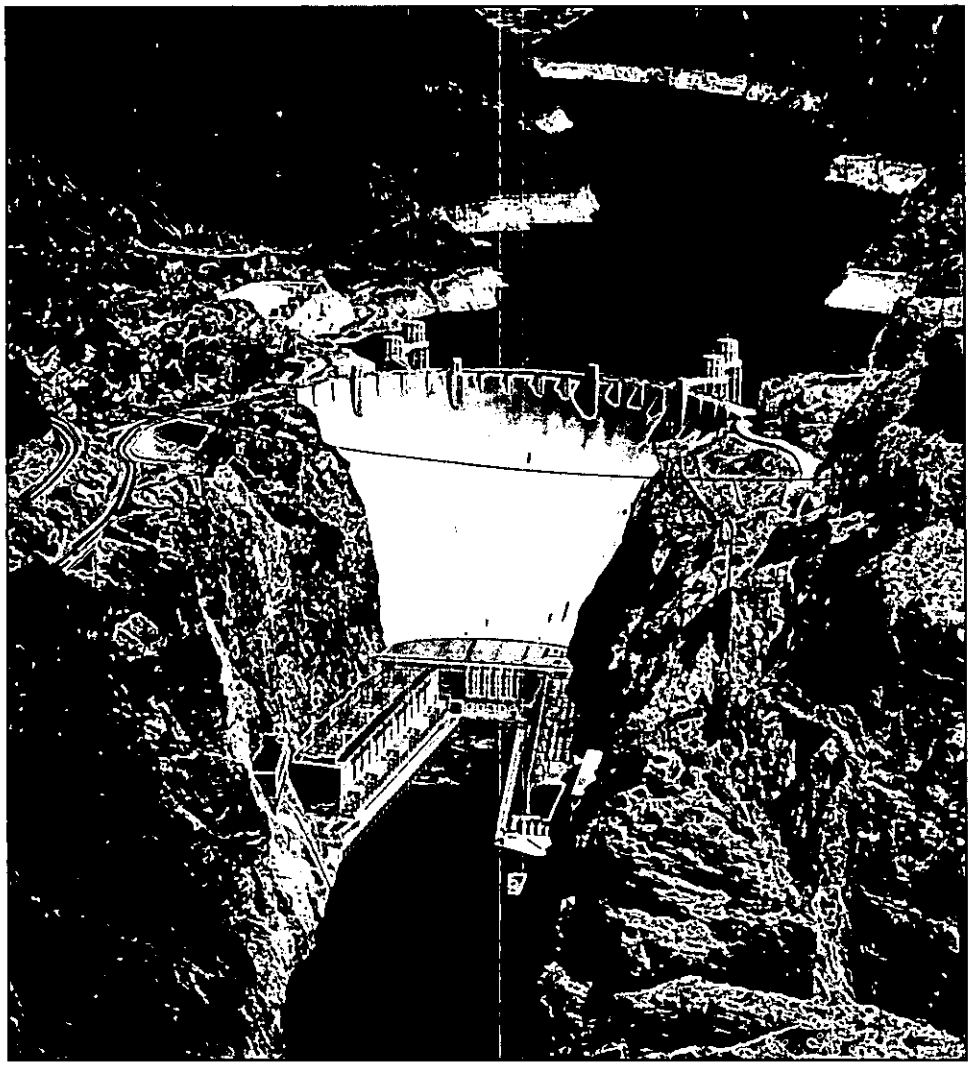
In 1905, the Colorado River changed its channel, flooding into California's Imperial Valley to form the Salton Sea and prompting Californians to demand that a dam be built to control the river's floods.

Faced with upper basin fears that a dam would allow rapidly growing lower basin states to put the river's water to beneficial use and secure senior water rights, the lower basin states agreed to a compact in 1922 which divided the Colorado River waters between the two basins. Those in California wanting flood control were joined by other California interests which sought hydroelectricity and a water supply for southern California.

In 1928, Congress enacted the Boulder Canyon Project Act for the construction of Hoover Dam and creation of Lake Mead.

Today, the United States owns a dam which cost $169 million. It is 726 feet high and backs up 28.5 million acre feet of water—the nation's largest man-made reservoir. The power plant has seventeen turbines with a capacity of 1,500 megawatts. Of the $169 million in costs, Congress determined that $5 million were non-reimbursible costs and $25 million would be deferred for flood control.

In 1987, the remaining $139 million will have been repaid. In addition, the project will have paid $133 million in interest and produced $463 million in revenues from power and water sales.



The estimated replacement cost is over $1 billion. The dam is expected to last at least another fifty years, and future revenues will be used to pay for salinity control to meet treaty obligations with Mexico.

Water from Lake Mead irrigates one million acres of the most productive farmland in the nation, as well as a half-million acres in Mexico. The dam provides full or supplemental supplies of water to thirteen million people, the power plant produces 2.5 to 4.5 billion kilowatt hours of electricity per year, and Lake Mead attracts seven million visitors a year.

At the time the project was undertaken, it could have been criticized as a raid on the federal treasury to benefit special interests. Fifty years later, it is recognized as one of the most beneficial public works efforts in the history of the nation.

III: NATIONAL INTERESTS; NATIONAL OBLIGATIONS

The United States government has a series of treaty obligations that depend on adequate supplies of western water for their fulfillment.

The future direction of national water development policy is anything but clear. Budgetary constraints, competing regional interests, and ever-changing federal priorities complicate the picture.

But western water development is not an issue of parochial concern. The United States government has a series of treaty obligations that depend on adequate supplies of western water for their fulfillment.

A comprehensive and coherent policy towards western water must reflect these treaty obligations:

1. INDIAN WATER RIGHTS

Over a century ago, through some 370 treaties and agreements, the sovereign American Indian tribes ceded vast areas of land to the federal government and were confined to comparatively small reservations.

In exchange, the government pledged to assist the Indians in making the transformation from nomadic life to a pastoral life as farmers and ranchers. The promise was made that the reservation lands would be made productive and self-sustaining. The Secretary of Interior was designated trustee for the nation's tribes.

THE LEGAL FRAMEWORK

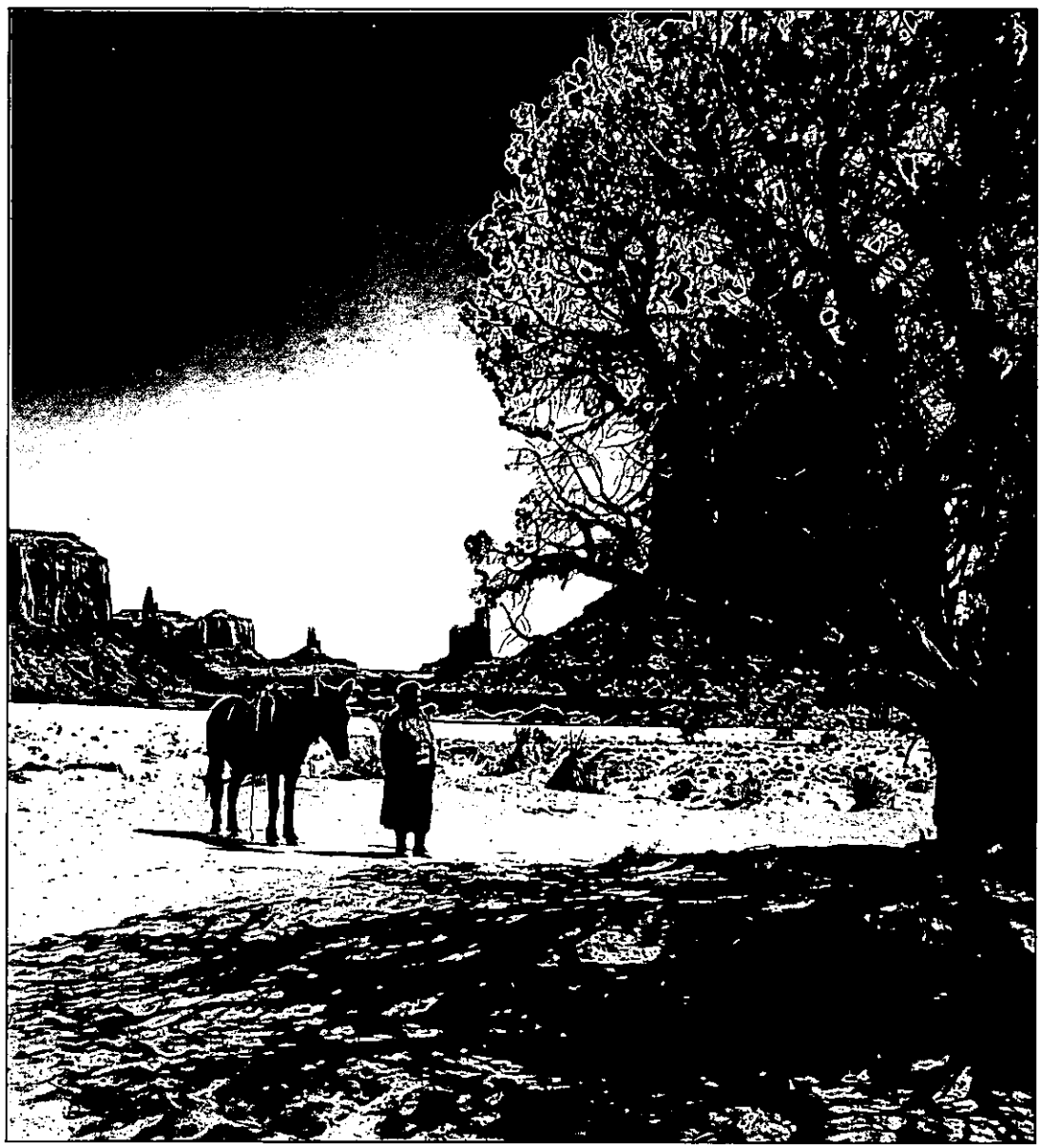
In 1908, in *Winters v. United States*, the U.S. Supreme Court ruled that, in granting lands to the tribes, the federal government had implicitly reserved sufficient water for their use.

The Court held that the reserved rights apply to water arising on or flowing across the reservation, and that the amount of water reserved must be sufficient to fulfill the primary purposes for which the reservation was established.

The priority of the reserved water right was determined by the date the reservation was created, and the Court held that such rights were not restricted by beneficial use or other requirements imposed by state law.

In the mid-1800's, as reservations were being established by the federal government, state water law was also evolving toward the doctrine of prior appropriation. Congress recognized the validity of this doctrine in the Mining Acts of 1866 and 1870.

Arizona represents the extreme example where potential claims exceed average supply for the entire state by approximately ten to one.



Significant portions of tribal lands in the West, such as the Navajo land in Monument Valley, Arizona, are extremely arid.

In the Desert Land Act of 1877, Congress approved past and future appropriations of water from public lands, declaring the water "free for appropriation and use of the public for irrigation, mining and manufacturing purposes." In other words, the Supreme Court decision in *Winters* and the congressional legislation were putting private interests and Indian water rights in direct conflict.

And as the civil rights movement of the 1960's gained momentum, and led in part to the Indian rights movement, tribal leaders became more aware that valuable water rights were not being enforced. Today, over fifty lawsuits involving water rights are pending in state and federal courts as the tribes seek fulfillment of the original promise to make their reservations livable, viable, and self-sustaining.

THE OUTLOOK FOR THE FUTURE

Disputes over Indian water rights are affecting the availability of water for urban growth in Tucson, Phoenix, Albuquerque, and Salt Lake City; for energy development in the San Juan, Powder River, and Uintah coal basins; for the expansion of hydro sources for Seattle; and for the maintenance of non-Indian agricultural development in Arizona, Nevada, and Washington.

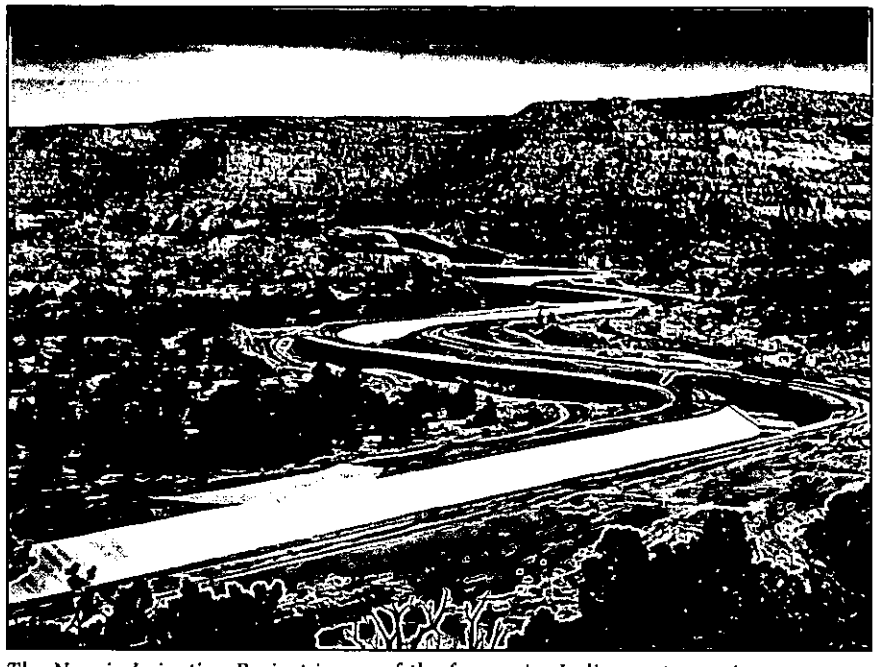
The outcome of this litigation is hard to predict. What we do know is that water rights litigation has been enormously time-consuming and expensive. The landmark *Arizona v. California* case has been in litigation for thirty years and still hasn't been completely decided. By federal estimate, the cost of the average Indian water rights suit is in the neighborhood of $3 million.

And even when cases have been appealed and finalized, if the appropriated water isn't readily available, congressional authorization, appropriation, and construction to provide the water can take twenty-five to thirty years. On a number of streams, new storage can't be built because the water simply isn't there.

The legal decisions that have been made have been largely ad hoc and inconsistent. The 1963 decision in the *Arizona* case, for example, awarded 900,000 acre feet per year to five tribes with 2000 members on the lower Colorado. But under the Colorado River Compact, the allocation to the lower basin states, 7.5 million acre feet per year, was already fully appropriated. The Court did not prescribe how the lower basin states were going to replace one-eighth of their total supply to meet these federal obligations.

The *Arizona* decision illustrates the need for a comprehensive approach to deciding Indian water rights cases, considering the extent of supply, the nature of existing uses, the potential future uses, existing compact obligations, and the precedential effect of the decision throughout the West.

A recent study prepared by the Western States Water Council uses the standard set in the *Arizona* case of "practicably irrigable acreage" to estimate the potential extent of Indian water claims in each western state. Arizona represents the extreme example where potential claims exceed average supply for the entire state by approximately ten to one. Arizona's neighbor, New Mexico, has proportions more typical of western states, with potential Indian claims amounting to eleven percent of the state's total supply.



The Navajo Irrigation Project is one of the few major Indian water projects.

Until Indian water rights are determined, state officials are unable to say with certainty whether water is available for new appropriation. Comprehensive planning is thus precluded, and the sale or transfer of existing rights may cease.

Because prospective buyers may not be certain they are buying secure rights, construction of approved water projects may be blocked, and major investments in manufacturing or industrial development may be postponed.

The situation for the tribes is no better. As the lawsuits drag on, unappropriated water is becoming more scarce. The federal government will not approve construction

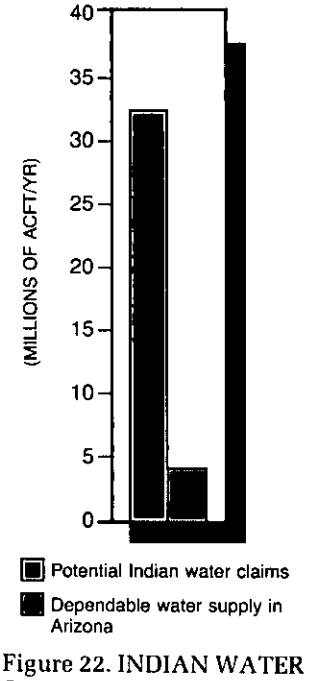


Figure 22. INDIAN WATER CLAIMS OVERWHELM AVAILABLE SUPPLIES IN ARIZONA

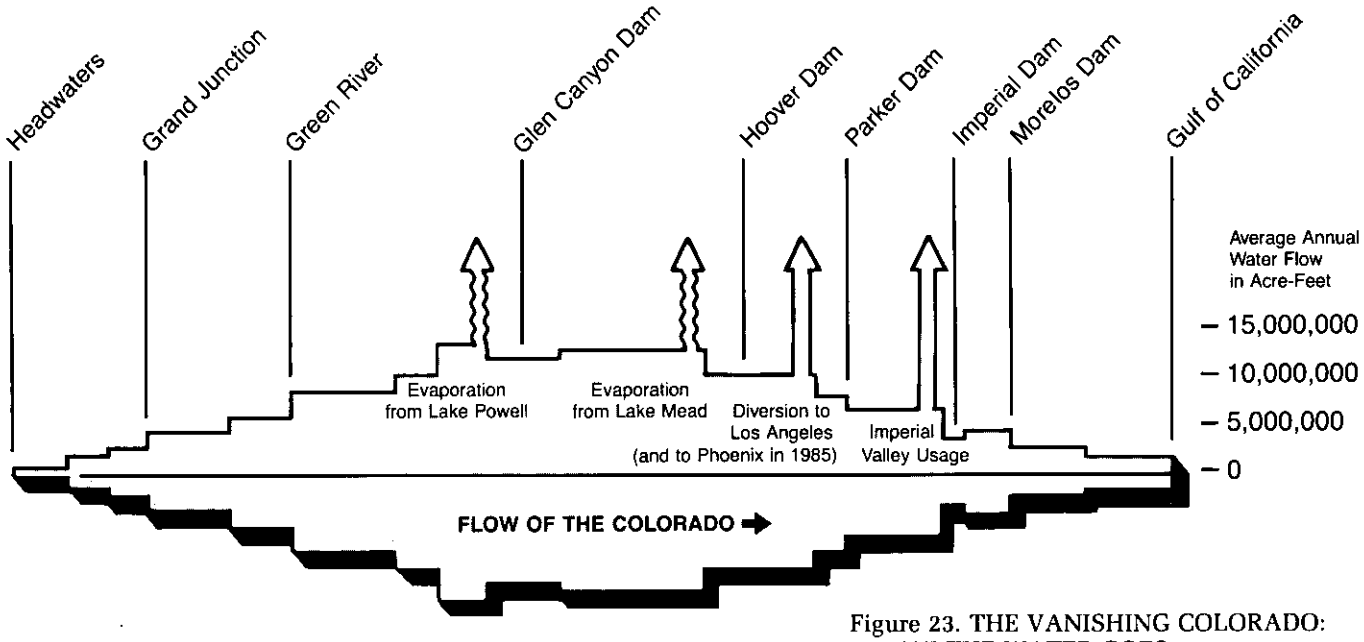


Figure 23. THE VANISHING COLORADO: WHERE THE WATER GOES

The Congress, the Department of Interior, the states, and the tribes must focus on legitimate expectations of both Indians and non-Indians to arrive at an equitable solution.

of Indian water projects until disputes are resolved, and economic development of Indian lands continues to lag.

Surely there must be a better way to resolve this problem.

The Congress, the Department of Interior, the states, and the tribes must focus on legitimate expectations of both Indians and non-Indians to arrive at an equitable solution.

Where possible, new sources of water should be developed which will provide tribes with their rightful water supply while protecting the investments and rights of existing users. Where new supplies are not available, the federal government has an obligation to justly compensate those who will lose their allocations, whether Indian or non-Indian.

2. RELATIONS WITH MEXICO

The ability to utilize and develop water resources in the West is affected by relations between the United States and its neighbors.

To the south, the nation shares a 2000 mile border with the Republic of Mexico. Almost 1300 miles of the border is river—1254 miles of the Rio Grande, and 24 of the Colorado.

In these desert lands, the rivers mean life. Two million acres of farmland are irrigated along the border, and fifteen pairs of sister-cities housing seven million people are dependent on the rivers' supplies.

TREATY OBLIGATIONS

In 1889, the governments of Mexico and the United States created the International Boundary Commission (now the International Boundary and Water Commission) to settle questions covering the location of the boundary when the rivers change course.

The first treaty to divide a portion of the waters of the Rio Grande was signed in 1906. In 1944, a major agreement was reached to allocate the water of the Colorado and Tijuana Rivers, as well as the Rio Grande.

The treaty guaranteed Mexico an annual allotment of 1.5 million acre feet of the Colorado River flow. At the time, total flow of the Colorado was estimated at 17.5 million acre feet, and the treaty reflected the Colorado Basin Compact agreement that

the upper basin states would receive 7.5 million acre feet, the lower basin states 7.5 million acre feet, with the remaining 2.5 million acre feet divided between obligations to Mexico and surplus.

In the intervening years, it has become clear that the average flows on the Colorado range from 13.5 to 15 million acre feet, which means that the river is overcommitted. By law, international obligations take precedence, and the upper and lower basin shares must be reduced to meet our treaty with Mexico.

Which states will have to provide the water is still unsettled, and the Department of Interior is examining ways to augment the flow of the Colorado to meet our commitment to Mexico.

Other areas of water policy remain in dispute:

- Three rivers, the Tijuana, the Alamo, and the New River, flow north into the U.S. The flows of all three present major health problems.
- Water leaking out of the All-American Canal flows across the border where it provides a groundwater supply to the Mexicali Valley. Water users in the U.S. are proposing to line the canal and salvage their water, thus depriving the Mexicans now using it as a source of supply.

These and other issues were addressed when President Reagan met with President de la Madrid in August, 1983. An agreement was signed to protect and improve the border environment, by addressing issues like sanitation, air pollution, and hazardous waste disposal.

However, a major issue, the problem of salinity, will not be resolved so simply.

THE SALINITY ISSUE

High concentrations of salt limit the usefulness of water and inflict major economic damage on agricultural, industrial, and municipal water users.

A combination of natural conditions and usage patterns turns the Colorado River extremely saline as it flows through the lower basin towards Mexico.

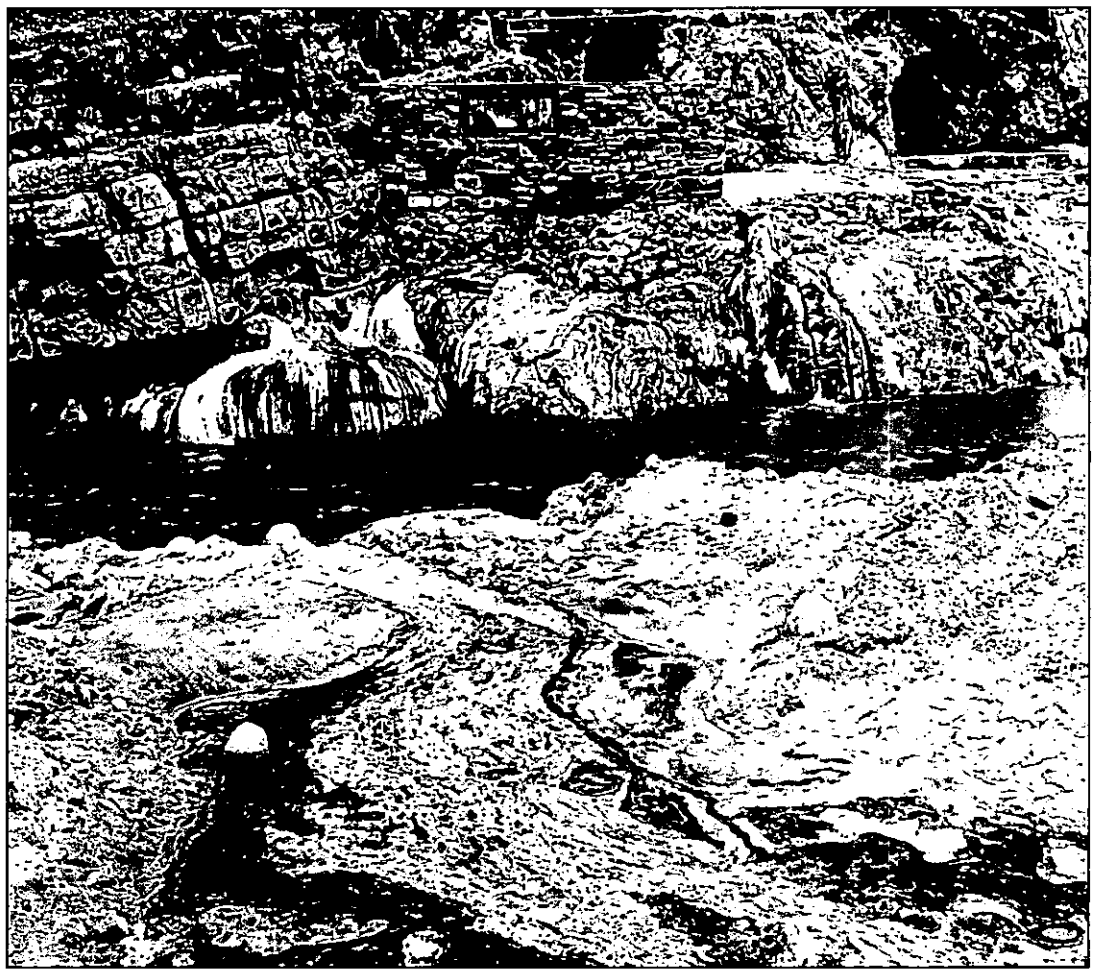
At the point where the river reaches Lake Mead, for example, it carries on an annual basis some nine million tons of salt. Damages from high salinity are estimated at $120 million per year on the U.S. side of the border.

The Colorado River's last drop of water, Colorado River Front Work and Levee System, Mexico

The damage to the Mexicali Valley is also substantial, and in 1974 Congress, responding to Mexican concerns, passed the Colorado River Basin Salinity Control Act. The Act addresses both obligations to Mexico and problems experienced within the United States.

The key provisions require that salt levels must be kept at or below the 1972 levels at Hoover, Parker, and Imperial Dams, and that the water delivered to Mexico under the Colorado River Compact would not contain more than 115 milligrams/liter of additional salts than the water going over Imperial Dam.

Cost estimates for controlling river salinity between now and the year 2010 range as high as $500 million.



Salt deposits like these near La Verkin Springs, Utah, cause much of the Colorado's salinity.

Excessive salinity destroys croplands.

The assumption behind this agreement is that the United States would succeed in controlling the salinity levels, an expensive and ambitious task.

The Colorado River Basin Salinity Control Forum is the mechanism through which the states and the federal government coordinate their salinity control efforts. Strategies include capturing the flows entering the river from salt springs, diverting saline waters for industrial use, and improving irrigation efficiencies.

The fact is, the optimum solution has yet to be determined. Cost estimates for controlling river salinity between now and the year 2010 range as high as $500 million. But if relations with Mexico are to be improved, the United States has no choice but to meet its salinity treaty obligations.

3. CANADIAN TREATIES

Since the signing of the Boundary Water Treaty of 1909, the International Joint Commission, United States and Canada, has resolved boundary disputes between the two nations.

The most significant treaty with respect to western water is the "Columbia River Treaty", signed in 1961. This agreement provides for construction, in Canada, of storage projects with capacities up to 15.5 million acre feet. The storage is to be used largely for the production of hydro power and for flood control.

The benefits of the flood control program are realized downstream in the United States, while the Canadians receive a greater share of hydropower generated in the United States as a result of stream regulation.

While relations with Canada have been less problematical than the issues confronting the United States and Mexico, there are a number of current controversies with both western and national implications:

- Seattle, Washington has a series of dams on the Skagit River to generate hydropower to meet urban demands. The city would like to raise the level of the Ross Dam to produce additional power, but raising the water level would back up water across the border and flood some sections of a Canadian valley of substantial environmental merit.
  Canada objects to Seattle's proposal, but the provincial government of British Columbia has previously agreed to raising Ross Dam. A compromise, where British Columbia would supply Seattle with low cost power over an extended period of time in exchange for Seattle withdrawing its proposal, is being negotiated.
- The state of Montana is concerned about the impact of potential Canadian coal development on tributaries of the North Fork of the Flathead River in British Columbia. Baseline information has been collected, while the government of British Columbia considers the request from the mining company to proceed with the development.

THE LIMITS OF STATE ACTION

In all these instances, the abilities of the states involved to control their own destinies is limited by the actions and obligations of the federal government.

As a national consensus evolves on water development, care must be taken that specific states are not forced to unfairly bear the brunt of what is actually a national responsibility and a national obligation.

Dam on the Skagit River.

The abilities of the states to control their own destinies is limited by the actions and obligations of the federal government.

IV: WESTERN NEEDS; NATIONAL OBJECTIVES

THE UNFINISHED AGENDA

Lost in the debate over western water policy is the fact that the development and storage programs that framed the controversy are largely completed.

The basic framework of mainstem dams, providing water storage, irrigation, hydroelectricity, flood control, navigation, and recreation, is largely in place.

One way of illustrating the status of the West's projects is to look at agency construction budgets over the past twenty-five years. Comparing *current dollars*—the amounts spent in each year plus the estimated costs to complete construction—would suggest that construction is less than half-way completed.

But if all the costs are translated into 1982 *constant dollars*, a different picture emerges. A look at the current western Corps accounts shows that eighty-five percent of the planned construction has been completed. Bureau of Reclamation figures list only sixty percent of their projects completed, but this is attributable to the large number of inactive projects on the Bureau books.

If the West's major water development projects are already in place, why is the West so vitally concerned about completing the rest of the major construction program?

Because most of the remaining fifteen percent needs to be completed to realize the full benefits of existing programs. In a number of cases, comprehensive plans have been made, arrangements and commitments put into place, water users have made decisions based on the plans, repayment schedules have been calculated on the basis of full development, and initial construction has been scaled to serve the completed project.

Does this suggest that every proposed project is appropriate and essential?

Not necessarily. In some instances, projects remain on the books because the priority of water rights or the schedules of payments may be tied to these authorizations.

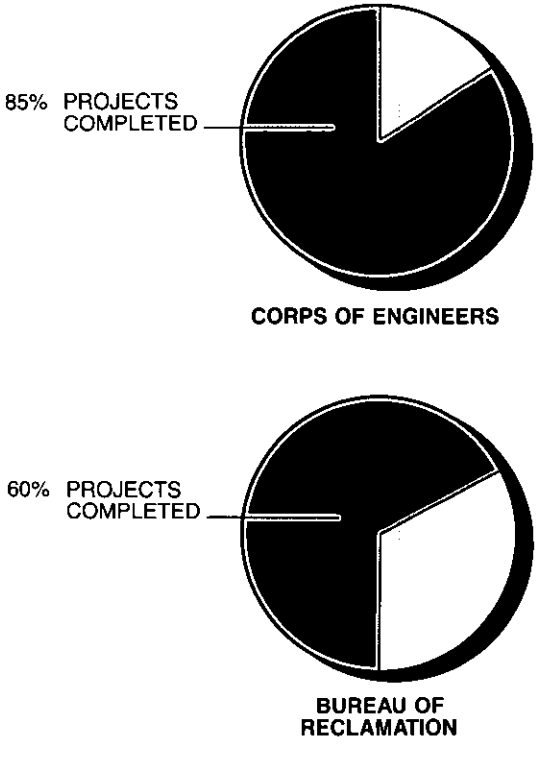


Figure 24. AGENCY BUDGETS SHOWING PERCENT OF WATER PROJECTS COMPLETED (In 1982 Constant Dollars)

THE UNFINISHED AGENDA—THE GARRISON DIVERSION PROJECT

The Garrison Diversion project in North Dakota is an uncompleted portion of the massive Pick-Sloan Program on the Missouri River.

Authorized in 1944, Pick-Sloan included six mainstem reservoirs in North Dakota, South Dakota, and Nebraska to produce electricity and provide flood control and navigation benefits for downstream states.

In exchange for the loss of valuable croplands, North Dakota and other upstream states were to receive irrigation for existing dryland areas. The Garrison Diversion Project is designed to distribute water stored behind one of the major dams.

Major commitments have been made in anticipation of construction. Initial facilities were designed and built to handle future water demand. Towns in the project area planned for future water supply from the Garrison project, the state applied for water rights to supply the water, and farmers planned to convert to irrigated agriculture.

Forty years later, project beneficiaries are still waiting for their benefits.

Of the promised irrigation in the Pick-Sloan Program, only eight percent has been built, with barely one percent provided to North Dakota.

Consider the equity of the situation. The downstream states from the Nebraska border to New Orleans have been saved approximately $1.7 billion in flood damages. Shipping on the stretch of river from Sioux City, Iowa, to the Mississippi has benefited from a deeper navigation channel, a lengthened navigation season, and a dependable flow.

By contrast, North Dakota loses an estimated gross business volume of $100 million annually as a result of the half-million acres of prime agricultural land flooded by the program, including seventeen percent of the state's woodlands. Loss in business volume from the unbuilt Garrison is estimated at $81 million, and twenty-nine towns remain dependent on poor quality groundwater or uncertain surface supplies.

Meanwhile, the Bureau of Reclamation estimates that $232 million has been invested in Garrison to date.

As a general rule, outdated projects *are not* being pushed by the western states. In a few cases, such as the Bradley Lake project in Alaska, when a state has felt that a project is essential and Congress has delayed authorization, the state has requested de-authorization and built the project with state funds.

The position of the western states is that those projects which are state priorities, and which Congress authorized as part of a multi-state, multi-benefits package, should be completed.

CHANGING NEEDS, NEW SOLUTIONS

Traditionally, the impetus for western water projects was to supply water for agricultural use.

But as the West continues to grow, this pattern of usage is changing. The major areas of economic development are in such sectors as services, tourism, energy development, small manufacturing, and retail trade—all largely municipal and industrial water uses.

Economic pressures caused by this changing pattern of consumption will force local, state, and regional authorities to change their thinking from "What is a beneficial use?" to "What is a *more* beneficial use?"—a far more difficult question.

THE ECONOMIC REALITIES

"Throughout the West, there has been historic, bipartisan consensus that our water is our most important resource. In the past, our focus was on the quantity of water available. In the future, that will shift to quality. As western governors, we are proud to maintain the ongoing tradition of safeguarding this resource for the future."

—Governor Allen I. Olson, North Dakota

Irrigated agriculture, which has expanded rapidly in the past, is unlikely to do so in the future. The decline in agriculture resulting from the cost of drilling wells and pumping groundwater, the rising cost of surface water, the need to maintain minimum quality and quantity standards for streamflows, the state of the nation's agricultural economy, and the demand from competing uses will more than offset any growth in irrigated acreage caused by the completion of existing programs.

As a general rule, outdated projects are not being pushed by the western states.

If projects are expected to pay their own way, how will projects emphasizing non-reimbursable purposes such as environmental quality and erosion and flood control be financed?

Farmers can typically afford to pay from $5 to $60 per acre foot of water. Industrial users often pay between $100 and $500 per acre foot. In the twenty years between 1960 and 1980, the value of a share of Colorado-Big Thompson water increased from $30 a share to a high of $2350. At $2000 per share, this translates to an annual payment of $280 per acre foot.

As water rights are sold, prices are continuing to escalate as well. Farmers now pay between $2 and $300 for the perpetual right to an acre foot. Ski areas have paid as much as $3000 for similar rights, and some sales in New Mexico have reached $12,000 for the right to use an acre foot each year.

THE SEARCH FOR NEW FINANCING SOURCES

"This is one of the major watersheds in history for western water development. The historic way of financing water development is at an end at the same time that new water pressures—for conservation, environmental protection, and urban growth—are rising."

—Governor Richard D. Lamm, Colorado

Completion of many of the large multi-state, multi-purpose projects, together with massive federal deficits, means that congressional appropriations for new project construction will become more and more difficult to sustain.

This raises a host of new questions.

What kind of projects, and what scale of projects can be financed independently through private markets?

If projects are expected to pay their own way, how will projects emphasizing non-reimbursable purposes such as environmental quality and erosion and flood control be financed?

How will states without large tax bases compete with relatively wealthy states to put their water to beneficial use?

Some new solutions have been proposed to meet the question of project financing, but the full implications have yet to be examined. Major proposals include:

1. *Increased user fees.* The Administration is advocating user fees, especially for users who are not now paying for benefits they receive. The initial focus is on navigation—on barges and other forms of water transportation to pay for dredging and locks, on shipping interests to pay for harbor costs, and on boaters to pay for small-harbor costs.

Others are looking to collect revenues from flood control projects by forming flood control districts and assessing those whose property value increased with construction of flood control facilities. The same approach could be used for those receiving benefits from hurricane protection, shoreline protection, and related projects.

User fees can be used to raise additional revenues as well as to cover costs. One possible form is that of pump taxes. In *Financing Western Water Investment*, a book written by Rod Smith for the Council of State Planning Agencies, the author proposes using pump taxes on groundwater withdrawals in a fiscal conjunctive management—dedicating pump tax revenues to augment surface supplies so that surface water will be available when the aquifer gets drawn

down or when groundwater is needed for domestic use.

But there are problems with this concept: it is not clear whether pump taxes can be levied on existing groundwater rights, which are protected property rights. Moreover, farmers, a group already facing high production costs, would be most impacted by such a strategy.

2. *Increased hydroelectric fees.* Currently, hydroelectric rates are tied to the amount needed to pay actual contruction costs. In large projects, such as the Colorado River Storage Project or the Pick-Sloan Program, the hydro rates, together with municipal and industrial water supply rates, first repay their costs with interest and then are reserved to pay back agricultural costs, without interest. Hydroelectricity has been the traditional "cash register" for western water development.

The price of electricity, whether generated by hydro facilities, fossil fueled plants, or nuclear plants, is based on cost. Most, but not all, areas of the country receive power from a mix of hydro, fossil, and nuclear plants. Generally the hydro portion is the lowest cost and therefore lowest priced portion of that mix.

It may be possible in certain cases to increase relatively lower priced hydro power without causing large percentage increases in overall electric utility bills. In such cases the increased hydro charges could be dedicated to water development costs, thereby creating a mechanism to generate funding from within the region where the development is needed.

Obviously many questions are raised by this approach. Hydro power is not distributed evenly to all consumers in every part of the West. Thus reliance on hydro rate increases could cost some more than others.

Any deviation from cost-based pricing of electricity, whatever the source and price, will be a dramatic departure from accepted standards. Electricity and all other energy costs have already risen much faster than other goods and services. Any further increases, no matter how small and no matter to what use the revenue is applied, will be strongly opposed by already hard pressed rate payers.

3. *Increased private participation.* "Privatization" has appeal because it taps non-tax sources of financing, often provides lower costs in a shorter construction period, and is a move towards less government involvement. At the same time, the size and type of water needs which are of appeal to private companies is restricted to those which are clear moneymakers. And the tradeoff for less government involvement could be loss of control, coordination, and capture of benefits from a public resource.

4. *Increased general taxes.* General tax revenues are a traditional source for state and local financing of water development, often on a pay-as-you-go basis.

Hydroelectricity has been the traditional "cash register" for western water development.

But it seems clear that the Congress and successive administrations are assigning a lower priority to western water development.

With increasing financial demands on state budgets, states will have increasing difficulties funding development from tax revenues unless new and higher taxes are enacted. However, states may still have to finance certain kinds of purposes from general taxes: those for which there are no other sources of financing.

5. *Continued federal financing.* For at least the past ten years it has become more and more difficult to gain passage of water appropriations bills. Congressional attitudes about regional economic development programs, public works funding in general, environmental values, and regional cooperation have changed. More recently massive, unprecedented federal deficits have put pressure on all discretionary appropriations.

   Some federal appropriations for western water development will continue to be made. But it seems clear that the Congress and successive administrations are assigning a lower priority to western water development. Funding for new starts will probably remain limited, and that which is provided may require significant cost sharing. This may be a continuing trend, and it may not be possible to reverse it in the near term.

   However, it is imperative that western state governments and other western interests work within these new realities to assure that attention is drawn to ongoing federal obligations, including Indian water development, treaty requirements, multi-state projects, environmental protection, and long-standing commitments.

THE DEBATE OVER FINANCING MECHANISMS

"We are ready for a new partnership on project financing. If representatives of the states and the federal government were to sit down together, we could design a good system and put a new policymaking model in place."

—Governor Scott M. Matheson, *Utah*

The concern over finding new revenue sources is equalled by the need for finding new financing mechanisms.

In the past, state-funded projects have been largely financed on a *pay-as-you-go* basis, primarily because many western states are constitutionally prohibited from general obligation debt financing.

With the growth in revenue bonding, these restrictions are less important. States now have the options of *revenue bonds* backed by user fees, sales of vendible products, or dedicated taxes, or *general obligation bonds* issued through state water authorities.

Federally-funded Bureau projects have relied on money appropriated by the Treasury with repayment occurring over fifty years. Certain types of projects, and certain types of purposes will continue to be financed by the federal government, but there are other options available for the federal government to assist state financing, in addtion to direct line-item appropriations:

- *Block grants.* Funds could be distributed to states based on an equitable formula, with the states then deciding how to use the financing. Block grants would simplify the congressional approval process and would place decision and management responsibilities in state hands. This approach might contribute to greater regional cooperation nationwide.
- *Federal loan programs.* A revolving fund could be created whereby repaid revenues would be available for new financing. A loan fund would enable projects to be built, while repayment would assure that high priority projects would be selected.
- *Federally guaranteed bond issues.* This approach would help low tax-base states place their bonds at reasonable rates of interest.
- *State and federal tax breaks.* Private financing will be more available if tax credits, tax exemptions, and traditional tax attractions are provided for water financing.
- *Simplification of the process.* States would be in a better position to attract private financing if they could assure investors that the length of the process,

standards for construction, and regulations would be simplified and/or expedited.

"The solution to western water problems does not rest entirely in new development or new projects. We must make a concerted effort to better use the water we have; to rehabilitate and maintain existing projects; and to promote water conservation."

—Governor John V. Evans, Idaho

ALTERNATIVES TO CONSTRUCTION

Improved conservation and management efforts may make it possible to avoid new construction in specific situations, thus saving water, the costs of new storage and distribution systems, and costs for water treatment facilities.

However, conservation can be a complex solution. The hydrological connection between surface water, groundwater, and return flows, and the multiple reuse of western water, complicates the legal right to conserve water and the receipt of conservation benefits.

Conservation may have negative environmental impacts by concentrating salts and other contaminants or by destroying water course plant growth which provides wildlife habitat.

And, conservation can be expensive. Agricultural technologies such as laser leveling and drip irrigation have high capital costs. Having to prove or disprove impairment of downstream rights may involve high legal costs. Buying out or retiring inefficient uses may be expensive, and changing the priority of use may incur high social and political costs.

The focus for conservation should be on real water savings at an acceptable cost, not merely on apparent savings.

There are options:

1. ***Conduct the technical and legal analyses to optimize conservation throughout a river basin.*** Clearly desirable, such an option will be lengthy, complex, and expensive. It involves hydrologic measurements on a far greater scale than those now made, gathering and integrating vast amounts of information over time, and intergovernmental coordination.
2. ***Facilitate the transfer of water at market prices.*** This is already starting to happen. The difficulties here are that two categories of users would be primarily affected: the poor, who could be shut out from acquiring water, and irrigated agriculture, which both buys and sells the most water. The net effect could be to drive up production costs, reduce the amount of foods grown, and threaten our country's cheap food policy.
3. ***Accept less than optimal water supply.*** Restrictions on time or frequency of water use, reduced reliability of quantity or quality of water supply, and statutory limits on growth may be acceptable solutions in certain instances.

OTHER CRITICAL NEEDS

INDIAN WATER RIGHTS

Although discussed at length earlier, it cannot be stressed how vital and how difficult this issue will be to resolve.

States want to protect their authority over the water resources of the state so that one body has responsibility for planning and managing this complex and critical resource. States want to assure the security of state water law and practices so that water users can rely on its rules and safeguards in making investment decisions. States want to protect existing users who have already made investments to develop and use water.

Most tribes feel that their water is the most valuable resource they have. They are determined to get full benefit from it. Because they too are in transition, they want to preserve their right to the maximum amount of water possible to cover any possible future need. And because water is gaining tangible value, some tribes hope to use it as a source of revenues to meet other needs.

Groundwater is far more difficult to manage and regulate than surface supplies.

Settlement of the disputes, which have such big stakes, will be difficult. Providing the water after agreement will also be a big job—locating the resource and building the facilities needed to store and deliver it will be a lengthy and expensive process.

Options include:

1. Providing the technical and financial assistance to tribes so that they have the necessary information to enter into negotiations for settlement.
2. Assuring that adjudications are decided in the context of the entire river basin—it hydrology, history, demographics, and existing and potential uses.
3. Determining whether tribes must use their water on reservation or may sell or lease it off reservation.
4. Where new supplies are unavailable, providing equitable compensation for those who lose their water—whether Indian or non-Indian.

INTERSTATE GROUNDWATER MANAGEMENT

As we increasingly tap our underground resources, we don't always have well developed systems to manage them, particularly on an interstate basis. Laws vary between states, and surface and groundwater laws vary within a state. Management responsibilities are fragmented. And many policy questions, such as the relationship of underground flows to surface compact deliveries or the relationship between surface uses and groundwater quality, have not been comprehensively addressed.

Groundwater is far more difficult to manage and regulate than surface supplies. To avoid immediate overuse and drawdown, the allocation of water must be controlled and enforced. But the costs of monitoring individual wells can be exorbitant, as can the costs of protecting groundwater quality.

Learning to integrate the use of surface and groundwater supplies—integrating the water law, using surface supplies when they are abundant and switching to groundwater when they are not, determining whether underground aquifers can be used as storage reservoirs for spring runoff—these are complex challenges for western policymakers.

There are three major approaches for managing groundwater resources:

1. Establish a state-directed process for examining the key issues and developing steps to resolve them. States have traditionally exercised primacy in groundwater control. If they wish to continue to do so, they will have to work together to assert active leadership in addressing unsettled issues.
2. Allow the courts to set groundwater policy, as they have recently in the *Sporhase* and *El Paso* decisions. If states can't reach cooperative solutions, they will continue to litigate their differences, giving the courts the opportunity to determine policy.
3. Leave it to Congress and federal agencies to establish national policy governing groundwater aquifers. EPA is responsible for setting water quality standards. Groundwater quality is determined to a large degree by the overlying land use. Because of the interstate nature of many aquifers, a case can easily be made to Congress that the federal government should intervene in groundwater management to protect water quality. At the same time, the uniqueness of each aquifer asks for site-specific management.

CASE STUDY: WESTERN MANAGEMENT INNOVATIONS

The ability of the western states to accommodate changes in water use are being demonstrated on a daily basis. Some highlights:

- Alaska and Wyoming have developed bold new approaches for state financing of water projects.
- In Arizona, Governor Bruce Babbitt, witnessing increased competition for water between cities, farmers and miners, led negotations which resulted in Arizona's Groundwater Management Act—the most comprehensive groundwater code in the nation.
- California has one of the most advanced water conservation programs in the nation.
- Governor Lamm of Colorado, tired of perennial disputes over water between the eastern and western slopes, instituted the Metropolitan Water Roundtable, which is negotiating a series of key tradeoffs.
- Hawaii is testing a process for purifying impaired-quality groundwater after it has been pumped.
- In Idaho, Governor Evans has encouraged his Department of Water Resources to develop a number of innovative financing mechanisms to implement the state water plan.
- Montana has established a Reserved Water Rights Compact Commission to address the state's Indian and other water rights disputes.
- Nebraska, in cooperation with neighboring High Plains states, is developing common strategies for protecting the Ogallala Aquifer.
- Nevada has enacted a comprehensive groundwater law which assures protection of existing rights while allowing reasonable use for new demands within the limitations of water quantities available.
- New Mexico is taking the lead in studying ways a state can preserve its groundwater, ranging from federal legislation to state appropriation of unappropriated groundwater.
- North Dakota is undertaking an extensive wetlands and wildlife enhancement program as part of the Garrison Project.
- Oregon, Texas, and Utah have active and effective loan programs to assist local governments in water development projects.
- In South Dakota, Governor Janklow agreed to sell Missouri River water for a coal slurry pipeline in order to raise revenues to finance water development so that the state could capture some benefit from its unused water rights. The benefits include the construction by the slurry pipeline company of a water pipeline which will deliver water to western communities in the state.
- Washington, in its Yakima River Basin Enhancement Project, is tapping experts nationwide to develop non-structural conservation measures.

These approaches will expand and multiply as the states continue to improve their ability to manage their own water resources.

ENDPAPER: WHAT DOES THE WEST WANT?

The West wants past commitments kept.

Projects currently underway or counted on such as the Central Utah Project, Garrison Diversion, and Columbia Basin were important when they were conceived and remain so today. They were approved as a total package when only part has been fulfilled.

The West wants the federal government to fulfill its responsibilities.

Indian water rights, international treaties, multi-state projects, equity issues beyond the scope of a single state, and environmental protection are clearly federal issues, and require the government's financial, technical, legal, and political resources.

The West wants a fair hearing.

Too often discussed glibly even by westerners as "pork barrel," western water development has an outstanding record of providing essential water supplies, returning large economic benefits to the nation, repaying more of its costs than other public works expenditures, filling national obligations, and providing prime recreation outlets for the nation. It's time to move past easy rhetoric in shaping the future of western water.

The West wants a cooperative relationship with the rest of the country.

The West, which knows the value of its own water development, understands the value of water resources to the nation. Western needs may differ from those of other regions, but all are important. Our nation will be poorer if we let our water investment deteriorate or refuse to provide sound water development for future generations.

The West wants time and assistance in developing solutions. This is a time of transition. The federal government has an obligation to work with the states, East and West, to develop alternative sources of revenue to finance water projects, to establish transitional financing mechanisms, and to provide technical assistance as the states assert new control over their destiny.

The West wants to get the job done.

The primary responsibility is not the federal government's. It is ours, those of us who live in the West. Governors, state legislators, local officials, civic leaders, the media, and everyone who relies on western water must cooperate to resolve the major issues facing us.

Deep and real differences will remain. But, if approached in good faith, respecting others' views, we will be able to move forward constructively to redefine "western water." To draw from Wayne Aspinall, one of the pioneers of western water development:

"There are never any easy solutions to water problems; they always involve compromise. The most pressing need is to get together—all segments of the [nation], both population and geographical—to figure out how to use our water. We must determine our priorities in a friendly way, not pitting East against West."

PHOTO CREDITS

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Fig. 2. Water Atlas of the United States

Fig. 3. Higginson-Barnett, Consultants. Bountiful, Utah

Fig. 4. Water Atlas of the United States

Fig. 5. Institute of Petroleum Geologists

Fig. 6. America's Soil and Water: Condition and Trends. U.S. Dept. of Agriculture, Soil Conservation Service.

Fig. 7. America's Soil and Water: Condition and Trends

Fig. 8. America's Soil and Water: Conditions and Trends

Fig. 9. National Water Summary 1983—Hydrolic Events and Issues. U.S. Dept. of Interior, U.S.G.S.

Fig. 10. Western States Water Council

Fig. 11. U.S. Dept. of Interior

Fig. 12. Office of Management and Budget (OMB) and Water Agency data

Fig. 13. OMB and Water Agency data

Fig. 14. Agency data

Fig. 15. Bureau of the Census, Congressional Research Service

Fig. 16. OMB and Agency data

Fig. 17. OMB

Fig. 18. OMB and Agency data

Fig. 19. OMB and Agency data

Fig. 20. Denver Research Institute. Denver, Colorado

Fig. 21. OMB and Water Agency data

Fig. 22. Western States Water Council

Fig. 23. Martin, Russell. "The Mighty Colorado," *Rocky Mountain Magazine*

Fig. 24. Higginson-Barnett (from Agency data)

ACKNOWLEDGEMENTS

The Western Governors' Association wishes to thank the following individuals and organizations for their contributions to this report:

Jack Barnett
Ken Dunn
John Echohawk
Keith Higginson
Blaine Liner
Bill McDonald
Warren Neufeld
John Spencer
Wes Steiner

Arizona State Museum
University of Arizona
Bureau of Reclamation
Corps of Engineers
Denver Research Institute
Ford Foundation
Soil Conservation Service
Tennessee Valley Authority
Western States Water Council

CREDITS

Design: W.C. Matthews & Company
Edit: David Ethan Greenberg
Photo Research: Susan Armstrong
Type: Mel Typesetting
Print/Production: Communigraphics, Inc.

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