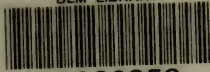


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Resources
for
Tomorrow

1961 annual report

THE SECRETARY OF THE

INTERIOR

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1961 *Annual Report*

THE SECRETARY OF THE INTERIOR

Stewart L. Udall



*For the Fiscal Year Ended
June 30, 1961*

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THE SECRETARY OF THE INTERIOR
WASHINGTON

DEAR MR. PRESIDENT: Transmitted herewith is the annual report of the Department of the Interior for the fiscal year 1961.

In preparing this summary of departmental activities we have been mindful of the statement in your special message to the Congress on natural resources that wise investment in a resource program today will return vast dividends tomorrow.

As you have said, our country has been generous to us in this regard—and we cannot now ignore her needs for future development.

In the year just past we have made great strides toward the sound conservation and development of our water, our land, our forest, and our mineral resources.

But perhaps more importantly we have laid the groundwork for programs just getting under way which in the years ahead will assure America of adequate resources to meet its growing needs.

Sincerely,

Secretary of the Interior.

THE PRESIDENT,
The White House.

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Part I

RESOURCES FOR TOMORROW

Resources for Tomorrow

The Department of the Interior has the prime function of planning for the future of America and working to conserve the natural resources which sustain its life.

But because so much of what is happening inside America today is drowned out by the clamor of an embattled world, it is only recently that we have become aware of a growing internal crisis which deeply affects the lives of all Americans.

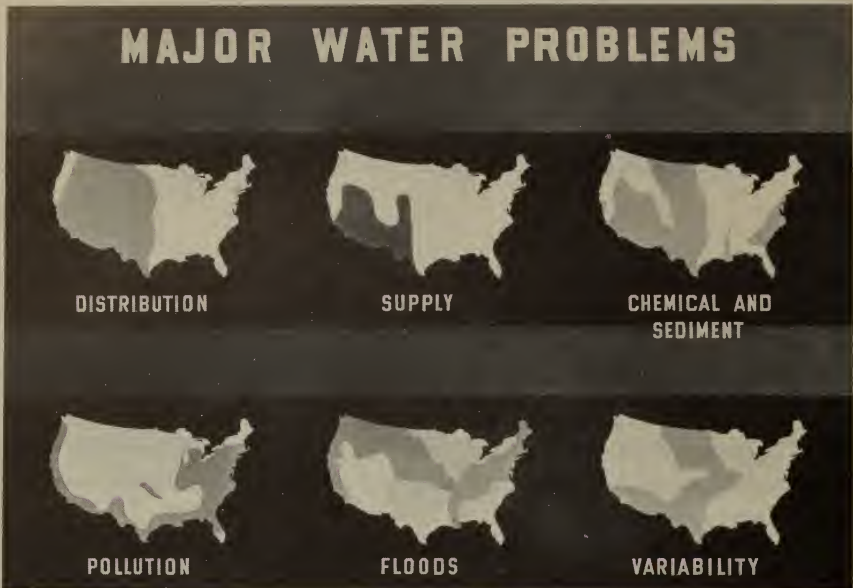
This "Quiet Crisis" concerns a battle being waged against us from within by the forces of natural progress and explosive growth. In its wake across America this battle has left polluted rivers and lakes, disappearing open space, overcrowded parks, declining resources, the threatened extinction of certain species of our wildlife, and dwindling opportunities for the outdoor experiences which through the years have had such a profound influence in shaping the national character of America.

At Odds With Our Environment

Never before has man been so at odds with his environment as we are in America today. In the short span of a hundred years—the century that bridges our great westward expansion and the present day—we have created forces hostile to nature that, given full sway, could in time make us strangers in our own land.

A great poet has written of our continent: "The land was ours before we were the land's."

As we survey the developments of the past two decades, we are driven to the inescapable conviction that the land which we and our forebears knew will not be "ours" for long unless we arrest the forces that would alter and blight it and despoil its fruits.



We are seeing the face of America change. This has been going forward rapidly, as we all know, since the end of World War II. For example, today more than a million acres of land each year is being converted from open space into industrial and commercial developments of various kinds.

Let us look at another of the changes. Forty years from now it is predicted that 85 percent of the people of this country will be living in urban centers. Consider how this movement will affect, among other things, the great problem of our water needs. We can anticipate these needs will double with our population growth in the next 20 years; they will quadruple in the next 40 years. Already there are areas where growth has been checked because of water shortages. Only in recent years have we realized that water is a resource with limitations.

There is the question, too, in this movement to urban centers, of how the enormously increased requirements for electric power will be met. Here the projected growth in demand even far outstrips our future water needs.

This again indicates the crises that we face in terms of conservation. Indeed, how our cities grow and how we use our resources will determine in the long run what kind of lives our people lead and what kind of people we are.

If we are to maintain man's proper relationship with nature, it is plain that we must broaden the role of resource planning in the management of our national affairs.



One of the greatest natural resource challenges of the 1960's is to insure that the urban population of America has open spaces near their teeming metropolises where a few quiet hours can be spent.

The American continent has, from the beginning, been hospitable to mankind. Its glories and its gifts have made possible the kind of life we know in America today. But the good earth will remain good only so long as we make it so.

A Forecast of Things to Come

Many years ago, Theodore Roosevelt summed up the challenge which we face today when he said: "To skin and exhaust the land instead of using it so as to increase its usefulness will result in undermining in the days of our children the very prosperity which we ought by right to hand down to them."

Each element of the "Quiet Crisis" in which we are now involved represents, at this stage, no more than a serious inconvenience, together with an uneasy prospect of the future. But—taken together—they add up to a circumstance that threatens the wellsprings of our national existence.

The history of man's progress is, in large measure, the chronicle of his emotional and physical relationship with the land—and, through the land, with himself and his fellow man. In America, we found a virgin continent with magnificent landscapes and a seemingly inexhaustible supply of natural resources. A good many of the qualities which we ascribe to our national character—humility, the sense of fair purpose and fair play, generosity, to name a few—are based to large degree upon our finding of the bounties of this land.

But what of America in the 20th century? How can we measure ourselves against traffic jams, blight, smog, polluted streams?

If a measurement is made, can we find ourselves otherwise than wanting in our environment of today?

At no time has a society achieved so much in the way of material progress—but at the same time allowed so many of its basic values to fall by the wayside.

And—in the strict accounting—one of the most vital of the values we have allowed to slip away is our oneness with the land—the utilization of the land's resources to give the American people the maximum of enjoyment, understanding, and inspiration from the sites and objects inherited from our past.

Time To Call a Halt

Admittedly, we must move ahead with the development of our land resources. Likewise, our technology must be refined and stimulated. But in the long run life will succeed only in a life-giving environment.



The beauty of nature and nature's works has always been an inspiration in American life. The park resources of America and the responsibility for their protection and enhancement rests with the Department of the Interior as one of its greatest resource challenges of the future.

We can no longer afford unnecessary sacrifices of living space and natural landscapes.

The sad truth is that development tends to outrun planning in our society. More often than not the wrecker's work is done before the conservationist and the planner arrive on the scene.

If we are to maintain man's proper relationship to the land, it is plain that we must insist that our developers be more conservation-minded, and we must broaden the role of resource planning in the management of our national estate.

In our haste to build new factories and roads and suburbs we must take care that man's need to refresh himself in his natural environment is not foreclosed, and that our basic resources—water, timber, fuels—are not unnecessarily diminished.

President Kennedy has called for one last great effort in the 1960's to finish the conservation work begun by Theodore Roosevelt who long ago counseled Americans to "set apart forever for the use and benefit of our people as a whole rich forested lands and . . . the flower-clad meadows of our mountains."

"This nation," the President said, "cannot lose sight of its natural resources—its land, wood, and water—while building its military might. We hold the sword, and we are determined to maintain our strength and our commitments. But we also hold in our hands the trowel."

This spirit motivated the first major conservation accomplishment of President Kennedy's administration—the creation of a magnificent National Seashore Park on the ocean sands of Cape Cod, in an area close to major population centers of the East.

Through this action, one of the most beautiful of America's remaining unspoiled open spaces will be preserved for all time for the use and enjoyment of this and the generations to come.

But at every hand near our growing centers of population similar opportunities are slipping through our fingers. Once land development has begun it is invariably "too late," for land prices quickly soar beyond the public purse.

Cooperative Effort Is Needed

What strategy, what plan of action, will save enough space for all of our people? Leadership from our public men is, of course, indispensable. Federal action is needed to round out our national park and wildlife refuge systems and to develop fully the recreation and timber potential of our forestlands.

We must also have aggressive State park expansion programs to reserve new parklands before they are pre-empted. Municipal lead-

ership, too, is essential if we are to provide adequate city park systems and enough fringe open space to permit our cities to expand gracefully.

We also need—and here the burden falls heaviest on local leadership—creative and farsighted use of zoning regulations and land use plans to compel the speculator and developer to put people first and ensure that adequate space is allotted to playgrounds and parks.

Government can provide the main thrust, but individuals must play a creative role if we are to ensure an adequate heritage for all Americans.

If our growth in the years ahead is to leave America a better, rather than a poorer, place in which to live, we must give far more attention to our uses of land and water, forests, fish and wildlife, parks and wilderness, minerals and fuels, and we must embark, while time allows, on an active preservation of the remaining open spaces which surround our populated areas.

In the future we can live in a land which is still worthy of being called "America the Beautiful" . . . or our cities can be hemmed in by a billboard-studded wasteland running monotonously from one super-city to another. The choice is ours—and the time to make the choice is now.

New Horizons

Under the vigorous leadership of the Kennedy Administration, this Department, in close collaboration with other Federal, State, and local agencies, is moving rapidly toward new horizons of resource conservation and development concerned not only with wildlife and natural resources, but with man himself.

The significance of our concern with the human resource has been well expressed by Wallace Stegner, the distinguished novelist, when he wrote:

"Something will have gone out of us as a people if we ever let the last remaining wilderness be destroyed, if we permit the last of our forests to be turned into comic books and plastic cigarette cases, if we drive the few remaining members of the wild species into zoos or extinction, if we pollute the last clean air or dirty the last clean streams or push our paved roads through the last of the silence.

"Not many people are likely any more to look upon what we call progress as an unmixed blessing. Just as surely as it has brought us increased comfort and more material goods, it has brought us spiritual losses and it threatens to become the Frankenstein that will destroy us."

Land and Recreation

One of the most important segments of this vigorous new program is concerned with our relationship to, and our use of land.

In his special message to the Congress on natural resources in February 1961, President Kennedy pointed out that he had instructed the Secretary of the Interior, in cooperation with the Secretary of Agriculture and other appropriate Federal, State and local officials and private leaders to:

- formulate a comprehensive Federal recreational lands program;
- conduct a survey to determine where additional national parks, forests, and seashore areas should be proposed;
- take steps to insure that land acquired for the construction of Federally-financed reservoirs is sufficient to permit future development for recreational purposes; and,
- establish a long-range program for planning and providing adequate open spaces for recreational facilities in urban areas.

Action to bring about these long-needed improvements in our recreational land planning and management is well under way.

At the same time, programs are being accelerated which will result in the more productive use of our public land. The Federal Government has responsibility for nearly 770 million acres of such land, much of it devoted to a variety of essential uses. But, for a number of reasons, some 477 million acres of public domain lands remain vacant, unappropriated and unreserved. Obviously, this represents a vital national reserve that should be devoted to productive use now and maintained for future generations.

To bring about this end, the Department of the Interior has taken steps in this Administration to:

—accelerate an inventory and evaluation of the nation's public domain holdings to serve as a foundation for improved resource management;

—develop a program of balanced usage designed to reconcile the conflicting uses—grazing, forestry, recreation, wildlife, urban development and minerals, and,

—accelerate the installation of soil conserving and water saving works and practices to reduce erosion and improve forage capacity; and to proceed with the revegetation of range lands on which the forage capacity has been badly depleted or destroyed.

Meeting Our Water Problems

Today in the United States we are using more than 300 billion gallons of water a day. By 1980, we will need 600 billion gallons a day.

This is going to be one of our most critical problems in the years ahead.

Water problems in one form or another touch all 50 States of the Union. In some areas it is a problem of availability, in others of salinity or quality; it may be a problem of maldistribution or in some cases a problem of excess. Regardless of the cause, as a Nation, we can no longer regard with parochial indifference the increasing imbalance between the supply and the demand for water in the United States.

At the same time, our available water supply must be used to give maximum benefits for all purposes—hydroelectric power, irrigation and reclamation, navigation, recreation, health, home and industry. If all areas of the country are to enjoy a balanced growth, our Federal Reclamation and other water resource programs will have to give increased attention to municipal and industrial water and power supplies as well as irrigation and land redemption. This Department, with the full cooperation and support of President Kennedy, is taking steps to speed the development of a balanced program to meet our water needs.

Already, as another major conservation achievement of this Administration, approval of the Congress has been won for pollution control legislation. This comes at a time when pollution of our country's rivers and streams has—as a result of our rapid population and industrial growth and change—reached alarming proportions. To meet all needs—domestic, agricultural, industrial, recreational—we shall have to use and re-use the same water, maintaining quality as well as quantity. In many areas of the country we need new sources of supply—but in all areas we must protect the supplies we have. The newly enacted pollution control legislation will, in the years to come, help make this possible.

At the same time, in an equally important action, the Congress authorized a \$75 million program which enables the Department to greatly accelerate its work toward development of the best and most economical processes and methods for converting saline and brackish water into water suitable for beneficial consumptive purposes.

The Act instructed the Secretary of the Interior to place emphasis on the conduct, encouragement, and promotion of fundamental scientific research and basic studies looking toward solutions of saline water conversion problems. To this end, at President Kennedy's request, a panel of his Science Advisory Committee has been working with the Department to assure the most vigorous and effective research and development program possible in this field.



Seated at his desk in the White House, President Kennedy presses a special button, made of magnesium extracted from sea water, to start fresh water flowing from the water conversion demonstration plant at Freeport, Tex., on June 21, 1961. With the President are Dr. Leland Doan, president, and (r) Dr. A. P. Beutel, vice president of Dow Chemical Company.

An example of the progress now being made in this vital area may be seen in the fact that in June 1961 President Kennedy pressed a button at his desk in the White House which set the machinery in motion—across the nation at Freeport, Texas—of the first saline water demonstration plant constructed by the Federal Government

in cooperation with private industry—a million-gallon-a-day plant that is already in the Freeport municipal water system.

Within months, dedication ceremonies were held marking completion of construction of a 250,000-gallon-a-day plant to demineralize the brackish well water at Webster, S. Dak., and construction was nearing completion on a second million-gallon-a-day sea water conversion plant at San Diego, Calif. Building of two additional plants in New Mexico and North Carolina is scheduled to begin in the coming fiscal year.

Science Advisor Appointed

Strengthening of still another vital water resource program—that dealing with oceanography—was assured during the year with the appointment of the noted scientist, Dr. Roger Revelle, as Science Advisory to the Secretary of the Interior.

Serving as the first science advisor in the history of the Department, Dr. Revelle is on leave of absence from his post as director of the University of California's Scripps Institution of Oceanography.

For the past several years, he has also been dean of the University's School of Science and Engineering at La Jolla, and, in addition to his contribution to the Department's work in oceanography, he will advise on and coordinate the numerous programs in other scientific fields.

Electric Power

In his 1961 message to the Congress on natural resources, President Kennedy had this to say in regard to electric power:

"To keep pace with the growth of our economy and national defense requirements, expansion of this nation's power facilities will require intensive effort by all segments of our power industry. Through 1980, according to present estimates of the Federal Power Commission, total installed capacity should triple if we are to meet our nation's need for essential economic growth. Sustained heavy expansion by all power suppliers—public, cooperative, and private—is clearly needed.

"The role of the Federal Government is supplying an important segment of this power is now long established and must continue . . .

"Hydroelectric sites remaining in this country will be utilized and hydroelectric power will be incorporated in all multiple-purpose river projects where optimum economic use of the water justifies such action."



A night scene at Grand Coulee Dam symbolizes the hydroelectric challenges faced by the Nation today. With three times as much power considered necessary in 20 years, the full hydroelectric potential of the Nation will play an important part in meeting these needs.

At the same time, the President directed the Secretary of the Interior to develop plans for the early interconnection of areas served by the Department's marketing agencies with adequate common carrier transmission lines; to plan for further national cooperative pooling of electric power, both public and private; and to enlarge such pooling as now exists.

In an initial move to comply with this directive, the Department established a special task force to study the feasibility of interconnecting the lines of the Bonneville Power Administration in the Pacific Northwest and those of the Central Valley Project in California.

Realizing the need to improve the existing transmission system, both public and private, the Department appointed a committee to begin studying possibilities of standardizing equipment in operations of an extra high voltage system. It invited private power interests to name a comparable committee to cooperate in an initial effort to standardize voltages looking toward eventual construction of a common carrier power grid.

An encouraging development resulting from this action came in September when the Edison Electric Institute outlined plans for a 10-

year program of transmission line construction which could well open the way for a major cooperative planning effort of inter-connecting and pooling facilities of public systems with those of private industry.

In a statement issued following the Institute's announcement, the Secretary of the Interior declared:

I am encouraged to learn of these new plans for pooling and interconnection of the Nation's power company systems. Since President Kennedy issued his message on natural resources in February of this year, there has been an increasing awareness on the part of the entire utility industry of the need to make optimum use of the Nation's electric power facilities.

It is timely that both public and private sectors of the power field are looking beyond mere interconnection of lines and are considering the mutual advantages of extra-high voltage transmission. Many countries in western Europe have already proved the mutual benefits attainable by such cooperation.

The logical next step is a cooperative industry-governmental effort to plan for the full utilization of the present and future facilities of private industry, consumer-owned utilities, and the Federal Government. These public agencies represent nearly 25 percent of the Nation's electric power industry. Such a move would be in the interest of sound, complete, overall planning. Wherever practicable, these major lines should be operated on a common carrier basis.

Meanwhile, the Congress approved construction on an all-Federal basis of the backbone transmission lines required to market the power generated by the giant five-State Colorado River Storage Project, and steps were immediately taken to expedite planning and progress toward completion of the undertaking. Simultaneously, the Department urged public agencies and private power companies to cooperate with it in working out a transmission system beyond the basic backbone system that will ensure the economic growth of the Colorado Basin, and promote the stability of the entire power industry.

A first step was taken toward the development of a striking new conservation tool for our electric power resources with the undertaking of studies looking toward so-called "pump-back" storage systems which permit the use of generation capacity during slack demand periods to build power reservoirs which can be pumped back into use at peak periods of power use.

The Challenge of the Future

These, then, are a few examples of how the Department of the Interior is moving as speedily as possible to develop our national resources for tomorrow. There are many others. For instance, new trails are being blazed for the American Indian through implementation of a Kennedy Administration task force report calling for greater emphasis on Indian education and the wider use and development of natural resources on the reservations.

In Reclamation, work is under way to schedule a progressive, orderly program of starting new projects to meet accumulated demands.

Similar actions are under way in regard to the conservation and development of our minerals, our fuels, our helium resources, our forests, and our wildlife. In the following pages, all of these vital programs will be discussed in detail, and the progress shown.

From its earliest days as the "housekeeping" agency of the Federal Government and through the period when it played an important role in the winning of the West, this Department has, in effect, become the "Department of the Future."

Its responsibilities in regard to natural resources have become not only national but international in scope.

The Department—at this challenging period in its existence—recognizes that the demands of a growing industrial society at home, as well as the nation's commitments to defend freedom abroad, presents it with the most serious resource demands.

Whether our physical and spiritual resources prove adequate to meet our needs tomorrow will be determined by the decisions we make—or fail to make—today.

This is the moment of decision in resource conservation.

Our actions toward this goal during the challenging 1960's will determine the character—and the achievements—of this nation for many years to come.

Our Outdoor Recreation Needs—Planning for Tomorrow

Under Theodore Roosevelt, a million and a half acres of outdoor wilderness was added to our national park system. Woodrow Wilson's administration provided a record 5.3 million acres of this precious resource, and under Franklin D. Roosevelt, the nation was enriched by an addition of another 3.5 million acres in our national parks.

But from the end of World War II until the start of President Kennedy's administration, America has added but 93,000 acres to its system of national parks.

During this period we as a people have failed to keep our trust for the future—failed to act with the traditional conviction and knowledge that America's strength flows from its streams, its mountains, its forests—from the land itself.



The majesty and wilderness of Cape Cod has successfully been preserved for public use by present and future generations through dynamic action to create a series of new National Seashores.

The cumulative effect of this neglect on the tomorrows to come may be seen in the fact that population projections indicate that in the next four decades the demand for municipal parks and playgrounds will increase 4 times, the demand for State and county recreation centers will increase 16 times, and the need for wilderness and seashore parks will be 40 times greater than it is today.

For nearly a score of years, the growing current needs for outdoor recreational space and facilities have, on a national basis, been largely neglected or ignored—to say nothing of the total inadequacy of planning for the far greater requirements of the future.

Today, we are losing a million acres of open space each year to various kinds of developments. Obviously, the trend from open space to “asphalt jungle” cannot be allowed to continue at this pace.

“One Last Great Effort”

In 1961, the Department of the Interior acted with all possible speed and vigor to respond to President Kennedy’s call for “one last great

effort" to round out the conservation programs given their start under Theodore Roosevelt.

In less than a year, a new seashore area has been added to our national parks system; a wetlands acquisition act is offering new protection to our waterfowl; expanded programs are under way in soil conservation, resource management and land use; and, by administrative order, millions of acres of public lands have been made available at low cost for park and recreational—as well as educational—purposes.

The Department's National Park Service increased its efforts during the year to preserve, while there is yet time, such outstanding and spectacular areas as: Padre Island, Tex.; Point Reyes, Calif.; Oregon Dunes, Oreg.; and Pictured Rocks and Sleeping Bear Dunes in Michigan.

At the same time, the Department also was giving increased attention to the need for recreation areas readily accessible to centers of population in the East. Among such areas under consideration are the Allagash country in Maine; Tocks Island in Pennsylvania, New Jersey and New York; and Between-the-Rivers in Kentucky and Tennessee.

In the West and Midwest, efforts are going forward for new parks and recreation areas such as the Canyonlands of Utah; the Great Basin of Nevada; Rainbow Bridge of Arizona and Utah; Jemez-Bandelier in New Mexico; the Ozarks River in Missouri; and a Prairie National Park in Kansas.

Footing the Bill

This generation in the coming decades has a "last-chance" opportunity to save perhaps 15 or 20 million acres for national parks, another 2.5 million acres for national recreational areas, more than a million acres for national parkways and scenic roads, and 4.5 million acres for wildlife refuge areas. The program even if spread out over the next few decades will be costly, but the costs will rise with each year of delay.

To help meet these costs—and to speed the program of land acquisition—the Department has proposed legislation to permit some Federal funding device specifically earmarked for this purpose; not for national park and recreation areas alone, but for State and local use as well. This would form the basis for a nationwide Federal grants-in-aid program that would be available to all levels of government on a matching basis for the acquisition of "open spaces."



The wild lakes and mountains, too, represent an intrinsically valuable resource asset in America and our efforts to preserve a portion of this pristine grandeur must be increased.

Quite recently, a number of our States have shown indications of their growing awareness of the "Quiet Crisis" in the field of outdoor recreation. Ten years ago, the States were spending only \$10 million annually on parks and recreational areas. In 1960, the figure rose to \$87 million, and in the calendar year 1961 it is expected to total an investment of some \$110 million in the preservation and maintenance of mountain, seashore, lake, and river park areas.

In these programs, a variety of financing methods are being used. Minnesota is earmarking gasoline taxes for park land acquisition and development. Wisconsin is financing its future parks from a 1 cent tax on cigarettes. Missouri uses a portion of property taxes. A \$75 million bond issue in New York provides \$20 million for State parks and \$40 million for grants to counties and municipalities on a 75 percent State and 25 percent local matching basis. Michigan's \$10 million park acquisition and development bond issue will be retired by a \$2 annual sticker fee and a single 50-cent admission charge.

Legislation providing multi-million dollar bond issues for park and conservation purposes has been passed from New Hampshire

to California, including New Jersey's aptly-named \$60 million "Green Acres Bond Act of 1961."

Combined Effort Required

Actually, as President Kennedy has said, what is required is a pooling of funds and effort by local, State and Federal governments if present and future recreational needs are to be met.

In recognition of this fact, the National Conference on State Parks, the American Institute of Park Executives, and other groups and organizations are cooperating with the Department in the organization of a new program known as Parks for America.

Parks for America represents a concerted national effort to seek authority and money to bid successfully in the competitive land market while suitable parklands are still available, and to defend existing parks against the threatened encroachment of commercial development. At the close of the fiscal year, the new program was gaining considerable momentum across the country.

Nationwide Planning

At the same time, as an integral part of Mission 66, the Department's National Park Service is preparing a nationwide plan for parks, parkways, and recreation areas to be published early in 1962, outlining a program that would provide all segments of our present and future population with adequate and readily available outdoor recreation areas. In the studies leading to the plan, the Service is working closely with the President's Outdoor Recreation Resources Review Commission.

The report will present a list of specific potential sites as well as recommended sites for consideration as parks, parkways and recreation areas of local, State and national significance in each of the 50 States. Following its publication, the National Park Service expects to cooperate with the States in the preparation of State recreational plans.

Creating a New "Shoreline"

The Department of the Interior has long been concerned about our vanishing shoreline—the rapid movement of coastal lands into uses which deny public enjoyment and appreciation.

Water is one of the major recreation attractions in the United States—a lake for boating, fishing, swimming, or for a scenic setting for a family picnic or campsite—and today the man-made reservoir



lakes of the Department's Bureau of Reclamation are in a sense creating a new and growing inland shoreline, one which now totals more than 7,000 miles devoted to public use.

The scope of this development may be brought into clearer perspective when it is considered that in California three projects alone—Shasta, Trinity and Whiskeytown Lake—are creating some 520 miles of shoreline, more than the straightline distance between New York City and Detroit, Michigan, in the Middle West.

Some idea of America's appreciation of this major new recreational resource may be seen in the fact that, in 1960, nearly 25 million visits were recorded at 177 Bureau of Reclamation recreational areas, and this figure was considerably exceeded in calendar year 1961.

Recreation on Public Lands

To provide still further recreational resources, the Department during the year inaugurated an intensive program for expanded recreational use of public lands.

In the past, a stumbling block in the progress of State and local programs was their inability to finance expensive land acquisition. To remedy this, the Department introduced a new pricing schedule for the sale to State and local governments of public lands expressly for outdoor recreation. Such tracts and areas can now be purchased from the Department's Bureau of Land Management for \$2.50 an acre. Leases are 25 cents an acre per year. But the lands must be dedicated to outdoor recreation for the public use of all Americans as a condition to their acquisition from the Federal Government.

As an additional stimulus, Congress has raised the total acreage that a State can acquire annually from the Government for use as parks. The limit of 640 acres per year has been raised to 6,400 acres per year and temporarily lifted to 12,800, with a minimum of six sites, for 1961 and 1962.

A unique action affecting the use and management of public land was taken early in 1961 with the formal designation by the Secretary of the Interior of a 92-square-mile Federal-State cooperative land and wildlife management area in south-central California.

The area—lying about halfway between Los Angeles and San Francisco—has been designated the Caliente National Land and Wildlife Management Area. Representing the first formal Federal-State land and wildlife area in the United States, it will consist of nearly 60,000 acres of public lands administered by the Department's Bureau of Land Management in cooperation with the Fish and Wildlife Service and the State of California. Through a cooperative program, the Department and the State will develop the wildlife, recreational and other natural resources of the land.

Following this initial move in the inauguration of a new type of public land management program, the Department during the fiscal year had under consideration 25 similar proposals covering approximately 850,000 acres in California.

Recreation Potential on Indian Lands

Many of the Indian reservations, because of their size and geographic location, offer outstanding possibilities for recreational developments. Major types of recreational potentialities include camping, boating, hunting, fishing, and all types of water and winter sports.

The geographic range includes the semitropical environment of

the Seminole reservations in southern Florida, the desert landscape of the Papago Reservation in Arizona, and the alpine areas on the Wind River Reservation in Wyoming. It also encompasses the vast and colorful semidesert areas on the Navajo Reservation and numerous wilderness and scenic areas on reservations in Arizona, Oregon, Washington, Wyoming, and other States.

In the past, only limited progress has been made in developing these recreational resources. Outstanding examples are the tribally developed Monument Valley tourist enterprise on the Navajo Reservation in northern Arizona, and the fishing, hunting, and camping facilities that have been made available for public use on the Fort Apache Reservation in the east-central portion of the same State.

During 1961, however, there was evidence of rapidly growing tribal awareness of the benefits to be realized from such developments. At the close of the fiscal year, several additional tribes had plans in preparation, or under consideration by the Department, for the development of recreational facilities.

Unquestionably, in the years ahead, the Indian reservations will play a steadily widening and growingly fruitful role in meeting the nation's recreational needs.

Expanding Our Wildlife Resources

Wildlife plays a unique role in America's outdoor recreational activities. For this, if for no other reason, it is a resource we have a responsibility to pass on to those who follow us.

But our wildlife, too, is facing its own "Quiet Crisis." Large numbers of species can be maintained only if there are large areas of the habitat they require. For example, wetlands are a vital requirement of many forms of wildlife. Great flights of waterfowl are just some of the creatures which need these areas. A wetland inventory published during the year by the Department's Fish and Wildlife Service listed 38 game and furbearing species reported by the various States as making use of one or more of the 20 types of wetlands.

Yet drainage and destruction over the years has taken a heavy and evergrowing toll.

The Department is moving ahead on a wetlands acquisition program to guarantee the existence of a network of key areas required to maintain a large population of waterfowl. At present, there are about 3.5 million acres of land in Federal refuges and about 2 million acres have been acquired by the States. It is estimated that at least another 7 million acres are required in public control.



Pressures on the migratory bird resources of America are increasing annually. Without adequate breeding grounds in the potholed prairies of North America and Canada, scenes of resting ducks in hunting grounds may disappear.

Funds for Acquisition

The Department's Bureau of Sport Fisheries and Wildlife has worked closely with the four Flyway Councils—which represent the States—on acquisition plans, setting up priorities and making decisions as to who will buy which areas with Federal and State funds. These plans will be reviewed annually to keep them up to date. Currently, it is planned that the Federal Government will acquire 4.5 million acres and the remaining 2.5 million will be purchased by the States.

Federal wetland acquisitions are financed from the revenues from annual sales of duck stamps. With receipts expected to average \$5 million to \$6 million a year and the cost of the 4.5 million acres for Federal acquisition estimated at \$227 million, simple arithmetic clearly shows that acquisition under this arrangement would require from 38 to 45 years—provided the land were still available and there was no increase in land prices.

To meet this problem, the Congress—in one of its major conservation actions of 1961—approved a Departmental proposal that it be

allowed to "borrow" funds against future duck stamp revenue to speed up wetlands purchase.

With a 7-year advance of \$105,000,000 under this program, the Department of the Interior will be enabled to make a major contribution to the preservation of wildlife as a recreational resource for tomorrow.

The "Growing Giant"

Marine sport fishing—the "Growing Giant"—is becoming "big" not only from the standpoint of the number of anglers it is attracting, but also because of the large number of industries—boats, motors, fuels, food, tackle, housing, charters, and numerous other services—it supports.

Today marine sport fishermen catch half a billion pounds of fish a year—and spend more than half a billion dollars doing it. Obviously, this is not only a form of outdoor recreation available for everyone—but also an economic resource of considerable importance to the national economy.

As our human population expands, future added needs in recreational angling will be largely met in two areas—from salt water species along our coasts and through improved management of the reservoirs now existing and to be created.

In the Department of the Interior, we have launched an expanding program of salt water sport fishery research, and we are developing plans for similar comprehensive research into reservoir fishery management.

Through these and other research and action programs, the Department is moving to assure "fish for the future" as a part of the general conservation and expansion of our recreational resources which President Kennedy has listed as among the vital needs of our national strength and vitality in the years to come.

The Growing Urgency of the Water Problem

Unless ways are found to save more fresh water and to convert salt water cheaply into fresh, the United States only 20 years from now will lack enough water to meet its needs.

In 1961, the need was emphasized when drought laid a searing hand across the upper plains area from northern Wyoming to Canada, while maintaining a 3-year reign over the thirsty lands of the Southwest.



Pressures on the sports fishery resources of America by its ever-growing population makes it imperative that programs of the Department to meet these needs are pressed forward.

It was further underscored when, early in the year, the Senate Select Committee on National Water Resources published its report on an intensive 2-year water study in which the Department of the Interior and other agencies participated.

The committee found evidences of already substantial areas of water shortage in many of the river basins in the western half of the United States. Its water supply-demand studies showed that full development of all available water resources in five regions of the West will be required by 1980 or earlier if the needs of the growing population are to be met and the projected expansion of economic activity achieved.

The report also estimated that by the year 2000, three other regions—including one area east of the Mississippi—will be added to the list of those in which full development of available water resources will be required if the projected demands are to be met.

Advance Warning by the President

In his precedent-setting special message on natural resources early in his new Administration, delivered in February long before the 1961 drought impact was fully apparent, President Kennedy expressed concern lest more immediately recognized problems compete adversely with the long-range challenge of water resource development. "The problems of immediacy," he said, "always have the advantage of attracting notice—those that lie in the future fare poorly in the competition for attention and money." Under the circumstances, he called for the fullest participation and cooperation of Federal, State, and local governments and private interests in wisely and effectively facing up to our natural resource problems—and in particular, those concerning our water supplies.

"The task is large," President Kennedy declared, "but it will be done."

The task is large. The Senate Select Committee estimated that the minimum requirement for dealing with the water supply and pollution abatement problems would involve the need for 315 million acre-feet of reservoir capacity for river regulation by 1980, and an additional 127 million acre-feet between 1980 and the year 2000. This 40-year estimate of minimum, nationwide storage needs is roughly five times the total water storage capacity built by the Department's Bureau of Reclamation in the 58 years between 1902 and 1960.

The capital costs appear large, too, if the offsetting benefits are considered separately.

The Select Committee estimated that new capital investments of \$12 billion would be required by 1980 to build the required minimum

POPULATION GROWTH IN RECLAMATION STATES

from 44 million in 1960 to

71 million in 1980

PACIFIC COAST STATES UP 72%

MOUNTAIN STATES UP 67%

PLAINS STATES UP 43%

109 million in 2000

PACIFIC COAST UP 176%

MOUNTAIN STATES UP 159%

PLAINS STATES UP 106%

TOTAL U.S. IN | 1980-261 million (up 45%)
 | 2000-383 million (up 113%)

Based on Dept. of Commerce data

storage capacity, and an additional \$6 billion by the year 2000, for a grand total of \$18 billion. Municipal and industrial sewage treatment works under the same program, which calls for water of relatively high quality in all the nation's streams, would require new investments estimated at \$42.2 billion by 1980, and an additional \$39.4 billion between 1980 and the year 2000, for a grand total of \$81.6 billion.

Required capital investments, therefore, for a minimum program of additional water storage and water pollution control facilities between now and 1980 amount to roughly \$3 billion annually, con-

siderably more than is being invested today, even under the accelerated Kennedy Administration program for the fiscal year 1961.

Prompt Action by the Department

The Department of the Interior reacted promptly to President Kennedy's challenge with the following actions in the water resource field:

1. Budgetary requests were initiated to provide funds in both fiscal years 1961 and 1962 to accelerate project planning and development, to expedite construction of starts on new, needed water resource projects.

2. Steps were taken to increase both the emphasis on and activity in engineering research, especially that associated with reducing loss of valuable water resulting from waste by evaporation, by transpiration of water—"stealing" weeds and trees, and by seepage losses and other wasteful irrigation practices.

3. Efforts were launched on a broad legislative front to authorize new water resource projects and to spell out new water policy, including an Administration proposal to create a Water Resources Council in the Executive Branch, to prescribe comprehensive planning on a river-basin basis, and to provide grants-in-aid for expanded planning by the respective States.

Results in the Making

Complex water resource facilities cannot be built in a day, or a year, and sometimes not even in decades. But at midyear, concrete results already were apparent in the Kennedy Administration's evolving water resource development program. The 1961 drought and Administration spokesmen were making water resource development a matter of immediacy.

Fiscal year 1961 funds for the Department's Bureau of Reclamation were reprogrammed to provide, within the Congressionally-approved appropriations, additional planning and construction work on needed projects.

This rescheduling permitted initiation of design and specification work leading toward a new construction start on the Red Bluff Diversion Dam, first step toward supplying water for the Tehama-Colusa Canal of the Sacramento Canals unit, Central Valley Project in California, and initiation of advance planning on the Wichita Project in Kansas. The latter is an \$18.2 million project to furnish urgently needed supplemental municipal and industrial water supplies to the city of Wichita.

AGRICULTURAL REQUIREMENTS**1980**

CROP YIELDS	+42%
CROP ACRES	+20 Million
DOMESTIC & EXPORT NEEDS	+60 to 90%

2000

CROP YIELDS	+75%
CROP ACRES	+63 Million
CLEARING OF FOREST (acres) not recommended	+73 Million
DOMESTIC & EXPORT NEEDS	+90 to 190%

Source: Report to Senate Select Committee on National Water Resources, Dec. 1959

Mid-March revisions in the 1962 budget also resulted in appropriations requests for \$900,000 for stepping up project investigations throughout the 17 Western States; funds to accelerate the \$96 million Canadian River Project to deliver supplementary water to 11 municipalities in Texas; for moving ahead by two years the delivery of water to the 33,960-acre Ainsworth Unit in Nebraska; for expediting construction of transmission lines in three major river-basin systems, and for other purposes.



The irrigated farms of the West offer quality foods and fibers, nonsurplus crops, and high-value specialty agricultural products to the Nation. These irrigated acres loom large in meeting our increased food needs of the future.

In mid-February, design and specifications staffs of the Bureau of Reclamation's Denver Engineering Center went on a 6-day, 58-hour week to speed up contract awards.

First water deliveries were made this spring from the Corning Canal of the Central Valley Project to water users in southern Tehama County in California, and from the new Southside Canal on the 22,000-acre Collbran project in western Colorado.

President Proposes Planning Act

The greatest emphasis to Administration efforts to meet the water challenge and provide sufficient resources for tomorrow came in mid-July when President Kennedy delivered to the Congress his proposed "Water Resources Planning Act of 1961," the most far-reaching water policy legislation sent to the Congress by the White House in many years.

Having an important bearing upon all water and related land conservation and development activities, the proposed Act would:

1. Establish a Cabinet-level Water Resources Council. The Council would be the keystone in a comprehensive structure for water resource planning within river basins and would provide overall guidance and standards for planning, consistent with existing law.

2. Authorize the President to create, at the request of the Governor of one or more affected States or of the Council, a river basin water resources commission for any region, major river basin, or group of related river basins in the United States. These commissions, composed of representatives of the States and Federal agencies concerned, would be charged with preparing and keeping up to date comprehensive, integrated plans for Federal, State and local development of water and related land resources. Also they would recommend long-range priorities for basic data collection and analysis and for investigation, planning and construction of projects; and, finally,

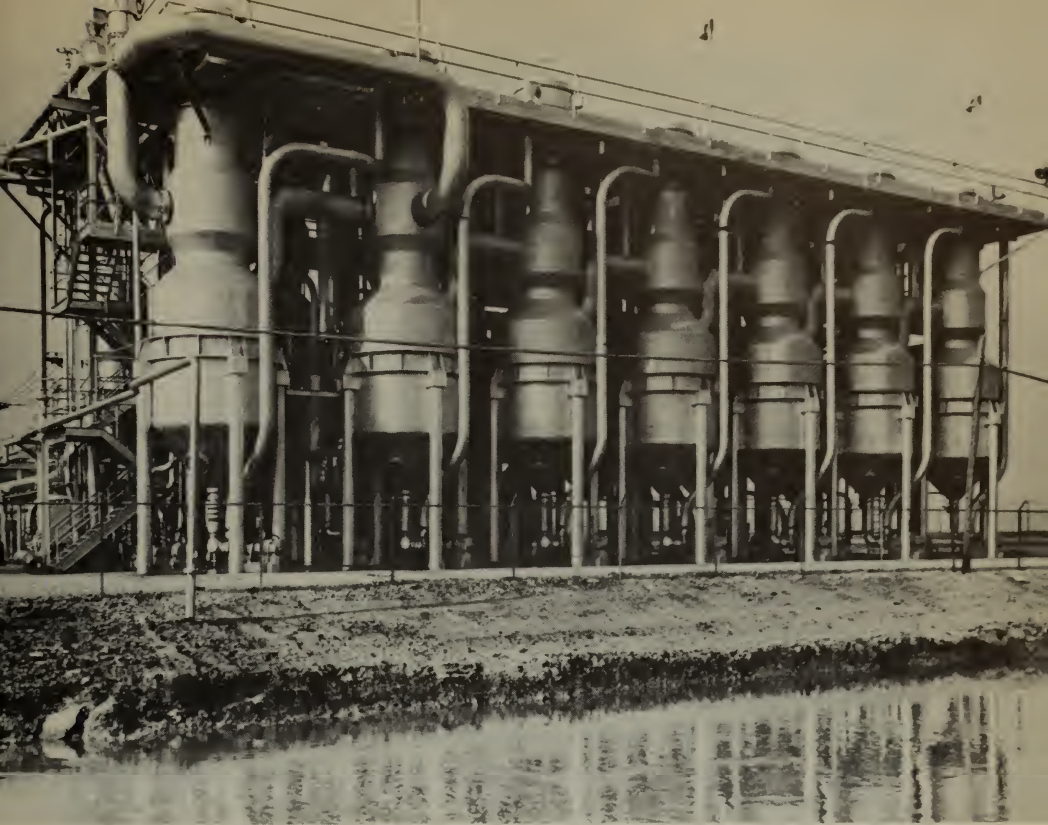
3. Provide encouragement to the States to fully and effectively participate in water and related land resource planning through financial assistance to aid in their planning.

This river basin planning would require that any plan take into account domestic, agricultural, energy, industrial, recreational, fish and wildlife, and other water resource conservation and developments. It would enable the Congress—within the Federal sphere of responsibility—to decide upon the many individual project developments on the basis of full information as to the overall needs and timing for basin development. States and local interests—within their respective spheres of responsibility—would be enabled to do likewise.

“We have a national obligation to manage our basic water supply so it will be available when and where needed and in acceptable quality and quantity—and we have no time to lose,” President Kennedy wrote the Congress. “The planning authorized by this legislation will provide a vital tool for achieving effective water resources management.”

Saline Water Conversion

On June 26, President Kennedy acted to attack the water problem on another front when he forwarded to Congress proposed legislation to expand and extend Federal efforts in the saline water conversion program. “This bill,” the President stated in a letter of transmittal, “will provide the Department of the Interior with a wide variety of tools to attack the saline water conversion cost barrier.



One of the greatest resource challenges of the coming decades is to provide new sources of potable water for a growing America. The Department is constantly seeking new and economical methods for converting sea water to fresh water in plants such as the one above at Freeport, Tex., the first saline-water conversion demonstration plant in the Nation.

It contemplates a major acceleration of current programs of basic and applied research, and permits the construction of conversion plants far larger than any now in existence to test the feasibility of known and yet to be developed processes.”

In September, the Congress responded by passing Public Law 87-295 which authorizes the expanded program and provides for an appropriation of \$75 million to achieve its aims.

In mid-1961, President Kennedy participated in ceremonies marking the dedication of the nation’s first saline water conversion demonstration plant at Freeport, Tex. “This is a work,” he said at that time, “which in many ways is more important than any other scientific enterprise in which this country is now engaged. It serves the interest of men and women everywhere. It can do more to raise men and women from lives of poverty and desperation than any other scientific advance.”

The Freeport plant is the first sea water conversion plant in the United States capable of producing 1 million gallons of fresh water

per day, and the first to regularly supply the water needs of a U.S. municipality.

As recently as the late 1930's, it cost between \$4 and \$5 to convert a thousand gallons of sea water into fresh.

Since then, equipment, fuel, and labor costs have increased several fold.

Despite these increases, cost of the Freeport product water is presently estimated at \$1-\$1.25 per 1,000 gallons, including 20-year amortization charges.

Thus it can be seen that important gains are being made in reducing costs. With improved techniques, more experience, and larger plants, it is anticipated that conversion costs—in the foreseeable future—can be still further reduced to somewhere in the neighborhood of 60 cents per 1,000 gallons.

In addition to the Freeport plant, four other sites have been selected for demonstration plant testing. They are at San Diego, Calif.; Webster, S. Dak.; Roswell, N. Mex.; and Wrightsville Beach, N.C.

During the year, a second plant was completed and dedicated—the 250,000-gallon-a-day facility to desalt brackish well water at Webster, S. Dak.—and work was nearing completion on a million-gallon-a-day sea water desalination plant at San Diego, Calif. At the same time, contracts had been let for design of the New Mexico and North Carolina plants, with work on this construction scheduled to start in the new fiscal year.

Other Legislative Efforts

Throughout the year, a steady flow of legislative reports to the 87th Congress gave the Department of the Interior's endorsement to proposed legislation to authorize additional water resource development projects for the West. These Administration-backed authorization proposals included:

The \$135 million Navajo Indian irrigation project and the \$86 million initial stage of the San Juan-Chama project in New Mexico and Colorado, to supply new and supplemental water to a total of 231,530 acres of land in the Southwest, including extensive Indian reservation acreage.

The \$170 million Fryingpan-Arkansas project to provide supplemental irrigation water to 280,000 acres in Colorado's Arkansas River Valley, and other multipurpose benefits.

The \$81.5 million mid-State multipurpose Reclamation project to deliver water to 140,000 acres in central Nebraska.

The \$183 million modification of the Garrison Diversion unit of the Missouri River Basin project in North Dakota, which would supply water to an initial stage development of 250,000 acres.

The \$45.5 million Burns Creek project, to build a reregulating reservoir and hydroelectric power plant on the Upper Snake River near Idaho Falls, Idaho.

The Need for Research

Research to provide an adequate scientific basis for decision-making is a primary need in solving the practical problems of water-resource management. Water knowledge is needed to establish and maintain scientific hydrology at a level that will assure advances in our understanding of the dynamic processes in nature which affect the occurrence, movement, quality, and usability of water. Without this information, much conservation effort with water, soils, and other resources will be of uncertain value.

The solution of water supply and pollution problems will continue to require the gathering and compiling of basic data, such as the first nationwide compilation of streamflow data by principal drainage basins, recently completed by the Department's Geological Survey. Perhaps of equal economic importance is the series of reports dealing with the frequency and magnitude of floods which, together with a series of flood inundation maps, provide essential data for planning protective works and for proper zoning of flood plans.

This basic research work of the Geological Survey ties in closely with the saline water program. Its studies on water quality and water resources help to determine areas where saline water conversion might be considered in the foreseeable future.

Reduction of Water Losses

During the fiscal year, the Bureau of Reclamation vigorously pursued an intensified program of engineering research aimed at reducing losses of valuable water from evaporation, transpiration of water-stealing phreatophyte plants and weeds, seepage losses, and other causes.

The second in a series of major cooperative field experiments with methods of reducing water losses due to evaporation by use of chemical monolayer films was conducted during the year on Sahuaro Lake in Arizona.

Participating in the experiment were engineers and scientists of the Bureau, the Department's Geological Survey, and the United States Public Health Service.

Sahuaro Lake, site of the test, is a 1,260-acre reservoir behind Stewart Mountain Dam on the Salt River Reclamation Project near Phoenix, Ariz.

The experiment showed reductions in water losses attributable to evaporation of approximately 14 percent for the period of October 1–November 17, 1960, and savings of about 22 percent for the October 19–November 17 period when maximum coverage was employed.

The first major field experiment was conducted in 1958 on the 2,500-acre Lake Hefner—a reservoir serving the domestic needs of Oklahoma City—and effected savings of about 9 percent in water losses from evaporation.

Additionally, research contracts in this field were executed in the 1961 fiscal year with Columbia University and with the Desert Research Institute of the University of Nevada. Thus action is being speeded to reduce as rapidly as possible the water evaporation losses in the West which now total about 25 million acre-feet per year.

At the same time, the Bureau of Reclamation announced that its research and development work in low-cost canal linings during the past 15 years have contributed to total savings to western water users of more than \$20 million in the construction of irrigation canals. Results of this program demonstrate that use of such linings can reduce annual canal seepage losses in the foreseeable future by an estimated 1.5 million acre-feet of water.

Moving To Meet the Challenge

Thus on many fronts the Department of the Interior is moving at a greatly accelerated pace toward solutions to the water problems which, unmet, could threaten our national development and progress in the years ahead.

Development of Our Hydroelectric Reserves

A major key to continuation of this Nation's vast industrial development—indeed to the preservation of its basic strength—lies in our ability to find ways of developing sufficient electrical capacity to meet the enormous future needs.

Accordingly, early in 1961, the Secretary of the Interior outlined a broad new power policy for the Department calling for a vigorous program of full development and maximum utilization of our total energy resources.

The need for such action may be seen in an examination of the supply and demand relationship in the area served by only one of

Glen Canyon Dam

Dam closure: Fall, 1962

First power production: 1964

Installed power capacity: 900,000 kw.

Reservoir capacity: 28,040,000 acre-feet



the great hydropower projects under construction by the Department's Bureau of Reclamation—the Colorado River Storage Project.

Bureau of Census projections show an increase in population of the four Upper Colorado Basin States from 3.9 million in 1960 to 6.4 million by 1980, an increase of 64 percent. At the same time, the Federal Power Commission projection of power needs for these States shows a requirement of 66,737 million kilowatt-hours in 1980, compared with 15,242 million kilowatt-hours used in 1960. This represents an increase of 337 percent in less than two decades—more than quadrupling the 1960 requirements.

Linking Forces

Obviously, the hydro plants of the Colorado River Storage Project cannot fill in all of this vast growth—nor can any single public or private utility.

Consequently, the Departmental policy placed emphasis on the need for maximum effort by all utility systems—Federal, State, municipal, private, and cooperative—in the interest of the public welfare.

Two of the major aims of the new policy are:

1. Enlarging regional cooperative pooling of generation and transmission facilities, and,
2. Planning for the early interconnection of areas served by Department marketing agencies with adequate common-carrier transmission lines.

A first important step toward achievement of these aims came during the year when the Department's Bonneville Power Administration, the U.S. Army Corps of Engineers, and nine private and public owners of hydroelectric generating facilities signed a coordination agreement designed to maximize power production at existing power-plants on Pacific Northwest rivers.

The agreement provides that storage and generating facilities on Pacific Northwest rivers shall be operated in much the same manner as if all were under one ownership.

It also provides for interchanges of energy and power among the signers in order to conserve water in reservoirs, and for coordination of the transmission facilities of the parties to the agreement.

Informal coordination in varying degrees prior to the signing of the agreement had resulted in approximately 1 million additional kilowatts. A substantial added number of firm kilowatts is expected to result from the agreement.

Intertie Study—A Part of Linking Forces

Another important step toward implementation of the Department's more vigorous power conservation and development policy was taken early in the year with appointment of a departmental task force to study the feasibility of a proposed extra high voltage common carrier power intertie between the Pacific Northwest and Pacific Southwest.

In a preliminary report on its findings, delivered in May, the study group indicated that the proposed intertie holds considerable promise of mutual benefit to both areas, by taking advantage of the diversity of loads, coordination of thermal and hydro plants and disposal of power surpluses during certain periods.



Artists rendition shows graphically the dynamic essentials of pumped back storage of water to gain maximum hydroelectric potential. Off-peak power, which otherwise sells at low rates, is used to pump water to a storage reservoir to gain more peaking power when economic value of the electricity is higher.

From a strictly engineering viewpoint, the report said that technology of extra high voltage transmission lines in the United States is "sufficiently advanced so that lines up to and including 500 kilovolts can be constructed without delay." The United States now uses lines up to 345 kv., but few at that voltage.

Study by Joint Committee

In April, 1961, the Secretary of the Interior appointed a committee to join with representatives of the Edison Electric Institute in studies designed to determine where the pooling of private and public power production would serve the national interest.

As the result of Federal initiative in this matter, the Institute in September announced a 10-year program of transmission line construction which could well open the way for a major cooperative planning effort of interconnecting and pooling facilities of public systems with those of private industry. At the same time, the action can represent

the forerunner to the logical next step—a cooperative industry-governmental effort to plan for the full utilization of the present and future facilities of private industry, consumer-owned utilities, and the Federal Government.

Treaty with Canada

Typical of the programs which the Department has supported to increase power development while at the same time promoting resource conservation for the future is the treaty with Canada under which the Arrow Lakes, Mica Creek, and Duncan Lake dams will be built on the upper Columbia River. These three dams, together with Libby Dam to be constructed in Montana, would provide additional storage for the heavy spring and summer runoff of the Columbia River system.

The treaty requires full coordination of Pacific Northwest storage and electric generation to get the most power production out of the Canadian storage to be provided under terms of the treaty. Canada is to receive 50 percent of all the additional power that can be generated downstream in the United States because of this storage. Ratification of the treaty is pending in Canada.

With the three Canadian dams and Libby Dam in full operation over 2 million kilowatts of firm power would be added to the Federal system in the United States.

A significant fact concerning this program is that it is designed to conserve an important renewable but presently wasted energy resource.

Through the years, such losses nationally have been on an almost incredible scale. For example, in the calendar year 1961, some \$30,000,000 worth of electric energy will be wasted over the spillways of Columbia River Federal dams because of the present inadequacy of transmission lines to market areas.

In many ways, the Department of the Interior is acting now to curb this wastage of a vital resource and to assure that our total supply of electric energy will be adequate to meet tomorrow's needs.

A "New Trail" for the American Indian

Shortly after the election in November 1960, President-elect Kennedy set forth the mandate on which his Administration is basing a determined effort to help our Indian citizens take their rightful place in the nation.



Indian students in Bureau schools learn about democracy in action by participating in class elections.

President Kennedy stated:

“We want every group which is now unable to make its full contribution to American strength to be given the opportunity to do so. It is in this spirit that we shall approach our work on Indian reservations, and it is in this spirit, I am sure, that Indians throughout the country will work together for a better life for themselves and thus a stronger America.”

As the Federal agency primarily responsible for carrying out this Presidential mandate, the Department of the Interior has embarked on a top priority program designed to provide self-sufficiency for the Indians as rapidly as possible, within the protection guaranteed them by history.

In February 1961, a special task force was appointed by the Secretary of the Interior to make a thorough study of the problems and programs affecting the lives of the 360,000 Indians still living on reservations, and the some 160,000 living in other areas, and to put forward recommendations looking toward "a better life" for these Americans.

In July, the task force—after travelling 15,000 miles and conferring with the representatives of 200 organized tribes—completed its report. The comprehensive document recommended programs and actions designed to blaze a new trail in Indian development.

In the introduction to its report, the special study group, composed of well-known experts in Indian affairs, had this to say:

"During the 90 years which have elapsed since the United States Government ceased to make treaties with Indian tribes, Congress has appropriated millions of dollars to finance its programs for the protection, subsistence and acculturation of this relatively small group of Americans . . .

"From time to time during these 90 years, critics of the Federal Indian program have raised the question of how long the Government must continue its special relationship with Indians. Underlying their concern has been an awareness of the accelerating cost of the program, a belief that to provide special services for Indians places them in a privileged category, and a contention that, because of excessive paternalism, the Federal program prevents Indians from achieving their maximum degree of self-sufficiency.

'A Certain Justification'

"An examination of the history and present status of Indian affairs reveals a certain justification for the reservations which these critics have expressed. Annual direct expenditures by the Federal Government for its services to Indians have risen from slightly over \$7 million in 1871 to more than \$160 million in 1961. Many treaties and hundreds of Federal statutes qualify Indians for services in the fields of health, education, welfare, banking and land management which are not available from governmental sources to any other group of Americans. Furthermore, the administration of these services has often been characterized by a paternalistic emphasis which has fostered continuing Indian dependence . . .

"Yet, even those who are most eager to end this special relationship are troubled by the fact that the bulk of the reservation Indian population is less well educated than other Americans, has a shorter life span, and has a much lower standard of living . . .

“What we are attempting to do for those in the underdeveloped areas of the world, we can and must also do for the Indians here at home. Furthermore, to insure the success of our endeavor, we must solicit the collaboration of those whom we hope to benefit—the Indians themselves. To do otherwise is contrary to the American concept of democracy. Basically, we must not forget that ours is a program which deals with human beings. We must have faith in their abilities to help themselves and be willing to take some risks with them.”

The Role of Government

In its concluding statement, the task force report declared—

“Much of the progress which the Indians have made has occurred during the past 40 years. They have been considered citizens only since 1924 and, in Arizona and New Mexico, their right to vote was not confirmed in the courts until 1948. Statutory authority for the organization of tribal governments was provided by Congress just a little over 25 years ago, and Indian youth have been drafted for military service only since World War II.

“The events of these past 40 years have done much to make Indians aware of the fact that they cannot alone decide the kind of future world they will inhabit. Furthermore, their experiences have shown them new ways of making their lives more secure and comfortable. Now, the desire of many for better incomes, more formal education, better health, and more voice in their own affairs rivals their desire to retain older ways.

“The task force believes that in the foreseeable future, the proper role of the Federal Government is to help Indians find their way along a new trail—one which leads to equal citizenship, maximum self-sufficiency, and full participation in American life. In discharging this role, it must seek to make available to Indians a greater range of alternatives which are compatible with the American system, and where necessary, to assist Indians with choosing from among these alternatives. As a part of this responsibility, it must mobilize and direct the vast reservoir of good will toward Indians which is found throughout the country.

“Finally, since many of the problems relating to Indian development are local problems, it must use its influence to persuade local governments, as well as those who live near Indian reservations, to recognize their stake in the Indian future and to work with the Indians and with the Federal Government in preparing the new trail.”



The American Indian has learned that through conservation he can put to work his natural and human resources for the betterment of his people.

Action Speeded on Recommended Programs

The recommendations of the task force in regard to programs for Indian progress were promptly made a part of the Department's official policy. These programs are designed to provide better housing, better health, more income, more education, better training, more and better opportunity for steady work at better wages, and the maximum development and use of natural resources on the reservations. Already important forward steps have been taken toward achievement of these aims.

The following are some of the problems toward the solution of which active efforts are in progress:

During the past 30 years—through tribal and individual enterprise and with practical help and technical guidance from the Department's Bureau of Indian Affairs—considerable development of physical resources in the Indian country has taken place. If we regard the 53 million acres of Indian land that is in trust or restricted status as a whole unit, it is safe to say that far more income is being produced from this unit today than was the case 30 years ago, or even 10.

But it is also clear that the potential of these 53 million acres has never come anywhere close to fulfillment.

The existing land base could be much more profitably utilized if it were worked by its Indian owners instead of being leased, as it is so often, to non-Indian tenants. In addition, several hundred thousand acres of additional land have irrigation potential but have not yet been brought under ditch. Continuing progress on this front is essential for two reasons: First, to improve the economic well-being of the Indian landowners; but also, to safeguard the valuable water rights that go with the land under various laws and court decisions, both of the Federal Government and of the States. The Department is pressing ahead vigorously toward solutions in these areas.

Other Fields of Action

In further response to the Presidential mandate for action leading toward a better life for American Indians, the Department is pressing forward rapidly with timber inventories on the commercially important Indian forest lands. The purpose is to provide better information on which to base cutting schedules. Forest inventories have now been completed on about three-fourths of the area. Inventories pay for themselves not only in planning but eventually help increase Indian income. Present indications are that the annual cut from Indian forested lands can eventually be increased by somewhere in the neighborhood of a hundred million board-feet above the level in recent years without injury to the basic forest.

Some tribal groups are favored by nature with rich deposits of oil, gas, and other minerals which have recently been discovered, are being commercially developed, and are producing substantial tribal income. As a part of its effort to improve the welfare of the Indians, the Department has under way a full program of resource development which will provide for the use of the best modern techniques in minerals exploration and development throughout the entire Indian country.

As mechanization and automation have moved into farming and ranching the opportunities for seasonal unskilled labor become smaller every year. This hits the Indian worker harder than others. The Department is in the process of developing a number of related programs to meet this growing problem.

One of the methods is the use of special inducements—such as plant sites, facilities, and on-the-job training programs—to bring manufacturing employment to the reservation areas. In a small number of reservations, there are programs of this type, but it is the Department's aim that this activity be substantially and swiftly increased.

A depressed reservation area can be improved by bringing individual Indians into contact with areas of greater opportunity. This means education in the broad sense; it means vocational training; it means job placement; and for those who wish it, it means relocation.

Educational Problems

The Department feels that it should be a source of concern to all Americans that after many years of educational efforts on behalf of the Indians, adult Indians living on reservations remain, on the average, only half as well schooled as adults elsewhere. Our failure to achieve better results in educational programs also is reflected in the large numbers of Indians who have no occupational skills; and this lack is in turn reflected in grim statistics of poverty, delinquency, and dependency.

We, as a people, face a major challenge in schooling and in vocational preparation of the Indians. We are still short 5,000 classroom seats to accommodate children of school age who are not now enrolled in any school—State, Federal, or private. We need to relieve the serious overcrowding which has developed in many of the schools presently operated by the Department's Bureau of Indian Affairs. We need to replace obsolete and dilapidated structures with up-to-date facilities. A good start already has been made, but with the population growth that faces us on the reservations, we have a major challenge in this area alone. We also must work continuously to improve the quality of classroom instruction. As one example, the children who come from non-English speaking homes have special needs which have not been met in the past, but which must be met. In all of these matters, the basic aim is to insure that the present and future generations of Indian children receive the same educational advantages, the same educational opportunities as other children throughout the country. It is not a simple problem, and it is a very important one.

Adults beyond school age also have an intensive need. Many adults on the reservations have had little or no formal schooling in their youth. They need an educational program suited to their special situation, and Federal programs are being carried out in this direction.

The leaders of the next generation will need to be college graduates trained in specialized schools of many kinds. But such schools accept only high school graduates; and the dropout rate of Indian youngsters in high school is very high. Programs are required to make certain that we are not losing potential leaders through high

school dropouts, and to assure that more scholarship aid is available for Indian high school graduates.

In all of these educational problem areas, the Department of the Interior, under the stimulating and sympathetic leadership of President Kennedy, has in this fiscal year made progress of an encouraging nature. This progress has been greatly facilitated through following the guidelines laid out in the Indian task force report.

One of the most encouraging forward steps has been in the field of adult vocational training. In the first session of the 87th Congress, legislation was approved providing for the training of more adult Indians in vocational schools and more on-the-job training in industrial plants. This program will be increased as rapidly as possible to at least twice its present size.

An Important First Step in Housing

Intertwined with all programs of human and natural resource development for the American Indian is the great need for improved housing on the reservations. In its report, the task force, with careful deliberation, used the phrase "truly shocking" to describe the housing conditions it encountered in its studies.

Throughout past decades, Federal assistance has been provided for public housing in many forms throughout the nation. But prior to this Administration, no such assistance had been available in the Indian country.

Thus, another important step in blazing a new trail for the American Indian took place in September when President Kennedy took part in a Housing and Home Finance Agency ceremony by which the first application for a public housing project on an Indian reservation was approved. Following this first step, priority status has been assigned by the Department's Bureau of Indian Affairs to the development of further housing project applications as rapidly as possible.

Progress Toward the Goal

From these highlights, then, it can be clearly seen that President Kennedy's desire to speed the development of the human and natural resources of the Indian reservations has already produced the first steps in a considerable betterment in the Indian way of life.

Obviously, much remains to be accomplished.

But the machinery has now been set in motion which will assist the some half-million Indians both on and off the reservations to bridge the gap now separating them from full participation in the benefits and challenges of present-day American life.

Developing the Potential of Our Public Lands

For 175 years, the public domain has furnished lands and natural resources to help meet the needs of a growing nation. More than half of the public domain has been taken over by private citizens—to settle, develop, and use.

Although no longer used primarily for settlement, the vast remainder of our public domain has a variety of vital uses, which become increasingly important and highly competitive as our population increases and gradually shifts westward.

Today, more than 168 million acres of the national land reserve plus 309 million acres of other Federal lands could and should be developed, improved, conserved, and utilized under aggressive Federal land and resource management. During this fiscal year, the Department of the Interior has instituted vigorous actions toward this end.

Our remaining public lands still offer present and potential natural resources of inestimable value—timber, outdoor recreation, forage, coal, oil, and minerals—all important resources of tomorrow. But the problem is to assure—through sound and orderly management—that the resources will be there when they are needed tomorrow.

Immediate steps must be taken to restore and improve the productivity of millions of acres that have been ravaged by floods and winds, or exhausted through overuse. Renewable resources must be managed on a sustained yield basis. Nonrenewable resources must be extracted without waste—and with particular concern for soil and water conservation.

Because of the proximity of much of the public domain to expanding western cities and communities, it is inevitable that demands will increase for public lands for urban and business development, and for outdoor recreational facilities.

Moratorium Ordered To Improve Administration

Immediately upon taking office in 1961, the Secretary of the Interior was confronted with an overwhelming backlog of incompleting applications for public lands, many of them filed 3 and 4 years previously. As a result, the Secretary ordered an 18-month moratorium on most types of nonmineral applications and petitions for lands of the public domain.

Not affected were applications filed prior to the moratorium. Also unaffected were petitions from State and local governments, applications and offers under the mining and mineral leasing laws, and scrip rights and settlement claims in Alaska.



Public domain lands of the United States offer recreational potentials to meet the increasing needs of State and local programs.

Reason for the backlog was a continual deluge of thousands of applications, often the result of duplicate filing and other questionable practices of some land locators and speculators.

These and other practices consumed valuable processing time, and cost the American public millions of dollars. Tasks of processing were made more arduous by the lack of a precise inventory of remaining tracts and areas of the public domain, and the statutory need for adhering to certain antiquated and frequently ambiguous public land laws and other regulations.

The moratorium allows time for three critical activities by the Department:

First: to eliminate the backlog of applications.

Second: to conduct a comprehensive inventory, evaluation, and classification of public lands; and,

Third: to review and revise regulations of the Department, and to initiate legislation proposals necessary to modernize and streamline the nation's land laws.

Inventory and Classification

Only through knowledge of the characteristics and capabilities of our remaining public lands can their best ultimate usage and proper management of the Nation's estate be achieved. To provide this information, the Department's Bureau of Land Management is conducting an inventory, evaluation, and classification of the national land reserve.

Areas are being classified for many uses—for urban development, public outdoor recreation, forestry, mining, wildlife, grazing, and other purposes, often in combination.

This—the first program of its kind—represents a significant step toward better Federal land management and improved conservation of our natural resources for tomorrow.

Administration of Land Laws

An important program for utilizing the lands of the public domain involves the administration of Federal land laws by the Department.

Under these laws, ownership of more than one billion acres of public lands have been transferred to State and local governments, and to private individuals, during the past 150 years.

Still in effect today are more than 5,000 laws pertaining to the disposition of public lands. Many of these laws are throwbacks to the 19th century, and today are obsolete, impractical, and antiquated.

As a first and significant step toward rectifying part of this problem of archaic land laws, the Department has recommended to Congress the enactment of a single land-sale law to replace about 30 old laws dating as far back as 1877. Other legislative proposals of this type will be made in future months.

Balanced Use

To achieve productivity and also satisfy conflicting demands for use of certain areas of public lands, a revitalized program of balanced usage is being developed by the Department's Bureau of Land Management.

Balanced usage is essentially the best and most effective use of the available resources of public lands—mitigated by the total availability of these resources regionally and nationally, the conservation of resources for future utilization, and a reconciliation of conflicting demands for current use of the lands.

Conservation is not hoarding. It is the full, judicious, and balanced usage of our natural resources, dominated at all times by the need to end waste.

Broad programs for soil and moisture conservation are currently concerned with correcting soil erosion and water losses that sometimes occur in parts of the public domain, particularly on Federal range lands west of the Rocky Mountain region.

Revegetation—through seeding and planting—of eroded lands is doing much to improve the forage capacity of public lands used by livestock and wildlife.

In some instances, new soil areas are being substituted for older, overused areas. The fertility of good acreages is being revitalized, and that of poor acreages being reestablished, by better tillage techniques, adequate use of fertilizer, and other measures.

General responsibility for the care and conservation of public lands includes continuing programs for the protection of natural resources from trespass, fire, insects, disease, and other depredation. Facilitating this work, more than a thousand miles of access roads are maintained annually throughout the nation.

Our extraction processes for minerals, timber, and other products of the soil are often wasteful. Increased productivity now requires modern and more effective extractive methods. Such methods are now being studied and developed as rapidly as possible by the Department.

Forest Resources

Of all our efforts to conserve vital natural resources for tomorrow's needs, our forest lands present the sharpest challenge to our foresight. This can be realized more clearly when we consider that the trees we plant today will not reach the minimum sizes needed for lumber until the year 2000. Yet, somehow, we must be prepared to meet a projected doubling of our current lumber consumption within 40 years.

President Kennedy, in his special message to the Congress on natural resources, took cognizance of this problem when he said:

“At present cutting rates, we are using up our old growth timber in Western stands. Because of the time requirements involved, we must move now to meet anticipated future needs, and improve the productivity of our nearly 500 million acres of commercial forest land.”

Of these 500 million acres the Department has responsibility for approximately 52 million acres as well as for an additional 131 million acres of noncommercial forest lands.

The Department has initiated a five-point program to place its forest lands in condition to meet their proportionate share of the Nation's goals in the year 2000:



The national land reserve, under scientific sustained-yield management, can provide an important portion of the timber resources of the future.

1. Provide adequate protection from fires, insects and diseases.
2. Identify specifically those public domain lands which should become a part of the national land reserve for forest management.
3. Complete the network of access roads required for protection, for the removal of forest products and for recreation.
4. Provide for the early reforestation of over 1 million acres.
5. Improve the quality of the growing stock within over 2 million acres.

Joint Action To Meet the Challenge

In his message, the President called upon the Secretaries of Agriculture and the Interior to coordinate programs and policies of their agencies for improved management of Federal forest lands looking toward greater productivity without diminishing the basic resource.

The two Departments have undertaken an intensive joint study of existing timber sale and management practices, and, in midyear, adopted the broad recommendations of the study group designed to achieve closer uniformity in these practices.

Among the recommendations adopted were orders to the agencies involved within the Departments to standardize management plan inventory procedures, and to reconcile differences in determining allowable timber cut.

Other recommendations included possible adoption of a joint nursery program, and action to meet land jurisdictional problems in the complicated checkerboard ownership areas of Western Oregon.

Additionally, by Presidential directive, the two Departments acted in concert during the year to accelerate the building of access roads to public forests in a move aimed at making additional supplies of merchantable timber available to small businesses.

While recommendations of the joint study group apply primarily to Federal forest lands in Western Oregon, some idea of the scope of the agreement may be seen in the fact that the six national forests in Western Oregon, under jurisdiction of the U.S. Forest Service of the Department of Agriculture, embrace approximately 6.3 million acres from which some 1.8 billion board feet of timber are harvested each year; while the Department of the Interior's Bureau of Land Management has the responsibility for about 2.5 million acres of Federal lands in 18 Western Oregon counties which produce more than 1 billion board feet of timber annually.

Additionally, this Department's Bureau of Indian Affairs is responsible for some 2.1 million acres of commercially valuable Indian-owned forest lands in the Pacific Northwest, producing nearly 400 million board feet of timber a year.

Range Resources

About 160 million acres, or half of the public lands in 10 Western States, are used primarily for raising livestock. Although much of the region is arid and mountainous, there is enough moisture to grow some vegetation. But for the most effective use of resources of the Federal range, there must always be sufficient grass and forage to feed livestock and wildlife.

Whenever too many cattle, sheep, or wildlife roam the range, vegetation suffers. And without plant cover, the rich topsoil washes away, and erosion ravages the terrain. In a few years, there are vast areas of devastation, vacant of vegetation and topsoil. Each year, thousands of tons of topsoil are washed down major rivers of the West.

Exactly in this way, more than 100 million acres of our public lands have been allowed to deteriorate during past years.



Aggressive programs of range management are needed to prevent the continued deterioration of public grazing lands.

Toward a solution, a new start is necessary—with a more aggressive program of Federal range management to put a stop as rapidly as possible to this enormous waste.

During 1961, the Department devised and began work on a program designed to achieve this end. The program proposed—in total—is both sweeping and costly. But it is also necessary that it be pressed forward without delay. It will take decades to reclaim and restore many of the devastated areas.

After inventory and evaluation of critically affected areas of the Federal range, the program features an accelerated restoration of durable plant cover—by seeding, planting, and proper management.

At the same time, soil and moisture conservation projects are being used to regulate run-off from watersheds, and divert water to critical areas.

Guarding the Heritage

The wealth of the public lands—with their forests, ranges, minerals, recreational potentials—is an important segment of our national heritage. Such wasteful inattention to this vital resource as that which permitted 100 million acres to become useless and denuded has in the past constituted what amounts to a national disgrace. Through the vigorous new conservation programs being instituted by this Administration, the tide is being turned and the riches of our lands are being not only guarded for today, but enhanced for the future.

Minerals and Fuels for Tomorrow

Planning for the development of mineral resources to meet tomorrow's needs embraces both a short and a long-range view. To those who must decide how and where Governmental efforts will be directed, the future consists of two tomorrows.

First, there is a tomorrow that is almost here—a future that can be predicted with some certainty. This period, comprising the immediate years ahead, can, for convenience, be called "Tomorrow—1970." Its problems in resource conservation are known—or can at least be anticipated—and, for the most part, they entail keeping abreast of relatively gradual changes.

There is also a more distant tomorrow—the year 2000 and beyond—for which mineral requirements and possible ways of fulfilling them must be appraised now.

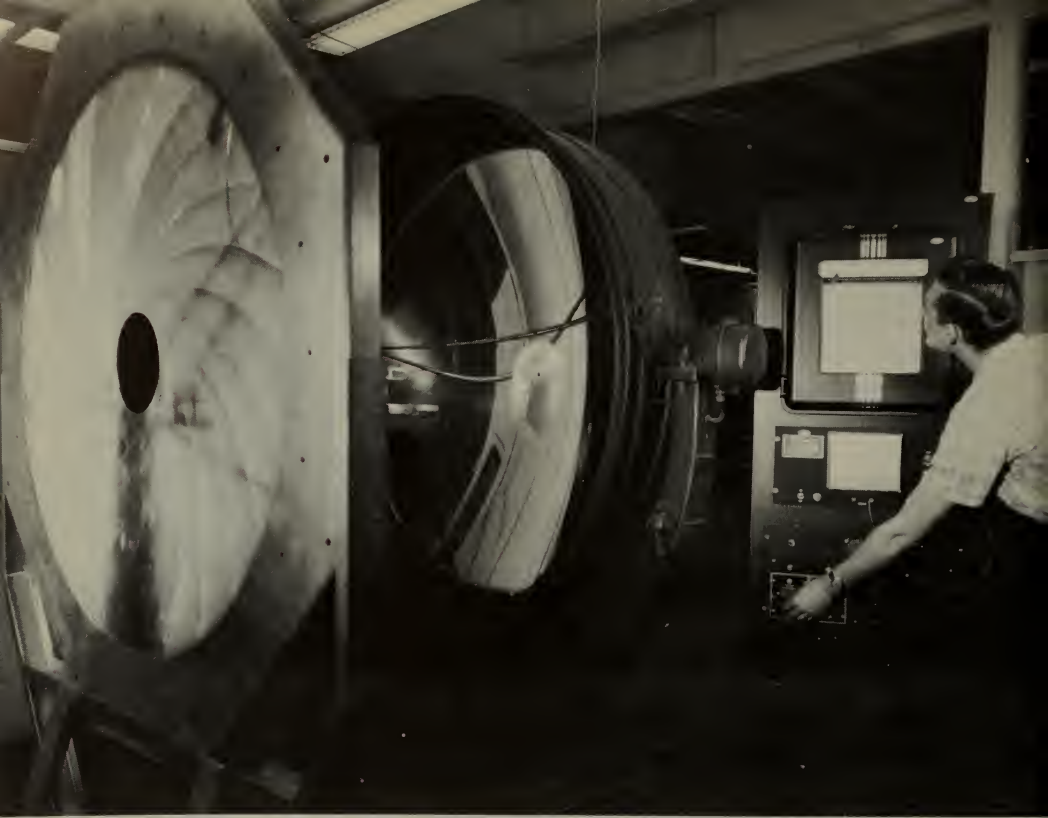
The future cannot be forecast with scientific precision. Therefore, programs must be both dynamic and flexible. They must be subject to continual review, and they must be revised as frequently as necessary in technological, economic, political, or social conditions.

The total environment in which the mineral industries will operate is expected to change only gradually within the next 10 to 20 years. International tensions may well continue, the nation's population and its economy should expand steadily, and its standard of living undoubtedly will keep rising.

Costs of discovering, extracting, and processing minerals will increase, as will the costs of research, but probably not enough to cause dramatic changes in technology.

Raw Materials: An Imperative Need

An unsettled and highly competitive international situation, combined with the pressures generated by a steadily growing population



Today's expanding requirements for metals capable of resisting the extreme heat of space travel result in new high-temperature research by the Department of the Interior.

and more complex economy, make it necessary that the United States continue to have adequate supplies of minerals and fuels to meet its expanding needs.

We live in an age of phenomenal technological progress. There seems to be virtually nothing that science cannot give mankind, and of late her gifts have been many and diverse. However, each advance, each forward step of science, almost invariably creates additional demands for metals, nonmetallics, and fuels.

Realizing that minerals are essential to progress, the Department of the Interior has, during the fiscal year just closed, intensified research on mineral raw materials. To begin this expansion, the Congress, during the year appropriated additional funds for the Department's Bureau of Mines to finance intensified studies in this important area.

Through these studies, the Department is seeking high-purity metals with special properties that will withstand extreme conditions encountered by high-speed aircraft, missiles, and space vehicles, or which will perform reliably in tomorrow's nuclear power plants and complex electronic computers and guidance systems. At the same

time, other Bureau of Mines scientists are working to develop new synthetics that will equal or out-perform natural minerals.

This work may well lead to establishment of entirely new industries, in the same way that Departmental research opened the way for commercial production of titanium and zirconium.

Improvement of Extractive Processes

Investigations to improve extractive processes also are being stepped up, both to broaden our domestic resource base and to keep mining and processing costs down. These studies will gain added impetus during the coming year when the Department acquires 155,000 curies of Cobalt-60 from the Atomic Energy Commission. This gamma ray source—one of the largest in the world—will enable researchers to evaluate radiation as a means of speeding mineral-extractive processes and of altering the properties of minerals and mineral fuels.

To insure adequate supplies of traditional raw materials, the Bureau of Mines is intensifying research on methods of producing iron, copper, lead, manganese, clays, and other materials from low-grade resources and from deposits lying at depths too great for economic recovery under present conditions.

Helium Conservation

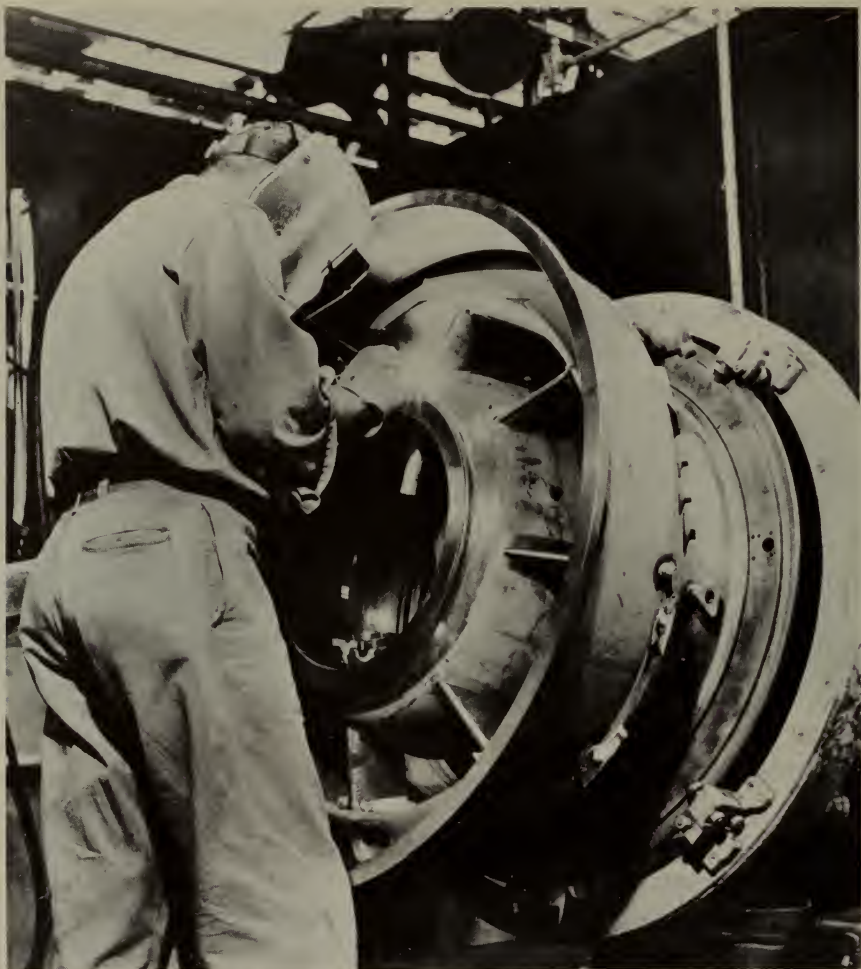
One of the most important and dramatic conservation developments of the year came with the launching by the Department of its new helium-conservation program.

The program, climaxing many months of study and careful planning, is a cooperative undertaking by Government and industry through which privately built and operated plants will capture helium from certain natural gases destined for fuel markets.

Underlying the urgent need for this conservation effort is the fact that the equivalent of a year's supply of helium now is lost every 45 days. If such waste were permitted to continue, the Nation's limited helium reserves could not be relied upon to supply anticipated national requirements beyond 1985.

The new program provides for recovering and storing for future use 52 billion cubic feet of helium which otherwise would be wasted when natural gases containing this valuable element are burned for fuel.

The Department began negotiations with private firms in March 1961, shortly after enabling legislation for the program became effective, and during the year contracts were awarded to four private



One of the major new conservation programs of the Department of the Interior deals with the saving of some 3 to 4 billion cubic feet of helium which is now wasted as natural gas goes to market. Helium, a critical resource, is used in a wide variety of military, industrial, space, medical, and research activities.

companies covering the entire \$47.5 million annual contracting authority made available by the Congress.

Phenomenal Growth in Demand

Demand for this second lightest of the elements has grown phenomenally within the past decade.

Lightness, inertness, and super-fluidity have made helium a versatile aid to American industry, which uses it in many different

processes ranging from shielded-arc welding and the growing of semiconductor crystals to quality control tests for air conditioners, refrigerators, and missile components. The element also plays essential roles in the Nation's nuclear-energy and space programs.

Perhaps the most promising use of helium is as a liquid whose extreme coldness (-452° F.) enables scientists to enter the realm of absolute zero. At this temperature, where molecular action virtually stops, researchers in the field known as "cryogenics" are uncovering new facts about the properties and behavior of a wide variety of materials. With liquid helium to help them, they are probing deeper into the mysteries of life and death.

Applications for helium for this use and others are expanding so rapidly that the Bureau of Mines estimates some 36 billion cubic feet of helium will be required for domestic use within the next 25 years.

The Department's new conservation program will insure that all essential demands are met and that large quantities of helium are placed in storage for use as needed in the future.

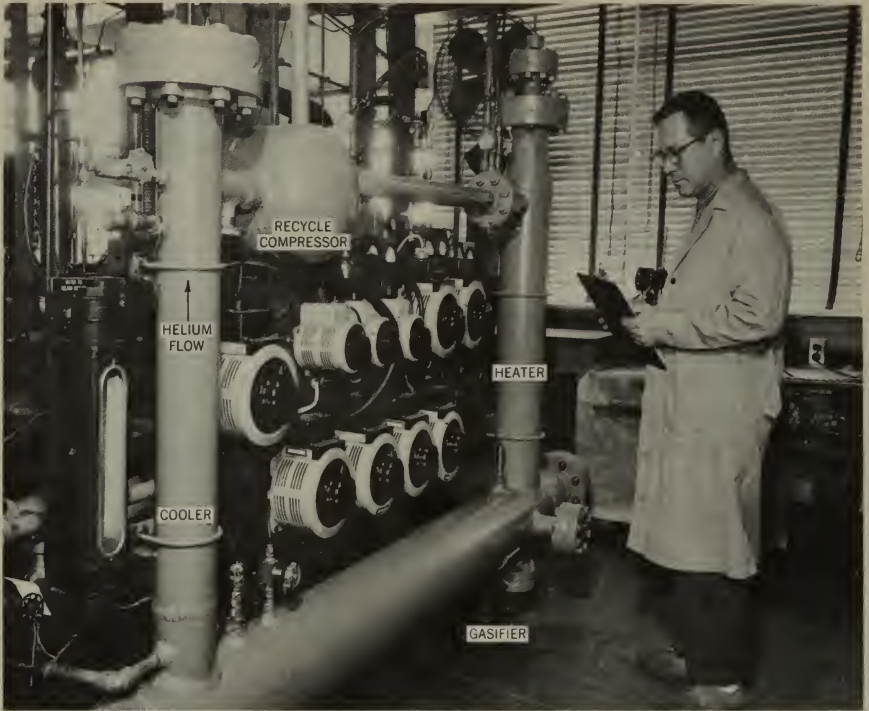
Tomorrow—2000

By the beginning of the next century, the complex of factors influencing, and depending upon, effective utilization of mineral resources shall have changed markedly.

If the present trend continues, the population of the United States will be approximately 300 million. In some parts of the world, there may literally be "Standing Room Only."

This growth in population may well be accompanied by significant changes in national economies and international relationships. Technology, too, shall have altered tremendously. In short, those changes that are foreseen as being gradual over the next two or three decades will culminate 40 years from now in conditions decidedly different from those of today.

In 2000 A.D., man will be mining the earth at far greater depths than now—and perhaps the ocean and the air as well. The prospector will require devices which can detect deposits far beneath the earth's crust, and tell him directly and accurately how much of which minerals are there. The miner will need vastly different methods and equipment that can withstand, and perhaps utilize, high temperatures and other adverse conditions which will be encountered in workings miles below the surface. The metallurgist must have at hand techniques which will permit recovery of minute values from extremely dilute solutions such as seawater.



One of the natural resource challenges facing the Nation is the search for substitute resources. The Department is working diligently on the transformation of abundant resources of coal into synthetic gas for home and industry.

The energy picture also shall have undergone a drastic change. New sources such as nuclear power, fuel cells, and perhaps solar energy will be helping conventional fuels supply an enormously larger market. Through synthesis, substitution, and transmutation, science will have to provide those materials which no longer are available in natural form or which may have become too expensive to produce by conventional methods.

This second tomorrow is remote. Nevertheless, it is inevitable, and only by trying to visualize it as realistically as possible by extrapolation of known circumstances can we prepare for it. The fate of our civilization—and that of the entire world—may well depend upon our readiness.

The Department is preparing to help meet the vastly increased mineral requirements of the future by steadily strengthening its basic research and resource appraisal programs.



The secrets of nature and nature's resources require painstaking scientific research in the laboratories of the Department of the Interior.

Basic Research—A Fund for the Future

Tomorrow's technology will grow out of today's basic research. The scientific marvels of the present—jet propulsion, atomic energy, rocketry, and similar modern miracles—have been derived from the basic research of the past.

World War II and the sustained technological drive which followed it have in a period of years heavily depleted the reserve fund of unused basic research data accumulated through generations of fundamental investigations. Replenishment of this reservoir to support the advances in mineral technology which the future will require has been a major objective of the Department in 1961—and shall continue as a high priority in the years ahead.

Today's basic research by the Department's Bureau of Mines covers a broad range of subjects and scientific disciplines and utilizes the latest techniques and equipment. In the field of mining, Bureau scientists are seeking a better understanding of rock and soil mechanics and trying to learn more about the action of explosives in breaking rock. The fundamental natures and structures of coal,

petroleum, oil shale, and a wide variety of metals and nonmetals are being studied.

In each of these areas, the Department is laying a foundation of basic knowledge that is essential to assured advancement in all branches of mineral technology.

Resource Appraisal

In the field of mineral resources, as in other areas of Departmental responsibility, the next century will witness growing competition for the nation's natural wealth.

The miner, the manufacturer, and the farmer of the future may each have a valid claim to the same limited quantity of some essential mineral resource or the land in which it occurs. When that time comes, Government can serve the people best by having at hand the information that will promote equitable and effective use of all resources.

Decisions as to whether public lands should be leased for mineral development or withheld for recreational use, or whether valuable mineral deposits should be inundated to provide irrigation water for farmlands, can be made only with full knowledge of the relevant facts and with an eye to the distant future.

For many years, the Department's Bureau of Mines has collected and correlated economic and technical data on production, distribution, consumption, and utilization of minerals and fuels in the United States and abroad. Such information, analyzed and evaluated by specialists, has provided a basis for intelligent planning of Bureau research and other activities. The results of these studies also have been disseminated to other Federal and State agencies, to industry, and to the public. This kind of information has consistently proved its usefulness in many areas of public and private interest.

To promote intelligent and effective utilization of mineral resources in the future, the Bureau is expanding and intensifying its fact-gathering program.

Studies of the methods employed and the costs involved in extracting, processing, and distributing minerals and fuels are being accelerated, and new emphasis is being placed on investigations that will reveal the true importance of minerals to different segments of the economy and the extent to which utilization of various resources depends upon development of others.

A comprehensive resource-appraisal program, designed to provide a definitive balance sheet for domestic mineral and energy supplies, also is under way. Although such a detailed inventory obviously can



Throughout the mineral-bearing regions of the United States, teams of Departmental scientists operate in mobile geochemical laboratories to seek out new mineral resources for the future needs of America.

never be completed inasmuch as the resource picture keeps changing, a running total is essential to those who must find the right decision in a tangle of conflicting interests.

Thus, by seeking new materials and additional sources of those we already have, by minimizing waste, by rebuilding our fund of basic knowledge, and by acquiring the facts essential to effective and equitable use, the Department is preparing for the mineral-resource problems of tomorrow. The success of these major efforts will contribute significantly to the survival and growth of our society.

Lead Time Required

To keep pace with the nation's growth and economic progress, tomorrow's mineral resource needs must be met by today's exploration.

Important mineral deposits must be found well in advance of actual needs because of the time required to bring them into production. The easily discovered mineral deposits have nearly all been found

and exploited, thus increasing the difficulty and risk of finding new deposits to maintain an adequate level of domestic supply. A vigorous program of exploration is essential to meet the growing needs of the future in the face of these increasing difficulties.

Today's costs and risks are so great that private industry, in many instances, is reluctant to undertake the entire burden of the search for new domestic sources of minerals. Therefore, the Government shares this burden through the Department's Office of Minerals Exploration, which will pay one-half of the cost of the work authorized by exploration assistance contracts, with repayment from royalties on production.

The list of mineral commodities eligible for exploration assistance has now been expanded to 38 by the addition of gold, silver, iron ore, bismuth, sulphur, and tellurium. Other changes presently are being considered which will help industry in the search for new mineral reserves.

National Coal Resources and Prospects for the Future

Studies undertaken by the Department's Geological Survey in 1961 revealed that coal constitutes 68 percent of the total ultimate recoverable reserves of mineral fuels in the United States. Petroleum and natural gas, the studies showed, total about 16 percent of the ultimate fossil fuel reserves, and oil from oil shale accounts for another 16 percent.

The estimated recoverable coal reserves of the nation totaled 830 billion tons as of January 1, 1960. Of this huge tonnage—some 1,442 times the recent annual production—47 percent is bituminous, 25.5 percent is sub-bituminous, 26 percent is lignite and 1.5 percent is anthracite and semi-anthracite. Even assuming a great increase in the rate of coal production, these reserves will last for many generations.

Despite these impressive figures, the problem of the use of coal as a fuel remains far from a solution.

Office of Coal Research Created

To assist in the development of a stronger coal market in the immediate years ahead, and to insure optimum use of this vast resource, the Congress authorized the creation within the Department of the Office of Coal Research. Although this assignment is shared with the industry itself and with other agencies of Government and private business, the eventual success or failure of the Office of Coal

Research will be measured by its contribution to the development of expanded coal markets.

Most of the increase in the use of coal in future years is expected to come from the expansion of the industry's two largest growth markets—steel and the electric utilities.

Today the Tennessee Valley Authority is one of the nation's best coal customers. In fiscal year 1960, it used more than 18.6 million tons of coal for which it paid more than 82.5 million dollars.

But the coal industry knows from experience that even "assured" markets—as the railroad and domestic consumers once were—can be lost through lack of progress and research. Both steel and the electric utilities can and will use the energy fuel that results in the lowest generated cost of electricity. Any appreciable change in the relative costs of coal, oil and gas would result in the gain or loss of millions of tons of market.

Thus, a vital function of the Office of Coal Research—which began its operations in the fiscal year just closed—is to aid in finding better and cheaper ways of mining and preparing coal, delivering it to the consumer at lower cost, and improving the efficiency and convenience of its utilization.

As contrasted with the longer-term and more-basic research program of the Bureau of Mines, the new Office of Coal Research is concentrating its efforts on short-range projects aimed at providing the most immediate assistance to the coal industry.

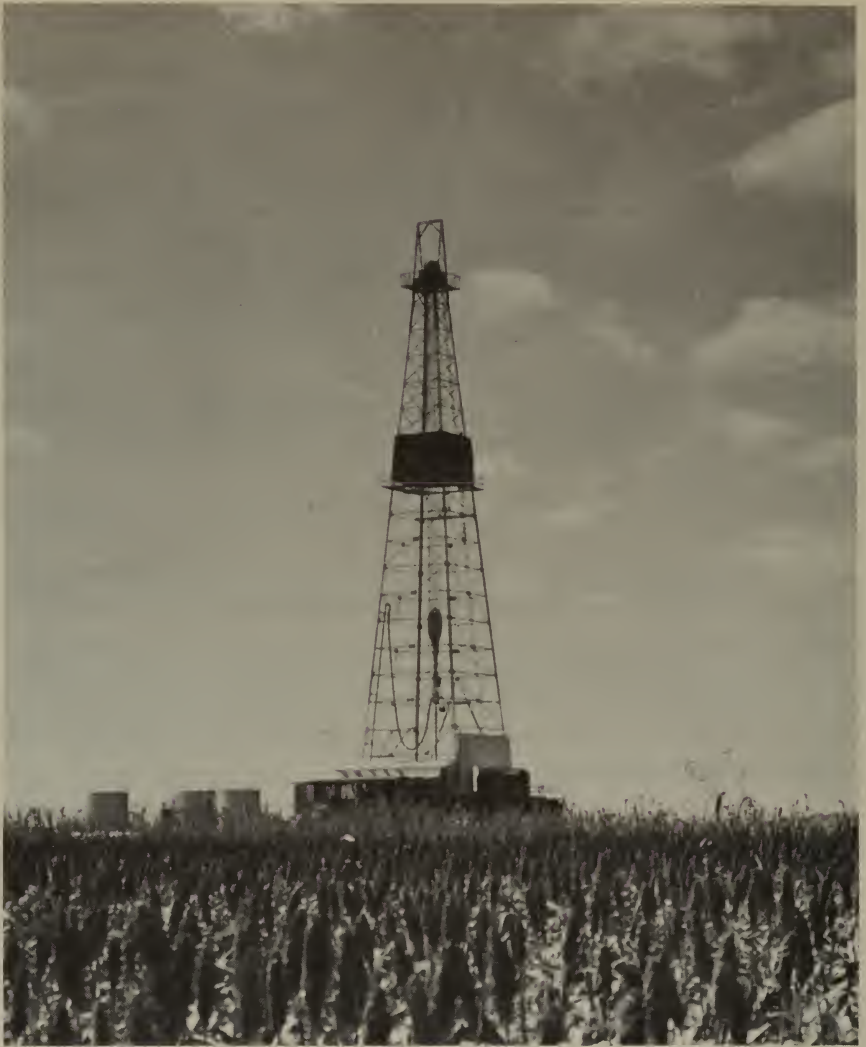
A Milepost of the Year

During 1961, more than 100 contract proposals were received and reviewed by the Office of Coal Research. These proposals came from colleges and universities, coal industry research groups, corporate research organizations, mining and industrial companies, and in some cases from private individuals.

A milepost of the year was the signing of the first formal contract by the Secretary of the Interior. It calls for a comprehensive study to identify new products which would expand present coal markets and generate new ones. Although the final report will not be available until early in 1962, sufficient information will be developed in 1961 to aid the Office in maximizing its impact and to indicate new areas of immediate promise.

Oil and Gas Reserves

During the fiscal year, the American Petroleum Institute and the American Gas Association reported that estimated measured proved



To meet the resource needs of the future, the Department promoted the conservation of oil and gas through scientific studies to insure efficient production and minimum waste.

reserves of liquid hydrocarbons and natural gas in the United States reached new record highs in 1960, despite a reduction in reserves of crude oil.

The nation's crude reserves were estimated at 31.6 billion barrels at the end of 1960—down more than 100 million barrels from the end of 1959.

Natural gas liquids reserves were estimated at 6.8 billion barrels, an increase of nearly 300 million barrels from the preceding year.

Total reserves of liquid hydrocarbons—crude and natural gas liquids—were estimated at nearly 38.5 billion barrels, an increase of more than 187 million from the 1959 total.

Production of crude oil for the year was estimated at more than 2.4 billion barrels, down nearly 12 million barrels from the 1959 total. Output of natural gas liquids, however, totaled more than 430 million barrels, up more than 46 million from the preceding year, making total production of all liquid hydrocarbons total more than 2.9 billion barrels, an increase of more than 34 million barrels.

Production of natural gas in 1960 was estimated at more than 13 trillion cubic feet—an increase of nearly 650 billion from the previous year's total.

Looking to the Future

From these figures it would seem abundantly clear that the production and reserve problems of the oil and gas industries remain some distance in the future.

Yet, following President Kennedy's reminder in his natural resources message to the Congress that the continental shelves bordering the United States contain roughly 20 percent of our remaining reserves of crude oil and natural gas, the Department acted during 1961 to accelerate leasing action on the Outer Continental Shelf off Louisiana and Texas—the first such action since early in 1960.

But of still broader importance was the approval by the Senate of a resolution authorizing the Senate Committee on Interior and Insular Affairs to make a full and complete investigation of the current and prospective fuel and energy resources of the United States, and of the present and probable future rates of consumption of these resources. The Committee, in addition, will examine Governmental policies and laws affecting the fuels and energy industries with the view of determining what, if any, changes may be advisable in order to provide an effective national fuels policy.

The objective of the study, which was given the strong support of the Department of the Interior, is to set forth policy guidelines which will assure the availability of energy for our expanding economy and the security of the United States.

There have been several attempts in the past 25 years to deal broadly with energy problems at the Federal level. However, the current study promises to be considerably more fruitful because it is the first full-scale examination of energy problems drawing upon the combined skills of the Congress, the Executive Branch, and the industries concerned.

Contribution From Indian Lands

Since the beginning of the 20th century, Indian lands have contributed importantly in supplying the nation's mineral needs. One of the Department's aims is to facilitate their playing an equally, or even more significant role in the future. The outlook, in broad terms, is distinctly encouraging.

Much of the oil and gas production from Indian lands has been in the Rocky Mountain region and the Williston Basin where exploratory work points to the strong possibility of broader producing areas. On the Navajo Reservation, the number of applications that have been made for oil and gas leases foreshadows exploration of unproven areas and extension of proven fields. Oil production from this area already is of considerable importance. For example, the Greater Aneth field—probably the largest single field discovered in the last 10 years—is located almost entirely on the Navajo Reservation. Announced plans for secondary recovery of petroleum resources from Indian lands through waterflooding insure the production of millions of barrels of additional oil in the years to come.

The cutback in purchases of uranium by the Atomic Energy Commission has reduced exploration and production of this mineral in a number of Indian areas. Substantial evidence, however, now points to a growing "peaceful use" market for fissionable materials derived principally from uranium and much of this ore can be expected to come from Indian lands.

Minerals From Public Lands

A great storehouse of mineral resources, is of course, within the lands of the public domain.

Administration and conservation of these vast mineral resources is the responsibility of the Department's Geological Survey and Bureau of Land Management.

The Geological Survey supervises all development and producing operations, and collects the royalties due the United States on such production. The Bureau of Land Management issues all permits, licenses, and leases for coal, oil, gas, and other fuels and minerals. Thus the two agencies share the responsibility for conservation of this valuable public resource.

During the fiscal year, programs were accelerated to assure, through surveys, inventories, use and replenishment studies, that the minerals storehouse of our public lands remains as fully stocked in the years to come as it is today

Commercial Fisheries—A Key to Future Food Needs

President Kennedy has pointed out that, at present levels of use, this country alone will need an additional 3 billion pounds of fish and shellfish annually by 1980—and that many other countries with large-scale protein deficiency can be greatly helped by more extensive use of marine foodstuffs.

“This,” the President said, “will require increased efforts, under Federal leadership, for rehabilitation of depleted stocks of salmon and sardines in the Pacific, groundfish and oysters in the Atlantic, lake trout and other desirable species in the Great Lakes, and many others through biological research, development of methods for passing fish over dams, and control of pollution. This Administration intends to give concerted attention to our whole national effort in the basic and applied research of oceanography.”

Despite 90 years of effort by dedicated scientists, this announcement of plans for a comprehensive Federal oceanographic program represented the most important advance yet made toward the goal of “farming” the sea.

Through this program, now getting under way, will come the information needed for the harnessing and building of the forces which affect the living resources of the sea and disclose the ways of adapting them to the needs of man.

The Food Chain of the Sea

The food chain of the sea gets its start from two sources—nutrients from land brought into estuarine areas and tidal flats, and nutrients brought up from the depths of the ocean by natural upwellings, or vertical currents.

These upwellings occur usually in two types of situations. They are found on the west side of continents because the winds from the land tend to push the water away from the shore, giving the lower strata of water a chance to rise. They are also found along the Equator where the trade winds and the rotation of the earth combine to roll the surface waters north and south, leaving a trough which is filled with water from the lower levels. At times upwellings may be found along the edges of some ocean currents where the meeting of cold and warm waters result in an upflow. The nutrients so brought to the surface waters form the basis for the food chain which supports the sea life in which man is most interested.

An ultimate accomplishment for the farming of the sea will be the creation of artificial upwellings to provide food for marine life when and where needed. The practical-minded fishery scientist does not



The sea around us represents another bountiful resource which helps to meet the ever-increasing food needs of the Nation—both today and in the future.

expect these results to be quickly arrived at, but he refuses to rule them out as a probability of the future resulting from increased scientific knowledge together with the pressures of population growth.

While awaiting the time when atomic or other energy can be applied to create artificial upwellings, man must content himself with other ways of utilizing the components which support the food chain. The seas are too vast and the waters too restless for the application of fertilizers as they are applied to land, but the use of trace elements

which will energize and stimulate the growth possibilities already present is an avenue being considered.

Improved Research and Management

At the same time the Department's Fish and Wildlife Service is giving increased attention to that part of aquaculture which has the best chance of success in the next few years. This includes perfecting research and management techniques to assure that stocks of desirable species will not be depleted and replaced by less desirable or inferior species. It also includes the culture of certain kinds of shellfish, particularly clams and oysters. Since this type of marine life is more sedentary than many other forms it lends itself more readily to farming practices.

Culture of shellfish is not new, but this form of sea farming has been handicapped by such things as blight, predators, and lack of seed stock. These problems have been under scrutiny, and answers are slowly but surely being found. At the same time, research on selective breeding goes on.

Salmon Research Program

An important development during the year was the granting of approval by the Congress for an emergency Alaska salmon research program. This 2-year program, for which a total appropriation of \$2.5 million was authorized, is now well under way.

Information gained from the investigations will supplement that already acquired through research conducted by the United States and investigations made under terms of the International Convention for the High Seas Fisheries of the North Pacific Ocean. This Convention, between Japan, Canada, and the United States, became effective in 1953, and its continuation, termination, or amendment is scheduled to be decided upon at a meeting of the signatory nations in 1963.

Specific data sought through the emergency program relate to the carrying capacity of the Alaska spawning streams and methods of predicting salmon abundance. The Alaska Department of Fish and Game and the Fisheries Research Institute of the University of Washington are aiding in the research under contracts with the Department's Bureau of Commercial Fisheries.

In another move involving international cooperation in conservation and development of fishery resources, the United States Government, acting upon the recommendation of the Department, has invited the Food and Agriculture Organization (FAO) to hold its world meeting

on the biology of tuna and tuna-like fishes in July 1962, in the San Diego area of California.

The fundamental objective of the conference is to assess the potential of the world's tuna stocks. The tunas, which were discarded fishes a half century ago, are now fished in every ocean except the Arctic and the Antarctic and by fishermen of many nations. It is hoped that from the conference will come a composite picture of the rate of utilization and the possibilities and limits of future development.

Meeting the Challenge

At the 1961 FAO International Conference on Fish in Nutrition—held in Washington—man was challenged to “plow” the seven seas and make them yield protein in twice the amount of that provided by land.

The Department of the Interior is moving to meet that challenge through such programs as these:

—A study of the nation's estuarine areas to determine if the encroachments of civilization are destroying fishery resources which utilize estuaries and tidal flats at some stage in their life history, or whether these developments can be turned into assets for marine life.

—Biological studies designed to guide man in the manner and times in which sea harvest can be taken most economically and the extent of the harvest to assure sustained yield of the resource.

—A research program designed to assure full utilization of the health and nutritional values of fishery products.

“The sea around us,” President Kennedy has said, “represents one of our most important but least understood and most wholly undeveloped areas for extending our resource base.”

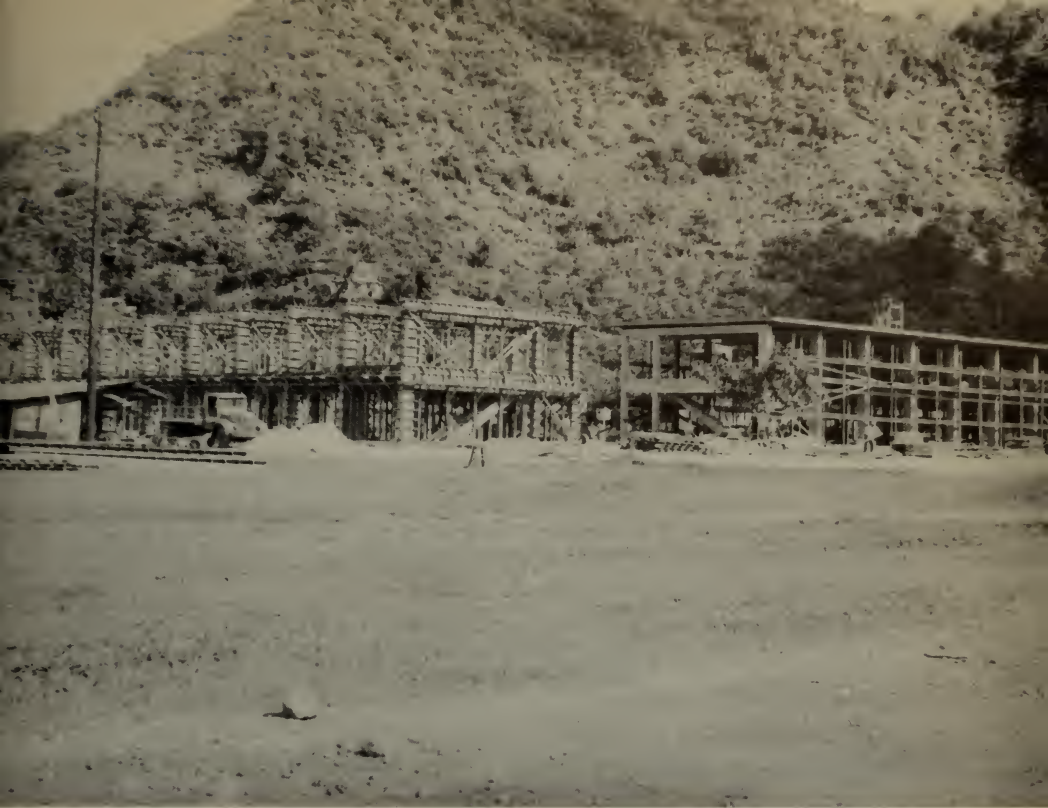
During 1961, the Department of the Interior made important contributions toward better understanding and greater development of our great marine food resource.

Building for Tomorrow in the Territories

Lying some 1,000 miles south of the Equator, American Samoa is a land of spectacular tropical beauty. The islands boast one of the finest harbors in the Pacific, and because of this they represented an important staging area for part of the American war effort in the South Pacific.

Yet, in the intervening years, the needs of these beautiful islands and its people have been largely forgotten or ignored.

The situation in regard to education of American Samoa's young



Construction of buildings to house South Pacific Commission Conference delegates showed this progress at the end of the fiscal year. Both buildings are scheduled to be reconverted after the conference for high school expansion.

people is a typical example. Today, on the islands, there are 45 public elementary schools, but the existing public junior and senior high schools provide nowhere near the space or facilities to meet the needs of elementary school graduates. Enrollment in the lone high school is currently limited to approximately 200 as contrasted to some 4,000 children enrolled in elementary schools.

“We are having to turn down at least two-thirds of the students that graduate from junior high,” Governor H. Rex Lee told the first session of the 87th Congress during hearings on appropriations for this fiscal year.

The situation has been much the same in other areas. The existing power system, for instance, is subject to frequent failures and is unable to meet the current demand for power, to say nothing of the future.

This Department has moved rapidly to bring about important changes and improvements for these “forgotten” people.

Congress granted appropriations to expand the high school plant and to rebuild the power system. At the close of the fiscal year, the new high school buildings were nearing completion, and a contract had been let to provide new power generating units.

Congressional approval was also granted for a supplemental appropriation of \$4.5 million to permit a sharp acceleration of the Department's programs to provide urgently needed services and facilities in the territory.

School Space for Every Child

Further educational construction ranks high among the items included in the supplemental appropriation act. When expended, these funds are expected to provide space in school for every child in American Samoa.

Other construction included in the supplemental appropriation are road improvements, repairs to government facilities, such as docks, improvements to the water system and other utilities, and reconstruction of certain medical facilities.

At the same time, a vigorous program is underway to develop a productive and self-sustaining tourist industry based not only on the islands' scenic beauty, but also on expansion and development of recreational resources. Tourism, as well as other economic progress, is expected to be enhanced by completion next year of a modern jet airport, on which construction was accelerated in 1961. Improvement



Ancient customs and ceremonies on American Samoa are retained by the population while moving toward more democratic forms of local government.

and diversification of agriculture has also been started and a deep-sea fishery training program for Samoans is showing encouraging results.

Meanwhile, economic development by private capital is not being overlooked. Negotiations are underway for the construction of a hotel to accommodate the tourist industry, and plans are being developed for possible location of a coconut processing plant in the territory. The provision of adequate public utilities and services is expected to lead to further use of Samoa's economic resources.

The sharply increased appropriation requests of this Administration have been designed to bring lagging economic and social development up to the levels reached to date in the political field.

An important milestone in political development was the election of the lower house of the Legislature by secret ballot, followed in 1960 by the drafting of a Constitution defining the powers of the territorial government and giving the Legislature certain legislative powers in place of its previous advisory functions.

Matched in Other Areas

This effort toward new progress in American Samoa is being matched in the other farflung areas for which the Department has responsibility in the Kennedy Administration's determined efforts to raise and expand resource horizons wherever and whenever possible.

In addition to Samoa, the Department's responsibilities extend from the Virgin Islands in the Caribbean to Guam and the Trust Territory of the Pacific Islands in the western Pacific.

Actually, the most important resource in these areas is the people themselves, a total of some 196,000 persons living on specks of land aggregating little more than 1,100 square miles. The task of economic and political development is infinitely varied, with peoples living in a thoroughly American society in Guam and the Virgin Islands at one end of the spectrum and with some peoples on remote islands of the Trust Territory still living much as they did in the middle of the last century.

But, regardless of location or current standard of living, the future depends upon today's and tomorrow's use and development of the resources of each territory, however presently limited. In each off-shore area revitalized resource programs of agricultural improvement and economic diversification have been inaugurated or are being planned for the months ahead.

Progress in the Virgin Islands

In the Virgin Islands, as in other territorial areas, no minerals have been found in commercial quantities. The economic backbone of the islands is the tourist industry and related recreational facilities. An accelerated program is underway to expand and develop the tourist economy on a year-round basis. A serious shortage of potable water and electric power, which has plagued the islands for many years, will be alleviated early in the calendar year 1962 with the completion of a water distillation plant with its electric power by-product. A stepped up agricultural program has been inaugurated and farmers are being encouraged to raise more foodstuffs in order that the islands may be more self-sustaining. Meanwhile, a reorganized Virgin Islands Department of Commerce is working toward diversification of the business and industrial life of the islands.

Since World War II, Guam has depended on a single industry—defense and defense-related activities. Recognizing the necessity to broaden the base of the island's economy, the Department is working rapidly toward development of an export trade program, industrial expansion, and an agricultural and fishery resource program. At the same time, the homesteading of government lands for the development of privately-owned farms is being encouraged.

The Trust Territory of the Pacific, with its more than 2,000 widely scattered islands and its greatly varied cultural groups, presents challenging problems in resource conservation and development. The people of the Territory are being encouraged to vitalize the economy by the expansion of both subsistence and export agriculture; the development of new marketable products to lessen the dependence upon copra (the single major export product); the development of commercial fishing; and the establishment of boatbuilding enterprises for fishing and transport.

Gaining Momentum

While spectacular progress in these widely scattered islands cannot be expected, it can be seen from the developments outlined here that the Territories have by no means been overlooked or neglected in the press toward full resource use and conservation. Many and varied programs are underway, and momentum is rapidly being gained.

In comparison to the vast comparable resource programs being undertaken in the continental United States, these actions may seem minute. But to the people of the islands they are far more than that—they represent tomorrow's hope.

Part II

ANNUAL REPORTS OF THE BUREAUS
AND OFFICES OF THE DEPARTMENT
OF THE INTERIOR

Office of the Assistant Secretary

Water and Power Development

KENNETH HOLUM, *Assistant Secretary*

THE ASSISTANT SECRETARY for Water and Power Development acts for the Secretary in implementing this area of the Department's program. He exercises secretarial supervision and direction over the Office of Saline Water, Bureau of Reclamation, Bonneville Power Administration, Southeastern Power Administration, and Southwestern Power Administration.

Largest and oldest of these agencies is the Bureau of Reclamation. It constructs water-use projects primarily for the reclamation of arid and semiarid lands in the West. It also markets electric power from projects built by itself and the Corps of Engineers in the 17 western States, exclusive of the Bonneville Power Administration's area, and operates high voltage transmission systems.

Bonneville Power Administration, Southeastern Power Administration and Southwestern Power Administration are strictly power marketing agencies. Along with the Bureau of Reclamation they market all electric power generated from federally-built water resource development projects and facilities.

Bonneville's market area, in which it also operates an extensive high-voltage transmission system, is a four-State area of the Pacific Northwest. Southeastern sells power in southeast States and Southwestern Power Administration in the central southwest States. The latter also operates a high-voltage transmission system.

On February 23, 1961, President John F. Kennedy issued the following set of principles governing the marketing of federally-produced power, under laws established by Congress:

1. Preference in power sales shall be given public agencies and cooperatives.
2. Domestic and rural consumers shall have priority over other consumers in the disposal of power.
3. Power shall be sold at the lowest possible rates consistent with sound business principles.
4. Power disposal shall be such as to encourage widespread use to prevent monopolization.

Pertinent data covering hydroelectric power marketing by the Department of Interior agencies in fiscal year 1961 are summarized in the following table:

Power production and marketing data, fiscal year ended June 30, 1961

Marketing agency	Installed capacity, as of June 30, 1961 (kilowatts)	Net energy generated (million kilowatt-hours)	Energy marketed (million kilowatt-hours)	Gross revenue (thousands of dollars)	Percent of power marketed to preference customers
Bureau of Reclamation.....	¹ 6,216,085	27,851	⁴ 14,798	⁵ 55,917	⁶ 85.4
Bonneville Power Administration.....	^{2 3} 3,937,000	17,424	28,522	69,702	38.7
Southwestern Power Administration.....	² 601,000	1,912	2,196	14,877	71.3
Southeastern Power Administration.....	² 1,283,600	3,855	3,862	19,711	⁷ 33.5
Total.....	12,037,685	51,042	49,378	160,207	-----

¹ Includes 985,035 kilowatts in Corps of Engineers, 31,560 kilowatts in International Boundary* Water Commission, and 5,199,550 kilowatts in Bureau of Reclamation projects.

² Capacity in Corps of Engineers projects.

³ Bonneville Power Administration also markets power from Bureau of Reclamation's Grand Coulee, Hungry Horse, Chandler and Roza powerplants with a capacity of 2,252,250 kilowatts.

⁴ Excludes 12,677 million kilowatt-hours delivered at Grand Coulee, Hungry Horse, Chandler, and Roza powerplants by Bureau of Reclamation to Bonneville Power Administration (this amount include in Bonneville Power Administration "energy marketed").

⁵ Excludes \$16,978,000 revenue received by Bureau of Reclamation from Bonneville Power Administration (this amount included in Bonneville Power Administration "gross revenues").

⁶ Excludes 12,677 million kilowatt-hours delivered to Bonneville Power Administration.

⁷ In addition, 57.3 percent of the total energy was marketed to the Tennessee Valley Authority.

The Office of Saline Water conducts programs to develop low-cost methods of converting saltwater from both the sea and ground to fresh water. It builds and operates plants to test various processes. The first of five authorized plants was completed and put into operation at Freeport, Tex., during fiscal 1961 and ground was broken for a second plant at Webster, S.Dak.

Certain defense functions dealing with electric power have been delegated to the Secretary by the Office of Civil and Defense Mobilization. These responsibilities are discharged by the Assistant Secretary through direction of the Defense Electric Power Administration. Under this program a field organization stands ready to handle

specific postattack power problems. It is made up of 16 power areas, each headed by a director with a deputy and an alternate. Power liaison personnel have been appointed to each of the eight OCDM regional offices, designated for each state and most of the local civil defense offices throughout the Nation.

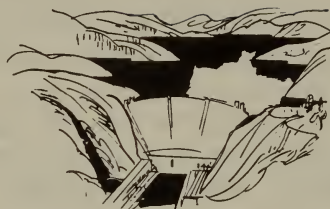
The Assistant Secretary conducted numerous conferences in Washington and in the field on power marketing problems and irrigation matters, with water and power consumer groups, congressional delegations and representatives of industry and local interests. He testified before congressional committees and appeared before interagency groups.

Of particular significance was the appointment of a five-man departmental task force to study the proposed Pacific Northwest-Pacific Southwest extra high voltage transmission intertie. The supplemental power supply program in the Missouri River Basin was extended through the navigation season 1965.

During the year the Office of Assistant Secretary reviewed 44 reports of the Corps of Engineers, Department of the Army, primarily for flood control and navigation improvements; 43 Federal Power Commission applications for permits and licenses to build hydroelectric projects; and 59 Department of Agriculture watershed work plans.

Bureau of Reclamation

Floyd E. Dominy, *Commissioner*



START OF CONSTRUCTION on seven new dams in the West highlighted a year of achievement in water resource planning and development by the Department of the Interior's Bureau of Reclamation during fiscal year 1961.

The new construction starts were initiated in five States—Whiskeytown Dam and Lewiston Dam in the Central Valley Project of California; Fontenelle Dam in the Seedskaadee Project of Wyoming; Crawford Dam in the Smith Fork Project and Lemon Dam in the Florida Project in Colorado; Yellowtail and Merritt Dams in the Missouri River Basin in Montana and Nebraska.

Under its planning and construction program for the fiscal year 1961, the Bureau of Reclamation continued to develop water and land resources in the 17 contiguous Western States, Alaska, and Hawaii.

An investment of about \$230 million was added to the Bureau's \$3.5 billion investment in western projects through completion of dams, powerplants, irrigation canals, pumping plants, electrical transmission lines, and other wealth-creating facilities of benefit to the entire nation. Construction completed during the year added more than 682,000 acre-feet of storage capacity in new Reclamation project reservoirs, 48,000 kilowatts of hydroelectric generating capacity, 462 miles of canals and related water conveyances and distribution structures, and 558 miles of high-voltage backbone transmission lines. These are listed in table 2 of the appendix.

Operation and maintenance of irrigation facilities during the year related to 196 storage or regulating reservoirs, 120 diversion dams, and carriage, pumping, and distribution facilities of irrigation water to

almost 8.2 million acres of fertile farm land, comprising 128,224 farms on which 525,000 persons resided.

Billion-Dollar Harvest

The harvest of crops on irrigated farms in Reclamation projects during the 1960 crop year exceeded \$1 billion for the second successive year. The crops grossing a record total return of \$1,157,528,693 were harvested from 6,899,711 acres in the 17 contiguous Western States, making an average return per acre of \$167.76, also a new record. Only a negligible portion of this production was in crops in surplus supply. Details of this production are shown in tables 7 and 8.

The 177 recreation areas on Reclamation projects received 24.3 million visitor days of use in 1960. These multipurpose water recreation attractions included 7,000 miles of reservoir shoreline and 1.4 million acres of water surface area.

Municipal and industrial water usage increased 37 percent over the 1959 usage, to reach a total consumption of 397 billion gallons. This water is marketed by 90 contracting entities which provide water to more than 200 communities and major industrial users. The cities and towns served contained 8,778,150 persons.

Reclamation project towns and cities continued to absorb project lands in their growth. In 1960 the acreage thus urbanized reached 181,543 acres, up 13,436 acres since 1959.

During the fiscal year, Bureau project planning technicians were engaged in the investigation and planning of proposed projects and units of projects throughout the West. Surveys for comprehensive water resource development were underway in ten river basins in the West, including one subbasin of the Missouri River Basin.

Evaporation Reduction Tests

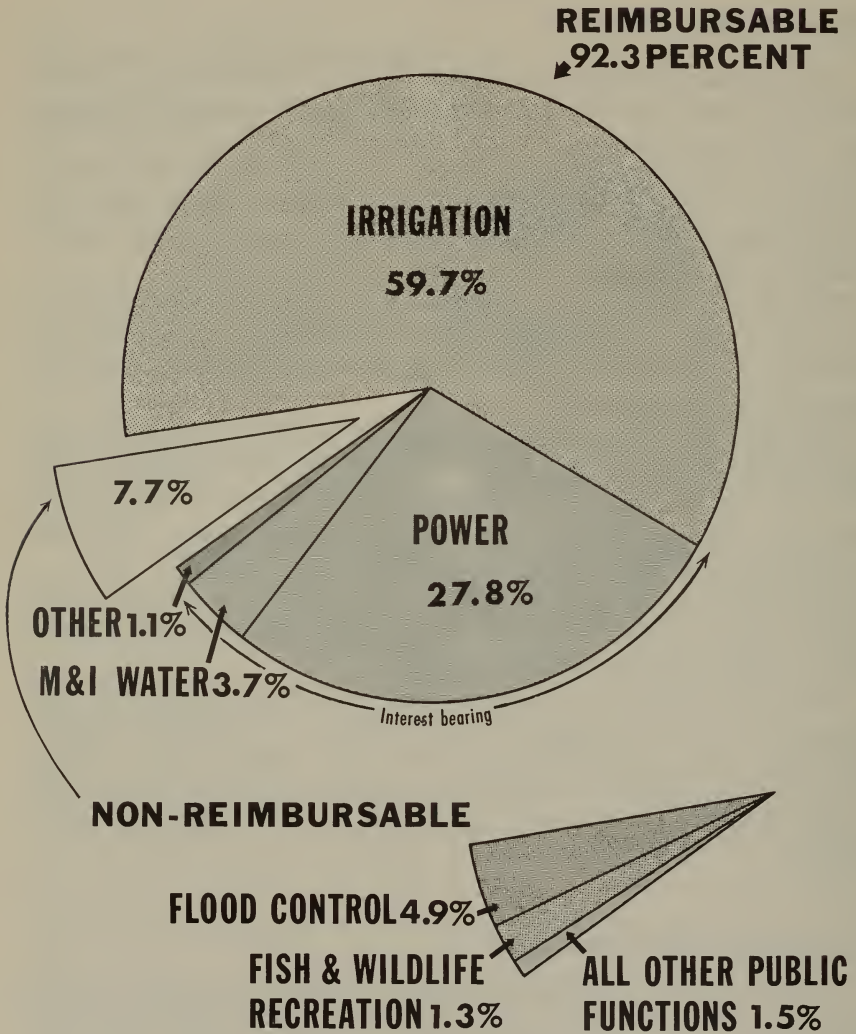
A highlight of the extensive Bureau research program was the performance, in cooperation with other agencies, of full-scale evaporation reduction tests at Sahuaro Lake near Phoenix, Ariz., and the preliminary work for mid-1961 tests at Cachuma Reservoir, Calif.

The Bureau marketed hydroelectric power produced at 47 Federal powerplants, which had a gross revenue during fiscal 1961 of \$72,743,347. The Bureau itself operates 42 powerplants with an installed capacity of 5,199,550 kilowatts.

During the fiscal year, the total value of all contracts awarded amounted to nearly \$171 million, comprising more than 700 separate

ALLOCATION OF PROGRAMMED COSTS

(ULTIMATE \$8.0BILLION)



contracts for construction, materials, equipment, and supplies. Of this, construction contracts accounted for about \$137 million, or 80 percent. As shown in table 1 in the appendix, 36 major construction and supply contracts exceeding \$1 million were awarded during the fiscal year.

Approximately 255 construction contracts having a value of more than \$77 million were completed during the year. There were 200

construction contracts in force at the end of the year with a total value of about \$438 million.

To assist in the overall government effort, ordered by President Kennedy to improve economic conditions in depressed areas, an accelerated work program was initiated in February 1961 to speed up the preparation of designs and specifications for impending contracts for construction and equipment. This acceleration was aimed at awarding all contracts possible before June 30, 1961, and affected a large number of construction and operating projects throughout the West. Procurement contracts for supplies and equipment were moved up as much as 2 years due to the expedited operations initiated to improve the national economy. Several important supply contracts were negotiated with manufacturers in areas of heavy unemployment under a set-aside procedure established in accordance with the President's program of aiding such areas.

A total of 123 construction specifications, 141 major supply invitations, and 199 minor procurement invitations were issued in fiscal year 1961. This was 32 more construction specifications, 83 more major supply invitations, and 112 more minor procurement invitations than during the previous year. This increased accomplishment was mainly due to the accelerated design and procurement program and represented a greater record than that accomplished during recent years.

Small Business Aided

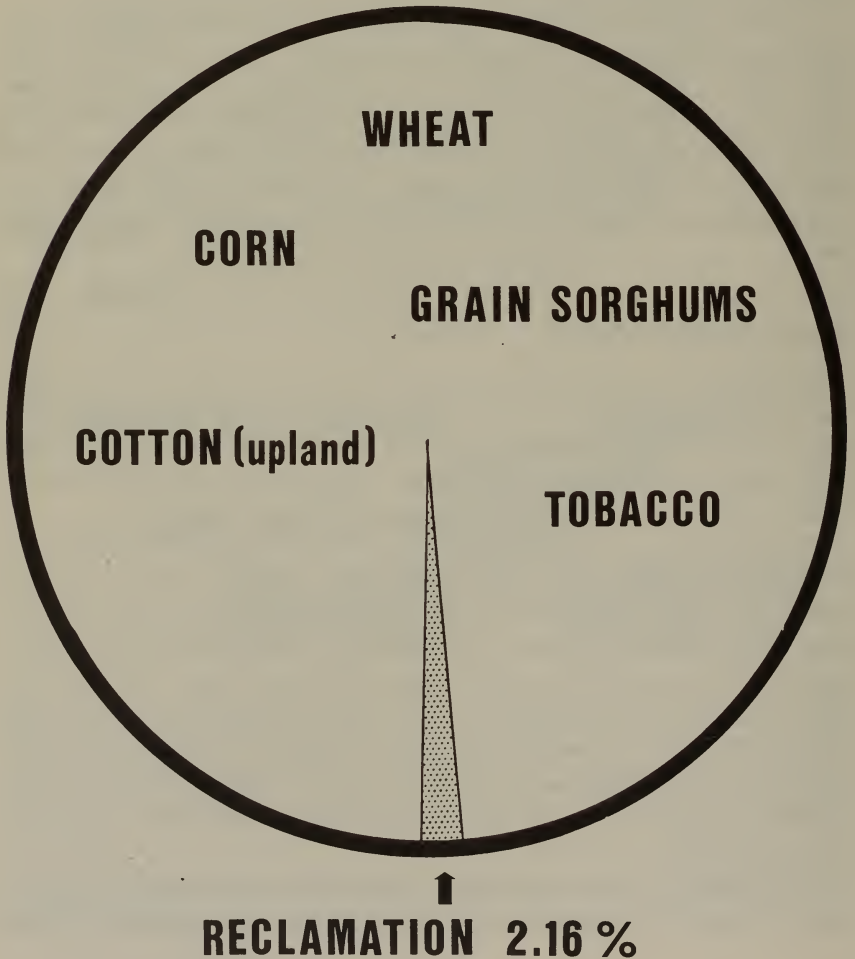
There were 75 invitations (45 major supply, 30 minor procurement) set aside for bidding only by small business firms during the fiscal year. This number of set-asides was greater than at any time since the program was begun. By comparison, only 18 invitations were set aside during the 1960 and 48 during the 1959 fiscal years.

The handling of bids for materials involving identical bids was a subject of national interest during the year, and the Bureau compiled and submitted a large quantity of information to the Antitrust Division, Department of Justice, in connection with 20 grand jury indictments of firms manufacturing various electrical items. Reports are being furnished for submittal to the Justice Department, on a continuing basis, for types of equipment involved in the 20 indictments. Also on a continuing basis, photostat copies are made of original contract documents involving the electrical equipment items covered by the indictments.

Two Bureau project offices established in other nations, by invitation, to assist in water resource development were expanded during

CROP SURPLUS NOT AFFECTED BY RECLAMATION

5 CROPS COMPRISE 94.83 PERCENT OF CCC LOANS AND INVENTORIES





Glen Canyon Dam in Arizona, major Colorado River storage project unit, climbs toward its designed height of 710 feet.

the year. The projects, staffed with Bureau technical personnel in cooperation with the International Cooperation Administration, are located in the Helmand Valley in Afghanistan and in the Blue Nile River Basin in Ethiopia. In addition, the Bureau dispatched 18 of its own specialists to 13 foreign countries for short-term assistance details, and provided in-service training for 356 visiting students, technicians and water resource officials from 34 countries.

Further details of the varied program of the Bureau of Reclamation are provided in the following sectional report on fiscal 1961 activities.

The "Statistical Appendix to the Annual Report of the Commissioner" contains complete annual and cumulative data on the Bureau's

irrigation, municipal water and power accomplishments, measured in both dollars and physical units, together with related investigations, construction, operation and administration information.

Construction Highlights

On the East Unit, Greater Wenatchee division, of the Chief Joseph Dam project in Washington, construction which started in January 1961 on a river pumping plant, booster pumping plant, and a 2-million-gallon reservoir to raise 76 cubic feet per second of water from the Columbia River was about 20 percent complete. In the Columbia Basin construction of the Royal Branch Canal laterals in Block 83 was completed in July 1960, except for pumping units which were returned to the factory for retesting and correction. These were reinstalled in April 1961. The West Canal Lateral System in Block 88 was completed in June 1961. Construction of the Hope Valley and Frenchman Hills pumping plants for the West Canal Lateral System in Block 80 was about 90 percent complete at the end of the fiscal year. The lateral system in Block 80 of the West Canal Laterals was also about 90 percent complete.

In Oregon, the earthfill Prineville Dam, Crooked River project, was completed except for installation of the elevator in the outlet works gate shaft. Construction of the Crooked River Diversion Canal and headworks was essentially completed at the year's end. Construction of the Ochoco Relift and Barnes Butte pumping plants, started in August 1960, was about 90 percent completed. The first section of the distribution canal was constructed during the year.

Enlargement of Emigrant Dam, Rogue River basin project, Oreg., was completed in April 1961. The South Fork, Daley Creek, and Grizzly Creek collection canal system and diversion dams were completed. Other construction completed included major structures for the East Lateral rehabilitation and new structures for the Ashland Lateral rehabilitation. The fish screen structure for Hyatt Prairie Dam and rehabilitation of the Oak Street Diversion Dam and first section of Talent Lateral were also completed. Rehabilitation of the second section of the Talent Lateral was nearly completed at the end of the fiscal year in less than half of the contract time.

In Montana, installation of acoustical treatment to reduce the noise level in the turbine gallery of the Hungry Horse powerplant was accomplished in May 1961.

Pacific Coast and Nevada

In the American River division of the Central Valley project of California, the El Dorado Main Lateral System, started in February 1961, was about 15 percent complete at the end of June, in 30 percent of the contract time. In Central Valley's Friant division, construction of the Tea Pot Dome Water District Lateral 99.4 and sublaterals was completed. Construction of the Stone Corral Irrigation District Lateral System, started in April 1961, was about 20 percent complete at the end of June. Construction of part 1 extension of the Madera Distribution System, started in February, was about 40 percent complete. Construction of the Corning Canal pumping plant in the Sacramento River division was completed.

On the Trinity River division the 10.7-mile-long Clear Creek tunnel was holed through at the end of July 1960. Placing of concrete lining in the invert of the tunnel was completed and placement of arch lining was started. At the end of June 1961, work was about 96 percent complete in 90 percent of the contract time. Construction of Trinity Dam was essentially completed in October 1960, except for the outlets works and the penstock installation. The outlet works stilling basin was completed in May, the control valves installed, and the anchor block and foundation for the control house completed. The dam was 97 percent complete in 85 percent of the contract time at the end of the fiscal year. Construction of the Trinity powerplant building (prime contract) which was started in August 1960, was about 80 percent complete at the year's end in 60 percent of the contract time. Clearing of two areas of the Trinity Reservoir was completed and the third area was about 90 percent complete at the fiscal year end.

Tunnel No. 2 of the Spring Creek Power Conduit was holed through in June 1961. Excavation of tunnel No. 1 was about 60 percent complete. The surge tank excavation was about 75 percent complete. Construction of the Spring Creek powerplant (prime contract) was started in 1960 and was about 36 percent complete at the end of June, slightly ahead of schedule. The tailrace tunnel was holed through in April.

Construction of the Clear Creek powerplant was started in August 1960. By the end of June the work was about 50 percent complete in 40 percent of contract time.

Construction of Whiskeytown Dam was started in September 1960 and had reached 30 percent completion by the end of June.

At Lewiston Dam, the Trinity River was diverted through an old existing placer mine diversion tunnel in March 1961 to get this job off to a fast start. The foundation was excavated and founda-

tion grouting well advanced and placement of embankment started. The fish hatchery outlet works and river outlet works were completed. The entire job was about 18 percent complete in 22 percent of contract time at the end of June.

On the Klamath project, Oregon and California, six contracts for pumping plants, lateral systems, and drains were in progress during the year in the sump No. 2 and 3 areas of the Tule Lake division. All except two were completed by the end of June.

In Nevada, construction of Prosser Creek Dam in the Washoe project was shut down for the winter from early November until mid-April. At the end of June 1961, work was about 43 percent complete in 61 percent of the contract time. Concrete for the diversion stage of the outlet works was completed in May and foundation grouting essentially completed in June.

Bonneville Basin

On the Weber Basin project, Utah, construction of the second stage embankment for Willard Dam was continued, except for winter shut-down, and by the end of June 1961 was nearly 80 percent complete. Pipeline and reservoir construction for the North Davis laterals, unit 1, of the Davis Aqueduct lateral system was started in September and was about 97 percent complete at the end of June. Pipeline and structures for the West Farmington lateral system were started in January and were nearly complete at the end of the fiscal year.

Work on the Provo River project, Utah, was mainly concerned with construction of dikes and revision of the Provo River channel, with one project completed in June and three others continuing until later in the year.

Colorado River Basin

At the Hoover powerplant, Boulder Canyon project, field erection was about 80 percent complete for the 17th and final generator and about 65 percent complete for the turbine and electrical work at the end of June.

On the Colorado River front work and levee system project, construction of Gila River Pilot Channel from the Gila River siphon to the Colorado River was started in October 1960, and completed the following February. Construction of the companion main outlet drain was started in January and by the end of June was about 75 percent complete, well ahead of schedule.

Construction of the Steinaker Dam, Central Utah project, a participating project of the Colorado River storage project, was completed



Engineers pull lanyard releasing 1-millionth cubic yard of concrete into Glen Canyon Dam.

in December 1960. The Fort Thornburgh Diversion Dam, Steinkaker Feeder Canal, and Rock Point Canal extension were started in July 1960, and completed in May 1961. Construction of the Steinkaker Service Canal, started in April 1961, was about 20 percent complete by the end of June.

In Wyoming construction of Government camp facilities for Fontenelle Dam of the Seedskaadee project was started in May 1961.

The \$7,917,000 contract for construction of Fontenelle Dam was awarded in June 1961.

Approximately 165,000 cubic yards of concrete were in place at the Flaming Gorge Dam, Colorado River storage project, in northeastern Utah. Excavation of the spillway tunnel was completed in May. The entire contract was about 47 percent complete at the end of the fiscal year in 60 percent of the contract time. Work started at the Vernal end of the Flaming Gorge-Vernal section of the 85-mile-long Flaming Gorge-Vernal-Rangely 138-kv transmission line. Work will proceed on the 119-mile-long Rangely-Oak Creek 115-kv transmission line as soon as the contractor procures materials.

The 1-millionth cubic yard of concrete was placed in Glen Canyon Dam, in northern Arizona, early in May 1961. By the end of June a total of 1,250,000 cubic yards had been placed. Concrete lining had been placed in all but the upper 100 feet of the left spillway tunnel raise and preparations were made for starting lining of the right spillway tunnel raise. Concrete placing was essentially completed to the base of the superstructure for Unit Bay 1 of the powerplant and superstructure structural steel has been erected. The other seven unit bays, service bay and machine shop were in various stages approaching that of Unit Bay 1. The entire contract was about 53 percent complete at the end of June 1961 in 62 percent of the contract time. The construction of the temporary tourist shelter on the left abutment was completed in June 1961.

Construction of Navajo Dam, on the San Juan River in New Mexico, was about 84 percent complete at the end of June in 63 percent of the contract time. The 20-millionth cubic yard of embankment now in place represents about 75 percent of the total required. The outlet works and auxiliary outlet works are complete except for second stage concrete. The spillway is complete except for the crest structure and inlet. A contract for relocation of the D&RGW Railroad and county roads in the reservoir area was started in November 1960 and was nearly completed at the end of June 1961 in less than half the allotted time.

Construction of the first section of the main canal in the Hammond project, participating project of the Colorado River storage project, in New Mexico, was started in August 1960 and was completed in June 1961. Construction of the Hammond Diversion Dam was started in April 1961 and was about 15 percent complete at the end of the fiscal year. Construction of the Hammond pumping plant was started in June.

The embankment for Paonia Dam in the Paonia project of Colorado was nearly completed at the end of the fiscal year. The entire work

was about 98 percent complete in 90 percent of contract time. The reservoir area clearing was completed in December 1960.

On the Smith Fork project in Colorado, construction of Crawford Dam was started in October 1960, and work at the end of June was mainly concerned with drilling the outlet works tunnel and placing the concrete lining preparatory to diversion. The work was about 35 percent complete at the end of the fiscal year and just about on schedule.

On the Collbran project of western Colorado the first and second sections of the Southside Canal were completed. The Leon Creek and Park Creek Diversion Dams and Leon Creek Feeder Canal were also completed. Work on the Bonham and Cottonwood pipelines was far behind schedule, which could cause serious delays in operation of the Molina powerplants. At the end of June the work was less than 70 percent complete in 90 percent of the contract time.

The contractor was instructed to increase his work force and requirements to insure completion in accordance with the contract. Construction of the Upper Molina and Lower Molina powerplants and penstocks was over 90 percent complete in 96 percent of the contract time. The powerplant structures are virtually complete and installation of equipment was in progress. The penstock for the Lower plant was essentially completed in May and a large part of the Upper plant penstock was also completed.

Southwest Projects

On the Middle Rio Grande project, N. Mex., channelization of three reaches of the Rio Grande was in progress. One of these was completed in September 1960, the second was nearly complete at the end of June 1961. The third was in process of clearing right-of-way and stockpiling jetty materials. Rehabilitation of older irrigation units in the Belen, Albuquerque and Socorro areas was in progress on seven jobs all of which were completed in the nonirrigation season between October 1960 and March 1961.

Work on Twin Buttes Dam, the San Angelo project, Tex., reached about 55 percent completion in 38 percent of contract time at the end of June 1961. Nearly 11½ million cubic yards of embankment had been placed of the 21 million cubic yards required. Clearing of the Twin Buttes Reservoir is underway and about 20 percent complete, the railroad relocation completed, and a contract was awarded for the 16-mile main canal.

In the Fort Cobb division of the Washita Basin project, Okla., construction of a district office building was completed in March.



Men work on concrete face of Flaming Gorge Dam on Green River in Utah as structure rises toward its ultimate height of 502 feet.

Construction of remote control and telemetering facilities for the Anadarko Aqueduct was about half completed at the end of the fiscal year.

In the Foss division, construction of Foss Dam was completed in March 1961. Construction of the 50-mile Foss aqueduct, including Clinton, Bessie, and Cordell laterals under a contract awarded in 1960, was about 30 percent complete in 42 percent of the contract time at the fiscal year end. Clearing of the Foss Reservoir was completed in April. Construction of Foss pumping plants Nos. 1, 2, and 3 was started in November 1960 and, by the end of June, was about 25 percent complete. Construction of the Foss district office building was started in November 1960 and completed in March 1961.

Missouri River Basin

In the Bighorn Basin division, Missouri River project, Wyo., Anchor Dam on the Owl Creek Unit was completed in October 1960, and grouting of the contraction joints was completed in May 1961. Remedial action is being studied on water escapement in the reservoir area.

In the Lower Bighorn division, the first work in connection with Yellowtail Dam, Mont., was started in November 1960. The prime contract for construction of the dam was awarded in April 1961. By the end of June, the contractor had moved in a large amount of equipment, and camp and construction facilities and work roads were being constructed.

In the Three Forks division, Missouri River Basin project, relocation of 15 miles of Union Pacific Railroad for the future Clark Canyon Dam and reservoir, in the East Bench Unit, was started, and, by the end of June, was about 60 percent completed in 40 percent of the contract time.

In the Transmission division, Missouri River Basin project, the Fort Peck-Dawson County leg of the 310-mile-long Fort Peck-Dawson County-Bismarck 230-kv transmission line had been completed in June 1961; the remaining Dawson County-Bismarck section was completed in October 1960. Foundations and towers for the 100-mile-long Bismarck-Jamestown 230-kv transmission line No. 2 were completed in February 1961. Stringing of conductor and overhead ground wire on this line was completed in June 1961.

Foundations and towers for the 84-mile-long Jamestown-Fargo 230-kv transmission line No. 2 were about 95 percent complete, as of June 1961, in 83 percent of the contract time. Field work on foundations and towers for the 136-mile-long Garrison-Jamestown 230-kv transmission line was about 30 percent complete in 50 percent of the

contract time with foundation work in progress and tower steel being erected.

Construction of the 114-mile-long Garrison-Minot-Rugby 115-kv transmission line was started in July 1960. The section crossing the Snake Creek Reservoir-Garrison Reservoir embankment was completed; the remainder was about 95 percent complete at the end of June 1961 in 75 percent of the contract time. Construction of the 110-mile-long Jamestown-Grand Forks 115-kv transmission line No. 1 was about 40 percent complete in 75 percent of the contract time by the end of June 1961.

Tornado Fells Towers

Tornadic winds in North Dakota on July 10, 1960, blew down 12 steel towers of the Jamestown-Fargo 230-kv transmission line No. 1. Reconstruction was completed within that month using an emergency contract.

Construction of Stages 03 and 04 additions to the Fargo substation was completed in November 1960. Construction of the Stage 04 additions to the Jamestown substation was complete at the end of June 1961 except for installation of Government-furnished transformers. Stages 03 and 04 additions at the Bismarck Substation were completed in May 1961.

Construction of foundations and towers for the 57-mile-long Oahe-Fort Thompson 230-kv transmission line was about 80 percent complete in 60 percent of the contract time by the end of June, 1961. Field work on the foundations and towers for the single-circuit transmission line approaches at the Oahe and Fort Randall switchyards was started in May 1961. The contractor started stringing operations in June for the addition of second circuit conductors on the 337 miles of Fort Thompson-Huron-Watertown, Fort Randall-Sioux City, and Fort Randall-Fort Thompson 230-kv transmission lines. The contract was awarded in May 1961 for stringing second circuit conductors on 74 miles of previously constructed Watertown-Granite Falls 230-kv transmission lines.

Construction of the 213-mile-long Sioux City-Spencer and Sioux City-Denison-Creston 161-kv transmission lines was started in April 1961. Construction of Stage 04 additions to the Granite Falls substation and Stage 03 additions to the Tyndall Substation were both completed in September 1960. Stage 03 additions to the Huron Substation were about 95 percent complete at the end of June. Construction of the Fort Thompson substation, Stage 01, was started in July 1960 and had reached 70 percent completion, about on schedule.

Work had been started on Stage 03 additions to the Rapid City substation, Stage 04 additions to the Sioux City substation, and Stages 08 and 09 additions to the Watertown substation. A contract was awarded in April 1961 for construction of a multichannel microwave radio communications system to link all Missouri River Basin powerplants and substations in the South Dakota power system.

Twelve-Year Construction Effort

In the Bostwick division, Missouri River Basin project, construction of the last section of the White Rock extension canal was completed in April 1961, to bring to a close major construction in this area extending over a period of 12 years.

In the Frenchman-Cambridge division, Missouri River Basin project, reconstruction of the last section of the old Culbertson Canal and construction of the first section of the Culbertson extension canal and lateral system was completed. The second section of the Culbertson extension canal and lateral system was about 95 percent complete at the end of June 1961 in about 68 percent of the contract time. Construction of Red Willow Dam in Nebraska was started in June 1960, and had reached about 35 percent completion by the end of June 1961 in 60 percent of the contract time. The outlet works was about 90 percent complete. Initial clearing of the reservoir was started in June 1961.

In the Middle Loup division, Missouri River Basin project, construction of Sherman Dam in the Farwell Unit, Nebr., was about 80 percent complete and about on schedule. Clearing of the Sherman Reservoir was completed. Construction of the Arcadia Diversion Dam was started and the work was about 20 percent complete in 35 percent of the contract time at the end of June 1961. The first section of the Sherman Feeder Canal had reached about 45 percent completion in 35 percent of contract time. A substantial amount of canal excavation had been accomplished on the second section of the Sherman Feeder Canal and tunnel excavation started. The work is about 30 percent complete in 35 percent of the contract time.

In the Oregon Trail division, Missouri River Basin project, the first generator in the Fremont Canyon powerplant was placed in operation in December 1960 and the second in January 1961, and all work was completed in March 1961. Completion of the Gray Reef Dam in the same division was completed in May.

Construction of Merritt Dam in the Sandhills division, Missouri River Basin project, was initiated in April 1961 and at the end of June was about 10 percent complete in 12 percent of the contract time.



Trinity Dam, Bureau of Reclamation's largest earth-filled structure, backs up the Trinity River in northern California.

In the Smoky Hill division, Missouri River Basin project, the modification of existing outlet works at Cedar Bluffs Dam was about 60 percent complete in 98 percent of the contract time. Construction of the Cedar Bluff Canal was started in 1961, and is about 10 percent complete in 30 percent of contract time. Construction of the second section of Cedar Bluff Canal was started in June.

In the Solomon division, Missouri River Basin project, the fourth section of the Osborne Canal was completed in April 1961.

In the Transmission division, Missouri River Basin project, construction of the 140-mile-long Kortes-Cheyenne 115-kv transmission line was completed in November 1960, and the 115-kv additions to the Cheyenne substation for terminal facilities for this line were completed in September 1960. Construction of the 65-mile-long Cheyenne-Pine Bluffs-Sidney 115-kv transmission line was nearly complete at the end of June in 75 percent of the contract time. Construction of the Kimball substation and 115-kv addition to the Sidney substation were both underway. Construction of a multichannel microwave radio communications system between the Flatiron Dispatch Office at Loveland, Colo., and the Cheyenne substation was essentially complete at the end of June 1961.

Principal features completed on Bureau projects in fiscal year 1961 are shown in table 2. The list includes six storage dams, seven diversion dams, and 462 miles of canals, pipelines, laterals, and drains; as well as 558 miles of transmission lines.

Safety-Contractor Forces

The Bureau continued to emphasize its safety program in the prevention of accidents through administration of sound safety practices and corrective measures to control hazards associated with heavy construction work. Significant progress was made by reducing the contractors' overall frequency rate 16 percent below the previous year's accident rate.

In this effort to reduce disabling injuries in Bureau construction operations and reduce construction cost resulting from accidents, contracts and specifications now include the following safety provisions requiring each contractor to (a) submit a proposed safety program to the contracting officer for approval prior to start of construction operations, (b) designate a competent contractor supervisory employee responsible for administration of the contractor's safety program, (c) hold weekly 5-minute "on-the-job" safety meetings conducted by all contractor foremen, and (d) provide first aid training for all supervisors of mechanics and laborers engaged in construction.

Engineering Design and Research

The Bureau continued during the fiscal year to develop engineering designs and design standards that will produce savings in the construction, operation and maintenance of its engineering works. This continuing effort benefited by the studies of a three-man team of Reclamation engineering specialists who visited several European countries to examine at first hand practices and procedures employed in the investigation, testing, design, and construction of concrete dams.

The importance and value of saving water otherwise lost in transit through canals is recognized. An appraisal of research and development work in the lower-cost canal lining program showed savings to western water users of more than \$20 million in the construction of irrigation canals over the past 15 years.

The search for better methods to locate and measure seepage continued. Several new installations of buried plastic Butyl rubber sheets as a membrane to prevent seepage were installed in canals during the year.



Men and machines place and compact earth in Navajo Dam on the San Juan River in New Mexico.

Experience of the past year in the field of earth dam design brought about a better understanding of the many complex variables involved. Special attention was concentrated on the analysis of foundation conditions from the standpoint of water retention and stability of soft foundations.

The feasibility of obtaining power from the electric field surrounding energized transmission lines was investigated. The electrical analogy tray apparatus was used to evaluate the mutual capacitance between the various conductions and between the conductors and ground. The techniques of noise control and the equipment necessary for detecting and analyzing noise sources in powerplants and pumping plants were studied. Noise control is now being considered in the original design of powerplants and pumping plants to eliminate correction of the conditions after the plant is built.

Field tests on two pumping plants where water column separation could be induced demonstrated the propriety of present Bureau design policy. Such policy calls for the design of water conduits for pumping plants so that water column separation cannot occur under any condition of operation.

During the year studies were started on the use of high strength reinforcement bars in precast reinforced concrete pipe. The high-strength bars, a relatively new product, have a yield strength of 60,000 pounds per square inch compared to 40,000 pounds per square inch yield strength for conventional reinforcement steel. The increasing use of precast concrete pipe in distribution systems gives great importance to this development.

New Technique Developed

A technique was developed and used for the first time at Yellowtail damsite to determine characteristics of abutment and foundation rock. Equipment and instruments were designed and utilized to increase the knowledge on properties of rock in place. The technique will be used at other damsites.

A new procedure in the preparation of specifications drawings showing geologic logs of drill holes released trained draftsmen for other work, increasing production. The use of typewritten notes in lieu of machine lettering equipment is the basis of the new technique. The altered procedure is aided by a new heat-resistant adhesive for plastic drafting film.

Studies were started on preliminary data for design of a 345-kv single-circuit, steel tower transmission line from Glen Canyon to Flagstaff to Pinnacle Peak (north of Phoenix, Ariz.). Basic information such as conductor size and arrangement, hardware, insulation, mechanical loading assumptions, climate, and corona limitations are among the points being studied. The transmission line will be unique for the voltage because a large percent of the length of the line will be in the 6,000- to 8,000-foot range of elevation.

Remote Powerplant Control

To minimize operating expenses, larger powerplants are being designed, where practical, for remote supervisory control. Current designs provide semiautomatic, pushbutton start-and-stop type controls at the Trinity, Clear Creek, and Spring Creek powerplants. Operation of these three plants and the control of water from the Keswick Control Center will save operating costs. All large plants being designed by the Bureau are being provided printing annunciators. This equipment will provide a permanent record which will give an accurate sequence when troubles occur. Operators will be relieved of such recording duties.

Specifications for high-speed voltage regulators for generators were revised extensively to incorporate improved methods of specifying

performance. The new requirements are based on definitions of performance which appear in a proposed standard prepared by the AIEE subcommittee on excitation systems.

Through the increased use of electronic computing equipment for engineering studies, Bureau of Reclamation engineers are further relieved from many routine calculations.

Calculations were produced for such diverse engineering problems as the determination of power flows in interconnected high-voltage power systems; earthwork quantities for canals, highways, and railroads; analysis of control data for concrete and earthwork structures; design studies for dams, powerplants, pumping plants, and other structural features.

Electronic computer program studies during the fiscal year aided in the development of more advanced designs and more efficient use of engineering materials. Studies included investigation of the development of uniform Bureauwide ADP procedures for nonexpendable movable equipment; crop census reporting; studies to determine capacities of large canals; statistical analyses of earthwork and concrete control data; structural designs of walls, slabs, and frames for powerplants and pumping plants; calculation of deflections in concrete dams; power system average rate and repayment studies; design and analysis of structures on elastic foundations; non-linear multiple correlations; hydrology system operation studies; and calculation of loss factors for electrical power systems.

A revised procedure was developed and implemented for processing Bureauwide real property data to produce useful current information as well as that required for periodic inventory and status reports on real property.

Evaporation Reduction Tests

Full-scale evaporation reduction tests were performed at Sahuaro Lake, Phoenix, Ariz., in cooperation with the Department's Geological Survey, Salt River Valley Water Users Association, U.S. Public Health Service, and the Arizona State Fish and Game Department. A new automatic technique of applying the monolayer-forming material in melted form was employed with encouraging results. A manual method of applying the monolayer-forming material with agricultural dusting equipment mounted on a boat also proved effective. The Sahuaro Lake investigations showed evaporation savings of about 14 percent for over a 6-week period using a mixture of hexadecanol and octadecanol as the monolayer-forming material.

In preparation for a full-scale evaporation reduction field test during the summer months of 1961 at Cachuma Reservoir, Calif., pre-



A dynamite blast launches preliminary construction on Yellowtail Dam on the Big Horn River in Montana.

vailing climatic conditions at the reservoir were studied and further research and development on the automatic dispensers were carried out. Twelve dispensers were built and installed at the reservoir. The Cachuma investigations are in cooperation with the Geological Survey, Cachuma Operation and Maintenance Board, Santa Barbara County Department of Parks, and the City and State Health Departments.

Aerial applications of the monolayer-forming material were field tested at Utah Lake in a cooperative program with the Utah State University. Preliminary studies were highly encouraging for this method of applying monolayers to large reservoirs. Evaporation losses in the 17 Western States total about 25 million acre-feet annually.

Concrete containing certain types of aggregate when exposed in a moist environment to freezing-thawing conditions is sometimes affected by surface deterioration in the form of popouts, scaling, and spalling. On large projects remedial measures such as heavy media separation are feasible economically, and they are being presently used for aggregates at Glen Canyon and Flaming Gorge Dams. On

smaller projects, cost would preclude such treatment, and to protect the concrete surface from deterioration, other means such as surface treatment may be the answer. Investigations of such treatments as epoxy resin, linseed oil, and silicones were started to determine their effectiveness in reducing freezing-thawing deterioration of concrete.

Improving Asphaltic Concrete

Preliminary research on improving asphaltic concrete for lining canals and reservoirs and facing dams showed that an epoxy-resin additive contributes to a higher quality mixture, exhibiting considerably greater compressive and tensile strengths and stability after aging. Other investigations into the performance of asphaltic concrete indicate that asbestos fibers produce a pronounced increase in tensile strength and stability. By using the finer fibers (low-cost waste screenings), a watertight material can be obtained. A new method for tensile testing of 4-inch-diameter asphaltic concrete test cylinders was developed to facilitate study of the correlation between compressive and tensile strengths.

A comprehensive report was published describing laboratory and field tests made so far in the study of epoxy resins for use in repairing concrete. New studies of epoxy-resin compounds were started on applications as decorative finish floors similar to terrazzo, as nonskid surfaces, and as surface treatments to protect concrete from freeze-thaw damage.

Model and field testing of jétty fields used in river channelization have produced sufficient data to permit generalization of design procedures. Analysis of the data and recommended design principles have been published in a form applicable to the solution of future channelization problems.

Investigations related to the carrying capacity of large canals were continued. Field tests on large concrete lined canals have revealed that resistance to flow from concrete surfaces increases with age, thus gradually reducing the carrying capacity. Preliminary trials of a model test facility designed to measure resistance coefficients of typical concrete surfaces demonstrated that laboratory values were of the same order of magnitude as field measured values. This will be a valuable tool for the further study of carrying capacity of large canals.

The results of preliminary investigations of the dissolved oxygen content of streams and reservoirs were reported. Particular attention was given to improving chemical methods of determining dissolved oxygen content. In these first tests, no significant oxygen de-

pletion was found in waters tested on the Bureau's Colorado-Big Thompson project of Colorado.

Brackish Water Conversion

In cooperation with the Department's Office of Saline Water, operation and testing was continued of different electro dialysis demineralization units, including a large demineralizer unit with two types of membranes manufactured in the Netherlands. A field test station was constructed, including installation of a four-stage demineralizer unit which was operated on a supply of brackish well water. Data obtained in these testing operations were used in the analysis and review of contractors' proposals for the Office of Saline Water electro dialysis demonstration plant at Webster, S. Dak.

An investigation was conducted on the type of steel required for pumps used with brackish water in demineralization pilot plants. Stainless and mild steels were compared for resistivity to corrosion and impingement attack. The need for a high alloy stainless steel was clearly demonstrated.

In some areas of the western United States there are loose soils which subside upon initial wetting when water seeps through irrigation conveyances. By correlating simple laboratory tests with field installations and test plots where known subsidence has occurred, a procedure was developed to provide a convenient measurement for indicating susceptibility to subsidence. The procedure is now finding important use in the investigations of subsidence problems connected with the San Luis Canal, Calif.

A portion of the Bureau's research program was financed this fiscal year with nonreimbursable funds. Congress, in appropriating such funds, recognized that much of the agency's research had benefited more than one project, and by advancing the art in engineering had general applicability to future projects and to the engineering profession as a whole. A new material, a new method, or a new concept permitting more economical design may result from studies for a single project. The economies achieved are often duplicated on similar projects built by the Bureau in the future.

Nonreimbursable research covered many varied fields—the development and improvement of construction materials, protective coatings for submerged and buried steel, the lining for canals, the structural behavior of rock foundations, and in specialized fields such as the reduction of evaporation from reservoirs through the use of monomolecular films.

Under nonreimbursement research, appreciable progress was made during the fiscal year on studies to determine the possibilities of



Prineville Dam on the Crooked River in Oregon stands completed.

greatly increasing power capacity of generating units in large powerplants. Investigations have been made relative to installation of a 300,000-kw generator on a single shaft from one turbine. The investigations were still in progress at the end of the fiscal year but tentative conclusions are that such units are entirely feasible and that improvements in economy of powerplant construction may be realized.

Foreign Contracting

Twenty-eight contracts totaling \$3,109,383 were awarded to companies offering foreign manufactured equipment, including five Eng-

lish, five Austrian, five West German, five Canadian, three Italian, two French, and one each Swiss, Japanese, and South African. Twenty of these were for electrical equipment. Two were for hydraulic turbines, one of which was the first contract to be awarded to a Japanese manufacturer. Two contracts were awarded for hoists, and one each for fixed-wheel gates, hollow-jet valves, strain meters and monometers, and electronic distance measuring instruments from South Africa.

Construction costs on Bureau projects increased about 1 percent during fiscal year 1961. Construction wage rates increased about 5 percent for the same period, while most construction material costs remained fairly stable.

The number of bids on Reclamation construction work decreased from an average of 7.4 bids received on each construction schedule in fiscal year 1960 to an average of 6.5 bids per schedule for the current fiscal year. This compares with an overall average of 6.3 bids per schedule for the past 10 years. Table 3 shows cost indexes for Bureau of Reclamation construction work based on the combined cost of materials and labor supplied by the contractor, and materials supplied by the government.

New Reference Works Issued

Two major reference works were issued during the year—the 873-page Reclamation Project Data and the new edition of the Earth Manual.

The project data publication provides information on 145 Federal water resources projects and units of projects initiated or completed during the Bureau's first 57 years. Included in the volume are tabulations of engineering data on Bureau structures, a glossary of technical terms, and a project location map. Similar data books, increasing in size and scope as the Bureau program expanded, were published in 1945 and 1948 as an outgrowth of a reference brochure first published in 1941.

The 1960 edition of the Earth Manual was published as a successor to the 1951 edition. The manual provides current technical information relating to field and laboratory investigations of soils used as foundations and materials for dams, canals, and many other types of structures built on Reclamation projects in the United States. The Bureau's many years of experience in investigating and testing the various properties of soils relating to engineering uses is incorporated in the publication.

Also published were technical records on the design and construction of Nimbus Dam and powerplant, Palisades Dam and powerplant, and Helena Valley pumping plant and tunnel. Three engineering monographs on petrographic and engineering properties of loess, calculation of stress from strain in concrete, and moments and reactions in rectangular plates were issued during the year. The latter publication has done much to alleviate the problem of design of wall and floor slabs for retaining walls.

In response to 7,350 requests for the Bureau's publications and informational materials, 38,000 copies of technical publications and informational pamphlets were sold or distributed. Sales of Reclamation publications totaled \$37,630. Approximately half of the total sales revenue came from foreign countries, an increase of 60 percent over last year. Publications sold for the Superintendent of Documents totaled \$17,678, an increase of approximately 30 percent over last year.

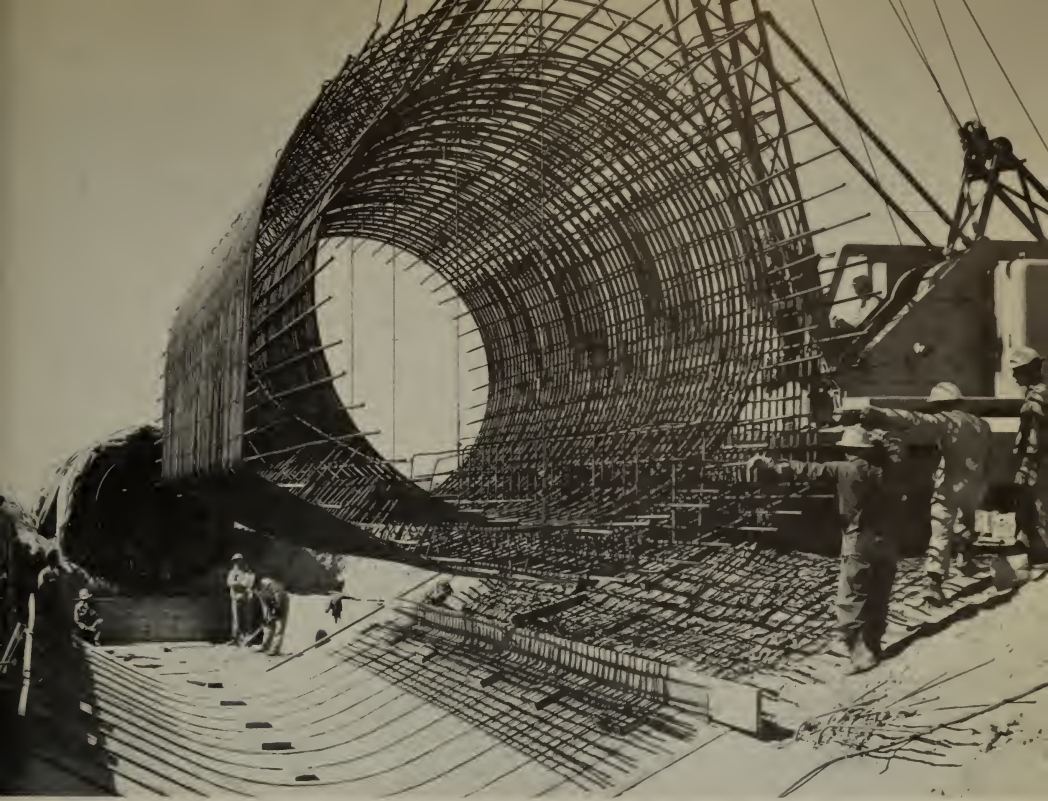
Engineers, scientists, and subprofessional employees of the Bureau hold offices on the national level in professional societies ranging from "task-force" worker on special committees to president in such groups as the American Society of Civil Engineers, American Society of Testing Materials, American Concrete Institute, U.S. Committee on Large Dams, World Power Conference. Included are numerous memberships on technical committees and chairmanships. More than 60 national or regional meetings were attended and technical papers authored by Bureau personnel were presented. Many of these papers were nationally received and recognized and were published in leading technical or society publications and journals.

The Bureau also published Bureau of Reclamation Appropriation Acts and Allotments, a 1,000-page chronological compilation, and Engineering Careers in Reclamation, a 50-page booklet designed to interest graduating students in working for the Bureau.

A new motion picture on the Colorado River storage project, *Key to the Future*, was produced. The Bureau also produced a film strip, *The Miracle of Water*, which briefly covers the story of Reclamation.

Irrigation and Land Use

The 1960 harvest of crops on irrigated farms in Reclamation projects was valued at \$1,157,528,693. These farms contained 6,899,711 irrigated acres, making the average gross crop return amount to \$167.76 per acre. The 1960 crop year established new records in Reclamation crop returns.



A 14-ton steel cage for section of outlet works is lowered into position at Red Willow Dam on the Missouri River Basin project in Nebraska.

The irrigated area under Reclamation projects was 96,686 acres greater than in the preceding year. Since 1920 the annual growth rate of the Reclamation area has been fairly constant, averaging 3 percent per year.

Projects added to the Reclamation area in 1960 were the Boysen, Frenchman, and Webster Units of the Missouri River Basin project and the Wapanitia project. Their combined irrigable area for service was 27,844 acres.

Reclamation farms numbered 128,224, and averaged 64 acres. The farm population was 524,930 persons—an average of 4 per farm.

Reclamation farmers produced a wide array of readily marketable crops. Vegetables comprised 22 percent of the total value, fruits and nuts 15 percent, and miscellaneous field crops 8 percent. Twenty-nine percent of the gross crop value came from feed and forage crops. Reclamation contributes little, if any, to the surplus crop categories.

From 1906 to 1960, the cumulative value of all Reclamation harvests amounted to \$16,532,586,077. The 1960 crop value was as great as the value of all the Reclamation production through 1925.

The average dollar's worth of farm production on Reclamation projects was enhanced by another 57.5 cents worth of processing accomplished at local crop and livestock processing plants. The direct income components—wages, interest, and profits—make up approximately half of the local processing cost.

Operation and Maintenance of Irrigation Works

The Review of Maintenance Program was carried forward to insure the safety and effective operating condition of all structures and facilities which are essential for protection of the investment in these facilities by the United States.

The continuing long-standing policy of transferring the care, operation, and maintenance of irrigation facilities to water user organizations was implemented with the transfer of the complete irrigation systems of the Michaud Flats project and the Roza division of the Yakima project to the respective water user organizations. In addition to these two systems, serving approximately 84,000 acres, five dams and storage reservoirs, three diversion dams, three equalizing reservoirs, several pumping plants, canal, aqueducts and wells were transferred.

The Bureau performs operation and maintenance of completed irrigation facilities of projects under construction, where public lands have been developed and a water user organization must be organized, and when the activity involves international and inter-state deliveries under compact commitments. At year's end the Bureau had transferred the operation and maintenance to local water user organizations of 46 percent of storage reservoirs, 70 percent of diversion dams, and distribution facilities serving 90 percent of the irrigable lands.

Weed Control

The Bureau of Reclamation is continuing its comprehensive weed control program which has proved very effective in reducing the problems caused by undesirable vegetation. Operation and maintenance costs caused by weeds have been decreased and the program is aiding materially in reducing water losses resulting from transpiration, evaporation, and seepage.

More efficient and economical methods of controlling weeds infesting banks and channels of irrigation and drainage systems are being developed through the research program conducted in cooperation with the Department of Agriculture. This phase of the program is being accomplished at four field stations in the West, and in the

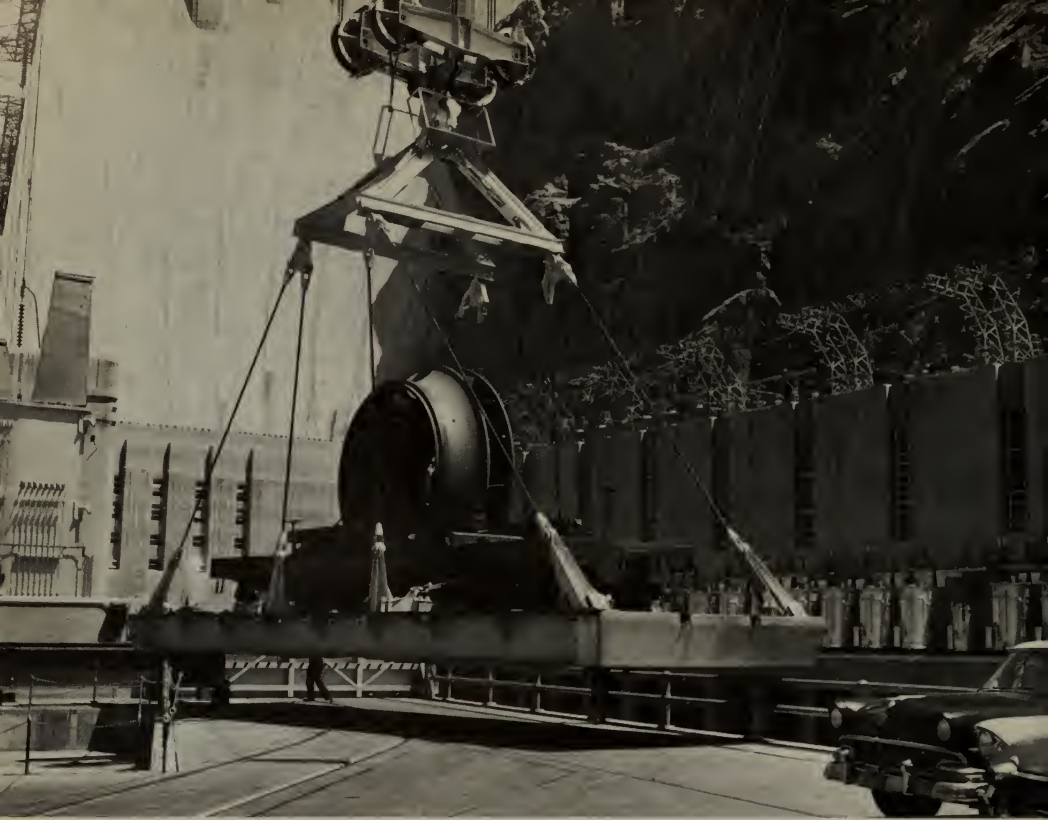
Assistant Commissioner and Chief Engineer's weed control laboratory in Denver.

From a recent survey it was estimated that nearly 2 million acre-feet of water is lost each year due to weeds on irrigation systems in the 17 Western States. It was similarly estimated that the total costs and losses caused by these weeds were about \$5¾ million. Even though this figure is high, the relatively small investment in research and education has prevented an additional \$15.8 million in costs and losses. Research is being continued to aid in solving this major irrigation problem. However, much more research is seriously needed to further reduce these costs and losses.

Progress was made in developing more effective methods for controlling woody phreatophytes, including salt cedar, where these plants have invaded irrigation systems, natural water courses, reservoirs, and other areas. These growths not only usurp millions of acre-feet of water so greatly needed for irrigation, municipal, and industrial purposes, but also increase flood hazards and take over lands which should be used for grazing and agriculture. It is estimated that in the 17 Western States, all undesirable phreatophytes infest over 15 million acres and transpire at least 25 million acre-feet of water annually. The Department of Agriculture and the Department of the Interior have committees of specialists who are working jointly on this and other weed control problems common to the Government agencies.

Aquatic weed control investigations performed in cooperation with the Agricultural Research Service so far indicate that vinyl-base antifouling paints containing high concentrations of cuprous oxide are particularly effective in inhibiting the attachment of algae on structures of irrigation systems. Many new herbicides were evaluated as aquatic weed killers through bioassay tests. One chemical showed particularly promising results as an aquatic herbicide in soil application, and was placed under field test. By studying behavior under controlled conditions, much was learned concerning the response of aquatic plants to herbicidal applications under varying environmental conditions.

A halogeton control program has been developed in cooperation with other agencies under the provisions of the Halogeton Glomeratus Act in the interest of increasing the land use value of the lands under the jurisdiction of the Bureau and of protecting the livestock which graze on these lands. It is known that this poisonous weed infests Bureau lands in Utah, Nevada, Colorado, Wyoming, and Idaho. Surveys to locate halogeton infestations and cooperative investigations to determine the most effective and economical control methods



The 115,000-horsepower turbine runner for Hoover Dam's 17th and final hydro-electric generating unit arrives for installation.

were continued this year. The actual control programs, including chemical spraying and grass seedings were continued primarily through agreements with the Bureau of Land Management.

The distribution of motion pictures, slides lectures, manuals, special releases on new equipment, and articles in *The Reclamation Era* have been continued to advise project personnel on new and more economical methods for controlling weeds.

Development Farms

The practice of establishing development farms on new irrigation projects has removed many of the factors which caused hardships and often failures of settlers on earlier developed projects. The development farms not only demonstrate more efficient and economical irrigation practices, but also show the value of conserving soil and water through promoting more efficient use of these important natural resources. This phase of conservation is especially important in view of our increasing population and the decreasing areas suitable for agricultural development.

Development farms are established as far as possible in advance of settlement, usually 2 to 5 years, in order that much of the necessary experience and information will have been obtained when the new settlers arrive. The farms are located in areas which best represent the soils and other conditions of the new project. The sites are chosen and the plans for the development and operation of each farm are formulated in cooperation with State Colleges, Department of Agriculture, and other interested agencies.

The major portion of each farm is devoted to field scale demonstrations of approved farm irrigation systems, irrigation methods, kinds and varieties of adapted crops, cultural practices, most effective fertilizers, weed control, farm drainage, and solutions to other problems faced by new irrigation farmers. From 10 to 25 percent of most of the farms is set aside for research, which is conducted by State College Experiment Stations and cooperating agricultural agencies such as the Agricultural Research Service and the Soil Conservation Service. Methods developed from research are thoroughly tested and demonstrated on the farms. Some of the farms have served the additional purpose of aiding in determining the feasibility of projects.

The Bureau of Reclamation and other agencies responsible for the development farms work closely with the State College Extension Services to be certain that the information from research findings and demonstrations is properly disseminated to the new settlers. Hundreds of farmers attend the annual field days and tours at which representatives of the Bureau and the cooperating agencies explain the work in detail. The settlers are encouraged to visit the farms at any time during the year to obtain information. Pamphlets are prepared and distributed which supply data on the crops raised, yields, and other pertinent information. In addition to project farmers the development farms benefit college and high school students who visit the farms with their instructors.

Seven development farms were in operation during fiscal 1961. Twenty-one farms previously operated have been discontinued because they have served their purpose. Additional farms are proposed for new areas scheduled for development.

The Bureau of Reclamation has continued its program of conserving soil and water on lands under its jurisdiction in keeping with the Department's policy on conservation of natural resources. These operations are directed primarily toward erosion control, reduction of water losses, and the protection of Reclamation-built works.

The program includes planting grasses and trees, building structures, and carrying out other desirable erosion control and soil

stabilization practices; controlling undesirable water consuming vegetation; and placing structures to protect irrigation facilities. Special research is conducted in prevention of water losses caused by evaporation, transpiration, and seepage. The program objectives are accomplished in cooperation with other Federal agencies as well as state, local and water users' organizations. During fiscal year 1961 there were 115 individual soil and moisture conservation programs on 64 Federal irrigation projects or units.

Cooperation With Other Agencies

The Bureau's activities in planning, developing and operating Federal irrigation projects and in the conservation of natural resources on lands under its jurisdiction have been greatly facilitated through cooperation with other agencies and organizations. Their special skills, experience and equipment have been fully utilized whenever it was to the advantage of the Government to do so.

The cooperative work is implemented by means of agreements between the Bureau and the other organizations involved which now include several agencies within the Department of Agriculture and the State Colleges and Extension Services of the 17 Western States and the State of Alaska, as well as many other Federal, State, and local organizations.

During fiscal 1961 there were 380 such cooperative agreements in effect. They include studies and investigations conducted on development farms, conservation activities, efficient use of soil and water, crop and cropping problems, assistance to county agricultural agents, and weed control. They cover also the development and management of reservoir, recreational, and wildlife areas, and assistance in solving many other problems pertaining to irrigation projects.

Cooperation with other agencies also includes active participation in numerous departmental, interdepartmental, basin, State, local and other committees whose functions are related to the Bureau's interests and responsibilities.

Land Settlement

During the 1961 fiscal year, the Bureau of Reclamation conducted two land openings. The first such opening made 12 full-time farm units on the Columbia Basin project in the State of Washington available for purchase by qualified applicants. The second offered fourteen farm units on the Minidoka project, North Side pumping division, Idaho, for entry under Homestead and Reclamation laws.



Sugar beets, grown here in Montana on the Missouri River Basin project, are one of the many diversified crops produced on Reclamation projects.

Since the close of World War II, a total of 2,842 farm units consisting of 274,491 irrigable acres, has been made available for settlement either by homesteading or by purchase on 14 Reclamation projects.

Settlers do not pay for the public land which is opened to homesteading. Government-acquired lands are sold to settlers as farm units. In either case, settlers pay to the Federal Government, through an irrigation district, or other recognized water users' organizations, the pro rata share of the construction costs of irrigation facilities built to supply the land with water. They also pay an annual charge for operation and maintenance of the irrigation works. The construction costs are paid without interest over a long period, usually 40 or 50 years.

Community Development

In completing the transfer of Boulder City, Nev., from the Federal Government to the then newly-created incorporated municipality on January 4, 1960, that portion of the municipal area known as Lakeview Addition was retained under Federal administration. Pursuant

to the provisions of the Boulder City Act of 1958, the Bureau accelerated subdivision and improvement of this one remaining area. By early March 1961, streets and curbing had been constructed, water and sewer lines installed, and related improvement work completed. On March 16, 1961, the transfer of Lakeview Addition to the municipal corporation of Boulder City was formalized. This action completed the transition of Boulder City, Nev., from its original status of a Federally administered city to that of a self-governed municipality under the laws of the State of Nevada.

Development has continued in the town of Page, Ariz., established in connection with the construction of Glen Canyon Dam, a principal feature of the Colorado River storage project. With initial subdivision completed and utilities available to serve the municipal area, establishment of permanent commercial enterprise has gone forward rapidly. The principal business area now consists of a balanced complement of businesses from which customers can obtain both basic essentials and a variety of supplemental commodities and services. Concurrently with the commercial development, a gratifying acceleration occurred during the latter part of the year in financial commitments for private residential construction.

As construction activities on Glen Canyon Dam and powerplant diminish, it is expected that there will be a compensating increase in tourist and recreational activity which will adequately insure a sound basis for continued municipal growth and development in the town of Page.

Although the community is presently managed and administered by the United States, plans for the future are based on the assumption of functional management and administration of municipal affairs as soon as practical by an appropriately organized corporate entity. As soon as such a transition is practicable the municipality of Page, Ariz., will be given assistance in assuming a position of self-government comparable to that occupied by other municipalities in the State of Arizona.

Recreational Use of Reclamation Projects

Recreational use of Reclamation projects in the 17 contiguous Western States continued to increase in 1960 as it has done during the past decade. This use at reservoirs and other project recreational management areas totaled 24.3 million visitor days, an increase of 1.6 million visitor days from the 22.7 million reported in 1959.

In 1960, recreational use was nearly four times heavier than in 1951, when 6.5 million visitor days were recorded, and more than

twice as large as the 9.8 million days of use in 1955. These data do not include recreational use of project lands, which are used mostly by project residents for upland game bird, game hunting and other recreational activities, which are substantial.

As has been true in previous years, sightseeing was most important among recreational users in 1960, followed by fishing, boating and water skiing, and other uses. The following tabulation shows various use categories reported :

<i>Activity</i>	<i>Number of visitor days</i>	<i>Activity</i>	<i>Number of visitor days</i>
Sightseeing -----	9, 348, 448	Swimming -----	1, 735, 085
Fishing -----	4, 445, 846	Camping -----	1, 348, 421
Boating and water skiing--	4, 107, 830	Hunting -----	348, 102
Picnicking -----	2, 704, 480	Other -----	282, 590

Many of the older Reclamation reservoirs have inadequate public use facilities. The absence of general authority to construct such facilities with Federal funds not only results in reduced public recreational benefits, but also poses many problems for organizations having responsibility for public use administration of these areas.

The inequities of the present situation are being recognized on many new projects where nonreimbursable Federal funds have been and are being provided in project authorizations. In addition, specific legislation on a few of the older projects has been introduced to alleviate acute problems in those instances where recreational use has far outgrown the facilities available. General authority to overcome inequities at all other reservoirs where basic facilities have not been provided would make possible the realization of the recreational potential that exists in these areas.

Fish and Wildlife Benefits

Construction of Reclamation projects often has a profound effect on fish and wildlife, particularly where waters of a stream are impounded to create a new reservoir. Usually some fish and wildlife values are destroyed while new ones are created. Occasionally, Reclamation reservoirs provide valuable additions to wildlife values as migratory bird refuges.

Enactment of the Fish and Wildlife Coordination Act on August 12, 1958 (P.L. 624, 85th Congress, 2d sess., 72 Stat. 503), strengthened Federal responsibility for fish and wildlife development on new Reclamation projects. Under this act, fish and wildlife are given equal consideration in the project development processes with other Reclamation functions. Occasionally, relative evaluation of the benefits to fish and wildlife and recreation are required in providing

maximum public benefits from these corollary functions of Reclamation development.

Project Development

The Bureau's project development program involves preparation of comprehensive plans for development of river basin resources and the investigation and planning of potential projects to meet the requirements of the fast growing population of the West for optimum utilization and conservation of its limited water resources. The program also includes detailed preconstruction studies on newly authorized projects.

Comprehensive Basin Surveys

During the year, the Bureau, in cooperation with other agencies, was engaged in comprehensive surveys in 10 river basins throughout the West, including one subbasin of the Missouri River Basin. A preliminary draft of a proposed report on the Upper Snake River Basin, Oregon, Idaho, Wyoming, was completed and released to interested governmental and local interests as a basis for public hearings. Completion of that report by the Bureau of Reclamation and the Corps of Engineers jointly is now in progress. Miscellaneous minor items of investigation in connection with other river basin surveys were also active.

Project Planning Reports

By the end of the year, project planning reports had been submitted to Congress on Agate Dam and Reservoir, Talent Division of the Rogue River Basin project, in Oregon, and on the Oroville-Tonasket Unit, Okanogan-Similkameen Division of the Chief Joseph Dam project in Washington. Planning reports on the Savery-Pot Hook project, Colorado-Wyoming, the Columbus Bend project in Texas, the North Loup Division of the Missouri River Basin project in Nebraska, and the Auburn-Folsom South Units of the Central Valley project in California were forwarded to the Bureau of the Budget to determine their position in relation to the President's program prior to their submission to the Congress.

Planning reports on the Arbuckle project in Oklahoma, the Waurika project in Oklahoma, the Upper Division of the Baker project in Oregon, the Merlin Division of the Rogue River Basin project in Oregon, the Crooked River project extension in Oregon, the Yolo-



Recreationists enjoy one of Reclamation's multipurpose benefits on the Weber Basin project's Echo Reservoir in Utah.

Zamora Unit of the Central Valley project in California, and Buttes Dam and Reservoir of the Middle Gila River project in Arizona were transmitted to affected States and interested Federal agencies for review.

Definite Plans

During the fiscal year, definite plans for authorized projects were completed on the Canadian River project in Texas, on the Cheney division of the Wichita project in Kansas, and on the revised plan for the Weber Basin project in Utah.

The planning report on the Crater-Long Lakes Division of the Snettisham project was submitted to the Congress. The report on the Devil Canyon project was under review by States and Federal agencies at the close of the year. Both projects are in Alaska.

Loan Program

During the fiscal year there was more overall activity in the Bureau's loan programs to assist local development than during the preceding

year. A résumé of activities under each of these two active loan programs follows:

Total estimated cost of projects under the Small Reclamation Projects Act of 1956 (P.L. 984)

Status	Accumulative to—	
	June 30, 1960	June 30, 1961
Notices of intent received.....	\$99,797,000	\$116,674,000
Loan applications received.....	59,980,000	77,270,000
Loans approved by Secretary.....	57,800,000	57,800,000
Designs and specifications approved.....	19,217,000	47,951,000
Construction initiated.....	17,275,000	35,725,000
Construction completed.....	0	4,673,000

Total estimated cost of projects under the Distribution System Act (P.L. 130)

Status	Accumulative to—	
	June 30, 1960	June 30, 1961
Notices of intent received.....	\$26,406,000	\$69,770,000
Loan applications received.....	26,406,000	29,995,000
Loans approved by Secretary.....	26,406,000	29,995,000
Designs and specifications approved.....	20,584,000	26,406,000
Construction initiated.....	15,872,000	26,406,000
Construction completed.....	3,570,000	3,570,000

The emphasis of the loan program shifted from the examination and approval of applications and contract negotiations to the various construction activities. Late in the year, however, a number of new applications were received. The Hawaii Omnibus Act (July 12, 1960, 74 Stat. 421) extended authority for small project loans to Hawaii.

By June 30, 1961, four projects had been completed under this program. One, using a distribution system loan, was completed in fiscal 1960 and the other three, all utilizing small project loans, were completed during fiscal 1961. These loans totaled about \$6,700,000 on projects costing \$8,243,000. Fifteen other projects were under construction, or ready to start, by June 30, with loans totaling about \$63,600,000. Three of these are distribution system loans while 12 are small project loans. Loans totaling \$13,000,000 have been approved for four other small projects, but for various reasons construction had not been started by the end of the year.

Ten applications for loans totaling \$20,434,000 were received during the year, including two for increases in previously approved loans.

River Compacts

The Columbia River Basin Compact was approved by the Compact Commissioners of the several basin States on October 3, 1960. The Compact has been ratified by the Montana and Idaho legislatures.

The Lower Niobrara and Ponca Creek Compact between the States of Nebraska and South Dakota was ratified by the two States and is awaiting consent action by the Congress.

When called upon, the Bureau has continued to provide technical assistance with respect to negotiations on the following unperfected inter-State compacts:

- Arkansas River (Arkansas and Oklahoma).
- Arkansas River (Kansas and Oklahoma).
- Cheyenne River (Wyoming and South Dakota).
- Little Missouri River (Wyoming, Montana, and North Dakota).
- Niobrara River (Wyoming, South Dakota, and Nebraska).
- Red River (Arkansas, Louisiana, Oklahoma, and Texas).
- Truckee-Carson-Walker Rivers and Lake Tahoe (California and Nevada).

Hydrology

The Hydrology Branch has continued to study the hydrologic aspects of proposed water resource development projects. These studies include, but are not limited to, evaluation of the quantity and quality of water supply in relation to the multiple-purpose requirements, determination of the amount and distribution of sediment load and its deposition, and potential flood magnitudes and frequencies as the basis of design. The requirements and limiting factors for selective withdrawals of water from reservoirs for controlling temperature of releases to aid in the spawning of salmon were studied with reference to provision of facilities in several water resource developments.

An improved method was developed to predict the amount and seasonal distribution of return flows from irrigation under certain known conditions. This will aid in the planning for reuse of irrigation return flows.

The basinwide hydrometeorological study of maximum probable storms for use in the design of spillways for dams in the Rogue River Basin was completed, and a similar study for the eastern slopes of the Sierra Nevadas was continued.

Coordination continued with the Corps of Engineers, Department of the Army, in the preparation of flood control operating rules for several Bureau reservoirs. Studies were continued of emergency operating rules for use in spillway design.

Cooperative investigations of the effects of land treatment and conservation practices on yield of streams were continued with the Agricultural Research Service and the Soil Conservation Service of the Department of Agriculture.

Studies were initiated on the efficiency and operation of sediment excluder devices and settling basins.

Studies were continued of the changes in the regime of stream channels resulting from the construction of dams or from the withdrawal or addition of water to the natural stream system.

International Streams Investigations

The Bureau of Reclamation is represented on two International Engineering Boards of the International Joint Commission. Under the Reference of January 12, 1948, the Souris-Red Rivers Engineering Board through interested Federal agencies reported on the possibilities of a joint plan of development of the Pembina River by the United States and Canada, and continued the systematic collection and study of hydrologic data and related flood control and irrigation investigations in the Souris, Red, and Missouri River Basins. The Waterton-Belly Rivers Engineering Board was not active during the fiscal year in connection with the Waterton-Belly Rivers Reference of January 12, 1948.

Hydroelectric Power Development

In order to utilize to the greatest advantage the irrigation water supplies made available by multipurpose reservoirs, the Bureau of Reclamation in its program of aiding in the development of America's water resources has constructed and, as of June 30, 1961, is operating 42 powerplants with an installed nameplate capacity of 5,199,550 kilowatts. In addition, the Bureau is responsible for marketing the power generated at four powerplants constructed by the Corps of Engineers with a total installed nameplate capacity of 985,035 kilowatts and one powerplant installed by the International Boundary and Water Commission, with a total nameplate capacity of 31,500 kilowatts.

Sale of electric power by the Bureau during the year aggregated 27,446 million kilowatt-hours, with revenues from sales totaling \$72,743,347.

Fiscal Year Expansion

During the fiscal year the installed nameplate capacity of hydroelectric powerplants at Bureau of Reclamation multipurpose projects and at projects for which the Bureau is responsible for marketing the power was increased 288,000 kilowatts.

As a result of water conservation works, the Bureau placed into operation during the year on the Glendo Unit of the Missouri River Basin project, the Fremont Canyon hydroelectric powerplant with

an installed nameplate capacity of 48,000 kw. Also during this period, the U.S. Army Corps of Engineers completed installation of two additional generating units each with a total capacity of 240,000 kw, at its Fort Peck and Garrison powerplants, the power of which is marketed by the Bureau.

Additional Capacity Under Construction

At the end of the fiscal year, the Bureau of Reclamation had under construction nine powerplants which will have an ultimate installed nameplate capacity of 1,605,850 kilowatts. They are listed below:

Plant	Project	River	State	Nameplate capacity (K W)
Clear Creek.....	Central Valley.....	Trinity.....	California.....	134, 000
Lewiston.....	do.....	do.....	do.....	350
Spring Creek.....	do.....	do.....	do.....	150, 000
Trinity.....	do.....	do.....	do.....	100, 000
Upper Molina.....	Colbran.....	Colorado.....	Colorado.....	8, 640
Lower Molina.....	do.....	do.....	do.....	4, 860
Glen Canyon.....	Colorado River Storage.....	do.....	Arizona.....	900, 000
Flaming Gorge.....	do.....	Green.....	Utah.....	108, 000
Yellowtail.....	Missouri River Basin.....	Big Horn.....	Montana.....	200, 000

The Bureau is also proceeding with the installation of Unit N-8 with a rated capacity of 95,000 kw at the Hoover powerplant on the Boulder Canyon project. This unit, scheduled to be in operation by December 1, 1961, is the last unit that will be installed in this plant and when completed will increase Hoover powerplant to its nameplate planned capacity of 1,344,800 kw.

The Corps of Engineers is proceeding with the construction of its Big Bend and Oahe plants in the Missouri River Basin project. The ultimate installed nameplate capacity of the Big Bend and Oahe powerplants in South Dakota will be 468,000 kilowatts and 595,000 kilowatts, respectively. The Bureau of Reclamation will be the marketing agent for energy generated by these new plants, as is the case for other plants constructed by the Corps on the Missouri River Basin project.

The hydroelectric powerplants constructed and operated or under construction by the Bureau of Reclamation and powerplants for which the Bureau is the marketing agent are listed in table 5.

Transmission System

To provide the electrical energy for the Bureau's projects and to market the power which is surplus to the Bureau's needs, a transmission system including powerplant substations, switchyards, and transmission lines, has been constructed. During the fiscal year end-



Engineers operate sluice gate of model in Bureau of Reclamation research laboratories in Denver.

ing June 30, 1961, approximately 558 circuit miles of transmission lines were completed resulting in a total system of 10,704 circuit miles of line. As of June 30, 1961, the installed transformer capacity of the individual substations operated by the Bureau was 11,512,271 kva.

The transmission lines completed in fiscal year 1961 are as follows:

Transmission lines completed during fiscal year 1961

Project and line	Voltages (kilovolts)	In service data	Circuit miles
Columbia Basin project:			
Jericho substation to Sand Hollow pumping plant..	13.8	July 1960.....	2.84
Missouri River Basin project:			
Fort Peck powerplant to Dawson County substation.	230	June 1961.....	105.20
Dawson County substation to Bismarck substation.	230	November 1960.....	209.00
Bismarck substation to Jamestown substation—Line No. 2.	230	July 1961 ¹	99.33
Kortes Powerplant-Cheyenne substation.....	115	November 1960.....	141.57
Total.....			557.94

¹ This was completed in fiscal year 1961 but was not placed in service until July 1961.

During fiscal year 1961 there were 121 contracts executed for the sale of power, transmission service or for other purposes. In addition to these contracts and in order to institute the Eastern Division of the Missouri River Basin project supplemental power service program and various net billing procedures, 91 letter agreements were also executed.

Included in the 121 contracts were various types as follows:

<i>No. of contracts</i>	<i>Types of customers</i>
15 -----	Private utilities
26 -----	REA cooperatives
42 -----	Municipalities
13 -----	Federal agencies
7 -----	State agencies
6 -----	Irrigation districts
12 -----	Non-REA cooperatives
<hr/>	
121	

A number of these executed contracts were renewals of current contracts to place the full allocation of power under contract or to incorporate the supplemental power service program.

The Bureau has continued its policy of contracting for wheeling power and energy beyond delivery points over existing facilities and has entered into several mutual interchange agreements with its customers to augment the supplemental power service program.

At the end of the fiscal year the Bureau had 61 contracts and 40 supplements or amendments under active negotiation with 45 municipalities, 20 REA cooperatives, 14 State agencies, 3 Federal agencies, 15 private utilities and 4 irrigation districts. A number of these are also to renew existing contracts or to revise current contracts to incorporate the supplemental power service program or to place the full allocation of power under contract.

The approved allocations for the Central Valley project, the eastern division of the Missouri River Basin and the pending reallocation of the Parker-Davis project and the renegotiation of the output of the Falcon Dam, all will require the preparation of new contracts or supplements to existing contracts with the allottees.

Financing Reclamation Projects

Appropriations made available to the Bureau of Reclamation for all purposes in fiscal year 1961 totaled \$281,663,705. This amount includes \$1,385,000 appropriated in two supplemental acts, most of

which was provided to cover pay raise costs. Permanent appropriations are not included. Appropriations for 1961 exceed those for 1960 by \$25.4 millions.

With an unobligated balance of \$39.7 million carried over from fiscal year 1960 for construction, investigations and the Loan Program plus funds advanced by water users, trust funds, the continuing fund for emergency expenses of Fort Peck project and new appropriations the total amount available to Reclamation was \$329 millions. Of this amount there remained unobligated at the close of 1961 for use in fiscal year 1962 funds in the amount of \$31.8 millions.

Funds appropriated, by activity, for fiscal year 1961, together with the amounts to be derived from the special and general funds are shown in the following condensed statement :

Condensed Statement of Appropriations, fiscal year 1961 (Exclusive of trust funds and permanent appropriations)

General investigations.....		\$5, 148, 000
Reclamation fund.....	\$3, 943, 000	
Colorado River development fund.....	500, 000	
General fund.....	705, 000	
Construction and rehabilitation.....		166, 744, 880
Reclamation fund.....	90, 000, 000	
General fund.....	76, 744, 880	
Upper Colorado River Basin fund.....		58, 700, 000
General fund.....	61, 400, 000	
Transferred to :		
Operation and maintenance.....	-2, 200, 000	
Emergency fund.....	-500, 000	
Operation and maintenance.....		34, 191, 000
Reclamation fund.....	26, 496, 000	
Colorado River Dam fund.....	1, 335, 000	
General fund.....	4, 160, 000	
Transferred from Upper Colorado River Basin fund.....	2, 200, 000	
Loan program.....		11, 642, 825
General fund.....	11, 642, 825	
Emergency fund.....		500, 000
Transferred from Upper Colorado River Basin fund.....	500, 000	
General administrative expenses.....		4, 572, 000
Reclamation fund.....	4, 290, 000	
General fund.....	282, 000	
Boulder City municipal fund, Lake View construction.....		150, 000
Proceeds from disposal of property.....	150, 000	
Disposal of Coulee Dam community.....		15, 000
Proceeds from sale of property.....	15, 000	
Grand total.....	281, 663, 705	281, 663, 705

Condensed Statement of Appropriations, fiscal year 1961 (Exclusive of trust funds and permanent appropriations)—Continued

Reclamation fund.....	\$124,729,000
Colorado River Dam fund.....	1,335,000
Colorado River development fund.....	500,000
General fund.....	154,934,705
Boulder City Municipal fund.....	150,000
Coulee Dam community.....	15,000
	<hr/>
	281,663,705

Repayment of Project Costs by Water Users

Contractual arrangements with irrigation districts, municipalities, industries and various other water user organizations consist of various forms and are written under a complex of laws dating back to the establishment of the Reclamation Service in 1902. The repayment program is constantly developing as the Congress recognizes new means of providing vitality to the multiple-purpose functions of the Nation's water resources development and accordingly enacts legislation to enable greater financial participation by an increasing number of beneficiaries. This progress has encouraged forward-looking State legislatures to keep pace by setting up Conservancy District and similar statutes—North Dakota, for example, has established the Garrison Diversion Conservancy District covering 25 counties—with ad valorem taxing capabilities which will greatly enhance irrigation repayment.

The dollar-value of all existing repayment contracts on June 30, 1961, was \$1,101,193,113. Of these outstanding water user obligations, there had been returned to the United States, on that date, in the amount of \$166,156,249 with practically no delinquencies. Water service contracts now in force will provide collections from water users for quantities to be received on a long-term basis in the form of additional repayment revenues in the amount of \$895 million.

During fiscal year 1961, 47 contracts were executed; 13 more (the 28 contractors of the Kings River project are counted as 1) were approved by the Department and are in the process of being executed by irrigation districts or other repayment entities concerned. Some of these contracts involve sizable sums of money and represent the means, otherwise unlikely of attainment, for appreciable numbers of people to reach a higher standard of living.

Foreign Activities

Technical Assistance for Newly Developing Countries

Under the agreement with the International Cooperation Administration entered into late in fiscal year 1961, the Bureau of Reclamation's team in Afghanistan, assisting the Helmand Valley Authority of the Government of Afghanistan, was expanded and advisory services were initiated. Technical advice and on-the-job training were instrumental in improving the operation and maintenance of the existing irrigation works and in reactivating construction and procurement activities of the Afghan Construction Unit. Land classification and drainage studies were started.

The previously established project engaged in the reconnaissance of the Blue Nile River Basin in Ethiopia, also a part of the ICA program, continued to gain momentum during the year. Extensive geologic, land-classification, and hydrologic investigations and land-use studies were continued, as was the program of training Ethiopian engineers and technicians in investigating and planning the development of water resources.

Laboratory studies being made to evaluate foundation conditions and construction materials for the Shihmen Dam, Formosa, and construction advisory services furnished at Wu Sheh Dam, Formosa, were completed. Design assistance to the Snowy Mountains Hydro-Electric Authority, Australia, was continued. The work for Australia was accomplished under the terms of Public Law 402, 80th Congress, and cost of the work was borne by the Snowy Mountains Authority.

In addition to the project-type assistance, Reclamation personnel were in great demand for short-term details to various parts of the world. The detailing of these Bureau specialists to assist foreign countries involved visits by 18 individuals to 13 countries where advice and assistance were provided on design, construction, operation and maintenance, organization and management, farm settlement, agricultural economics, drainage, and project planning. These activities were undertaken at the request of the International Cooperation Administration, the United Nations, The International Bank for Reconstruction and Development, or the government of the foreign country involved through the International Educational Exchange Service of the Department of State. Funds to cover all costs of such details are provided by the agency requesting the services. In addition to this technical aid to foreign countries, the Bureau cooperated with the Office of Saline Water in detailing a specialist to Japan and Israel for water demineralization studies.

Other continuing activities in support of the U.S. Government's foreign-aid program consisted of providing on-the-job training and observation programs for foreign engineers and technicians at Bureau of Reclamation facilities in the United States; detailing reclamation specialists for short visits to various countries to assist with specific problems; and furnishing Bureau publications and other technical material to agencies of foreign governments.

Training and observation programs ranging from a few days to a year or more in duration were implemented for 356 individuals from 34 countries. Arrangements were completed for three Ethiopian engineers graduating from American colleges to receive in-service training in water resources development prior to returning home to work with Bureau personnel on the Blue Nile River reconnaissance project, Ethiopia. Actions were initiated to implement combined long-term academic and in-service training programs in the United States for a selected group of employees of the Helmand Valley Authority of Afghanistan. The training will prepare the participants for responsible positions with the Authority.

Legal Activities

Contract negotiations were conducted between the Bureau and the city of Englewood, Colo., leading to preparation of a draft of proposed contract under which the United States would accept on the West Slope water which the city is entitled to divert, and would release to the city from the facilities of the C Big T project on the East Slope an equivalent amount of water less carriage losses. The city would pay appropriate charges for the service, and the United States would retain all additional revenues derived from passage of the water through power generation facilities.

Institution of a program involving closer scrutiny of all incidents of equipment and material failure to determine existence of possible facts indicating manufacturers' liability for breach of implied warranty of fitness for intended use or for latent defects in design or condition not barred by limitations against claims for defects in materials and workmanship stated in contract clauses. The program has already had beneficial effects.

Statistical Summary

TABLE 1.—Major Bureau of Reclamation contracts awarded in fiscal year 1961

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TABLE 9.—Accretions to Reclamation Fund by States

TABLE 10.—The Reclamation Fund, funds available for appropriation, fiscal years 1960-61

TABLE 1.—Major Bureau of Reclamation contracts awarded in fiscal year 1961

Feature	Project	Amount of award
Yellowtail Dam and powerplant.....	Missouri River Basin.....	\$39,809,359
Eight 125,000-kva generators for Glen Canyon powerplant.....	Colorado River storage.....	8,007,798
Fontenelle Dam.....	Central Valley.....	7,917,170
Whiskeytown Dam, Trinity River division.....	Florida.....	5,820,807
Lemon Dam and County Road relocation.....	Central Valley.....	4,126,456
Spring Creek powerplant, Trinity River division.....	Missouri River Basin.....	3,335,243
213 miles of Sioux City-Spencer and Sioux City-Denison-Creston 161-kv transmission lines.....		
Spring Creek Debris Dam, Trinity River division.....	Central Valley.....	3,196,387
Stringing conductor for second circuit additions to Fort Thompson-Huron-Watertown, Fort Randall-Sioux City, and Fort Randall-Fort Thompson 230-kv transmission lines.....	Missouri River Basin.....	3,096,520
Merritt Dam, Ainsworth unit.....	.....do.....	2,655,044
Lewiston Dam, Trinity River division.....	Central Valley.....	2,410,542
Farwell Main Canal and Central Canal, Farwell unit.....	Missouri River Basin.....	1,935,855
Crawford Dam.....	Smith Fork.....	1,930,779
Constructing foundations and furnishings and erecting steel towers for 136 miles of Garrison-Jamestown 230-kv transmission line.....	Missouri River Basin.....	1,913,500
Sherman Feeder Canal, Farwell unit.....	.....do.....	1,818,343
115 miles of Rangely-Oak Creek and 10 miles of Kremmling-Green Mountain 115-kv transmission lines and 8.3 miles of Kremmling-Gore Tap 69-kv transmission line.....	Colorado River storage.....	1,809,720
114 miles of Garrison-Minot-Rugby 115-kv transmission line.....		
Sherman Feeder Canal and Tunnel, Farwell unit.....	Missouri River Basin.....	1,806,171
Two 74,444-kva generators for Clear Creek powerplant, Trinity River division.....	.....do.....	1,682,722
Two 83,333-kva generators for Spring Creek powerplant, Trinity River division.....	Central Valley.....	1,581,284
Main Canal, Station 0+00 to 838+59.....	.....do.....	1,491,400
Three 40,000-kva generators for Flaming Gorge powerplant.....	San Angelo.....	1,487,494
Two 55,555-kva generators for Trinity powerplant, Trinity River division.....	Colorado River storage.....	1,477,516
Laterals 1 through 10, and sublaterals for East unit, Greater Wenatchee division.....	Central Valley.....	1,428,445
Relocation of Union Pacific Railroad for East Bench unit, Three Forks division.....	Chief Joseph Dam.....	1,398,236
110.5 miles of Jamestown-Grand Forks 115-kv. Transmission Line No. 1.....	Missouri River Basin.....	1,395,336
Steinaker Service Canal.....	.....do.....	1,352,207
El Dorado main and reservoir, American River division.....	Central Utah.....	1,327,584
85.2 miles of Flaming Gorge-Vernal-Rangely 138-kv Transmission line.....	Central Valley.....	1,327,490
Pipelines and laterals for Corral Irrigation District, Friant-Kern division.....	Colorado River storage.....	1,279,899
Stringing conductors and overhead ground wires for 58 miles of Oahe-Fort Thompson 230-kv transmission line, 230-kv Oahe switchyard approaches, and 1.42 miles of 115-kv Oahe-Midland transmission line.....	Central Valley.....	1,189,092
Two 105,000-hp hydraulic turbines for Spring Creek powerplant, Trinity River division.....	Missouri River Basin.....	1,166,473
River and booster pumping plants.....		
Arcadia Diversion Dam and Sherman Feeder Canal, Farwell unit.....	Central Valley.....	1,125,000
Main Canal and laterals, gravity extension, East and West highline laterals—unit 2B—Davis aqueduct.....	Chief Joseph Dam.....	1,104,087
Stringing conductors and overhead ground wires for Bismarck-Jamestown 230-kv Transmission Line No. 2.....	Missouri River Basin.....	1,093,548
	Weber Basin.....	1,082,033
	Missouri River Basin.....	1,001,450

TABLE 2.—Principal features completed on Bureau of Reclamation projects in fiscal year 1961

Feature	Project	State
Royal Branch laterals, Block 83	Columbia Basin	Washington.
Wahluke Branch laterals, Block 20, including White Bluffs pumping plant No. 2 and WB10A3 pumping plant.	do	Do.
West Canal laterals, Block 88	do	Do.
Prineville Dam	Crooked River	Oregon.
Relocation Oregon State Highway 27	do	Do.
Crooked River Diversion Canal and headworks	do	Do.
Distribution Canal	do	Do.
Enlargement of Emigrant Dam	Rogue River Basin	Do.
South Fork, Daley Creek and Grizzly Creek collection canal system and 3 diversion dams.	do	Do.
Major structures for East lateral rehabilitation	do	Do.
Ashland lateral rehabilitation	do	Do.
Rehabilitation Oak Street Diversion Dam and 1st section Talent lateral.	do	Do.
Rehabilitation of 2d section Talent lateral	Rogue River Basin	Do.
Teapot Dome Water District distribution system	Central Valley	California.
Corning Canal pumping plant	do	Do.
Trinity road relocation, Rush Creek to Stoney Creek	do	Do.
Trinity road relocation, Stoney Creek to Ridgeville	do	Do.
Trinity road relocation, Ridgeville to Covington Mill	do	Do.
Trinity road relocation, Cedar Creek to Nelson Creek Gap.	do	Do.
Canals, laterals, and drains, Sump No. 2, contract unit 1.	Klamath	Oregon.
Canals, lateral, and drain, Sump No. 2, contract unit 2.	do	Do.
Pumping plants W, X, and Y	do	Do.
Wellton-Mohawk main conveyance channel, 1st section.	Gila	Arizona.
Wellton-Mohawk main conveyance channel, 2d section.	do	Do.
Wellton-Mohawk main conveyance channel, 3d section.	do	Do.
Steinaker Dam	Central Utah	Utah.
Fort Thornburgh Diversion Dam Steinaker feeder canal, and Rock Point canal extension.	do	Do.
Southside Canal, 1st section	Collbran	Colorado.
Southside Canal, 2d section	do	Do.
Leon Creek and Park Creek Diversion Dams and feeder canal.	do	Do.
Clearing of 1st phase of Flaming Gorge Reservoir	Colorado River storage	Utah.
Hammond main canal, 1st section	Hammond	New Mexico.
Ricks Creek laterals for Davis Aqueduct lateral system.	Weber Basin	Utah.
Installing natural gas engines in pumping plants	Lower Rio Grande Rehabilitation.	New Mexico.
Rehabilitation of H lateral	do	Do.
Rehabilitation of C and G lateral system	do	Do.
Rehabilitation of K lateral system	do	Do.
Channelization of Rio Grande, Belen area, unit 4	Middle Rio Grande	Do.
Channelization of Rio Grande, Belen area, unit 2	do	Do.
Foss Dam	Washita Basin	Oklahoma.
Anadarko aqueduct	do	Do.
Dawson County substation	Fort Peck	Montana.
Anchor Dam	Missouri River Basin	Wyoming.
Foundations and steel towers for Fort Peck-Dawson County-Bismarck 230-kv transmission line, 310 miles.	do	North Dakota.
Stages 03 and 04 additions to Fargo substation	do	Do.
Foundations and towers for Bismarck-Jamestown 230-kv Transmission Line No. 2, 100 miles.	do	Do.
Stringing conductor and OHG wire for 310 miles, Fort Peck-Dawson County-Bismarck 230-kv transmission line.	Fort Peck and Missouri River.	Montana, North Dakota.
Stringing conductor and OHG wire for 100 miles of Bismarck-Jamestown 230-kv Transmission Line No. 2.	Missouri River Basin	North Dakota.
White Rock extension canal, final section	do	Kansas.
Pump No. 1 canal and Pump No. 1 south canal and lateral system.	do	Do.
Culbertson Canal, 2d section	do	Nebraska.
Culbertson extension canal, 1st section	do	Do.
Generators for Fremont Canyon powerplant	do	Wyoming.
Completion of Fremont Canyon powerplant	do	Do.
Gray Reef Dam	do	Do.
Osborne Canal, 4th section	do	Kansas.
Kortes-Cheyenne 115-kv transmission line	do	Wyoming.

TABLE 3.—Bureau of Reclamation construction indexes, fiscal year 1961 (for application to field costs only)

Cost indexes based on January 1940 costs=\$1.00	July 1960	January 1961	June 1961
Dams:			
Earth.....	2.14	2.18	2.18
Dam structure.....	1.82	1.86	1.86
Spillway.....	2.41	2.43	2.43
Outlet works.....	2.71	2.73	2.73
Concrete.....	2.36	2.36	2.36
Diversion.....	2.67	2.67	2.67
Pumping plants:			
Building and equipment.....	3.01	2.97	2.93
Structures and improvements ¹	3.03	2.98	2.98
Equipment.....	3.10	3.02	2.99
Pumps and prime movers.....	3.22	3.13	3.06
Accessory electric and miscellaneous equipment.....	2.90	2.88	2.88
Steel penstocks and discharge pipes.....	3.88	3.88	3.88
Canals and conduits:			
Canals.....	2.40	2.40	2.38
Canal earthwork.....	1.45	1.47	1.44
Canal structures.....	3.26	3.26	3.23
Conduits (tunnels, free-flow, concrete-lined).....	2.85	2.87	2.87
Laterals and drains.....	3.10	3.17	3.17
Lateral earthwork.....	1.46	1.47	1.46
Lateral structures.....	3.85	3.96	3.96
Powerplants, hydro:			
Building and equipment.....	2.97	2.97	2.95
Structures and improvements ¹	2.99	2.96	2.96
Equipment.....	2.98	2.96	2.93
Turbines and generators.....	2.97	2.97	2.93
Accessory electric equipment.....	2.87	2.76	2.72
Miscellaneous equipment.....	2.92	2.92	2.92
Concrete pipelines.....	2.49	2.49	2.49
Switchyards and substations.....	3.05	2.92	2.92
Transmission lines:			
Wood-pole 115-kv.....	2.59	2.57	2.57
Poles and fixtures.....	2.51	2.44	2.46
Overhead conductors and devices.....	2.63	2.65	2.65
Steel-tower, 230-kv.....	2.83	2.83	2.83
General property (buildings).....	3.19	3.16	3.16
Roads and bridges:			
Primary roads.....	2.60	2.58	2.58
Secondary roads (unsurfaced).....	2.30	2.37	2.37
Bridges (steel).....	3.23	3.25	3.25
Composite index (indicates general cost trend).....	2.65	2.67	2.67

¹ Indexes for structures and improvements on pumping plants and powerplants are based on a reinforced concrete structure.

TABLE 4.—Bureau of Reclamation power systems, power sales, and revenues by projects, fiscal year ending June 30, 1961

Projects	Sales of electric energy, kilowatt-hours ¹	Revenues from sales ¹
Boulder Canyon.....	3,636,417,739	\$9,196,317.35
Central Valley.....	2,918,544,536	11,593,152.46
Columbia Basin ²	12,422,201,720	13,141,353.50
Eklutna.....	173,339,836	1,759,291.07
Falcon.....	84,629,900	357,019.42
Fort Peck.....	63,956,057	271,137.57
Hungry Horse ²	835,863,000	3,840,225.99
Minidoka Units 1 through 6.....	203,558,160	1,031,974.43
Missouri River Basin:		
Eastern Division.....	3,650,973,144	14,717,531.60
Western Division ³	1,480,682,548	9,278,922.96
Palisades, Boise, and Minidoka Unit 7.....	529,872,105	1,735,217.35
Parker-Davis.....	1,210,155,720	4,861,949.67
Provo River.....	11,534,160	34,793.40
Rio Grande.....	51,471,958	298,027.46
Rogue River Basin.....	49,514,000	301,474.43
Weber Basin.....	11,228,400	33,915.01
Yakima ²	133,512,912	424,890.60
Yuma.....	9,709,467	28,855.06
Grand total.....	27,477,165,362	72,906,049.33

¹ Does not include energy sales and revenues in transactions between Bureau projects. Includes Rogue River project test period sales; 31,091,600 kilowatt-hours and \$162,702.36.

² Deliveries to and revenues from Bonneville Power Administration included as follows:

Columbia Basin.....	11,739,494,736	\$12,800,000
Hungry Horse.....	833,148,000	3,833,000
Yakima.....	104,577,465	345,000
Total.....	12,677,220,201	16,978,000

³ Includes systems of Riverton, Shoshone, Colorado-Big Thompson, Kendrick, and North Platte projects.

TABLE 5.—Hydroelectric powerplants

State	Project	Name of plant	Calendar year of initial operation	Nameplate rating		Number and nameplate rating of generators	
				Existing (kilowatts)	Ultimate (kilowatts)	Existing (kilowatts)	Ultimate (kilowatts)
A. CONSTRUCTED AND OPERATED BY BUREAU OF RECLAMATION							
1. Alaska	Eklutna	Eklutna	1955	30,000	30,000	2-15,000	2-15,000
2. Arizona-Nevada	Boulder Canyon	Hoover 1	1936	1,249,800	1,344,800	14-82,500; 1-40,000; 2-2,400; 1-50,000	2-2,400; 1-50,000; 1-95,000
3. Arizona-Nevada	Parker-Davis	Davis	1951	225,000	225,000	5-45,000	5-45,000
4. Arizona-California	do	Parker	1942	120,000	120,000	4-30,000	4-30,000
5. California	Central Valley	Folsom	1955	162,000	162,000	3-54,000	3-54,000
6. California	do	Keswick	1949	75,000	75,000	3-25,000	3-25,000
7. California	do	Nimbus	1955	13,500	13,500	2-6,750	2-6,750
8. California	do	Shasta	1944	379,000	379,000	5-75,000; 2-2,000	5-75,000; 2-2,000
9. California	Yuma	Siphon Drop	1926	1,600	1,600	2-800	2-800
10. Colorado	Colorado-Big Thompson	Big Thompson	1959	4,500	4,500	1-4,500	1-4,500
11. Colorado	do	Estes	1959	45,000	45,000	3-15,000	3-15,000
12. Colorado	do	Flatiron	1954	71,500	71,500	2-31,500; 1-8,500	2-31,500; 1-8,500
13. Colorado	do	Green Mountain	1943	21,600	21,600	2-10,800	2-10,800
14. Colorado	do	Marys Lake	1951	8,100	8,100	1-8,100	1-8,100
15. Colorado	do	Pole Hill	1954	33,250	33,250	1-33,250	1-33,250
16. Colorado	Grand Valley	Anderson Ranch	1932	3,000	3,000	2-1,500	2-1,500
17. Idaho	Boise	Grand Canyon	1950	27,000	40,500	2-13,500	3-13,500
18. Idaho	do	Black Canyon	1925	8,000	8,000	2-4,000	2-4,000
19. Idaho	do	Boise Diversion	1912	1,500	1,500	3-500	3-500
20. Idaho	do	Minidoka	1909	13,400	13,400	1-5,000; 1-2,400; 5-1,200	1-5,000; 1-2,400; 5-1,200
21. Idaho	Pallsades	Pallsades	1957	114,000	114,000	4-28,500	4-28,500
22. Montana	Missouri River Basin	Canyon Ferry	1953	50,000	50,000	3-16,667	3-16,667
23. Montana	do	Hungry Horse	1952	285,000	285,000	4-71,250	4-71,250
24. New Mexico	Rio Grande	Elephant Butte	1940	24,300	24,300	3-8,100	3-8,100
25. Oregon	Rogue River Basin	Green Springs	1960	16,000	16,000	1-16,000	1-16,000
26. South Dakota	Missouri River Basin	Angostura	1951	1,200	1,200	1-1,200	1-1,200
27. Utah	Provo River	Deer Creek	1958	4,950	4,950	2-2,475	2-2,475
28. Utah	Weber Basin	Weber Basin	1958	4,275	4,275	2-2,137.5	2-2,137.5
29. Utah	do	Wanship	1958	1,425	1,425	1-1,425	1-1,425
30. Washington	Columbia Basin	Grand Coulee	1941	1,974,000	1,974,000	18-108,000; 3-10,000	18-108,000; 3-10,000
31. Washington	Yakima	Chandler	1956	12,000	12,000	2-6,000	2-6,000
32. Washington	do	Roza	1956	11,250	11,250	1-11,250	1-11,250
33. Wyoming	Missouri River Basin	Fremont Canyon	1960	48,000	48,000	2-24,000	2-24,000
34. Wyoming	Kendrick	Alcoya	1955	36,000	36,000	2-18,000	2-18,000

35. Wyoming.....	1939	32,400	32,400	3-10,800
36. Wyoming.....	1952	15,000	15,000	2-7,500
37. Wyoming.....	1958	24,000	24,000	2-12,000
38. Wyoming.....	1950	36,000	36,000	3-12,000
39. Wyoming.....	1927	4,800	4,800	2-2,400
40. Wyoming.....	1925	1,600	1,600	2-800
41. Wyoming.....	1948	5,000	5,000	1-5,000
42. Wyoming.....	1922	5,600	5,600	1-4,000; 2-800
Subtotal A.....		5,199,550	5,308,050	

B. CONSTRUCTED AND OPERATED BY OTHERS—POWER MARKETED BY U.S.B.R.

1. Montana.....	1943	165,000	165,000	2-35,000; 1-15,000; 2-35,000; 2-40,000; 1-35,000.
2. North Dakota.....	1956	400,000	400,000	5-80,000
3. South Dakota.....	1954	320,000	320,000	8-40,000
4. South Dakota.....	1956	100,035	100,035	3-33,345
5. Texas.....	1954	31,500	42,000	3-10,500
Subtotal B.....		1,016,535	1,027,035	

C. UNDER CONSTRUCTION BY BUREAU OF RECLAMATION

1. Arizona.....	1964	0	900,000	8-112,500
2. California.....	1963	0	134,000	2-47,000
3. California.....	1962	0	1,350	1-350
4. California.....	1963	0	150,000	2-75,000
5. California.....	1963	0	100,000	2-50,000
6. Colorado.....	1961	0	8,640	1-8,640
7. Colorado.....	1961	0	4,860	1-4,860
8. Montana.....	1966	0	200,000	4-50,000
9. Utah.....	1963	0	108,000	3-36,000
Subtotal C.....		0	1,605,850	

D. UNDER CONSTRUCTION BY OTHERS—POWER TO BE MARKETED BY U.S.B.R.

1. South Dakota.....	1964	0	468,000	8-58,500
2. South Dakota.....	1962	0	595,000	7-85,000
Subtotal D.....		0	1,063,000	

¹ Powerplant units operated by Southern Edison Co. and City of Los Angeles Department of Water and Power as agents of the United States.
² Leased to Public Service Co. of Colorado for operation.

TABLE 6.—*Summary by classification of customers for 12 months ending June 30, 1961*¹

	Number of customers	Sales of electric energy kilowatt-hours	Revenues from sales
Privately owned utilities.....	31	2,037,859,771	\$7,574,999.89
Municipal utilities.....	119	2,025,171,188	9,258,453.73
State government utilities.....	14	4,363,032,866	15,680,476.14
Cooperative utilities (Rural Electrification Administration projects).....	53	2,870,839,822	14,603,974.33
Other Federal utilities ²	6	12,756,286,642	17,321,857.72
Residential and domestic.....	302	6,200,246	32,123.80
Rural (other than Rural Electrification Administration projects).....	7	193,930	1,222.68
Commercial and industrial.....	19	97,439,581	490,708.28
Public authorities.....	86	2,231,460,170	6,577,623.11
Interdepartmental.....	45	1,088,681,146	1,364,609.65
Total all customers.....	682	27,477,165,362	72,906,049.33

¹ Does not include energy sales and revenues in transactions between Bureau projects.

² Totals include 12,677,220,201 kilowatt-hours delivered to Bonneville Power Administration for marketing and \$16,978,000 in payments by that agency.

TABLE 7.—*Acreage, production, and gross crop value by crops and types of crops—1960*

Crops	Irrigated lands		Tonnage		Gross crop value	
	Total	Percent of total	Total	Percent of total	Total	Percent of total ¹
Cereals:	<i>Acres</i>					
Barley.....	527,497	7.65	731,323	2.205	\$30,173,497	2.61
Corn.....	367,277	5.32	785,020	2.367	30,923,101	2.67
Oats.....	185,470	2.69	165,303	.499	7,491,621	.65
Rice.....	6,405	.09	11,591	.035	975,020	.08
Rye.....	2,024	.03	1,640	.005	66,739	.01
Sorghums (sorgo, kaffir, etc.).....	107,970	1.56	164,933	.497	6,900,651	.60
Wheat.....	418,589	6.07	631,128	1.903	34,457,533	2.98
Other cereals.....	84,331	1.22	133,883	.404	5,743,132	.49
Total cereals.....	1,699,563	24.63	2,624,821	7.915	116,731,294	10.09
Forage:						
Alfalfa hay.....	1,715,703	24.87	6,627,093	19.984	154,556,403	13.35
Other hay.....	189,026	2.74	356,497	1.075	7,143,874	.62
Irrigated pasture.....	1,005,077	14.57	2,595,059	7.825	32,873,189	2.84
Corn fodder.....	9,989	.14	63,856	.192	509,314	.04
Silage or ensilage.....	216,320	3.14	3,563,790	10.747	23,526,705	2.03
Crop residue: Beet tops.....			1,742,253	5.254	1,305,453	.11
Stubble, stalks, etc.....			156,025	.470	1,359,228	.12
Straw (all kinds).....			220,144	.664	1,990,755	.17
Root crops (carrots, etc.).....	157		1,201	.004	10,750	
Other forage.....	43,669	.63	73,519	.222	625,299	.06
Total forage.....	3,179,941	46.09	15,399,437	46.437	223,900,970	19.34
Miscellaneous field crops:						
Beans, castor.....	631	.01	490	.002	56,294	.01
Beans, dry and edible.....	362,871	5.26	295,851	.892	41,929,892	3.62
Broomcorn.....	2,351	.03	397	.001	127,376	.01
Cotton, lint (Upland).....	502,301	7.28	243,616	.735	153,472,134	13.26
Cotton, seed (Upland).....			405,016	1.221	20,047,145	1.73
Cotton, lint (American-Egyptian).....	31,317	.45	8,734	.026	9,187,469	.79
Cotton, seed (American-Egyptian).....			15,945	.048	791,428	.07
Hops.....	17,577	.26	17,218	.052	12,062,500	1.04
Peppermint.....	14,675	.21	568	.002	4,111,946	.36
Spearmint.....	9,107	.13	362	.001	2,643,799	.23
Sugar beets.....	394,552	5.72	7,348,754	22.160	78,214,902	6.76
Other miscellaneous field crops.....	3,071	.05	4,568	.014	400,651	.03
Total miscellaneous field crops.....	1,338,453	19.40	8,341,519	25.154	323,045,536	27.91
Vegetables:						
Asparagus.....	17,466	.25	22,485	.069	4,850,312	.42
Beans (processing).....	11,040	.16	19,610	.059	2,491,240	.21
Beans (fresh market).....	539	.01	1,535	.005	386,343	.03
Broccoli.....	10,227	.15	63,454	.191	5,115,412	.44
Cabbage.....	5,188	.08	52,458	.158	2,736,730	.24
Carrots.....	12,733	.18	136,362	.411	8,638,420	.75
Cauliflower.....	2,303	.03	14,827	.045	1,828,516	.16
Celery.....	2,486	.04	53,200	.160	3,103,008	.27
Corn, sweet (processing).....	24,836	.36	147,649	.445	3,082,354	.27
Corn, sweet (fresh market).....	7,013	.10	20,730	.063	2,163,240	.19
Cucumbers.....	2,033	.03	20,283	.061	2,490,151	.21
Greens (kale, etc.).....	71		121		16,954	
Lettuce.....	66,214	.96	423,381	1.277	44,402,903	3.83
Melons: Cantaloupes, etc.....	35,319	.51	215,741	.651	17,219,290	1.49
Honey ball, honeydew, etc.....	4,881	.07	42,083	.127	2,421,604	.21
Watermelons.....	8,598	.12	71,047	.214	2,039,812	.18
Onions, dry.....	15,508	.23	256,436	.773	9,932,496	.86
Onions, green.....	77		734	.002	72,905	.01
Peas, green (processing).....	10,918	.16	19,392	.059	1,522,655	.13
Peas, green (fresh market).....	380	.01	689	.002	128,753	.01
Peppers (all kinds).....	3,747	.05	15,073	.045	3,162,558	.27
Potatoes, early.....	44,434	.64	583,955	1.761	27,515,131	2.38
Potatoes, late.....	216,466	3.14	2,103,251	6.342	78,209,130	6.76
Squash.....	2,770	.04	15,904	.048	2,085,715	.18
Sweet potatoes.....	383	.01	1,657	.005	177,379	.01

¹ Additional revenues are included in computing percentages.

TABLE 7.—Acreage, production, and gross crop value by crops and types of crops—1960—Continued

Crops	Irrigated lands		Tonnage		Gross crop value	
	Total	Percent of total	Total	Percent of total	Total	Percent of total ¹
Vegetables—Continued	<i>Acres</i>					
Tomatoes (canning).....	16,028	0.23	250,941	0.757	\$6,182,190	0.53
Tomatoes (fresh market).....	10,261	.15	135,891	.410	19,827,426	1.71
Other vegetables.....	7,090	.10	37,567	.113	4,626,612	.40
Total vegetables.....	33,379	7.81	4,726,456	14.253	256,429,239	22.15
Total nursery.....	3,988	.06			9,048,621	.78
Seeds:						
Alfalfa.....	77,795	1.13	16,144	.049	8,359,686	.72
Clover (all kinds).....	27,726	.40	6,100	.018	2,559,185	.22
Corn.....	10,133	.15	12,284	.037	1,389,315	.12
Flaxseed.....	18,702	.27	17,926	.054	1,948,293	.17
Grass (all kinds).....	21,021	.30	4,330	.013	3,993,420	.35
Lettuce.....	918	.01	164		238,150	.02
Onion.....	910	.01	278	.001	467,469	.04
Pea.....	32,313	.47	34,654	.105	2,649,113	.23
Potato (all kinds).....	1,086	.02	8,775	.027	662,536	.06
Sugar beet.....	2,287	.03	3,324	.010	967,070	.08
Other seed.....	13,747	.20	7,370	.022	1,674,371	.14
Total seeds.....	206,638	2.99	111,349	.336	24,908,608	2.15
Fruits:						
Apples.....	44,534	.65	283,485	.855	26,442,957	2.28
Apricots.....	9,144	.13	70,380	.212	6,506,964	.56
Berries (all kinds).....	2,950	.04	10,860	.033	4,021,927	.35
Cherries.....	6,048	.09	10,758	.032	3,531,713	.30
Citrus: Grapefruit.....	16,198	.24	129,284	.390	6,026,930	.52
Lemons and limes.....	12,518	.18	128,156	.386	5,977,014	.52
Oranges and tangerines.....	34,224	.50	282,482	.852	27,182,620	2.35
Dates.....	3,752	.05	24,217	.073	7,057,882	.61
Grapes, table.....	56,062	.81	355,348	1.072	27,085,731	2.34
Grapes, other.....	36,729	.53	261,927	.790	13,486,970	1.17
Olive.....	8,508	.12	34,295	.103	5,188,159	.45
Peaches.....	24,379	.35	131,058	.395	7,996,900	.69
Pears.....	25,395	.37	156,927	.473	13,552,855	1.17
Prunes and plums.....	12,265	.18	55,353	.167	8,288,556	.72
Other fruits.....	3,281	.05	10,567	.032	1,432,095	.12
Total fruits.....	295,987	4.29	1,945,097	5.865	163,779,273	14.15
Nuts:						
Almonds.....	8,490	.12	5,275	.016	2,588,041	.23
Pecans.....	5,264	.08	2,794	.008	2,052,287	.18
Walnuts.....	6,210	.09	5,337	.016	2,701,634	.23
Other nuts.....	15		3		1,850	
Total nuts.....	19,979	.29	13,409	.040	7,343,812	.64
Family gardens and orchards.....	20,463	.30			4,629,530	.40
Total all crops.....	7,304,021	105.86	33,162,088	100.000	1,129,816,883	97.61
Less multiple cropped.....	556,710	8.07				
Total harvested cropland and pasture.....	6,747,311	97.79				
Cropland not harvested.....	135,899	1.97				
Soil building.....	16,501	.24				
Acres irrigated.....	6,899,711	100.00				
Additional revenues ²					27,711,810	2.39
Total gross crop value.....					1,157,528,693	100.00
Full irrigation service.....	3,487,546	50.55			580,485,979	50.15
Supplemental irrigation service.....	3,362,942	48.74			568,853,368	49.14
Temporary irrigation service.....	49,223	.71			8,189,346	.71

¹ Additional revenues are included in computing percentages.² Includes payments received from Federal and commercial agencies.

TABLE 8.—Irrigation and gross crop value data, by projects, for each State, 1960

State and project	Irrigable area for service				Irrigated area	Gross crop value	
	Full	Supple- mental	Temporary	Total		Amount	Per irrigated acre
Arizona:							
Gila.....	103,449	-----	-----	103,449	78,934	\$15,130,194	191.68
Salt River.....	238,357	-----	-----	334,087	222,278	69,049,902	310.65
Yuma (see also California).....	51,936	95,730	-----	51,936	45,649	24,793,175	543.13
Yuma Auxiliary.....	3,406	-----	-----	3,406	2,942	1,100,492	374.06
Totals—Arizona.....	397,148	95,730	-----	492,878	349,803	110,073,763	314.67
California:							
Boulder Canyon.....	604,718	-----	-----	604,718	489,889	159,510,560	325.61
Cachuma.....	500	26,610	-----	27,110	11,216	7,371,780	657.26
Central Valley.....	33,855	817,021	32,154	883,030	740,187	213,326,208	288.21
Klamath (see also Oregon).....	80,649	-----	-----	80,649	78,120	11,284,488	144.45
Orland.....	19,811	-----	-----	19,811	17,440	1,363,916	78.21
Santa Maria.....	-----	35,200	-----	35,200	30,651	26,668,046	870.05
Solano.....	960	-----	-----	29,800	23,905	7,034,035	294.25
Ventura River.....	14,620	1,576	-----	2,536	1,529	1,023,828	669.61
Yuma (see also Arizona).....	-----	-----	-----	14,620	10,749	2,327,303	216.51
Totals—California.....	755,113	910,207	32,154	1,697,474	1,403,086	429,910,164	306.27
Colorado:							
Colorado-Big Thompson.....	-----	720,000	-----	720,000	720,000	89,857,886	124.80
Fruitgrowers Dam.....	-----	2,662	-----	2,662	1,962	238,332	121.47
Grand Valley.....	34,086	7,994	-----	42,681	35,027	3,841,682	109.63
Mancos.....	-----	8,650	-----	8,650	7,166	318,496	44.48
Paonia.....	-----	13,070	-----	13,070	9,049	1,614,127	178.35
Pine River (see also New Mexico).....	-----	40,111	-----	40,111	35,167	1,518,216	43.18
Pine River Indian Irrigation.....	-----	13,000	-----	13,000	9,917	383,994	38.77
Uncompahgre.....	76,457	-----	-----	76,457	63,595	5,604,426	88.12
Totals—Colorado.....	111,143	805,488	-----	916,631	881,883	103,377,159	117.22
Idaho:							
Avondale.....	873	-----	-----	873	508	31,820	62.64
Boise (see also Oregon).....	223,065	136,115	-----	359,180	322,916	41,648,203	128.98
Dalton Gardens.....	944	-----	-----	944	595	55,698	93.61
Lewiston Orchards.....	3,595	-----	-----	3,595	1,909	513,110	268.78
Little Wood River.....	-----	9,549	-----	9,549	7,720	471,628	61.09
Mitchaud Flats.....	9,720	-----	-----	9,720	8,522	1,608,500	188.75
Mimidoka.....	214,642	945,354	430	1,160,426	1,080,835	127,853,852	118.29
Owyhee (see also Oregon).....	33,360	-----	-----	33,360	31,289	4,226,833	135.09

TABLE 8.—Irrigation and gross crop value data, by projects, for each State, 1960—Continued

State and project	Irrigable area for service				Irrigated area	Gross crop value	
	Full	Supple- mental	Temporary	Total		Amount	Per irrigated acre
Idaho—Continued							
Preston Bench.....	5,010	4,500		4,500	4,061	\$343,891	84.68
Rathdrum Prairie.....				5,010	4,094	441,341	107.80
Totals—Idaho.....	491,209	1,095,518	430	1,587,157	1,462,449	177,194,876	121.16
Kansas:							
Missouri River Basin:							
Bostwick division:							
Courtland unit.....	30,989			30,989	19,955	1,640,737	82.22
Solomon division:							
Kirwin unit.....	11,500			11,500	8,216	651,841	79.34
Webster unit.....	4,800			4,800	1,159	91,659	79.08
Totals—Kansas.....	47,289			47,289	29,330	2,384,237	81.29
Montana:							
Butler Root.....	16,665			16,665	16,260	645,748	39.71
Bufalo Rapids.....	22,938			22,938	21,117	1,624,092	76.91
Frenchtown.....	4,810			4,810	4,071	190,319	46.75
Huntley.....	32,447			32,447	24,161	1,707,196	70.66
Intake.....	881			881	781	35,383	45.30
Lower Yellowstone (see also N. Dak.)	36,832			36,832	30,192	2,315,843	76.70
Milk River.....	116,062			116,062	87,148	3,876,452	44.48
Missoula Valley.....				977	641	22,070	34.43
Missouri River Basin:							
Helena-Great Falls division:							
Three Forks division:	14,121			14,121	7,305	309,165	42.32
Crow Creek pump unit.....	4,545			4,545	3,456	304,256	88.04
Yellowstone division:							
Savage unit.....	2,215			2,215	1,934	82,484	42.65
Sun River.....	91,823			91,823	66,843	2,688,223	40.22
Totals—Montana.....	344,316			344,316	263,909	13,801,231	52.30
Nebraska:							
Missate Flats.....	11,662			11,662	11,258	1,314,060	116.72
Missouri River Basin:							
Bostwick division:	22,593			22,593	18,194	1,536,806	84.47
Superior-Courland unit.....							

Frenchman-Cambridge division:	38,522	1,030	38,522	32,698	2,728,412	83.44
Cambridge, Meecker-Driftwood and Red Willow units	-----	-----	-----	-----	-----	62.66
Frenchman unit	-----	1,030	1,030	-----	-----	-----
Middle Loup division:	-----	-----	-----	-----	-----	-----
Sargent unit	12,900	-----	12,900	7,680	568,671	72.74
Oregon Trail division:	-----	-----	-----	-----	-----	-----
Glendo unit (see also Wyoming)	171,571	22,524	22,524	17,484	2,170,938	124.17
North Platte (see also Wyoming)	-----	92,398	263,969	246,160	26,176,420	106.34
Totals—Nebraska	257,248	115,952	373,200	834,458	34,546,960	103.30
Nevada:	-----	-----	-----	-----	-----	-----
Humboldt	-----	-----	-----	-----	-----	-----
Newlands	71,901	39,623	39,623	22,822	1,611,713	70.62
Truckee Storage	-----	28,755	28,755	57,817	3,982,914	68.89
Totals—Nevada	71,901	68,378	140,279	101,701	7,111,385	72.01
New Mexico:	-----	-----	-----	-----	-----	-----
Carlsbad	25,055	-----	25,055	20,023	3,601,851	179.89
Fort Sumner	6,500	-----	6,500	5,363	417,862	77.92
Middle Rio Grande	121,680	-----	121,680	53,799	4,322,470	80.34
Pine River (see also Colorado)	-----	1,030	1,030	-----	-----	-----
Rio Grande (see also Texas)	102,082	-----	102,082	85,162	24,953,072	90.69
Tucumcari	41,411	-----	41,411	31,854	1,332,140	41.82
Vermejo	7,379	-----	7,379	4,592	162,350	35.35
Totals—New Mexico	304,107	1,030	305,137	201,823	34,883,157	172.84
North Dakota:	-----	-----	-----	-----	-----	-----
Bulford-Trenton	7,655	-----	7,655	6,511	502,711	77.21
Lower Yellowstone (see also Montana)	19,388	-----	19,388	15,615	1,362,850	87.28
Missouri River Basin:	-----	-----	-----	-----	-----	-----
Heart Division:	-----	-----	-----	-----	-----	-----
Dickinson unit	400	-----	400	323	26,768	82.87
Heart Butte unit	2,463	-----	2,463	1,413	75,509	53.44
North Dakota pumping division:	-----	-----	-----	-----	-----	-----
Fort Clark unit	2,039	-----	2,039	1,040	73,516	70.69
Totals—North Dakota	31,945	-----	31,945	24,902	2,041,354	81.98
Oklahoma:	-----	-----	-----	-----	-----	-----
W. C. Austin	47,809	-----	47,809	42,161	5,793,082	137.40
Totals—Oklahoma	47,809	-----	47,809	42,161	5,793,082	137.40
Oregon:	-----	-----	-----	-----	-----	-----
Bainbridge	4,292	-----	4,292	2,812	118,118	42.00
Boise	1,696	7,281	7,281	7,200	390,480	53.79
Burnt River	-----	15,616	13,616	11,424	111,509	78.31
Totals—Oregon	4,292	7,281	13,616	11,424	799,672	51.64

TABLE 8.—Irrigation and gross crop value data, by projects, for each State, 1960—Continued

State and project	Irrigable area for service				Irrigated area	Gross crop value	
	Full	Supple- mental	Temporary	Total		Amount	Per irrigated acre
	Acres	Acres	Acres	Acres	Acres	Dollars	
Oregon—Continued							
Crescent Lake Dam.....	6,650	-----	-----	6,650	5,994	\$368,641	61.50
Crooked River.....	8,500	-----	-----	8,500	8,222	797,270	96.97
Deschutes.....	50,000	47,743	1,247	98,990	90,577	13,567,422	149.79
Grants Pass.....	10,370	-----	-----	10,370	7,239	677,395	93.58
Klamath (see also California)	135,330	-----	-----	135,330	120,596	14,195,380	117.71
Owyhee (see also Idaho)	71,656	-----	-----	71,656	79,661	13,096,107	164.40
Rogue River Basin.....	23,801	-----	-----	23,801	20,885	5,679,137	271.92
Umatilla.....	17,859	-----	513	31,387	24,558	2,308,160	93.99
Wale.....	32,000	-----	-----	32,000	31,346	2,480,793	79.14
Wapinitia.....	2,108	-----	-----	2,108	1,580	108,744	71.07
Totals—Oregon.....	340,461	120,456	1,760	462,677	417,590	54,698,828	130.99
South Dakota:							
Belle Fourche.....	57,183	-----	-----	57,183	54,333	2,923,534	53.81
Missouri River Basin: Cheyenne division: Angostura unit.....	12,135	8,900	-----	12,135	11,371	850,055	74.76
Rapid Valley.....	-----	8,900	-----	8,900	6,617	342,648	51.78
Totals—South Dakota.....	69,318	8,900	-----	78,218	72,321	4,116,237	56.92
Texas:							
Balmorhea.....	-----	10,608	-----	10,608	6,922	851,225	122.97
Rio Grande (see also New Mexico)	76,114	118,350	-----	294,444	67,135	17,039,991	253.82
Totals—Texas.....	76,114	28,938	-----	205,052	74,057	17,891,216	241.59
Utah:							
Hyrum.....	-----	6,800	-----	6,800	6,163	368,506	54.93
Moan Lake.....	-----	75,256	-----	75,256	56,027	1,315,014	23.52
Newtown.....	-----	2,600	-----	2,600	12,399	2,377,996	186.66
Ogden River.....	-----	23,447	-----	23,447	15,899	2,231,435	140.81
Piute River.....	-----	48,136	-----	48,136	42,319	4,946,171	102.70
Sagefield.....	-----	13,694	-----	13,694	11,596	690,475	42.72
Seefeld.....	-----	15,863	-----	15,863	10,607	382,549	64.30
Strawberry Valley.....	17,269	-----	-----	44,573	41,927	3,934,387	81.13
Weber River.....	-----	108,978	-----	108,978	91,379	10,528,033	115.21
Totals—Utah.....	17,269	322,076	-----	339,345	277,597	23,407,556	84.32

Washington:										
Chief Joseph Dam	2,860	181,844	155	2,860	1,465	289,791	197,81			
Okanuba Basin	425,514	181,844	155	425,514	294,195	40,912,096	139,06			
Okanogan	5,038	181,844	155	5,038	4,139	1,086,717	262,56			
Yakima	279,922	181,844	155	461,921	393,830	75,965,564	192,89			
Totals—Washington	713,334	181,844	155	895,333	693,629	118,254,168	170,49			
Wyoming:										
Eder	17,022			17,022	12,711	295,294	23,23			
Kendrick	23,957			23,957	19,759	898,384	45,47			
Missouri River Basin:										
Bighorn Basin division:										
Hanover-Bluff unit	6,327			6,527	5,674	480,398	84,67			
Owl Creek unit		11,338		11,338	9,310	498,839	53,58			
Boysen division:										
Boysen unit		11,338		19,906	17,915	1,314,961	73,40			
Oregon Trail division:										
Glendo unit (see also Nebraska)		8,732		8,732	6,287	652,865	103,84			
North Platte (see also Nebraska)	54,752	16,317		71,069	69,477	6,272,336	90,28			
Riverton	54,337			54,337	49,645	2,459,657	49,54			
Shoshone	93,529			93,529	77,634	5,170,586	66,60			
Totals—Wyoming	250,124	36,387	19,906	306,417	268,412	18,043,320	67,22			
Totals—All States	4,325,848	3,789,874	55,435	8,171,157	6,899,711	1,157,628,693	167,76			

¹ Area for which service is available under Warren Act contract.

² Includes 18,330 acres for which service is available under Warren Act contract.

TABLE 9.—*Accretions to reclamation fund by States, fiscal year 1961*

	Sale of public land		Proceeds from Oil Leasing Act		Total to June 30, 1961
	Fiscal year 1961	To June 30, 1961	Fiscal year 1961	To June 30, 1961	
Alabama.....			\$1, 171. 68	\$217, 568. 97	\$217, 568. 97
Arizona.....	\$676, 835. 73	\$6, 419, 988. 36	279, 778. 08	1, 619, 304. 70	8, 039, 293. 06
Arkansas.....			41, 355. 04	152, 278. 13	152, 278. 13
California.....	1, 958, 923. 92	17, 646, 795. 18	3, 340, 076. 93	85, 518, 032. 96	103, 164, 828. 14
Colorado.....	679, 550. 91	12, 849, 004. 61	4, 606, 675. 74	56, 907, 128. 48	69, 756, 133. 09
Florida.....			265. 38	3, 487. 44	3, 487. 44
Idaho.....	342, 140. 26	9, 888, 225. 10	398, 030. 31	1, 856, 593. 13	11, 744, 818. 23
Illinois.....				74. 81	74. 81
Indiana.....				84. 00	84. 00
Kansas.....		1, 046, 576. 99	189, 733. 71	962, 957. 61	2, 009, 534. 60
Louisiana.....			124, 005. 19	1, 505, 548. 42	1, 595, 548. 42
Michigan.....			1, 310. 89	35, 341. 21	35, 341. 21
Mississippi.....			3, 391. 38	33, 352. 72	33, 352. 72
Montana.....	129, 100. 89	17, 095, 818. 50	2, 270, 386. 09	21, 875, 511. 83	38, 971, 330. 33
Nebraska.....	1, 286. 40	2, 223, 294. 97	8, 769. 29	99, 356. 93	2, 322, 651. 90
Nevada.....	630, 244. 02	4, 280, 072. 47	190, 796. 31	4, 304, 971. 55	8, 585, 044. 02
New Mexico.....	238, 965. 40	8, 242, 890. 95	9, 606, 973. 15	72, 104, 879. 59	80, 347, 770. 54
North Dakota.....	908. 64	12, 301, 892. 18	118, 559. 35	1, 388, 251. 04	13, 690, 143. 22
Oklahoma.....	18, 519. 80	6, 081, 955. 97	54, 510. 58	407, 930. 33	6, 489, 886. 30
Oregon.....	1, 132, 207. 22	20, 225, 259. 62	72, 377. 55	429, 205. 56	20, 654, 465. 18
South Dakota.....	4, 862. 40	7, 898, 491. 73	93, 802. 53	1, 171, 015. 00	9, 069, 576. 73
Utah.....	39, 071. 83	5, 301, 671. 58	3, 892, 515. 21	27, 616, 679. 91	32, 918, 351. 49
Washington.....	249, 569. 20	10, 167, 950. 41	816. 76	97, 575. 53	10, 265, 525. 94
Wyoming.....	120, 679. 46	9, 972, 233. 75	17, 712, 192. 83	194, 487, 815. 05	204, 460, 048. 80
Total.....	6, 222, 866. 08	151, 642, 122. 37	43, 007, 414. 98	472, 794, 944. 90	624, 437, 067. 27
Other accretions				Fiscal year 1961	Total to June 30, 1961
Proceeds, Federal water power licenses.....				\$72, 347. 95	\$1, 876, 829. 18
Proceeds, potassium royalties and rentals.....				2, 187, 495. 02	23, 369, 344. 23
Receipts from naval petroleum reserves, 1920-38, act of May 9, 1938.....					29, 778, 300. 23
Proceeds from rights-of-way over withdrawn lands, act of July 19, 1919.....				1, 338. 72	15, 827. 69
Miscellaneous mineral leasing permits.....				150. 00	617. 25
Miscellaneous items, other.....					5. 78
Total.....				2, 261, 331. 69	54, 970, 924. 36
Grand Total.....				51, 491, 612. 75	679, 407, 991. 63

TABLE 10.—*The reclamation fund, funds available for appropriation, fiscal years 1960-61*

Receipts and appropriations	Actual 1960	Actual 1961
Unappropriated balance brought forward (as of June 30).....	\$130, 388, 611	\$119, 663, 735
Accretions and collections:		
Bureau of Reclamation (145000.100).....	16, 379, 781	20, 034, 338
Other agencies (145000.200).....	50, 040, 920	51, 491, 613
Power revenues (145000.300).....	49, 022, 147	49, 302, 725
Subtotal, accretions and collections.....	115, 442, 848	120, 828, 676
Plus expired and lapsed appropriations.....	680, 418	2, 048, 572
Total available for appropriation.....	246, 511, 877	242, 540, 983
Less permanently authorized appropriations for—		
Refunds and returns.....		92, 000
Farmers Irrigation District, North Platte Project.....	8, 000	8, 000
Deduct annual appropriation for—		
General investigations.....	3, 742, 742	3, 943, 000
Construction and rehabilitation.....	95, 000, 000	90, 000, 000
Operation and maintenance.....	23, 807, 400	26, 496, 000
General administrative expenses.....	4, 290, 000	4, 290, 000
Subtotal, annual appropriation.....	126, 840, 142	124, 729, 000
Total appropriations.....	126, 848, 142	124, 829, 000
Balance carried forward.....	119, 663, 735	117, 711, 983

Bonneville Power Administration

Charles F. Luce, *Administrator*

BONNEVILLE POWER ADMINISTRATION, authorized by the Bonneville Project Act of 1937, is the designated marketing agency of the Department of the Interior for 20 hydroelectric generating plants of the Columbia River power system currently completed or under construction.

Federal Projects

Power was marketed during fiscal year 1961 from nine Corps of Engineers plants and four of the Department's Bureau of Reclamation plants with an installed generating capacity of 6,189,250 kilowatts.

Completion of the projects under construction will bring the nameplate rating to 8,389,250 kilowatts, and completion of the authorized projects to 9,303,250 kilowatts. Projects existing, under construction, and authorized for construction, by the Corps of Engineers and Bureau of Reclamation are shown in table I.

Generation Added

Columbia River power system additions in fiscal year 1961 have a nameplate rating of 156,000 kilowatts. The last two units of 78,000 kilowatts each were added at the Corps of Engineers project, The Dalles.

TABLE 1.—U.S. Columbia River power system—General specifications, projects existing, under construction and authorized June 30, 1961

Project	Operating agency ¹	Location	Stream	Plant installations		Date in service (initial unit)	Generation fiscal year 1961 ³
				Number of units	Total capacity kilowatts ²		
Existing:							
Bonneville.....	CE	Washington-Oregon	Columbia.....	10	518, 400	June 1938.....	3, 178
Grand Coulee.....	BR	Washington	do.....	18	1, 944, 000	September 1941.....	11, 883
Hungry Horse.....	BR	Montana	South Fork Flathead.....	4	285, 000	October 1952.....	266
Detroit.....	CE	Oregon	North Santiam.....	2	100, 000	July 1953.....	4, 511
McNary.....	CE	Washington-Oregon	Columbia.....	14	980, 000	November 1953.....	4, 511
Big Cliff.....	CE	Oregon	North Santiam.....	1	18, 000	June 1954.....	104
Lookout Point.....	CE	do	Middle Fork Willamette.....	1	120, 000	December 1954.....	208
Albeni Falls.....	CE	Idaho	Pend Oreille.....	3	42, 600	March 1955.....	162
Dexter.....	CE	Oregon	Middle Fork Willamette.....	1	15, 000	May 1955.....	73
Chief Joseph.....	BR	Washington	Columbia.....	16	1, 024, 000	August 1955.....	4, 535
Chandler.....	BR	Washington	Yakima.....	2	12, 000	February 1956.....	63
The Dalles.....	CE	Washington-Oregon	Columbia.....	16	1, 119, 000	May 1957.....	4, 387
Roza.....	BR	Washington	Yakima.....	1	11, 250	August 1958.....	55
Subtotal.....					6, 189, 250		30, 230
Under Construction:							
Ice Harbor.....	CE	Washington	Snake.....	3	270, 000	December 1961.....	
Hills Creek.....	CE	Oregon	Middle Fork Willamette.....	2	30, 000	February 1962.....	
Congar.....	CE	do	South Fork McKenzie.....	2	25, 000	November 1963.....	
Green Peter.....	CE	do	Middle Santiam.....	2	90, 000	April 1966.....	
Foster.....	CE	do	South Santiam.....	2	30, 000	April 1967.....	
John Day.....	CE	Washington-Oregon	Columbia.....	10	1, 350, 000	June 1967.....	
Lower Monumental.....	CE	Washington	Snake.....	3	405, 000	December 1967.....	
Subtotal.....					2, 200, 000		
Authorized:							
Libby.....	CE	Montana	Kootenai.....	4	344, 000		
Little Goose.....	CE	Washington	Snake.....	3	405, 000		
Lower Granite.....	CE	do	do.....	3	405, 000		
Subtotal.....					1, 154, 000		
Total, 23 projects.....					9, 543, 250		

¹ CE—Corps of Engineers; BR—Bureau of Reclamation.² Nameplate rating.³ Millions of kilowatt-hours.



A lineman attaches the lead or "soek" line to helicopter for a 2,000 foot run to bridge a deep, precipitous canyon with Bonneville Power Administration's Rocky Reach-Maple Valley 345,000 volt transmission line.

Existing storage capacity usable for power in Federal reservoirs is 9,868,500 acre feet. An additional 414,000 acre feet will be provided by Cougar and Hills Creek on which construction is under way, and 5,343,000 acre feet will be provided by Libby and Green Peter projects which are authorized for construction.

All generation and storage capacity under Federal construction will be in service by October 1968 under the present schedule. Service dates for the other authorized projects are not yet scheduled.

Non-Federal Projects

Addition of 541,500 kilowatts of nameplate rating by non-Federal utilities increased the generating capacity of non-Federal resources in the area served by the Bonneville Power Administration to a total of 4,186,080 kilowatts.

Future additions under construction or licensed for construction by non-Federal utilities would add 2,077,550 kilowatts to the area's resources.

Northwest Power Pool

Generation by the principal electric utility systems of the Pacific Northwest during the fiscal year 1961 is shown in the accompanying chart.

All utilities listed are members of the Northwest Power Pool with the exception of Pend Oreille County Public Utility District. Pend Oreille County Public Utility District is included because it provides a substantial part of its generation to the pool. The Utah Power and Light Company and the British Columbia Electric Company are members of the pool, but are not included as their major service areas are outside the region.

The Columbia River power system provided a total of 55.5 percent of the energy generated by the major utilities of the region. Bonneville Power Administration provided 6.7 billion kilowatt-hours of energy to meet the net requirements of seven other pool utilities in addition to its other load.

Bonneville Power Administration's electric energy account for fiscal year 1961 is shown in table II.

Transmission Network

Bonneville Power Administration, as part of its marketing function, is responsible for construction, operation, and maintenance of transmission facilities to transmit the power to the region's load centers. The BPA transmission grid at the end of the fiscal year consisted of 8,155 circuit miles of high voltage transmission lines and 208 substations.

TABLE II.—*Electric energy account for fiscal year 1961*

Energy received (millions of kilowatt-hours):	
Energy generated for BPA:	
Bureau of Reclamation.....	12, 806
Corps of Engineers.....	17, 425
Power interchanged in.....	8, 666
Total received.....	38, 897
Energy delivered (millions of kilowatt-hours):	
Sales.....	28, 528
Power interchanged out.....	8, 563
Used by Administration.....	34
Total delivered.....	37, 125
Energy losses in transmission and transformation.....	1, 772
Losses in percent of total received—percent.....	4. 6
Maximum demand on Federal plants (kilowatts) Sept. 26, 1960, 6-7 p.m. PST.....	4, 579, 000
Load factor, total generated for BPA, percent.....	75. 4



Suspended 230,000 volt lightning arresters form an intricate pattern atop the McNary Dam powerhouse.

Electrical Coordination and Integration

Bonneville Power Administration's high voltage transmission grid serves as the "backbone" for all interconnected utilities of the Pacific Northwest. The BPA transmission system had 436 points of connection as of June 30, 1961, almost double the 256 connections of 11 years ago. These include interconnections with all the principal utilities having generating facilities in the region.

Growth of Wheeling Program

The wheeling program under which the Federal transmission grid is made available for transmission of non-Federal power generation to area load centers increased by 31.7 percent in fiscal year 1961 over the previous year.

Bonneville Power Administration wheeled or transferred for other utilities 8.8 billion kilowatt-hours of energy as compared to 6.7 billion kilowatt-hours the previous year. During the same period other utilities wheeled or transferred 2.2 billion kilowatt-hours of energy for the Government.

Power is being delivered under long-term firm capacity contracts from the Pelton project of the Portland General Electric Co., the Box Canyon project of the Pend Oreille Public Utility District, the Priest Rapids project of the Grant County Public Utility District, and the Rocky Reach project of the Chelan County Public Utility District.

Excess capacity contracts cover power from the Swift project of the Pacific Power and Light Company, the Rock Island project of the Grant County Public Utility District; and into the region from the Idaho Power Company.

Public Utility Sales Increase

Sales to publicly owned utilities continued to increase at a higher rate than sales to other classes of customers. Over the last 10-year period sales to publicly owned utilities increased 224 percent, while total sales increased 89 percent. During the same period, energy sales to the other classes of customers increased as follows: private utilities, 20 percent; aluminum companies, 31 percent; and Federal agencies and other customers 198 percent.

Detail of energy deliveries by classes of customers for 1961 compared with 1960 are shown in table III.

Unused Capacity

Bonneville's industrial customers have, in the aggregate, an estimated capacity to use power at the rate of approximately 1,900,000 kilowatts. As of June 30, 1961, their power purchases from the Government and from other sources totaled 1,472,000 kilowatts, leaving idle plant capacity of about 430,000 kilowatts. Firm deliveries from the Government were 1,089,000 kilowatts, interruptible deliveries were 246,000 kilowatts, and 137,000 kilowatts were purchased from non-Federal sources.

TABLE III.—Sales of electric energy by classes of customers

	Fiscal year 1961		Fiscal year 1960		Percent increase
	Millions of kilowatt-hours	Mills per kilowatt-hour	Millions of kilowatt-hours	Mills per kilowatt-hour	
Publicly owned utilities: ¹					
Firm.....	10,876	2.72	10,418	2.71	4.4
Nonfirm.....	198	2.51	135	2.52	45.7
Total.....	11,074	2.71	10,553	2.70	4.9
Privately owned utilities:					
Firm.....	3,587	2.23	4,599	2.16	-22.0
Nonfirm.....	722	2.50	954	2.50	-24.3
Total.....	4,309	2.28	5,553	2.21	-22.4
Aluminum plants:					
Firm.....	7,431	2.01	7,761	1.98	-4.2
Nonfirm.....	1,128	1.76	1,167	1.82	-3.3
Total.....	8,559	1.98	8,928	1.96	-4.1
Other industries: ²					
Firm.....	4,193	2.24	4,098	2.26	2.3
Nonfirm.....	393	2.24	515	2.20	-23.7
Total.....	4,586	2.24	4,613	2.25	-0.6
Total energy:					
Firm.....	26,087	2.37	26,876	2.33	-2.9
Nonfirm.....	2,441	2.11	2,771	2.16	-11.9
Total.....	28,528	2.35	29,647	2.32	-3.8

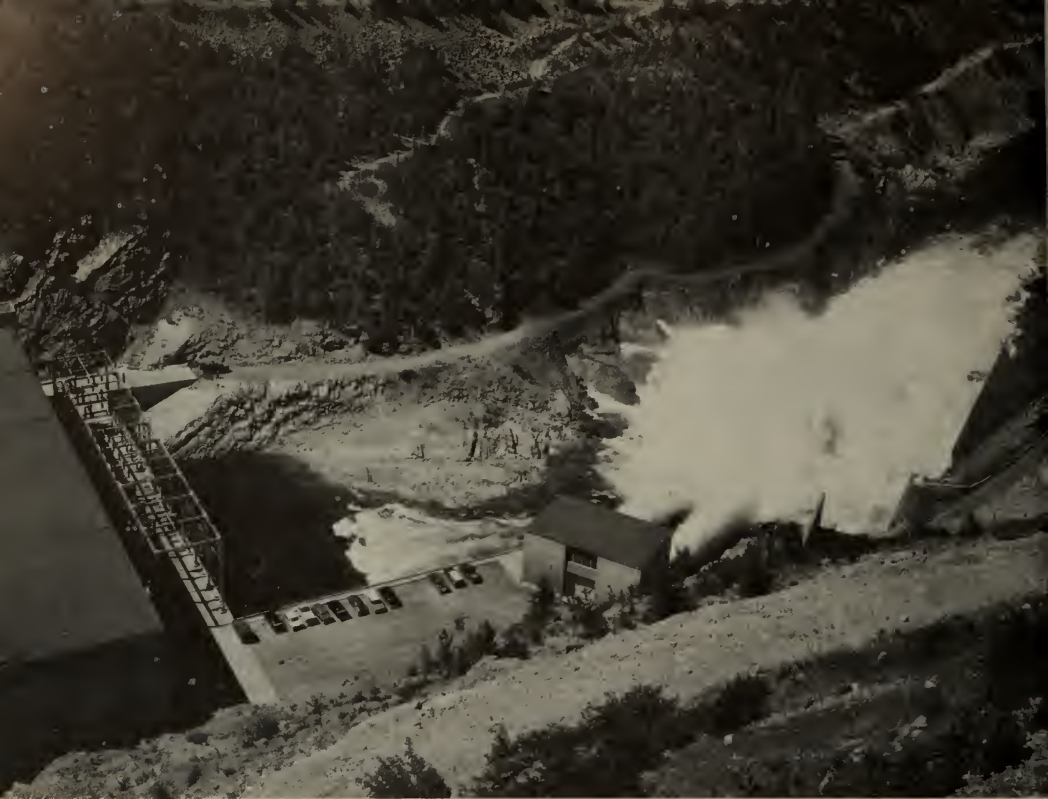
¹ City of Richland billed to Atomic Energy Commission July through October 1959. Data have been shifted from Federal agencies for comparative purposes.

² Includes Federal agencies.

Construction Program

Bonneville Power Administration's grid was expanded by the addition of 196 circuit miles of transmission lines, 363,625 kilovolt amperes of substation transformer capacity and 534,360 kilovolt amperes of reactive. At the close of the year, the grid consisted of 8,224 miles of transmission lines, 14,472,747 kilovolt amperes of transformer capacity and 2,435,545 kilovolt amperes of reactive. Eight new substations were added to the system for a total of 208 substations.

Major facilities completed include the 113 mile, 287,000 volt line between Columbia, near Wenatchee, Washington and Covington, near Seattle, Wash., to integrate into the system and to carry the output of Grant County Public Utility District's Priest Rapids and Chelan County Public Utility District's Rocky Reach hydroelectric projects into the Puget Sound area; a 23 mile, 230,000 volt line from Rocky Reach hydroelectric project to Columbia, near Wenatchee, to integrate the output into the BPA system; an additional 230,000 volt line from The Dalles hydroelectric project and the Big Eddy



Water from the Hungry Horse storage reservoir puts on a spectacular display as it leaves the generator penstocks. Before it reaches the sea, it will generate additional power at every major Federal and non-Federal Columbia River power project downstream from Hungry Horse.

substation, to carry added generation; a 53 mile, 115,000 volt line between DeMoss and Fossil, Oreg., to improve service to the electric cooperatives in north central Oregon. An additional 250,000 kilovolt ampere transformer was installed at the Longview substation to serve the load growth in that area.

Construction was underway at the close of the fiscal year on a 128 mile, 345,000 volt line from Chelan County Public Utility District's Rocky Reach hydroelectric project to Maple Valley, near Seattle, Wash., to bring the generation to western Washington; a 9 mile, double circuit 115,000 volt line to integrate the output of the Corps of Engineers' Ice Harbor hydroelectric project into the BPA system near Pasco, Wash.; an 81 mile, 345,000 volt line, between The Dalles hydroelectric project and McLoughlin substation, near Oregon City, Oreg.; a 130 mile, 115,000 volt line between Redmond and Burns, Oreg.; and a 5 mile, 115,000 volt line between the Corps of Engineers' Hills Creek hydroelectric plant and Oakridge, Oreg.



A line crew working at the 4,000-foot level in the rugged Cascade range near Snoqualmie Pass, prepare to place the bridge in place on a 115-foot steel transmission tower of the Rocky Reach-Maple Valley 345,000 volt transmission line. The 128-mile line, scheduled for initial energization at 230,000 volts this winter, carries power from the Rocky Reach and other mid-Columbia projects to western Washington load centers.

Energy Sales of 28.5 Billion Kw.-hr.

During fiscal year 1961, BPA sold 28.5 billion kilowatt-hours of electric energy for \$67,100,000, an average of 2.35 mills per kilowatt-hour. Energy sales were approximately 4 percent below the previous year.

Percentage distribution of energy sales by classes of customers for fiscal year 1961 follow:

	Number of customers, June 1961	Energy sale by percent of total
Publicly owned utilities.....	81	38.8
Privately owned utilities.....	8	15.1
Aluminum industry.....	9	30.0
Other industries and Federal agencies.....	18	16.1
Total.....	116	100.0

Power Rates

Bonneville Power Administration has maintained the same basic wholesale rate level since beginning of operations in 1938. Pursuant to action taken during 1959, the existing rates will continue until December 20, 1964.

During fiscal year 1961, BPA delivered about 67 percent of its energy sales at an average cost of 2.19 mills per kilowatt-hour to industry sales and to utilities having substantial generating facilities.

A summary of energy sales for fiscal year 1961, classified by rate schedules, is shown in table IV.

TABLE IV.—Sales of electric energy by rate schedules fiscal year 1961

Rate schedule	Millions of kilowatt-hours	Percent of total	Percent change from fiscal year 1960	Mills per kilowatt-hour
C-4 ¹	19,105	67.0	-7.2	2.19
F-4.....	51	0.2	-8.9	4.63
A-4 ¹	2,373	8.3	10.0	1.68
E-4.....	5,972	20.9	5.9	3.08
H-3.....	1,013	3.6	-14.3	2.50
Space heating.....	14	(²)	(³)	1.00
Total.....	28,528	100.0	-3.8	2.35

Major features of rate schedules:

- C-4..... Kilowatt-year for transmission system firm power.
- F-4..... Demand-energy rate for firm power.
- A-4..... Kilowatt-year rate for at-site firm power.
- E-4..... Demand-energy rate for firm power for resale to ultimate consumers.
- H-3..... Energy rate for dump, emergency, breakdown or experimental service.
- Space heating..... Special space heating rate applicable in vicinity of Grand Coulee plant.

¹ Includes interruptible industrial sales.

² Less than 0.05%.

³ Initial service under this rate September 1959.

Financial Condition

Since fiscal year 1957 the BPA gross operating revenues have not kept pace with generating capability. Gross revenues for 1961 were only 5 percent more than for 1957. During this same 4 year period,



Chief Joseph Dam, one of the recently completed mid-Columbia projects supplies power for central and northwest Washington loads of Bonneville Power Administration.

installed capacity increased 32 percent. In the preceding 3 years, that is, 1957 compared with 1954, revenues increased 47 percent and capability 49 percent.

The lack of continued growth in gross revenues during the past 4 years reflects the economic recession, which had a particularly severe impact upon power sales to the aluminum industries served by BPA, and the development of non-Federal power supplies by BPA customers, thereby displacing its sales.

This adverse sales trend, together with increased costs which necessarily have accompanied the additions to both transmission and generating plant capacities, has resulted in unfavorable net financial results of operations during these 4 years.

Nevertheless, as of June 30, 1961, the BPA was \$26.4 million ahead of schedule in the repayment of its investment to the Treasury. These financial results pertain only to the Bonneville Power Administration and not to the U.S. Columbia River Power System which includes the generating projects as well as the Administration's transmission system. For the power system as a whole, the repayment of

the investment, on June 30, 1961, was \$37.8 million ahead of schedule. These data are computed on a payout basis.

Revenues have not kept pace with the additions to the power system's generating capability. As a result, substantial amounts of both firm and secondary power have gone unsold. The accompanying chart compares the amounts of unsold power with the payout deficit for the power system as a whole during the past 4 years together with a forecast for the ensuing 4 years. In every year the unrealized revenues were more than twice the total system payout deficit. In other words, had half, or even considerably less than half in some years, of the available unsold capability been marketed, the power system would have continued to operate in the black.

Bonneville Power Administration is sold out of long-term firm power. Historically, the Administration has had no difficulty in marketing its firm power when available on a long-term contractual basis. Presently, BPA has inquiries from established industrial firms for substantial quantities of long-term firm power. The principal current financial problem is developing markets for large blocks of secondary power and unsold short-term firm power held in reserve for normal load growth.

Unsold power in 1961 represented \$31.5 million in potential gross sales and the forecast for 1962 is equivalent to \$30.7 million of potential revenue. The chart indicates there will be substantial amounts of unsold power through 1965, but it is anticipated that all of the firm power capability will have been sold by that time.

Financial Results

Financial results of operations for the Bonneville Power Administration for fiscal year 1961 compared with fiscal year 1960 are shown in summary form in tables V, VI and VII. These data are necessarily preliminary inasmuch as the annual audit by the General Accounting Office was not complete at the time of the preparation of these statements. However, it is anticipated that final figures will not differ materially from those now available.

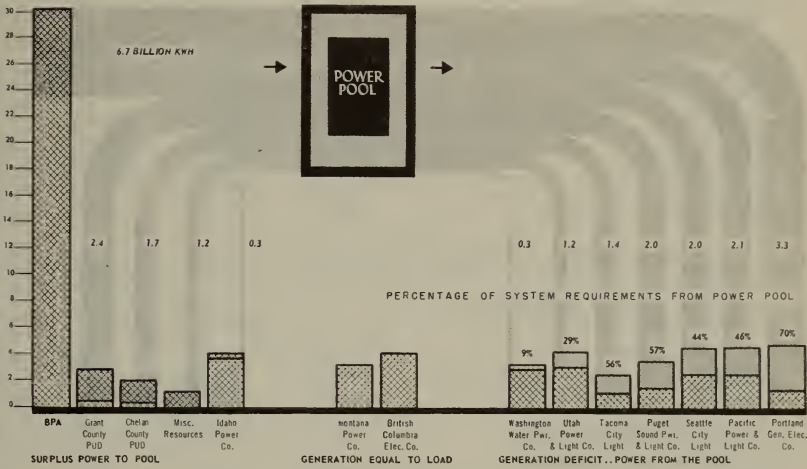
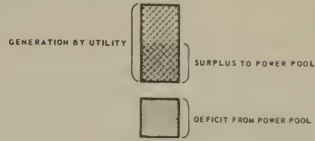
The financial information is presented on two bases: (1) an accrued cost accounting basis in accordance with the uniform system of accounts prescribed by the Federal Power Commission for electric utilities, and (2) a payout basis.

The principal differences between these methods are: (1) payout is based on cash receipts rather than accrued revenues but it does include accrued expenses with the exception of noncash exchange account items; (2) in lieu of depreciation expense payout substitutes

NET OPERATIONS ENDING JUNE 30, 1961

Northwest Power Pool

BPA SUPPLIED 54.5% OF NET ENERGY REQUIREMENTS



amortization of the capital investment over periods of time shorter than the estimated service lives used in cost accounting for determining depreciation expense; and (3) payout provides for use of power revenue receipts to assist in the repayment of irrigation costs, whereas cost accounting does not include such payments as power costs.

It should be noted that payout requirements govern the system rate level because cash receipts must be adequate to cover total payout requirements assigned to be repaid from power operations for all of the projects in the Columbia River Power System.

Statement of Revenues and Expenses

A comparative statement of the revenues and expenses of the Bonneville Power Administration on a cost accounting basis for the fiscal years 1960 and 1961 is presented in table V. Energy sales decreased by \$1,949,506 or 2.83 percent during the year. Other electric revenue increased by \$653,152, or 31.8 percent, the large increase being due mainly to the increase in wheeling energy from non-Federal projects to load centers. Total operating revenue in 1961 was \$69,701,865, which was 1.83 percent lower than the revenue of \$70,998,219 for 1960.

TABLE V.—*Bonneville Power Administration: Comparative statement of revenues and expenses, fiscal years 1960 and 1961 (preliminary)*

[Cost accounting basis]

	Fiscal year 1960	Fiscal year 1961	Increase or decrease	Total to June 30, 1961
Operating revenues:				
Sales of electric energy.....	\$68,944,050	\$66,994,544	(\$1,949,506)	\$785,236,987
Other electric revenue.....	2,054,169	2,707,321	653,152	19,014,972
Total operating revenue.....	70,998,219	69,701,865	(1,296,354)	804,251,959
Less revenues allocated to generating projects:				
Bonneville Dam.....	2,100,000	2,100,000	-----	67,925,430
Columbia Basin project.....	12,800,000	12,800,000	-----	187,158,680
Hungry Horse.....	3,833,000	3,833,000	-----	31,073,210
Albeni Falls.....	1,400,000	1,200,000	(200,000)	9,775,000
McNary.....	9,000,000	8,200,000	(800,000)	72,110,000
Detroit-Big Cliff.....	1,700,000	1,401,000	(300,000)	14,240,000
Lookout Point-Dexter.....	1,700,000	1,400,000	(300,000)	11,400,000
Chief Joseph.....	6,500,000	6,500,000	-----	30,650,000
Yakima-Kennewick and Roza.....	345,000	345,000	-----	1,631,000
The Dalles.....	7,700,000	10,800,000	3,100,000	25,820,000
Total revenues allocated to generating projects.....	47,078,000	48,578,000	1,500,000	451,783,320
Operating revenues allocated to Bonneville Power Administration.....	23,920,219	21,123,865	(2,796,354)	352,468,639
Less operating expenses:				
Purchased power.....	652,314	696,859	44,545	10,204,716
Operation, maintenance, administration, etc.....	11,493,368	12,290,512	797,144	133,249,978
Total operating expenses.....	12,145,682	12,987,371	841,689	143,454,694
Less interest and other deductions:				
Interest on Federal investment.....	8,707,281	9,259,321	552,040	91,078,057
Less amount charged to construction.....	389,960	555,390	165,430	8,257,159
Miscellaneous income deductions, net.....	9,423	23,907	14,484	1,507,916
Total interest and other deductions.....	8,326,744	8,727,838	401,094	84,328,814
Net revenues available for depreciation and amortization of Federal investment.....	3,447,793	(591,344)	(4,039,137)	124,685,131
Less depreciation and amortization.....	12,067,262	11,670,101	(397,161)	121,578,808
Net revenues.....	(8,619,469)	(12,261,445)	(3,641,976)	3,106,323

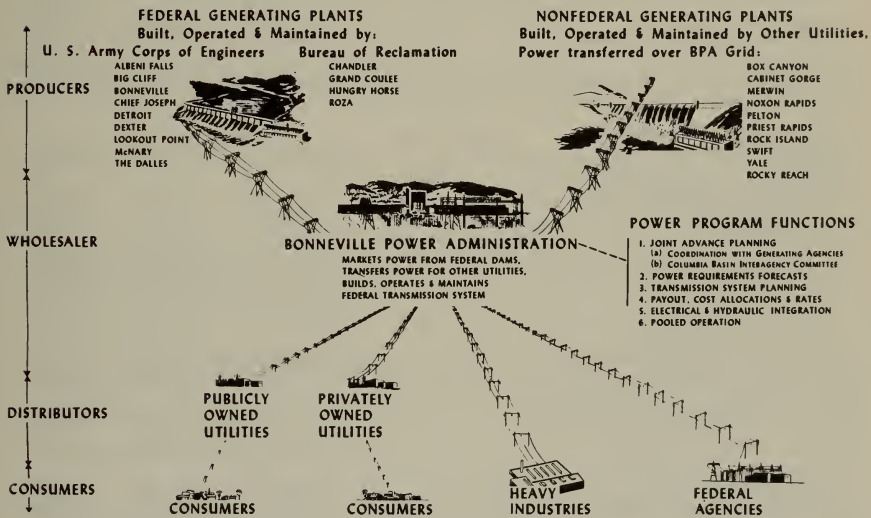
In fiscal year 1961, after the allocations of receipts to the generating projects, revenues were \$591,344 less than the BPA's aggregate expenses for operation, maintenance, administration, marketing and interest. This deficit compares with a surplus of \$3,447,793 in 1960. After provision for depreciation expense, \$11,670,101, the net deficit in 1961 was \$12,261,445 compared with \$8,619,469 in 1960.

On a cumulative basis through June 30, 1961, revenues available to BPA after allocations to the generating projects were \$352,468,639. These revenues exceeded the BPA's total operating expenses of \$143,454,694 plus total interest and miscellaneous expenses of \$84,328,814 by \$124,685,131. This excess provided for cumulative depreciation expense of \$121,578,808, and resulted in net revenues of \$3,106,323.

Revenues allocated to the Federal generating projects that supplied power to the Bonneville Power Administration totaled \$48,578,000

in 1961, an increase of \$1,500,000 over 1960. These allocations are independent of the amount of energy generated but are geared to the schedules necessary to repay the costs allocated to power, and for financial assistance in irrigation repayments. However, in recent years actual allocations have been less than the scheduled amounts because of the unfavorable revenue trend. Nevertheless, as stated elsewhere, because of surpluses accumulated in earlier years, the repayment of the investment continues to be substantially ahead of schedule. Such costs include operating expenses, interest on and amortization of the power capital investment at all the generating projects, plus financial assistance to irrigation repayment in the case of the Columbia Basin and the Yakima projects.

Functions of Bonneville Power Administration



Comparative Balance Sheet

Table VI is a condensed statement of assets and liabilities on a cost accounting basis for the investment in Bonneville Power Administration as of June 30, 1960 and 1961. Electric transmission plant in service at the end of 1961 was \$471,363,377, an increase of \$20,433,786 during the year. Construction work in progress at the end of the year was \$31,997,123, an increase over 1960 of \$4,328,398. The total investment in electric transmission plant increased \$24,771,404.

TABLE VI.—*Bonneville Power Administration: Condensed statement of assets and liabilities as of June 30, 1960 and 1961 (preliminary)*

[Cost accounting basis]

	Fiscal year 1960	Fiscal year 1961	Increase or decrease
ASSETS			
Electric plant—original cost:			
Electric plant in service.....	\$450,929,591	\$471,363,377	\$20,433,786
Electric plant leased to others.....	445,307	445,307	
Construction work in progress.....	27,668,725	31,997,123	4,328,398
Electric plant held for future use.....	869,741	878,961	9,220
Total electric plant.....	479,913,364	504,684,768	24,771,404
Less reserve for depreciation.....	96,992,049	106,683,039	9,691,050
Original cost less reserves.....	382,921,315	398,001,669	15,080,354
Current assets:			
Unexpended funds.....	20,379,457	13,650,761	(6,728,696)
Special funds.....	692,210	738,437	46,227
Accounts receivable:			
Customers.....	10,390,953	9,579,440	(811,513)
Others.....	352,286	355,860	3,574
Material and supplies.....	5,058,948	4,523,980	(534,968)
Total current assets.....	36,873,854	28,848,478	(8,025,376)
Other assets and deferred charges.....	1,864,284	598,451	(1,265,833)
Total assets.....	421,659,453	427,448,598	5,789,145
LIABILITIES			
Investment in U.S. Government:			
Congressional appropriations.....	606,329,912	636,233,139	29,903,227
Transfers ¹	18,114,857	19,096,834	981,977
Interest on Federal Investment:			
Charged to operations.....	73,111,455	81,818,736	8,707,281
Charged to construction.....	8,707,281	9,259,321	552,040
Continuing fund.....	1,833,035	1,833,035	
Gross investment.....	708,096,540	748,241,065	40,144,525
Less funds returned.....	309,865,071	332,133,255	22,268,184
Net investment.....	398,231,469	416,107,810	17,876,341
Accumulated net revenues:			
Balance June 30, 1959 and 1960.....	23,987,237	15,367,768	(8,619,469)
Net revenue for year.....	(8,619,469)	(12,261,445)	(3,641,976)
Balance June 30, 1960 and 1961.....	15,367,768	3,106,323	(12,261,445)
Total investment.....	413,599,237	419,214,133	5,614,896
Current and accrued liabilities:			
Accounts payable.....	5,329,472	5,325,644	(3,828)
Employees accrued leave.....	2,261,177	2,471,786	210,609
Total.....	7,590,649	7,797,430	206,781
Deferred credits.....	469,567	437,035	(32,532)
Total liabilities.....	421,659,453	427,448,598	5,789,145

¹ Consists of goods and services furnished without charge by other Federal agencies less such items furnished to other agencies by BPA.

The gross investment of the Federal Government in Bonneville Power Administration increased \$40,144,525 in fiscal year 1961. These gross amounts include, in addition to transmission capital investment, the amounts necessary for operation, maintenance and interest expenses. Funds returned to the Treasury by BPA after deducting amounts allocated to the generating projects increased \$22,268,184, with the result that the unpaid investment owing to the Treasury increased only \$17,876,341.

Repayment of Federal Investment

The amount of the Federal investment in the Bonneville Power Administration and the status of repayment on a payout basis as of June 30, 1961, are shown in table VII. From the inception of operations to June 30, 1961, the Bonneville Power Administration has returned cash receipts to the Treasury in the aggregate amount of \$783,916,575. Of this total, \$451,783,320 has been allocated to the generating projects and \$332,133,255 to the transmission system. These receipts have reimbursed the Federal Treasury in full for Bonneville Power Administration's expenses of operation, maintenance, marketing, administration, etc., totaling \$122,396,342, and have repaid interest on the transmission investment in the amount of \$82,820,898 with the balance of \$126,916,015 applied to repayment of the capital investment. This capital repayment exceeded scheduled amortization requirements by \$26,398,015 and represented repayments of 24 percent of the total capital investment of \$529,373,064.

TABLE VII.—*Bonneville Power Administration—summary of Federal investment in transmission system and repayment as of June 30, 1961 (preliminary)*

[Payout basis]

	Gross investment	Repayments	Net investment
Investment in current expenses:			
Operation, maintenance, etc.....	\$122,396,342	\$122,396,342	-----
Interest.....	82,820,898	82,820,898	-----
Total current expenses.....	205,217,240	205,217,240	-----
Investment in capital assets:			
Electric plant investment and other capital assets.....	529,373,064	¹ 126,916,015	\$402,457,049
Unexpended appropriations.....	13,650,761	-----	13,650,761
Total capital investment.....	543,023,825	126,916,015	416,107,810
Total federal investment.....	748,241,065	² 332,133,255	416,107,810

¹ Consists of \$100,518,000 scheduled amortization and \$26,398,015 repaid in excess of scheduled requirements. The total repayment, \$126,916,015 equals 24.0 percent of the invested capital of \$529,373,064.

² Total cash receipts covered into the U.S. Treasury by BPA to June 30, 1961..... \$783,916,575
 Less amounts allocated to generating projects..... 451,783,320

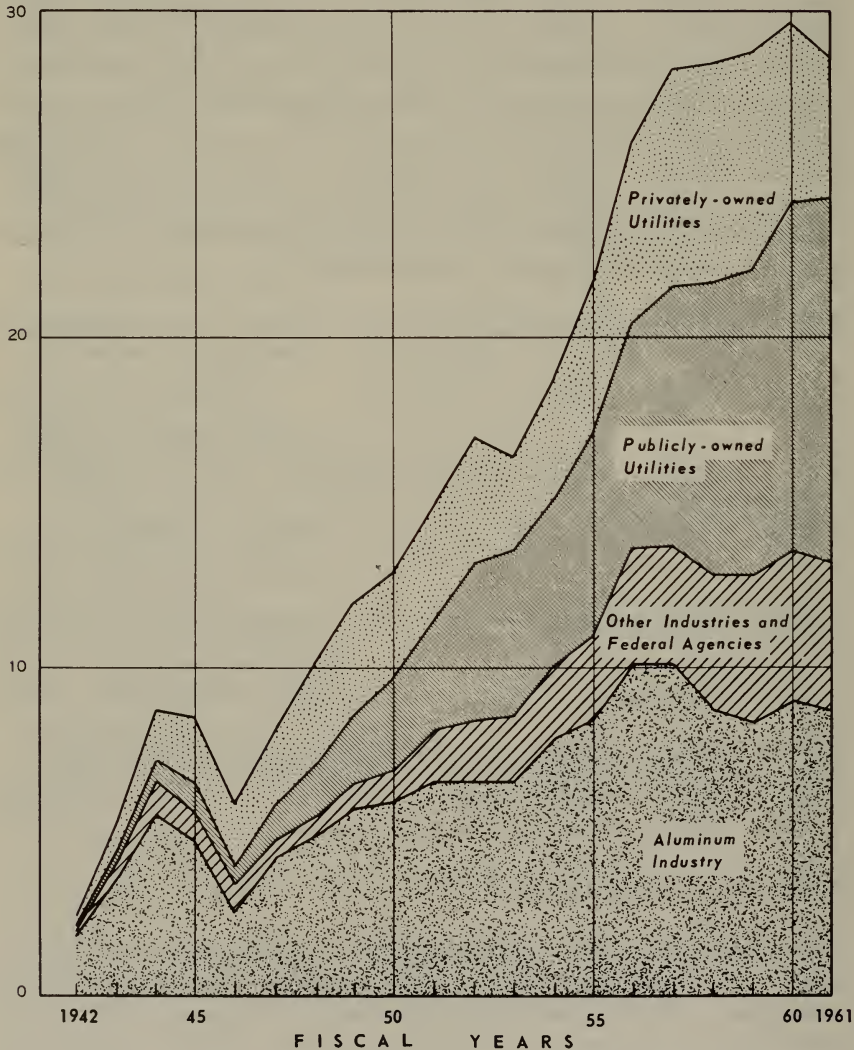
Cash receipts allocated to Bonneville Power Administration..... 332,133,255

Power Marketing Outlook

The Bonneville Power Administration is taking vigorous action to market both firm and secondary power supplies. This action includes reactivation of the Power Marketing and Utilization Division, together with a stepped up marketing program. Such a program is imperative if Bonneville Power Administration is to wipe out the current annual payout deficit and avoid the threat of increased power rates in the near future.

Sales of Electric Energy by Class of Customer

BILLIONS OF
KILOWATT HOURS



Significant developments during the year in power marketing included the Treaty with Canada relating to cooperative development of the water resources of the Columbia River Basin, the proposal for adding generators at Hanford, the study of the Pacific Northwest-Pacific Southwest intertie, and sale of additional firm power for new large electroprocess industries.

The Treaty with Canada was signed in January and ratified by the United States in March. Ratification is now pending in Canada. The Treaty would provide about 2 million kilowatts of dependable capacity in the United States, including the downstream benefits from three storage dams to be constructed in Canada as well as Libby Dam in the United States. Cost of power resulting from the Treaty under initial conditions will be about \$14 per kilowatt-year delivered at load centers.

A second development is the proposal to add power features to the reactor under construction at the Hanford Engineering Works. Waste steam thereby could be utilized to generate power. The President's budget proposal is to construct two generators at the plant and to coordinate this power with the United States Columbia River power system. Power under the dual-purpose stage would cost about \$13 per kilowatt-year at load centers and during the single-purpose stage it would be comparable in cost to alternative power sources. A power supply from Hanford would bridge the gap of 1964-65 and 1965-66 and enable the Bonneville Power Administration to immediately sell existing surplus power for industrial expansion. This surplus cannot be sold on a long-term basis at the present time because of a regional deficiency without the Hanford power in 1964-65.

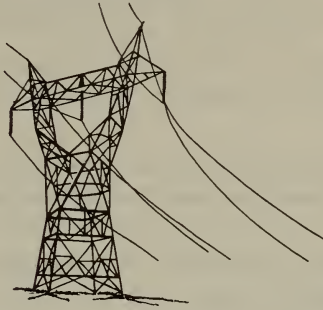
A third development is an investigation of a Pacific Northwest-Pacific Southwest extra-high voltage intertie. A five-man Task Force was appointed by the Secretary of the Interior, headed by Charles F. Luce, Administrator of the Bonneville Power Administration, and including H. P. Dugan of the Bureau of Reclamation at Sacramento, Calif.; M. A. Chase, an engineer in the Office of the Assistant Secretary for Water and Power; Morgan Dubrow and Bernard Goldhammer, both of the Bonneville Power Administration.

The Task Force is investigating the possibilities of an extra-high voltage intertie with the Pacific Southwest. Such an intertie would enable the Bonneville Power Administration to dispose of surplus secondary energy and possibly surplus peaking capacity. The intertie would also be useful in firming up capacity in the Pacific Northwest by import of off-peak energy from California. This year Bonneville had about \$30 million worth of unused power, part of which could be utilized with such an intertie.

Bonneville offered 150,000 average kilowatts of firm power in May 1960, with the requirement of the purchase of at least an equal amount of secondary power for industrial expansion. Contracts were executed during fiscal year 1961 to supply power for the expansion of the aluminum plant at The Dalles, Oreg., for a new plant at Wauna, Oreg., and for a plant at Anaconda, Mont., which will produce steel and other minerals from a slag pile from the smelter there.

Southwestern Power Administration

Douglas G. Wright, *Administrator*



THE SOUTHWESTERN POWER ADMINISTRATION is the Department of the Interior agency designated to market surplus electric power and energy generated at 14 water resource multiple-purpose reservoir projects of the Corps of Engineers in the Southwest, in accordance with the provisions of section 5 of the Flood Control Act of 1944.

Gross revenues for Southwestern Power Administration for fiscal year 1961 were \$14,953,011.48.

During fiscal year 1961, sales to private utilities accounted for 31 percent of the revenue dollar, electric cooperatives 57 percent, municipalities 9 percent, and public authorities 3 percent, as compared with fiscal year 1951 when private utilities accounted for 82 percent, electric cooperatives 16 percent, municipalities 2 percent, and public authorities 0 percent.

As of June 30, 1961, the original cost of Southwestern Power Administration transmission facilities totalled \$27,832,217.

Marketing

During fiscal year 1961, Southwestern Power Administration, after making intensive studies of its customers' power needs, initiated changes and amendments to some contracts, and continued negotiations with certain of its major wholesale power customers for the purpose of effectuating more complete integration of its power system with the other power systems of the Southwest area.

The goal is to provide preference customers served by Southwestern Power Administration with a more satisfactory and economical source of power supply to serve the ever-increasing electrical power loads on their respective systems, while at the same time assuring maximum benefits to preference customers by the most effective marketing of hydroelectric power produced from the nine Federal multi-purpose projects now in operation, as well as that which will be produced from five such projects now under construction and scheduled for operation in the near future. In order to accomplish this goal, Southwestern Power Administration is continually studying its power marketing program in its effort to provide maximum use of such generating capacity.

One major integrating arrangement, which will provide load center service to five REA electric distribution cooperatives in western and northern Arkansas, was accomplished during fiscal year 1961. This arrangement, effected through the contractual agreement of the Arkansas State Electric Cooperative, Inc., North Little Rock, Ark., the Southwest Electric Power Company, Shreveport, La., and Southwestern Power Administration, provides that SPA will be marketing peaking hydroelectric power in the amount of 25,000 kw in July 1964, 27,500 kw in July 1965 and will thereafter gradually increase this amount to the maximum of 62,000 kw in July 1970; the Arkansas State Electric Cooperative, Inc., will construct a 50,000 kw thermal plant near Ozark, Ark., scheduled for completion at the end of fiscal year 1962; and the result will be integrated operation of the power systems of Southwest Electric Power Company, Southwestern Power Administration, and the Cooperative.

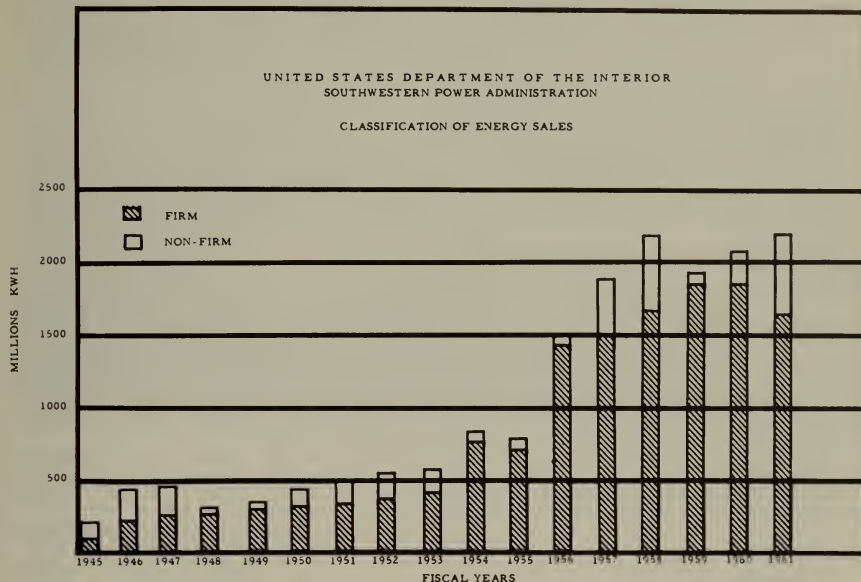
A similar broad integration arrangement of the power systems in Missouri, initiated early in fiscal year 1961, is still being actively negotiated. This arrangement provides for the power systems of six G&T Cooperatives and three private utility companies in Missouri, to be integrated with Southwestern Power Administration for marketing power in that area.

Contracts

Under the terms of the power marketing contracts accomplished during fiscal year 1961 with the Cities of Jonesboro, Arkansas, and Carthage, Missouri, Southwestern Power Administration will sell these municipalities blocks of peaking power, interruptible capacity, and dump energy.

Operations under these contracts will become effective upon the completion of (1) approximately 40 miles of 161 kv transmission line

now being constructed by Jonesboro for interconnection at a point near Water Valley, Ark., with the Federal high voltage grid, and (2) approximately two miles of 69 kv transmission line being constructed by Carthage for interconnection at the Southwestern Power Administration's substation at Carthage, Mo. The scheduled dates for the completion of these transmission lines is in the spring of 1962 for Jonesboro, and the summer of 1961 for Carthage.



Sales

Southwestern Power Administration's electric power sales in fiscal year 1961 increased to 554,520 kilowatts from 545,405 kilowatts in fiscal year 1960, and to 2,196,367,916 kw.-hr. from 2,060,866,640 kw.-hr. in fiscal year 1960. The sales were made to 29 public bodies, 10 REA electric distribution cooperatives, 9 REA G&T cooperatives,¹ one industry (aluminum), and 7 private electric utilities.

The sales of kilowatt-hours of energy by class of customer during fiscal year 1961 were as follows:

	<i>Fiscal year 1961 millions of kw.-hr.</i>
Municipalities.....	192.0
REA electric cooperatives.....	3,310.7
Public authorities.....	63.3
Defense industry (aluminum).....	505.4
Private electric utilities.....	125.0
Total.....	2,196.4

¹ Includes Tex-La Electric Cooperative.

Installed and Dependable Capacity

The installed and dependable capacity and current capability in both the hydroelectric plants and the steam electric plants in Southwestern Power Administration's interconnected system are shown in the following table:

TABLE No. 1

Project or plant	State	River basin	Installed capacity kilowatts	Dependable capacity kilowatts	Capability June 30, 1961 kilowatts
Hydroelectric interconnected system:					
Bull Shoals.....	Arkansas.....	White.....	160,000	100,000	184,000
Denison.....	Oklahoma-Texas.....	Red.....	70,000	54,000	80,000
Fort Gibson.....	Oklahoma.....	Grand.....	45,000	45,000	48,000
Norfolk.....	Arkansas.....	White.....	70,000	56,000	80,000
Table Rock.....	Missouri.....	do.....	100,000	69,000	¹ 110,000
Tenkiller Ferry.....	Oklahoma.....	Illinois.....	34,000	28,000	39,000
Subtotal.....	.....	.....	479,000	352,000	541,000
Isolated plants:					
Blakely Mountain.....	Arkansas.....	Ouachita.....	75,000	75,000	75,000
Narrows.....	do.....	Little Missouri.....	17,000	14,000	19,000
Whitney.....	Texas.....	Brazos.....	30,000	24,000	29,000
Subtotal.....	.....	.....	122,000	113,000	123,000
Total hydroelectric.....	.....	.....	601,000	465,000	664,000
Steam:					
Central Electric Power Coop.....	Missouri.....	.....	15,000	16,000	16,000
N.W. Electric Power Coop.....	do.....	.....	40,000	42,000	² 21,000
Western Farmers Electric Coop.....	Oklahoma.....	.....	30,000	31,000	31,000
Total steam.....	.....	.....	85,000	89,000	68,000
Grand total.....	.....	.....	686,000	554,000	732,000

¹ Units 3 and 4 under test during June. Commercial operation of these units expected during July.

² One unit out of service for repair.

Mechanical difficulties and resultant overhaul kept both Unit No. 3 and No. 4 at Table Park project out of commercial operation, except for periods of testing, during a part of the fiscal year. With these two additional units in operation, the installed capacity of the interconnected hydroelectric system is 701,000 kilowatts.

Inflows into the reservoirs of the projects interconnected by the SPA transmission systems were greater than median for 8 months of fiscal year 1961, with average flow for the year being approximately 150 percent of median. Storage in the reservoir system was 96 percent of full pool at the beginning of the fiscal year, and was approximately 125 percent full on June 30, 1961, with flood storage in four of the six interconnected projects.

The total net hydroelectric generation of fiscal year 1961 was 1,987.2 million kilowatt-hours, which was almost equal to the maximum annual generation of the fiscal year 1957. The net generation from the



Springfield dispatcher's office, Springfield, Mo., is the nerve center of SPA's electric transmission system in Missouri and Arkansas. Information regarding the power flow between the SPA system and other systems is telemetered into this office for use in automatic load control equipment.

interconnected hydroelectric system amounted to 1,665.5 million kilowatt-hours.

The amounts of energy generated by G&T thermal electric plants for marketing by Southwestern Power Administration during fiscal year 1961 are as follows:

	<i>Kilowatt-hours</i>
Central Electric Power Cooperative (Chamois, Mo.)-----	48, 094, 000
N.W. Electric Power Cooperative (Missouri City, Mo.)-----	111, 197, 000
Western Farmers Electric Cooperative (Anadarko, Okla.)-----	108, 063, 500
Total thermal-----	267, 354, 500

In addition to the generation from the hydroelectric and fuel electric plants whose output is marketed by SPA, energy was obtained from other sources in the amount of 102,370,188 kilowatt-hours for delivery to SPA customers during fiscal year 1961.

Southeastern Power Administration

Chas. W. Leavy, *Administrator*



DURING FISCAL 1961, Southeastern Power Administration of the Department of the Interior marketed 1,263,400 kilowatts of capacity (with peak generation of 1,488,850 kilowatts) and 3,861,792,445 kilowatt-hours of energy. It was sold to 52 public bodies, 74 rural electric cooperatives, 1 Federal agency, and 5 privately-owned utilities.

Sales during the year earned \$19,711,259.50, as compared with \$20,650,668.97 for the previous year, bringing the revenue earned in all years to total \$130,980,082.91.

The output was generated at 11 Corps of Engineers projects: Wolf Creek, Dale Hollow, Center Hill, Old Hickory, and Cheatham projects in Kentucky and Tennessee; Allatoona and Buford projects in Georgia; Clark Hill project in Georgia and South Carolina; Jim Woodruff project in Florida; and John H. Kerr and Philpott projects in Virginia.

The installed generating capacity of 1,283,600 kilowatts includes a 12,000 kilowatt unit which was placed in commercial operation at Cheatham project in Tennessee during the year. Construction by the Corps continued on three projects (Walter F. George in Georgia and Alabama, Hartwell in Georgia and South Carolina, and Barkley in Kentucky). The construction underway will add 524,000 kilowatts of installed capacity.

The combined output of Wolf Creek, Center Hill, and Dale Hollow projects continued to be sold to the Tennessee Valley Authority under a long-term contract. The entire output of the Old Hickory and Cheatham projects was sold under another long-term contract with TVA.

The Philpott project output was sold to the Appalachian Power Company under temporary arrangements during a portion of the year pending the conclusion of negotiations for long-term sale. Under a contract effective March 31, 1961, providing for the integrated operation of the Philpott and Kerr projects, the output of Philpott and two-thirds of the Kerr project output were sold to the Virginia Electric and Power Company and to 17 cooperatives in Virginia and North Carolina; the remainder of the Kerr output continued to be sold under long-term contracts to Carolina Power and Light Company, and to 16 public bodies and cooperatives in North Carolina.

Part of the Clark Hill project output was sold under long-term contracts to two public bodies in South Carolina. The one-half of the output of the Clark Hill project and the entire output of the Allatoona and Buford projects were sold under long-term contracts to Georgia Power Company and 86 public bodies and cooperatives in Georgia. The output of the Jim Woodruff project was sold under long-term contracts to Florida Power Corporation and 6 public bodies and cooperatives in Florida.

The Congress appropriated \$280,000 for headquarters operations and maintenance for fiscal year, and \$520,000 for the purchase of firming energy and the payment of wheeling fees. Southeastern's working force numbered 34 employees at the beginning of fiscal 1961 and 33 employees when the year ended.

Office of Saline Water

Charles F. MacGowan, *Director*



ON JUNE 21, PRESIDENT KENNEDY pressed a special magnesium button in his office in the White House to signal the start-up of the 1-million gallon per day saline water conversion demonstration plant at Freeport, Tex., the first demonstration plant in the Nation.

In his remarks, which were broadcast to the crowd assembled at Freeport for the ceremony, the President said: "This is a work which in many ways is more important than any other scientific enterprise in which this country is now engaged. It serves the interests of men and women every place. It can do more to raise men and women from lives of poverty and desperation than any other scientific advance."

A bill was submitted near the end of the fiscal year to expand and extend the Saline Water Conversion Program. In his letter transmitting the draft bill to the Congress, the President said: "This bill will provide the Department of the Interior with a wide variety of tools to attack the saline water conversion cost barrier. It contemplates a major acceleration of current programs of basic and applied research, and permits the construction of conversion plants far larger than any now in existence to test the feasibility of known and yet to be developed processes."

The intense personal interest of the President has focused international attention on the activities of the Office of Saline Water. The Office is receiving an ever-increasing number of visitors and letters from foreign countries, especially those in the more arid areas of the world, seeking information on current developments. The Office of Saline Water is rapidly becoming the focal point and clearing house for most international efforts in this field.

Basic Research

To maintain a successful research and development program, great emphasis must be placed on basic or fundamental research. Low cost saline water conversion has not yet been achieved and thus new ideas and new processes are needed which can result only from such basic studies.

To date the Saline Water Conversion Program has been primarily an engineering development effort with emphasis on basic hardware. Progress has been made but relatively little effort has been expended toward studying basic phenomena so necessary in developing new processes or improving existing ones. Hence, it was decided that a detailed technical review of the basic research activities in the general field of desalting be undertaken.

As a result, a review was organized and carried out by the National Academy of Sciences-National Research Council at Woods Hole, Mass., under a grant from the Office of Saline Water. Several senior scientists and engineers attended and participated in the review and several recommendations and suggestions were made relating to saline water conversion. It was established that a much broader basic research program would be highly desirable.

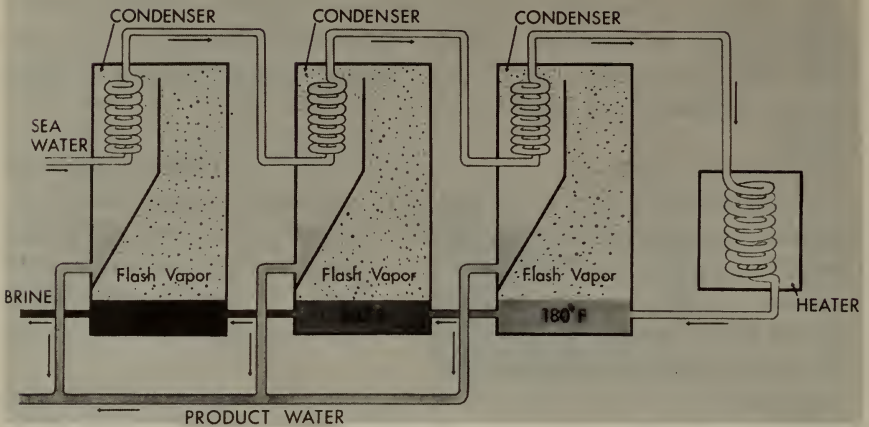
Current research includes laboratory and theoretical investigations on various new conversion processes, scale formation, membrane development (ion-selective and osmotic types), heat transfer, corrosion, use of radioisotopes, sea water conversion by-products, etc.

Studies are underway to determine the possibility of utilizing radioisotopes as a source of heat for various conversion processes. Preliminary results have indicated that certain calcined fission products may compete favorably with conventional fuels as an energy source. To date, the investigations have included detailed economic studies, operation analyses, design studies on the heat source, and a compatibility study between the heat source and various saline water conversion processes.

One approach to resolving the scale problem is to remove the scale-forming elements in the pretreatment of raw sea water. Research is underway to determine the economic feasibility of preparing a high-analysis fertilizer from the elements removed in such a pretreatment and thus pay (all or partially) for this additional operation which would virtually eliminate the scale problem.

Work is continuing on the properties of gas hydrates. In the hydrate process, the water reacts with a hydrating agent to form a solid hydrate which can be separated from the salt solution (sea water). After separation, the hydrate is decomposed into the product water and the agent which can be recovered. This process is similar

FLASH DISTILLATION



Schematic diagram of the process to be utilized in the 1 million gallons per day saline water conversion demonstration plant now under construction at San Diego, Calif.

to the freezing process in many ways, however, due to the fact that the various hydrates have different thermo-dynamic properties, optimum operating conditions can be achieved by appropriate selection of the hydrating agent.

Basic research on the development of osmotic membranes (those that reject salt but permit the passage of water) is progressing. The current work has two principle objectives: One is to determine the molecular characteristic of the Polymer films (membranes) that will insure prolonged high transmission rate of water and negligible transmission of salts. The other is to prepare films having these superior transmission characteristics and good durability.

Studies on mechanisms of scale formation, use of acoustic vibrations to improve heat transfer in distillation units, corrosion of construction materials by sea water, and electrochemical demineralization of water with carbon electrodes of large surface area are showing considerable progress.

Processes Development

Applied research activities continued on many conversion problems with development emphasis being on processes in the major groups of distillation, membrane, separation by freezing and other chemical, electrical or physical conversion methods.

Several distillation processes are the farthest advanced with multiple stage flash distillation and very recently, the long tube vertical

multiple effect distillation receiving increasing attention for commercial use in converting sea water.

However, research and development on distillation processes has continued both in the investigation of new systems and in improvements of processes now in use by such means as developing better methods of scale control. For example, the pilot equipment used in developing the LTV process in the first demonstration plant has continued operation in order to develop better means of controlling calcium sulphate scale. The systems based on the development of wiped film evaporator have advanced to the building of a 1,000 gallons per day prototype unit for Naval use.

New research studies were initiated on the prevention of scale by application of sludge recirculation techniques to multiple stage flash evaporation. Also, the equipment was used to investigate means of preventing scale formation in the vapor compression forced-circulation demonstration plant which will be built at Roswell, N. Mex. In that connection, the assistance of the Corps of Engineers was obtained in operating experimental units in the field at the Roswell site. The vapor reheat process in which there are no metallic heat transfer barriers advanced closer to pilot plant development. The freezing process will be demonstrated in a 250,000 gallons per day plant at Wrightsville Beach, N.C.

At the present, there are two different freezing processes being investigated under contract to this Office at the pilot plant level. The first of these is a 15,000 gallons per day pilot plant which utilizes the principle of flash evaporation of precooled sea water with the subsequent absorption of the water vapor by a chemical absorbent. The resulting ice is separated from the saline liquor and washed free of adhering salt and then melted by utilizing the heat of absorption. The technical feasibility of this process has been demonstrated by a 600 hour continuous run. The initial operation of this plant was started at Syracuse, N. Y., near the contractor's facilities, so that modifications to the unit if needed, could be made conveniently during the initial stages. The plant was then moved to the present location, Wrightsville Beach, N.C., for further evaluation.

Operation of the second pilot plant was started at St. Petersburg, Fla. This is a 35,000 gallons per day unit in which precooled sea water is frozen by flashing a hydrocarbon refrigerant (butane) in direct contact with the feed stream. The ice crystals are washed free of salt and melted by condensation of the refrigerant vapor.

Progress has been made in the above described pilot plant operations. However, it was found that additional data and modified design were needed in order to obtain satisfactory extrapolation of

design to large size freezing conversion plants. These additional studies are now in progress. Further research is also being conducted on crystal growth and ice washing techniques.

The emphasis on the development of membrane processes has continued to be placed on electrodialysis which is most important in the conversion of brackish waters. The greatest effort in this field has been in the development program being supported by the Office of Saline Water at the Bureau of Reclamation Laboratories in Denver. Scientific and engineering personnel are gaining experience on electrodialysis.

In a related area, at the request of the Israeli Council of Research and Development, an engineer was sent to the Negev Institute for Arid Zone Research in Beersheba, Israel, for consultation in connection with the electrodialysis program. Five different commercial units have been obtained and are being evaluated in the Denver Laboratory. During the year, a field test site was made available near Denver for further evaluation of electrodialysis equipment on brackish well waters.

In a related area, the ion exchange field, favorable results have been obtained in the operation of a pilot unit in preventing calcium sulphate scale formation in sea water evaporators by ion exchange softening using the concentrated waste brine from the evaporator to regenerate the resin. A pilot plant unit has been operating at Freeport, Tex. This new technique may be applicable to the process of forced circulation vapor compression distillation to be used by the Roswell brackish water demonstration plant.

The operation of experimental types of solar stills at the Daytona Beach, Florida site resulted in the design and installation of an improved type of basin solar still which uses only concrete, glass, and asphalt in its construction. Simplification of design of this 3,000-square-foot still gave a major reduction in the cost per square foot. The materials used were expected to give very long life with minimum maintenance. Test operation of the new still began in June. Other smaller solar type stills are also being evaluated.

Initial research results on the new chemical processes based upon the use of propane hydrates were favorable. Accordingly, the development effort has been expanded, and it is expected that during the next year pilot plant development will be started.

In the processes development activities, 28 applied research contracts were current during the year and 13 technical reports were published.

Towards the end of the year, preliminary plans were being made for installation of a pilot plant test facility at a site at Wrightsville



Lyndon B. Johnson, Vice President of the United States, dedicating the Nation's first saline water conversion demonstration plant in Freeport, Tex. In the left foreground are Secretary of the Interior Stewart L. Udall and Senator Clinton P. Anderson of New Mexico, Chairman of the Senate Committee on Interior and Insular Affairs.

Beach, N.C., made available by the State of North Carolina and being made suitable for use by the State.

Demonstration Plants

Five sites have been selected and five processes programmed for demonstration plant testing. They are as follows:

- Long tube vertical multiple-effect distillation, Freeport, Tex.
- Multistage flash distillation, San Diego, Calif.
- Electrodialysis, Webster, S. Dak.
- Forced-circulation vapor-compression, Roswell, N. Mex.
- Freeze demineralization, Wrightsville Beach, N.C.

The Chicago Bridge & Iron Co. completed construction of the Freeport, Tex., saline water conversion demonstration plant on May 7, 1961.

Following several weeks of initial test operations the plant was placed in full production on June 21.

The Freeport plant represents a number of significant "firsts" in the field of saline water conversion. It is the first sea water conversion plant in the United States capable of producing 1 million gallons of fresh water per day—the first sea water conversion plant to regularly supply the water needs of a U.S. municipality; the first sea water conversion plant to use 12 evaporators in an integrated operation and first to operate at temperatures up to 250° F.

Based on the data obtained thus far from the operation of the plant, the cost of the product water is \$1–\$1.25 per 1,000 gallons including 20-year amortization charges.

Freeport Process

In the long-tube vertical multiple effect distillation system utilized in the Freeport plant, sea water falls through bundles of 2-inch tubes in a series of evaporators under progressively reduced pressure. In the first evaporator, steam around the outside of the tube bundle causes part of the sea water to boil as it falls through the tubes. Emerging at the bottom of the evaporator, then, is a mixture of vapor and hot brine.

The hot brine is pumped to the top of the second evaporator where under slightly reduced pressure it again falls through the inside of the tubes. The vapor produced in the first effect flows to the outside of the tube bundle in the second effect. Here the vapor is condensed to fresh water by giving up its latent heat to the sea water falling through the tubes which again causes part of the water in the tubes to boil. The same process is repeated through all 12 effects to the plant.

A \$1,608,000 construction contract for a 1-million gallons per day plant at San Diego, Calif., was awarded to Westinghouse Electric Corporation on November 5, 1960. On November 16, 1960, a \$482,200 construction contract was awarded to Asahi Chemical Industry Company, Ltd. for the 250,000 gallons per day electro dialysis process demonstration plant to demineralize the brackish well water at Webster, S. Dak. Considerable progress has been made toward the completion of these plants by the end of this fiscal year.

A contract for the architect and engineering services for the Roswell, N. Mex., plant was awarded to the Catalytic Construction Company of Philadelphia, Pa.; and a similar contract was awarded to the Lummus Company of New York City for the Wrightsville Beach, N.C. plant. It is anticipated that construction of those plants will start during fiscal 1962.

Office of the Assistant Secretary

Mineral Resources

JOHN M. KELLY, *Assistant Secretary*

THE ASSISTANT SECRETARY for Mineral Resources discharges the responsibilities of the Secretary of the Interior with respect to the Department's programs in the field of the development and utilization of minerals and metals, including mineral fuels. He exercises supervision over the Geological Survey, the Bureau of Mines, the Office of Minerals Exploration, the Office of Oil and Gas, the Office of Minerals Mobilization, the Office of Geography, the Oil Import Administration, and the Office of Coal Research.

The Assistant Secretary serves as the principal spokesman for the Department of the Interior at the policy-making level within the Federal Government for matters relating to minerals and fuels, and is a focal point within the Government for contacts respecting minerals and fuels with Congress and the public.

Petroleum and petroleum related problems continued to occupy much of the time and attention of the Assistant Secretary and of the staff. Emphasis during the fiscal year was placed increasingly upon improving the national security posture of the United States with respect to petroleum planning and to developing positions for use of the United States in its contacts with the petroleum mobilization planning bodies of other nations.

The Office actively participated in the formulation of new policies relating to the Oil Import Administration. During the year, a major revision of the import program as it relates to residual fuel oil

imported for use as fuel was developed. Public hearings were conducted and a review initiated with respect to the crude oil aspects of the import program.

The Office participated extensively in discussions within the Administration and with members of the Congress relating to measures for relief of the depressed segments of the domestic mining industry. These discussions culminated in development of a series of proposals which, if finally approved, will measurably improve the position of domestic mines.

The Office maintained its leading role in the United States' participation in the International Lead-Zinc Study Group. Representatives of the office attended meetings in Geneva, Switzerland, in September 1960 and Mexico City in March 1961. The Office supplied representatives to a meeting in New York in June 1961 of a Working Committee established by the Study Group to explore the possibility of developing a commodity agreement for lead and zinc.

The Office continued to take an active part in decisions relating to stockpile acquisitions and disposal, and maintained its interest in advising the Department of Agriculture with respect to acquisition of strategic and critical materials for the supplemental stockpile through barter transactions.

In this connection, the Office was the principal point of coordination in the negotiations relating to the development of a program to remove surpluses of lead outside of the United States now overhanging the market and thereby pave the way for a general improvement in the balance of supply versus demand of this commodity.

The Office devoted much time and attention to developing the organization, and Administrative and operational guidelines, of the newly created Office of Coal Research. By the end of the period staffing had been substantially completed and the way was cleared for the Office to begin to evaluate proposals and enter into contracts for coal-related research projects.

At the end of the fiscal year, the Office was in the process of developing revisions to the program of Federal financial assistance to exploration activities administered by the Office of Minerals Exploration. The revisions will broaden coverage of the program, and strengthen its operations.

Geological Survey

Thomas B. Nolan, *Director*



WATER AND MINERALS—two of the resources constituting the Nation's basic wealth are prime responsibilities of the Geological Survey of the Department of the Interior. Ever since this bureau was established in 1879 following recommendations of the National Academy of Sciences, its scientists and engineers have studied the country's mineral and water resources and have constantly added to the fund of knowledge to be drawn upon in the solution of problems inherent in the expansion of the economy of the Nation. Its findings give backbone to textbooks, bolster conservation, pave the way for community development, and provide national sinews.

Through land classification activities, the Survey seeks out dam sites and potential mineral and fuel deposits for public benefit, meanwhile supervising constructive exploitation and adding royalty monies collected to State and National treasuries.

Topographic and geologic mapping provide orientation for orderly national or local planning. This is an essential element in urban and industrial economic growth—a valuable concomitant in providing living space during the current population explosion. Topographically, approximately half the United States is adequately mapped today, and steady progress is being made toward complete coverage. An important step in this direction was the 3-year program recently started by Ohio for Statewide map coverage at 1:24,000-scale.

Better understanding of the geochemical, geophysical, and geologic processes involved in the formation and localization of ore is essential to the improvement of prospecting techniques. The proper coordination of laboratory and field operations help delineate the most likely places to search for new or additional minerals and mineral fuels.



Volcanology studies by the Geological Survey are conducted principally in Hawaii—scene of active volcano displays such as pictured above. Besides acting as a "civil warning" station, basic purpose is to provide scientific data on the earth's mysteries.

Such work is especially important to the critical task of finding ore deposits that are masked by overburden.

Minerals Exploration

A newly opened window on the future is afforded by present day geochemical and geophysical explorations constituting part of the long-range minerals program. New data are being sought on the physical properties of rocks, on the nature of ore-forming fluids, and on the physical, chemical and biochemical changes that take place as a result of natural weathering.

Such increased knowledge of geologic processes is finding applications in many fields. A research program now underway at the Hawaiian Volcano Observatory provides new understanding of some of the phenomena involved in the formation of ore deposits. It also provides for immediate application some of the geophysical measurements whereby a volcano's potential eruption cycles can be predicted.

Geologic Division

In its long-range programs investigating and appraising the Nation's mineral resources and applying geologic knowledge to serve national interests, the Geologic Division of the Survey is conducting a wide variety of research operations in many fields.

Investigations range from studies of the structure of continents to studies of the subatomic structure of minerals, of areas close to the North Pole to some within 200 miles of the South Pole, of samples obtained from below the crust of a congealing lava pond formed during a volcanic eruption to materials that have been frozen for long periods of time, and from studies in well-equipped laboratories to work in areas where the only access is by pack train or helicopter.

Such investigations can be grouped into three general categories: studies in economic geology, in regional geology, and in geologic processes and principles. Some are carried out on behalf of other Federal agencies, including the Defense Department, Atomic Energy Commission, National Science Foundation, International Cooperation Administration, Bureau of Public Roads, and the Department's Bureau of Mines and Office of Minerals Exploration.

Others were in progress in cooperation with 17 States, Puerto Rico, Los Angeles County, and the City of Seattle. Of outstanding importance is a 10-year program to map in detail the geology of the entire State of Kentucky which was started during the year.

Geologic Publications

Results of the Division's investigations were published in 93 professional papers and bulletins, 77 maps, and some 250 technical papers in scientific journals. An additional 92 reports were made available in files open for public reference. A synopsis of research during the year ending June 30, 1960, was published in October as Professional Paper 400-A, entitled "Geological Survey Research, 1960." A companion volume of 232 short papers summarizing results of individual investigations was published at the same time as Professional Paper 400-B.

Economic Geology

Economic geology investigations include both field mapping and topical (resource) studies in areas known or believed to contain minerals or mineral fuels of present or potential value (1) to establish guides useful in the search for concealed deposits; (2) to define favorable areas for exploration; and (3) to appraise the resources.

Other studies are concerned with the preparation on a national basis of estimates of the quantity of resources and with the synthesis of data to help define areas favorable for exploration. Still others are designed to provide geologic information applicable to the solution of engineering problems, such as construction of dams, roads, public buildings, earthquake damage, landslides, and erosion. In the field of public health and safety, geologic guides are being used in studies of mine drainage, in the disposal of radioactive waste, and in studying the effect of the distribution of certain elements on public health.

Highlights of some of these investigations are summarized below:

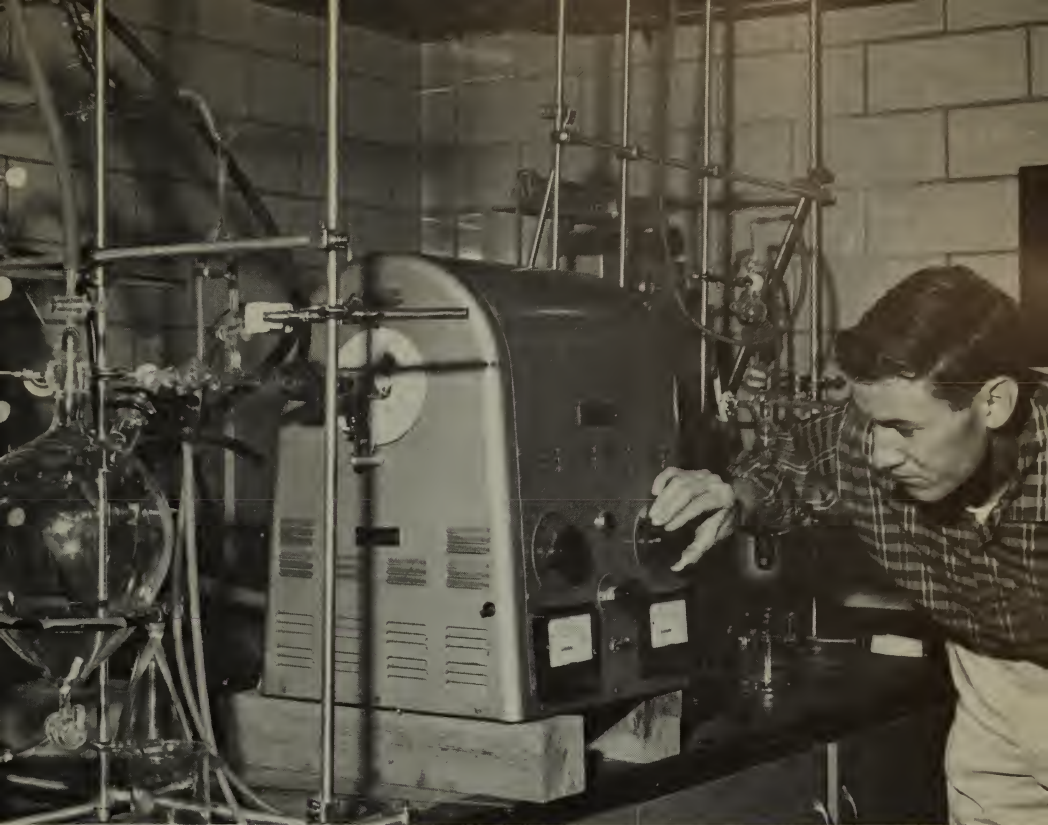
Structural information and other geologic data published by the Geological Survey were the basis for exploration by private industry that extended the area of known zinc-silver-lead ores in the East Tintic, Utah, mining district. Survey work also contributed to the definition of a major potential source of molybdenum at Questa, N. Mex., through a federally assisted exploration project of a mining company and the Department's Office of Minerals Exploration.

Geochemistry Aids Exploration for Minerals

Geochemical prospecting near Pima, Ariz., indicates that broad halos surround large deposits of molybdenum and copper. These halos form prospecting targets as much as 2 miles from known deposits of copper and more than 8 miles from known deposits of molybdenum. In Nevada, geochemical abnormalities in an area of complex faulting may represent leakage halos of ore deposits in or below the thrust plane. In Somerset County, Me., geochemical sampling has indicated two areas that contain abnormal amounts of copper and has led to discovery of a quartz vein containing appreciable amounts of galena.

Sources of beryllium are being studied in different geologic environments: at Spors Mountain, Utah, where the beryllium minerals are in volcanic rocks; at Wheeler Peak, Nev., where they replace limestone near an intrusion; at Lake George, Colo., where they are associated with granitic and metamorphic rocks; and on the Seward Peninsula, Alaska, where they occur with tin and tungsten in veins. A simple "contact-printing" method of testing the rocks to distinguish the beryllium-bearing ore mineral, bertrandite, from quartz, has been developed, and a sensitive probe has been designed to log the distribution of beryllium minerals in drill-holes.

Indications are that germanium, now recovered mainly as a by-product of zinc smelters, possibly can be recovered also from copper



Considerable apparatus is needed for the complicated studies of carbonate rocks to determine at what temperature they were formed in nature.

smelters. Analyses indicate copper sulfide-bearing minerals contain more germanium than does sphalerite, the principal zinc-bearing sulfide mineral.

New Guides to Selective Mining

Recognition of significant differences in the chromium and iron content of chromite from the Stillwater area, Montana, within layers of massive chromitite, and between adjacent layers of massive chromitite and olivine-bearing chromite, will provide guides for selective mining of higher grade layers.

Nearly all sandstones that contain uranium deposits that are the chief source of domestic uranium ores, were found to be deposited in a continental sedimentary environment, thus indicating that additional deposits would more likely be found in sandstones accumulated in closed basins or fault-block valleys than in marine strata.

Geologic and geophysical data on the Atlantic coastal plain and continental shelf indicate a very large volume of sedimentary rocks that constitute a potential petroleum-bearing area. Oil shales of

the Green River formation have potential reserves of more than 50 billion barrels of oil in an area of about 700 square miles in southeastern Uinta Basin, Utah, and about 20 billion barrels in an area of 500 square miles in one member alone of the Firehole Basin area, Wyoming.

New Map of U.S. Coal Fields

A newly revised map of the coal fields of the United States has been published in two sheets, Sheet 1 for the conterminous United States and Sheet 2 for Alaska. An appraisal of the coal resources of Arkansas increases by 70 percent the estimates made about 50 years ago, and indicates reserves total more than 2 billion tons of low-volatile bituminous coal and semianthracite. Reserves for Washington are conservatively estimated to be 6 billion tons, most of which is semibituminous and some of which has coking qualities.

Geology Aids Engineering

A better understanding of the geologic causes of landslides and other mass movements of rocks has permitted the development of better zoning regulations by officials of several metropolitan areas. Use of geologic data in planning major construction and land development projects has reduced costs and hazards, and increased safety.

Engineering geology studies have also been carried out on behalf of the Atomic Energy Commission in the selection of sites for underground nuclear tests, evaluation of effects during and after explosions, and for the prediction of effects in proposed high-explosive and nuclear tests. Data on the structure and composition of the earth's crust and upper mantle are also obtained from the studies.

Also on behalf of the Atomic Energy Commission, investigations are being made to determine safe disposal methods for radioactive wastes. These range from studies of minerals such as crandallite that show specific ability to combine with or otherwise retain high-level radioactive waste products, to studies of large areas containing deep basins of sedimentary rocks that may provide suitable sites for deep underground storage of low-level waste products.

A study started at the suggestion of the National Cancer Institute indicates that vegetation growing near highways in Washington County, Md., and near Denver, Colo., contains a markedly higher lead content than similar vegetation at greater distances from the roads.



Geologists of the Survey use small portable core drills in collecting unweathered rock samples for geochemical analysis.

Regional Geology

Geologic maps that depict the composition, structure, history and origin of the rocks that form the earth's crust are being prepared for many parts of the United States. These studies, supplemented by geophysical, geochemical, stratigraphic, and paleontologic investigations provide the basic data to guide the search for useful earth materials and the appraisal of potential uses of the areas studied. They are especially useful in industrial and civil planning.

The work is broadly dispersed to provide data on as many facets of geology as possible. As a result of some of these studies, a better

understanding of much of the volcanic terrane in the southern Rocky Mountains is beginning to emerge from detailed mapping of the very large volumes of welded tuffs in that region, and several caldera structures in Colorado and New Mexico have been identified as sources of this ancient explosive volcanism. Some of these calderas are associated with mineral districts.

Broad Studies for Resource Development

Studies of the former extent of glaciation along the Ohio River valley and geophysical studies of buried stream valleys in Ohio have furnished data useful to water resource development. Studies of ancient Lake Bonneville, ancestor of the present Great Salt Lake in Utah, indicate that the region has probably been uplifted as much as 210 feet since the glaciers retreated. This rebound is 70 percent of the theoretical maximum. Study of the progressive distribution of fossils and living species of freshwater clams indicates that the ancestral drainage of the Snake River, now a major tributary of the Columbia, flowed southward through a chain of basins and did not join the Columbia drainage until recent geologic time.

Studies in Puerto Rico, the Canal Zone, and the islands of the western Pacific provide data on the development of the Panama land bridge, which came into existence during Pliocene time, and of the Pacific basin. Studies in Antarctica indicate that the White Continent has a framework similar to that of other comparable land masses. A broad shield of Precambrian metamorphic and igneous rocks is adjoined by a broad terrane of Paleozoic sedimentary rocks that accumulated in a geosyncline. The Palmer Peninsula is a tectonic belt of Cretaceous and younger rocks comparable to and perhaps associated with the development of the Andes. Paleozoic rocks were deformed and intruded by igneous rocks in a series of events that progressed away from the shield toward the Palmer Peninsula. Geologic mapping has been started in the eastern Horlick Mountains, in our first attempt to acquire systematic coverage for an appreciable area south of the Antarctic Circle.

Geologic Processes

Research in economic and regional geology must be founded on knowledge of natural processes within the earth, knowledge that is sought through research in both theoretical and practical aspects of all the related earth sciences, such as paleontology, geomorphology, geophysics, geochemistry, mineralogy, petrology and isotope geology.



Survey geologists use small portable core drills to reach below the surface and gather unweathered rock samples for geochemical analysis.

Study of past and present geomorphic processes may supply suggestions on remedial measures to protect, preserve, and conserve our natural assets. For example, the scenic cliff at Gay Head, Mass., has retreated at the rate of 4,000 feet in 3,000 years, but information on the mechanics of erosion suggests that further accelerated erosion could be decreased by draining the swamps behind the cliff and by protecting the base of the cliff with rip-rap.

Geologic Aspects of Project Chariot

Measurements in a deep drill hole along the Alaskan coast of the Chukchi Sea indicate that frozen ground stretches down some 1,200 feet below the surface and extends out beneath the sea. These data also indicate that the mean annual temperature has increased gradually during the last 60 to 80 years, and that the sea is gradually encroaching on the land.

Two important indicators of changes associated with rapidly applied large stresses, such as meteor impact and large explosions, have been studied. The mineral coesite, first identified in high-pressure laboratory experiments, has been found in shattered rocks at four natural meteor craters and at one crater formed by nuclear explosion. Shock-induced changes have also affected the thermoluminescent properties of rocks both in rock debris associated with large craters and in rocks used in high-velocity impact studies in the laboratory.

Drilling Yields Magnetic Data

Studies of past changes in the earth's magnetic field show that the latest reversal of the field occurred about a million years ago. This change may ultimately furnish a very distinct, worldwide marker horizon.

Drill-hole logging devices to determine in-place acoustic properties and density, as well as electrical properties and magnetic susceptibility, are being used to supplement geophysical observations obtained at and above the surface. Such multiple data generally permit better identification of the rocks and structures penetrated by drill holes.

New extremely sensitive seismic equipment has been designed and constructed for the Survey to be used in a project conducted in behalf of the Department of Defense. This equipment will aid in obtaining more reliable and detailed knowledge of the structure of the earth, and in accurate determination of epicenters of earthquakes and man-made explosions. It has successfully recorded the effects of a 400-pound charge at a distance of 94 kilometers. Development of portable

tiltmeters has aided scientists at the Hawaiian Volcano Observatory in predicting volcanic activity, as the volcano undergoes measurable swelling prior to eruption.

How Ores Are Formed

Studies in mineralogy, petrology and geochemistry probe the chemical and physical properties of minerals, and indicate the conditions under which rocks and minerals are formed. Data of the minor element and rare earth content of rock-forming minerals have direct use in the search for sources of many newly useful materials. Laboratory studies of the progressive development of different kinds of rock from molten material of the same initial composition through different cooling histories have aided in understanding how such widely different rocks as basalt and rhyolite can be produced at different times from a single volcanic center.

In a sequence in the Jemez Mountains, N.M., for example, successive rock types are progressively enriched in some components, culminating in the rhyolitic phase in which volatile materials are notably concentrated. Under some conditions, explosive release of these volatiles produces a succession of ash-falls and voluminous ash-flows which may become welded tuffs. Upon depletion of volatiles, viscous, gas-poor flows or domes are extruded.

Mineralization Changes

Studies in metamorphic processes develop information on index minerals that indicate pressure and temperature conditions at the time the rocks formed. For example, the zeolites (hydrous silicates of aluminum) are indicators of low-grade metamorphism and glaucophane is an indicator of high pressure but low temperature metamorphism. Variations in the chemical composition of the sedimentary rocks provide data on the geochemical balance between source areas supplying the sediments and the environment in which the sediments were deposited. Locally derived components may be determined as well as the probable source of other components. For example, most of the sodium in thick trona (sodium carbonate) deposits in the Green River formation of Wyoming and neighboring areas was probably derived by weathering and erosion of the adjacent mountains.

As an example of the unexpected dividends of basic research, the design for a biochemical fuel cell has resulted from a study of the geochemical balance between bacteria and their environment. In the

course of this study an electrical potential was observed to result from bacterial action on aquatic organic wastes. A simple model was designed consisting of a small cell containing bacteria and algae in saline solutions. It is believed to be capable of producing electricity indefinitely, using only solar energy to sustain growth of the algae.

Geochronology Studies

Marine sediments deposited in about the last 200,000 years can now be dated by measuring the relative abundance of thorium 230 and protactinium 231 formed in the radioactive decay of uranium precipitated from seawater. This method appreciably extends the range of more precise geochronologic studies of the Pleistocene, which had been limited to the last 30 to 40 thousand years by use of the carbon 14 method.

Survey scientists participated in the preliminary planning and test drilling for the National Academy of Sciences-National Research Council "Mohole" project, and now are studying samples and measurements obtained in these highly successful tests. In other studies of the suboceanic floor off southern California, aeromagnetic data indicate several linear magnetic features that parallel structural trends of the Peninsular Range. Studies of the Aleutian Trench and seas between Alaska and Hawaii, in collaboration with the Navy Hydrographic Office and the Coast and Geodetic Survey, are obtaining bottom samples and geophysical measurements at sea as well as geophysical data on the Aleutian Islands.

Methods for Rapid Rock Analysis

In laboratory research, new methods are providing faster and more accurate chemical analyses for the large number of samples obtained in all studies. Procedures for making rapid analyses of silicate rocks in use for several years were augmented by rapid-method analytical procedures for carbonate rocks and phosphate rocks. Today, rapid analyses are possible for all major rock types.

Analytical procedures for high-accuracy rock and mineral analyses have been extensively revised to combine conventional wet chemical separations with appropriate spectrographic and spectrophotometric techniques. In spectrographic techniques, a promising start has been made in developing direct-reading analytical procedures. Direct measurement by phototube of selected lines of the spectra is used to determine the amount of the element being analyzed. The technique was successfully tested in a study of about 180 samples containing

beryllium. A simple direct determination of the beryllium content of ores and rocks without the necessity of separation has been developed using fluorescent morin and a fluorometric procedure.

In the study of very small volumes of rocks and minerals, an electron probe method developed last year has been successfully used to analyze small metallic spherules contained in tektites, enigmatic glassy rocks presumably meteoritic in origin, and to study minute inclusions in the spherules. Spherules, mainly iron with a little nickel, are a few tenths of a millimeter in diameter. The inclusions, tentatively identified as iron phosphide, measure about 1 to 5 microns (thousandths of a millimeter) in diameter. In other studies of zoning in minerals, the electron probe detected and analyzed zones as small as 2 to 4 microns in width.

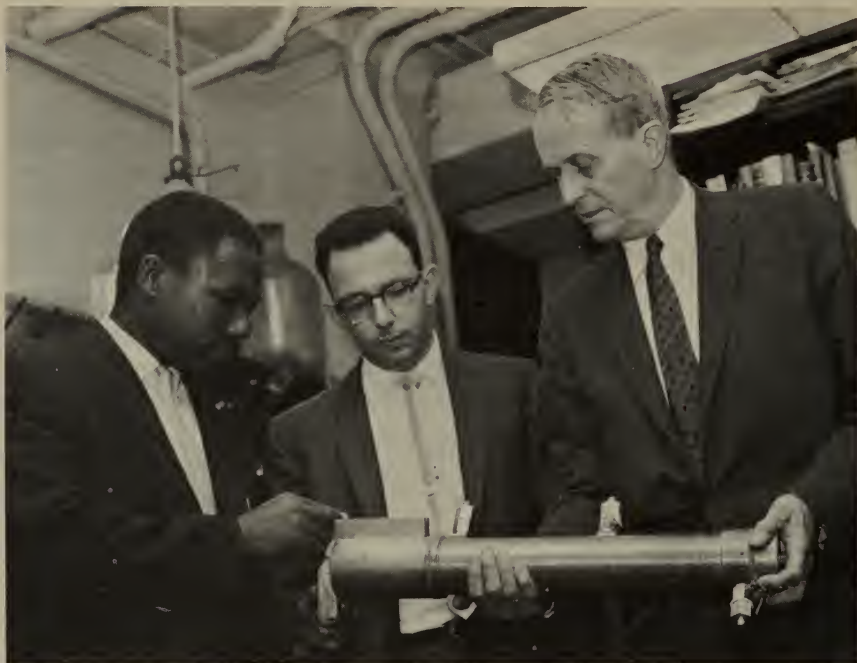
Foreign Geology

Technical assistance to foreign governments is primarily designed to aid the development of their economies through better understanding of their natural resources. This program under auspices of the International Cooperation Administration includes the training, advisory and service functions of 59 Geologic Division scientists working in cooperation with their host country counterparts in 13 nations, sharing advances in methods and techniques of geologic research and investigations; and the training in this country of some 137 earth scientists and technicians from 41 countries.

During the year, a training and advisory service program was begun in Bolivia; a mineral exploration and development program was begun in Pakistan to supplement an advisory and service program; and a 10-year advisory and training program in India was concluded. Technical aid was supplied to the disaster area in Chile following major earthquakes last year, to assist in developing plans for rebuilding in the affected area.

Conservation Division

The principal tasks of the Survey's Conservation Division are to classify Federal lands as to mineral and water resources and supervise mineral recovery under leases, permits, and licenses on Federal, Indian, and Naval petroleum reserve lands. A headquarters staff and a field staff of geologists and engineers make surveys, maps, and reports dealing with water power, fuels, minerals, and chemicals essential to the economy of the United States; supervise mining and



Scores of technical personnel, trainees and public officials from abroad receive on-the-job training from Geological Survey scientists and engineers each year through sponsorship by International Cooperation Administration.

drilling operations to assure safe and economical production by private enterprise of coal, oil, gas, and other minerals; and supervise operations of the Federal Petroleum Board.

Mineral Classification

During fiscal year 1961, the Geological Survey processed a total of 29,631 applications involving the use or disposition of Federal lands. This included 6,857 requests involving outright disposal with no reservation of minerals or with the reservation of one or more specified minerals, and 21,152 applications under Federal leasing laws involving the right of private enterprise to lease Federal lands for the extraction of minerals.

Initial or revised definitions of 304 producing oil and gas fields were made affecting Federal leaseholds; 182 reports were drawn up on the mineral potentialities of specific lands for various agencies of the Federal Government; and 634 miscellaneous reports were made in connection with activities on Federal lands involving unit plans, participating areas, productive limits, and associated matters.

Geologists from field offices throughout the West also made investigations and produced reports and maps as needed to assist engineers in planning development and in administering Federal leases.

Public Lands Classification

In the course of classifying public lands, approximately 1,300 square miles of preliminary mapping was completed and investigations are well along on large areas in the San Juan and Permian basins, N. Mex. Geologic reports and maps have been completed for the Paradise quadrangle in Utah and important phosphate lands have been classified. Following review, five petroleum withdrawals were revoked involving about 85,500 acres.

Maps or reports were completed on the following fields or areas:

<i>Structure maps</i>	<i>Reports</i>	<i>Geologic maps</i>
Southeastern San Juan Co., Utah.	Holter Sandstone Member of the Marias River Shale, Colorado Group, Mont.	Configuration of basement rocks in the north half of California.
Roxie oil and gas field, Franklin Co., Miss.	Stratigraphy of the saline facies of the Paradox Member of the Hermosa Formation of southeastern Utah and southwestern Colorado.	Revision of maps showing areas of prospective value for oil and gas for several States.
Cross-sections of Paradox Basin.	Geology of the Northeast Rangely coal area, Colo.	Maps for sodium, potash and asphaltic minerals.
Cheyenne oil field, Major Co., Okla.	Review of the classification of the Salton Sea area, Calif.	

In connection with damsite investigations, a geologic reconnaissance was made on the Trask and Siletz Rivers, Oreg., and on the Smith River, Calif. In Alaska, geologic reconnaissances were made of the Kashwitna Valley, Sheep River and Talkeetna River damsites, and a revised report was completed on the geology of the Bradley River damsite, Kenai Peninsula.

Waterpower

Investigations were conducted in Alaska, California, Idaho, Oregon, Montana, and Washington during the year to determine the waterpower and storage possibilities of streams and lakes on public lands. Nine sets of river survey maps were published covering 345 miles of stream channel and 10 damsites. Four reports on waterpower resources were submitted for publication and three on the

geology of waterpower sites. Four others on waterpower resources, one on geology of waterpower sites, and two on the review of waterpower withdrawals were made available for public reference.

Work was continued on the systematic review of all land withdrawals for waterpower and storage purposes and on the preparation of required reports. During the year, 6 reports were prepared covering 256,000 acres. Thus far in this program, 41 reports have been prepared for a total of 776,000 acres. About 40 percent of the withdrawn area is being recommended for restoration to entry because studies indicate these lands do not have sufficient water power or storage value to justify their retention in a reserve status. Lands withdrawn in powersite reserves total 7,213,091 acres. Lands in reservoir site reserves total 130,981 acres.

Two hundred reports were prepared and submitted to the Department's Bureau of Land Management on the waterpower value of lands affected in applications for rights-of-way and 6,900 reports were made on applications for land acquisition. Thirty-seven were submitted on applications to the Federal Power Commission for permit or license and 52 on applications for restoration of lands in powersite withdrawals.

Mining

Supervisory control is exercised by the Survey over mining activities concerned with prospecting, development, and production of minerals under permits and leases.

Permits and leases issued under applicable laws and regulations involve operations on public lands for coal, potassium, sodium, and phosphate and on Indian and acquired lands for such metals and minerals as copper, iron, lead, manganese, nickel, tungsten, uranium, vanadium, zinc, asbestos, barite, bentonite, clay, coal, garnet, gypsum, feldspar, fluorspar, limestone, mica, peat, phosphate, pumice, quartzite, quartz crystal, sand and gravel, stone, and vermiculite.

Mining supervision includes responsibility for investigating and reporting on applications for leases and prospecting permits; recommending lease terms; enforcing compliance with lease terms and regulations governing the conduct of prospecting, mining, and milling operations; and determining the royalty liability of lessees, maintaining accounts, preparing statements, and receiving payment of royalties and rentals.

As of June 30, 1961, there were 3,062 properties under supervision involving leases, permits, and licenses in 30 States. Two thousand and twenty-nine were on public land, 290 on acquired land, and 743

on Indian land. Production during the fiscal year is estimated at 25,364,000 tons, valued at \$165,300,000 with royalties amounting to \$7,870,000.

A further breakdown of production figures for these lands shows potash ranking first with 12,631,800 tons valued at \$73,170,000 followed by coal, 5,440,000 tons valued at \$33,630,000; phosphate, 2,057,000 tons valued at \$5,655,000; and uranium ore, 1,484,000 tons valued at \$21,351,000. Other production in substantial quantity includes sodium compounds, 1,037,000 tons valued at \$26,736,000, and sand and gravel, 2,872,000 tons valued at \$2,432,000.

Mining Highlights

Among notable mining events during the year was the November start of a new soda-ash mine and refinery at Stauffer, Sweetwater County, Wyo., about 21 miles northwest of the town of Green River. Two mine shafts are being sunk to a depth of 1,000 feet to tap the "Big Island" trona deposit involving Federal, State, and Union Pacific Railroad lands. The first trona mine at nearby Westvaco has been in operation since 1947.

To develop one of the richest potash deposits in the United States shaft sinking operations began during March 1961 on the Cane Creek anticline southwest of Moab, Utah. Discovery had been made on prospecting permits issued by the Department of the Interior. A 36-mile railroad will be constructed from Crescent Junction to the mine and a refinery site in the Colorado River Canyon.

Prospecting operations in northwest New Mexico on Federal, Indian and privately owned land have disclosed three-quarters of a billion tons of coal in deposits suitable for strip mining. These deposits will provide fuel for thermal power plants planned or under construction in New Mexico and Arizona.

Several major mining companies are prospecting in southeast Missouri where they have made valuable discoveries of lead and zinc in sediments, and prospectively valuable discoveries of copper and iron in basement rocks. A modern mill near Viburnum has been completed and placed in operation, and additional shafts are being put down on new discoveries.

Oil and Gas Leasing

Supervision of oil and gas activities includes operations for the discovery, development, and production of crude oil, natural gas and products extracted from natural gas, on Federal, Indian, and certain military and Naval petroleum reserve lands.



Pulling a core barrel during exploration for potash on public lands at Cane Creek, Utah. This work led to discoveries resulting in a new industry for Utah with an initial investment of \$25 million for new access roads, plant, mineshaft, railroad, etc.

Unitization activities of oil and gas operations involving public and acquired land were reflected in the approval of 91 new plans during the year and the termination of 83 that had been previously approved, leaving 428 approved plans covering 7,929,970 acres outstanding. About 59 percent of the petroleum, 44 percent of the natural gas, and 60 percent of the gasoline and liquified petroleum gases obtained from public and acquired lands during the year were produced under approved unit agreements.

On the Outer Continental Shelf, no unitization plans were approved and one was terminated during the year. The total now stands at 14, embracing 333,253 acres.

Table showing supervised oil and gas activities

PROPERTIES AND WELLS UNDER SUPERVISION

Lands	Number of properties	Acres	Number of States	Wells spudded	Wells completed	Completions productive ¹	Number of wells, June 30, 1961	
							Pro-ductive ¹	Total
Public.....	135,132	103,022,415	24	2,144	2,181	1,413	19,512	33,422
OCS.....	456	1,710,951	off 3	431	499	387	2,176	3,047
Acquired.....	6,387	4,417,032	30	88	94	45	379	998
Indian.....	11,769	4,329,745	16	623	699	469	7,053	11,593
Naval petroleum reserve No. 2.....	17	9,226	1	7	8	8	482	738
Military and miscellaneous.....	21	17,981	4	29	19	19	168	200
Total.....	153,782	113,507,350	-----	3,322	3,500	2,341	29,770	49,998

PRODUCTION, VALUE, AND ROYALTY LANDS UNDER SUPERVISION

Lands	Oil, barrels	Gas, 1,000 cubic feet	Gas liquids, gallons	Value	Royalty
Public.....	160,526,000	507,069,000	365,734,000	\$501,093,000	\$62,217,000
OCS.....	55,476,000	310,680,000	0	253,568,000	47,556,000
Acquired.....	5,268,000	22,941,000	245,000	20,592,000	2,641,000
Indian.....	53,427,000	88,531,000	122,153,000	162,491,000	20,591,000
Naval Petroleum Reserve No. 2.....	4,770,000	5,445,000	13,860,000	16,560,000	2,239,000
Military and miscellaneous.....	1,361,000	40,934,000	3,356,000	9,740,000	1,426,000
Total.....	280,828,000	975,600,000	505,348,000	964,044,000	136,670,000

¹ Multiple completions (2 or more separately productive zones) are counted as separate wells.

NOTE.—Production and royalty figures include some estimates. Royalty figures do not include revenues from rentals and bonuses. Not included in the table, but also under supervision, are 1 salt and 5 sulphur leases in the OCS which yielded about \$711,000 in royalties on production during the year.

On Indian lands, 12 new units were approved and none were terminated; the total number of plans in effect at the end of the year being 72, involving 134,975 acres.

There were 169 drilling units, or communitization agreements, approved during the year and 3 terminated making a total of 1,187 outstanding as of June 30. Three development contracts were approved and none terminated. A total of 17 such contracts were outstanding on June 30 involving 5,955,310 acres.

Connally Act Administration

The Connally Act of February 22, 1935, supports conservation activities of oil-producing States by prohibiting the interstate shipment of oil produced in violation of certain State oil and gas conservation laws. This act is administered by the Federal Petroleum Board at Kilgore, Tex., under supervision of the Geological Survey.

While the Connally Act is applicable wherever State laws limit the rate of production and prescribe conditions for producing and handling oil, its chief application is in 106 counties of Texas, Lea and Eddy

Counties in New Mexico, and all of Louisiana. The Board also enforces provisions of the act in Mississippi, Oklahoma, Arkansas, and Kansas.

Unless exempted by the Board in writing and by notice, producers within designated areas are required to maintain daily production records and file monthly production reports of operations on each lease in an oilfield. Transporters and refiners are also required to file monthly reports covering operations in 4,607 separate oilfields. They account for approximately 4,040,800 barrels produced daily from Texas, Louisiana, and New Mexico. Producing wells increased from 99,370 to 101,824 during the year.

At the beginning of the year there were 13 cases of alleged violation of the act on the docket of the Board and 11 new investigations were started. Nine cases resulting in fines of \$53,800 were settled.

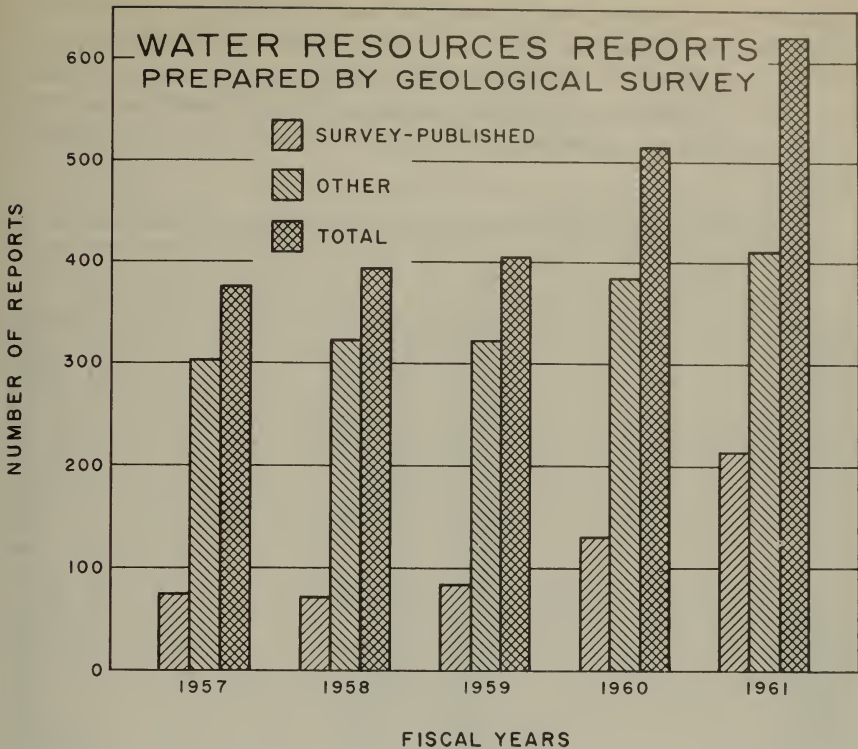
Water Resources Division

One of the major resource problems facing the Nation today is the need for new facts and knowledge about water to provide a sound basis for water management. The United States is a water-rich country but local shortages have become common during the past decade and are a matter of growing public concern.

The aim of water management is to obtain optimum use of available supplies based on a thorough understanding of the characteristics of the resource and on quantitative facts regarding its inconstant availability. Hence water investigations of the Geological Survey have two purposes: To increase knowledge concerning its occurrence, movement, and interaction with the environment; and to provide a running tabulation of water supplies from year to year—where they are and how much.

The planning of investigations to meet these general objectives is oriented specifically toward information needed to solve major water problems, each of which has a distinctive geographic distribution.

The Geological Survey water resource investigations include the systematic collection, analysis, interpretation, and publication of hydrologic and related data; appraisal of water resources of specific areas; study of water requirements for industrial, domestic, and agricultural uses; and research and development in hydrologic principles and processes to improve the scientific basis and techniques of investigations. The results of these investigations and their allied research studies are published either as reports of the Geological Survey, reports of cooperating State agencies, or in scientific journals.



Water Resources Reports

Inasmuch as public opinion indirectly governs the development and utilization of water resources, information on the principles of hydrology and on the availability and long-term supply of water must be communicated not only to those concerned directly with water development and management, but also to the general public.

The effectiveness of water-resource management in the future will depend on the availability of reports which provide necessary facts and scientific interpretation. The primary emphasis on Survey-published reports has resulted in the production of almost double the number produced the year before.

During fiscal year 1961, the Survey prepared 163 water supply papers, 20 circulars, 22 professional papers, and 9 bulletins concerning water. In addition, 76 reports were made available for public reference and 335 reports were prepared for publication as cooperative State reports and as abstracts and articles in scientific journals. Three chapters of a new manual of hydrology were published during the fiscal year, making a total of six chapters completed since the manual was started in 1959. Chapter 7 is in manuscript.

Survey water-resources investigations constitute a coordinated effort between Federal, State, and local agencies. Cooperative investigations began in 1895 and have grown steadily, now constituting about 58 percent of the total program. Funds made available by States and local agencies in 1961 for cooperative investigations include:

State and municipal offering for cooperative water resources investigations

State	1961	State	1961
Alabama.....	\$165,956	Nebraska.....	\$131,750
Alaska.....	11,539	Nevada.....	79,499
Arizona.....	206,556	New Hampshire.....	16,576
Arkansas.....	97,559	New Jersey.....	221,048
California.....	832,425	New Mexico.....	160,233
Colorado.....	246,683	New York.....	374,682
Connecticut.....	52,461	North Carolina.....	163,637
Delaware.....	45,699	North Dakota.....	91,889
District of Columbia.....	3,172	Ohio.....	206,150
Florida.....	374,876	Oklahoma.....	150,479
Georgia.....	196,111	Oregon.....	132,930
Guam.....	16,800	Pennsylvania.....	270,641
Hawaii.....	208,299	Puerto Rico.....	92,399
Idaho.....	89,987	Rhode Island.....	33,720
Illinois.....	109,128	Samoa.....	3,000
Indiana.....	214,301	South Carolina.....	43,585
Iowa.....	117,106	South Dakota.....	67,127
Kansas.....	219,325	Tennessee.....	113,720
Kentucky.....	146,822	Texas.....	457,429
Louisiana.....	271,477	Utah.....	213,881
Maine.....	28,251	Vermont.....	11,769
Maryland.....	84,373	Virginia.....	55,277
Massachusetts.....	90,930	Washington.....	234,763
Michigan.....	135,431	West Virginia.....	48,383
Minnesota.....	133,018	Wisconsin.....	90,410
Mississippi.....	99,253	Wyoming.....	48,627
Missouri.....	56,799		
Montana.....	69,655	Total.....	7,833,596

Surface Water Investigations

Streamflow and other surface-water data were obtained at 7,400 sites distributed throughout the 50 States, Guam, Samoa, and Puerto Rico. A special summary of all streamflow records for the period 1888-1950 is essentially complete; summaries for all States but one have been published. Reports were published covering the north Atlantic slope basins, the south Atlantic and eastern Gulf of Mexico basins, and the Great Basin.

Flood-frequency analyses, parts of a nationwide study, were completed for the Lower Mississippi River basins and for south Atlantic slope basins, James River in Virginia to Savannah River in Georgia. Pending completion of this project, preliminary statewide analyses are being made in cooperation with several State agencies. Reports were made available in 1961 covering Indiana, Kansas, New York, New Mexico, Ohio, Pennsylvania, Tennessee, and Wisconsin.

Five flood reports were published as water-supply papers or circulars:

- Floods of August–October 1955, New England to North Carolina.
- Floods of May 1955 in Colorado and New Mexico.
- Floods of January–February 1959 in Indiana.
- Floods of September 1960 in eastern Puerto Rico.
- Floods of February–March 1961 in the southeastern States.

As part of its continuing program for mapping flood-inundated areas, the Survey published two hydrologic investigations atlases that show areas flooded in recent years in the vicinity of Chicago Heights, Ill., and Mount Vernon, Ohio. Flood-inundation maps covering 16 metropolitan areas in six States are nearing publication and work is in progress on similar maps covering 5 additional metropolitan areas in five States.

Runoff studies of maximum annual floods for 2,443 drainage areas of less than 400 square miles have been made and reports are being prepared at the request of the Soil Conservation Service. Hydraulic data for 69 drainage-structure sites were furnished to highway departments in 13 States.

Compacts for the apportionment of interstate waters usually include provision for measurement of streamflow, commonly by the Geological Survey. Seventeen such agreements are in effect and eight others are under negotiation. In addition, water-resources investigations were continued along the Canadian boundary as required by the Boundary Water Treaty of January 11, 1909.

Ground-Water Investigations

The ground-water program includes systematic collection, analysis and interpretation of hydrologic and geologic data; research in fundamental principles of ground-water hydrology and hydraulics; equipment development; and operational research and training to improve the scope and methods of investigations.

During the 1961 fiscal year work progressed on 480 ground-water projects including an urgently needed study of the basin of the Colorado River downstream from Davis Dam. As development of its resources proceeds, the Colorado River basin inevitably will present one of the Nation's very "tight" water-supply situations. Objective of the study is to determine hydrologic relationships upon which to base competent management of all the water at optimum effectiveness for all foreseeable purposes and under all foreseeable situations. Current plans contemplate intensive studies with special attention to ground water over a period of 6 to 8 years.

A second large areal study is continuing in the Mississippi Embayment. This apparently water-rich region, covering about 90,000

square miles in parts of nine States, receives 45 to 50 inches of precipitation in average years and is crossed by several large rivers. Nevertheless, drought is common during the growing season. The study is aimed at an understanding of the regional geologic environment and its influence on the response of the hydrologic system to climatic fluctuations and to water-supply development. Application of this knowledge will lead to the most effective use of the area's potential water resources. The study begun in 1957 is scheduled for completion in 1966.

In the West, significant progress has been made in the use of electric analog models for analyzing ground-water flow problems. A Survey-built unit has been placed in operation at Phoenix, Ariz., to provide district offices with technical advice and support in the analysis of specific hydrologic problems. Establishment of this unit culminates a long period of research and development by a Survey research team.

A summary of the ground-water situation in the United States as of 1960 is in preparation. This will provide a sequel to the summary published for 1950. The earlier publication, Survey Circular 114, is still in demand, but the third printing was exhausted several years ago. All of which alerted Survey officials to the value of a periodic summary of the Nation's ground-water situation, and will stimulate the effort to prepare a new one at least every 10 years.

Chemical Quality of Water Investigations

Programs in water quality are oriented to fundamental and applied research supported by intensive areal investigations and by operation of national networks of observation stations. Studies are carried on in all the major river basins and in many smaller drainage areas. An important part of this work is evaluating the quality of ground-water supplies.

Some examples of current research in scientific hydrology relating to water quality include: studies in atmospheric chemistry; exchange phenomena of radioactive substances; occurrence and distribution of minor elements in fresh and saline waters; isolation and measurement of organic complexes in water; effects of plant and animal life on water quality; sorption of radionuclides on earth materials; and geochemistry of iron and manganese compounds in natural waters.

Reports published in 1961 included: Methods for the collection and analysis of water samples; complexes of ferrous iron with tannic acid; ammoniated thermal waters; iron content of selected water and land plants; and quality of surface waters for irrigation. In addition to

these formal reports, a large number of replies were prepared covering requests for water-quality information.

Sediment Investigations

A Survey evaluation of sediment loads in drainage basins throughout the Nation continued in 1961 with intensive studies of sediment transport centered in the Missouri, Colorado, and Middle Rio Grande basins.

Research in this field included: distribution and concentration of radioactive wastes in streams by fluvial sediment; transport parameters in sand bed streams; roughness in alluvial channels and sediment transportation; mineralogy of fluvial sediments; statistical techniques for utilization of sediment reconnaissance data; and methods for measurement and analysis of sediment loads in streams. Investigations of sediment yields and trap efficiency of reservoirs in small watersheds were continued in collaboration with the Soil Conservation Service.

Reports made public during the year discussed dispersion and concentration of radionuclides on stream sediments; transportation of sediment in alluvial channels; effects of depth of flow on discharge of bed material; quality of surface waters of the United States; and related subjects.

Soil and Moisture Conservation

Hydrologic and geologic investigations to provide data for use in conservation programs of land administration agencies were continued on about the same scale as those in effect during the preceding year. Studies connected with the development of range-water supplies were made in many areas of the western States with emphasis on studies covering grazing districts or geographical units.

Reports planned for publication as Geological Survey Water-Supply Papers were prepared for western Utah; the Ely Grazing District, Nev.; a part of northeastern Montana; a part of southwestern Idaho; and the Mescalero Indian Reservation, N. Mex. Data on runoff and sediment yields and on the progress of erosion were collected in Montana, Wyoming, Colorado, New Mexico, Arizona, and Utah. A report summarizing studies made during the period 1947-59 was prepared for publication. Research was carried forward on soil-plant-water relationships on both upland areas and range-water spreaders. Appraisals were made of the hydrologic effects of installed measures on range lands in several localities.



Saltcedar study site near Buckeye, Ariz., before the reestablishment of vegetation. The tall mast carries instruments to measure wind, temperature and humidity profiles. The shorter mast supports radiation measuring devices.

General Hydrologic Investigations

In the field of stream morphology, research was continued on the interrelation of factors influencing stream-channel characteristics. A study was made of channel widening and flood-plain construction on the Cimarron and Red Rivers in Kansas and Oklahoma. Studies of the causes of cutting or filling of channels were made in several localities ranging in environment from the Southwestern deserts to alpine areas of the Northwest.

Research to develop methods of interpreting the flood history of rivers from the growth and form of trees on their flood plains is being continued. In addition, a study of the botanical history related to selected glaciers of Mount Ranier was made and a report prepared.



Interior Department hydrologist watching the spread of a thin film of octadecanol (a floating waxy fluid for the suppression of evaporation in small reservoirs). The scene is a small stock tank near Laredo, Tex.

Studies such as these will aid in extending hydrologic records backwards both in space and time.

In recognition of the need for conserving water, considerable emphasis was given during the year to collecting data and conducting research on water losses by evaporation from free water surfaces and transpiration by plants. Measurements of evaporation were made at sites in Arizona, California, Texas, and Oklahoma. Laboratory and field research were continued to develop methods to suppress evaporation by applying and maintaining a monomolecular film on a water surface. The method found most successful to date involves using octadecanol spread by a wind-controlled dispenser such as that shown in the accompanying photograph.

Phreatophyte Studies

Studies of the use of water by vegetation of little or no economic value, and of ecological changes that may be anticipated by removing

such vegetation, are in progress in several areas and environments. An intensive study on the consumption of water by saltcedar (*Tamarix pentandra*) is being conducted by Geological Survey in cooperation with the Department's Bureau of Reclamation in the valley of the Gila River near Buckeye, Ariz. An effort is being made to determine the physical and physiological factors that determine rate and quantity of the water use. In the Humboldt River Valley near Winnemucca, Nev., Geological Survey is participating with other Federal and State agencies on the use of water by greasewood and willows.

Hydrologic Studies

Studies of the hydrologic effects of juniper-pinyon removal in the Carrizo-Corduroy area of the Fort Apache Indian Reservation, Ariz., was continued for the fourth year. This research is concerned with changes in runoff, sediment yield, soil moisture, and changes in vegetation resulting from the removal of the trees. A progress report covering the first 3 years of study was prepared.

Studies on the hydrologic effects of urbanization were continued. The work included an intensive program of data collection and analysis conducted in three small watersheds in the San Francisquito basin near Menlo Park, Calif., and broader scale, more generalized studies comprising analyses of runoff records collected in sewered areas and urban watersheds in several cities. On the San Francisquito project, comparisons will be made of hydrologic conditions before and after residential development.

Hydrology of Glaciers

Glacial hydrology is another field of water resources investigation which recently has been given increased attention. Glaciers in the United States (south of Alaska) contribute nearly 2 million acre-feet of water to streamflow each summer. Basic glaciological research, together with an intensive program of meteorologic and hydrologic data collection on South Cascade Glacier, Wash., has revealed the distinctive characteristics of glacier runoff and has led to better understanding of the ice melt and runoff processes.

The sensitive but enigmatic response of glaciers to climatic changes is also under active study. Mass budget determinations made each year



Glaciologists taking snow cores from a Glacier in western United States to obtain profiles of snow density, hardness, grain size, wetness, and dirt content.

on South Cascade Glacier serve as indices of glacier behavior and climatic trends in the Northwest.

Technical Assistance Program

Under auspices of the International Cooperation Administration, Geological Survey hydrologists worked with 11 foreign governments in water-resources investigations broadly directed toward the advancement of national economies. Long-term projects were carried on in Afghanistan, Chile, Egypt, Iran, Libya, Pakistan, Philippines, Saudi Arabia, Sudan, Turkey, and Tunisia. Geological Survey scientists were assigned for short periods to Brazil, Egypt, Nepal, Philippines,



Cartographic aid of the Geological Survey puts finishing touches on the shaded relief drawing of Oahu, Hawaii. Although this plate is produced with black ink by the artist, it will be printed in brown on the final map.

and Thailand to assist with expanding current water programs or to help solve special problems.

Survey overseas programs emphasize the establishment or strengthening of host-country water-resources investigation agencies. On-the-job training in methods and techniques of conducting investigations and the providing of advisory assistance in organizational problems are principal activities of the overseas programs. In the 11 host countries, to which Survey personnel were assigned, more than 150 local citizens were given technical training and education. In addition, 46 individuals from 25 foreign countries were given training in the United States.

Topographic Division

The Topographic Division of the Geological Survey prepares and maintains the National Topographic Map Series covering the United

States and its territories and possessions. Mapping operations include four major phases: Aerial photography, geodetic control, photogrammetric and field surveys, and cartographic work.

Related activities include research and development of mapping instruments, methods and techniques; the preparation of special maps and supplying Federal agencies and the general public with published maps, advance map materials, aerial photography, geodetic control lists, and map information.

Through the International Cooperation Administration, the Geological Survey extends technical assistance to many nations and their accredited representatives. During fiscal year 1961, extended periods of technical training were provided by the Topographic Division to visitors from Brazil, Chile, Columbia, El Salvador, Iran, Japan, Mexico, Pakistan, Sudan, and Tunisia. A topographic mapping team was sent to Yemen to execute a topographic survey of the city of Taizz. A technical expert was furnished to ICA for 4 months for the purpose of conducting an investigation of topographic mapping facilities in Brazil.

Training Program

The Division assisted in a Geological Survey photogeologic training program by providing brief periods of instruction in photogrammetry. Tours of Division mapping facilities as well as technical discussions on equipment and procedures were arranged for visitors from abroad. Mapping of Libya and Saudi Arabia continued in support of geologic investigation.

Staff work continued for the domestic names activity of the Board on Geographic Names resulting in the publication of three lists containing decisions on 1,418 names. Another list containing 447 names was published on July 1.

Surveying and Map Preparation

As a result of the surveying and cartographic operations of the Topographic Division, 111,000 square miles of new standard topographic mapping were completed during the year at scales of 1:24,000 and 1:62,500 (1:63,360 in Alaska). In the revision program, 12,600 square miles were completed. The Division also completed 3,600 square miles of new mapping and 3,400 square miles of revision using

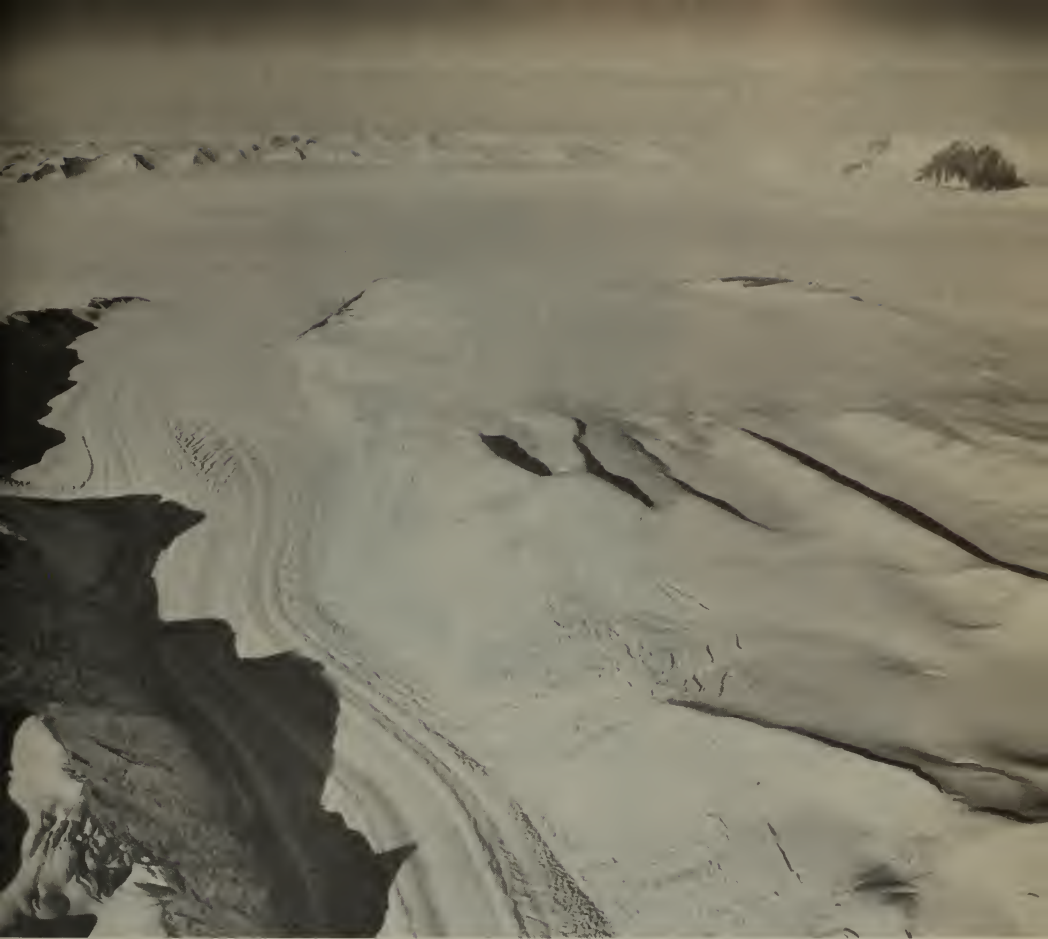


Survey map makers use scooters to carry themselves and their instruments over moderately rugged terrain in the Western States.

topographic survey data of other civil agencies and the Department of Defense.

In addition, numerous special maps were published for various purposes such as research, administration, or information. In cooperation with the Department's National Park Service, several park maps are being made, among them Lassen Volcanic, Olympic, Yosemite, and Wind Cave. Cartographic compilation is in progress for State maps of Minnesota, Montana, Nebraska, Nevada, North Dakota, South Dakota, and Washington. Urban area maps were published for New York City and Madison, Wis.

Quadrangle mapping projects were underway in most of the States, the Virgin Islands, and Puerto Rico. Nearly 270 permanently marked triangulation stations were established to provide control for areas totalling more than 23,000 square miles. About 1,953 linear miles of transit traverse, 4,011 miles of electronic traverse, and about 8,225 linear miles of levelling were run with permanent marks established at intervals of two or three miles. The results of these sur-



The vast and desolate area of Antarctica is being mapped by the Department of the Interior.

veys are made available on request to other Government agencies and the public.

Antarctic Mapping

Operations concerned with topographic mapping in Antarctica were conducted with the support of the National Science Foundation. During the 1960-61 austral summer, five engineers were assigned to the Antarctic area to establish control for mapping, using methods that combine solar observations and triangulation. Tellurometers, electronic distance measuring instruments, were used for the first time in the Antarctic, promising greater speed and efficiency for future control operations. More than 100,000 square miles of aerial photog-



Topographic engineers of the Geological Survey use the latest electronic distance measuring devices in mapping Antarctica.

raphy were obtained at flight heights ranging from 18,000 to 25,000 feet by U.S. Navy Air Development Squadron Six (VX-6). A Survey photo-liaison technician was assigned in an advisory capacity to the Squadron's photographic laboratory in Christchurch, New Zealand, to insure that coverage of mapping-quality photography was obtained. Map compilations were completed in the vicinity of the Sentinel Mountains, the Executive Committee Range, the Thurston area and McMurdo Sound at scales of 1: 50,000, 1: 250,000 or 1: 500,000. The Geological Survey continued to serve as the U.S. Antarctic Map and Aerial Photography Library, and provided consultant services to scientific and technical visitors.

Several mapping assignments were undertaken for other divisions of the Geological Survey and for other agencies. Included in this category were the detailed mapping of stream flood plains in Fairfax County, Va., and Emmons Glacier, Wash., from terrestrial photography. The 1:1,000,000-scale series of North America, published for Army Map Service, was completed.

During fiscal year 1961, cooperative programs were in effect with 32 States and Puerto Rico. Total cooperative offerings during the year amounted to about \$3,150,000.

The following table is a detailed summary by States of Survey map production during fiscal 1961:

Areas (in square miles) mapped or revised during fiscal year 1961 for publication at standard scales (contour intervals, 5 to 100 feet)

State	Area mapped, scale		Area revised	Total
	1:24,000	1:62,500		
Alabama.....	368			368
Alaska.....		22,311		22,311
Arizona.....	1,334			1,334
Arkansas.....	1,646			1,646
California.....	3,760		672	4,432
Colorado.....	2,280	273	769	3,322
Connecticut.....			118	118
Delaware.....				
District of Columbia.....				
Florida.....	299			299
Georgia.....	643	256		899
Hawaii.....			62	62
Idaho.....	2,613			2,613
Illinois.....	878		55	933
Indiana.....	2,532		901	3,433
Iowa.....	220			220
Kansas.....	2,858		531	3,389
Kentucky.....			3,512	3,512
Louisiana.....		1,460	192	1,652
Maine.....	548	198		746
Maryland.....				
Massachusetts.....			560	560
Michigan.....	923	177		1,100
Minnesota.....	2,184	331		2,515
Mississippi.....	1,587	51		1,638
Missouri.....	1,945		989	2,934
Montana.....	2,511	1,113		3,624
Nebraska.....	1,372			1,372
Nevada.....	3,009	171		3,180
New Hampshire.....				
New Jersey.....				
New Mexico.....	5,434	201	183	5,818
New York.....	80		1,056	1,136
North Carolina.....	51	63		114
North Dakota.....	1,604		303	1,907
Ohio.....	13,387			13,387
Oklahoma.....	2,649			2,649
Oregon.....	87	876	1,153	2,116
Pennsylvania.....	1,473		114	1,587
Rhode Island.....				
South Carolina.....	377	244		621
South Dakota.....	851			851
Tennessee.....	704			704
Texas.....	8,079	491	564	9,134
Utah.....	2,156			2,156
Vermont.....				
Virginia.....	1,267			1,267
Washington.....	645		95	740
West Virginia.....	2,410			2,410
Wisconsin.....	2,479			2,479
Wyoming.....	5,267	434	731	6,432
Total.....	82,510	28,650	12,560	123,720
Puerto Rico.....			388	388
Virgin Islands.....				
Total.....	82,510	28,650	12,948	124,108

Research and Development

Considerable accomplishment is noted in research and development for improving instruments, techniques, and procedures in mapping operations. Major efforts were devoted to the application



The Geological Survey's new self-propelled electronic elevation meter automatically measures ground elevations. It is virtually a computer on wheels.

of electronic devices and methods in control surveys; to improving the stability and imagery of aerial photography; to attaining better map accuracy; and to developing better treatment and symbolization for map features. The preparation and publication of the new Manual of Topographic Instructions continued as a major activity; four volumes have been published, and two more were in press at the end of the year.

Noteworthy accomplishments in research and development in field survey operations included the procurement of two new transistorized elevation meters for fourth-order vertical control for topographic mapping. These are vehicle-borne instruments to measure elevations of points on highways as the topographer drives along the road. Transistorization of the electronics has reduced power requirements and attendant problems significantly, and has reduced field troubleshooting to a simple routine of replacing printed circuit boards successively until the faulty one is located. Another major improvement over previous models is the inclusion of an automatic printing recorder, activated by pushing a button. This eliminates dangers of misreading, misrecording, or transposing digits, always present in manual recording. The addition of an electronic leveling adjustment greatly improves the instrument's accuracy and usefulness.

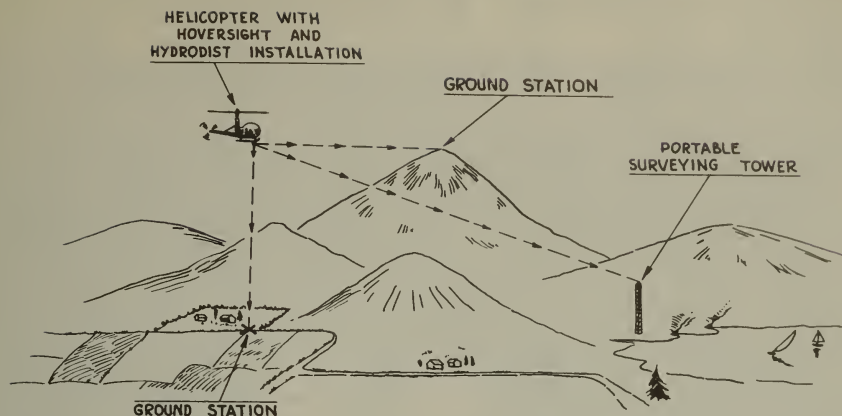


Diagram above illustrates the operation of Geological Survey's "Hydrodist-Helicopter-Hoversight" system (H-H-H) using a precise electronic distance measuring instrument carried aloft by a helicopter equipped with a newly designed optical plummet which provides a means for plumbing the helicopter over a ground station.

Both vehicle-mounted instruments are now in field use on control operations.

Hydrodist-Helicopter-Hoversight System

Investigation was started on a unique system for the establishment of horizontal ground control, combining use of the Hydrodist, a precise electronic distance-measuring instrument; a helicopter for transportation, and as a platform for occupying a horizontal position; and the Hoversight, a newly designed optical plummet, which provides a means for plumbing the helicopter over a ground station.

In operation, Hydrodist master-units are located on the ground, or on towers, at known positions, and the helicopter, containing a Hydrodist remote unit and a hoversight, is in flight about 100 feet above the point for which a position is desired. Simultaneous viewing through the hoversight by the pilot and the observer indicates when distance and angle measurements can be made from known points to the remote unit. The system is designed for use in establishing both basic and supplemental horizontal control. Investigations are also underway to determine the feasibility of combining a vertical control system with the Hydrodist-Helicopter-Hoversight (H-H-H) system.

Fifteen production models of a new lightweight portable surveying tower have been delivered to the Survey. These can be erected and transported without disassembly and are intended particularly for theodolite observations and electronic distance measurements over

trees and other obstructions. Production models at a 50-foot height have successfully undergone stability tests. Towers can be erected and transported by helicopter or towed by a light field vehicle.

Research in photogrammetry included a study and field test of ground targets to determine proper target materials and configuration, dimensions, and colors that will provide precise identification of field-surveyed control points on aerial photography. This is expected to lead to improved mapping procedures and improved map accuracy.

Electronic Computer

Research in analytical aerotriangulation was continued. A program has been developed for using high-speed electronic computers to determine mathematically the map-coordinate positions for images appearing on a strip of aerial photographs. The computer program will now establish positions for controlling a strip of nine consecutive aerial photographs.

An investigation of the use of polyester-base films for aerial photography has continued. Geological Survey use of this dimensionally stable film has created enough interest so that three major film producers now supply this product. Investigations in film-developing procedures to obtain optimum image quality is continuing.

Projector Researches

A new universal projector support frame has been developed capable of supporting Kelsh, ER-55, or Multiplex projectors, as well as super-wide-angle projectors when they become available. Features of the new table frame are a granite reference plane, an electrical system that will serve the several types of projectors, and an automatic light balance unit. Two Universal table frames were fabricated during the year, for operational testing. It is believed that the use of this equipment in quantity will provide operational flexibility and economy in photogrammetric surveys.

The prototype model of the Universal Orthophotoscope (Model U-60) has been used for several months for both research and production.

An intensive investigation was carried out to determine the comparative value of two existing automatic photographic dodging systems for diapositive preparation.

Map Information

Facilities for supplying information on maps, aerial photography and geodetic control surveys to Federal, State, and local government



A Civil Engineering Technician of the Geological Survey is drawing topographic map detail with the Kelsb plotter. This stereoplotting machine employs swinging lights whose motions are controlled by arms attached to the tracing table thus concentrating all of the light on the tracing table platen.

agencies and to the public are maintained at the Map Information Office in Washington and at Division field offices. Services include over-the-counter map sales for the convenience of the public, commercial firms, and Government agencies; sale of prints of advance materials from current topographic mapping and photostats of out-of-print maps; graphic or tabular assemblies of map, photographic, and geodetic-control information.

The Map Information Office continued to serve as the central depository for maps which make up the National Atlas of the United States. Among the sheets received this year from other Government agencies were 14 maps portraying mean sky cover, sunrise to sunset, monthly and annual.

Publications

The results of research and investigations by Geological Survey scientists and engineers, both in the field and in the laboratory, are

made available to the public through a variety of reports and maps. Of the formal reports published by the Survey, books are printed by the Government Printing Office and maps are printed in the Survey's own plant.

During the past fiscal year, 217 technical book reports were published. Printed maps totalled 2,475, of which 1,690 were new and 785 were reprints. The 2,475 maps comprised 7,643,413 copies that ranged in size from 13 by 18 inches to 50 by 72 inches. The Geologic Map of the United States was reprinted during the year.

	New	Reprinted
Topographic maps:		
Standard topographic.....	1, 070	¹ 452
Standard topographic (engraved).....		161
Standard topographic (revisions).....	122	---
1:250,000 scale.....	46	20
Scale conversions.....		32
Planimetric.....	6	7
State base.....	4	12
State topographic indexes.....		82
Miscellaneous.....	4	15
Geologic maps:		
Geologic quadrangles and miscellaneous investigations.....	34	4
Mineral resources.....	26	---
Geophysical investigations.....	20	---
Conservation maps: River surveys.....	27	---
Water Resources maps: Hydrologic atlases.....	36	---
Maps for inclusion in book reports.....	159	---
Maps for other agencies.....	136	---
Total.....	1, 690	785

¹ Includes 25 maps totalling 24,000 copies printed by other Government agencies.

Geological Survey maps are distributed and sold by mail and over-the-counter from Washington, D.C.; Denver, Colorado; and Fairbanks, Alaska. In addition, over-the-counter map sales are made at 14 other Survey offices. Approximately 550 authorized commercial agents throughout the United States also sell these maps to the public.

In addition to approximately 42,000,000 maps, books, and pamphlets at hand at the beginning of the year, 6,444,300 copies were received of new and reprinted maps, as well as 401,300 copies of reports. Distribution of 4,784,000 maps including 592,500 map indexes was slightly more than last year's corresponding total of 4,579,100. Approximately 302,500 book reports and pamphlets and 134,700 copies of the Survey's monthly announcement of new publications also were distributed during the fiscal year.

The total distribution was implemented by 246,700 individual orders. Sale of maps to the public brought in \$662,060.93, and that amount

was deposited to miscellaneous receipts in the United States Treasury. All the book reports distributed by the Survey and 24 percent of all maps were provided free for official and educational use. General distribution of Survey book reports to the public is through sale by the Superintendent of Documents, Government Printing Office, Washington, D.C.

The total number of publications distributed by the Geological Survey during this year as compared with last is shown in the following table:

	Fiscal year 1960 maps, map indexes and book reports	Fiscal year 1961 maps, map indexes and book reports	Percent of increase or decrease
Washington.....	2,786,200	2,698,150	-3
Denver.....	1,701,400	1,953,300	+15
Fairbanks.....	46,000	47,600	+3
Other field offices.....	320,250	387,450	+21
Total.....	4,853,850	5,086,500	+5

Public Inquiries Offices

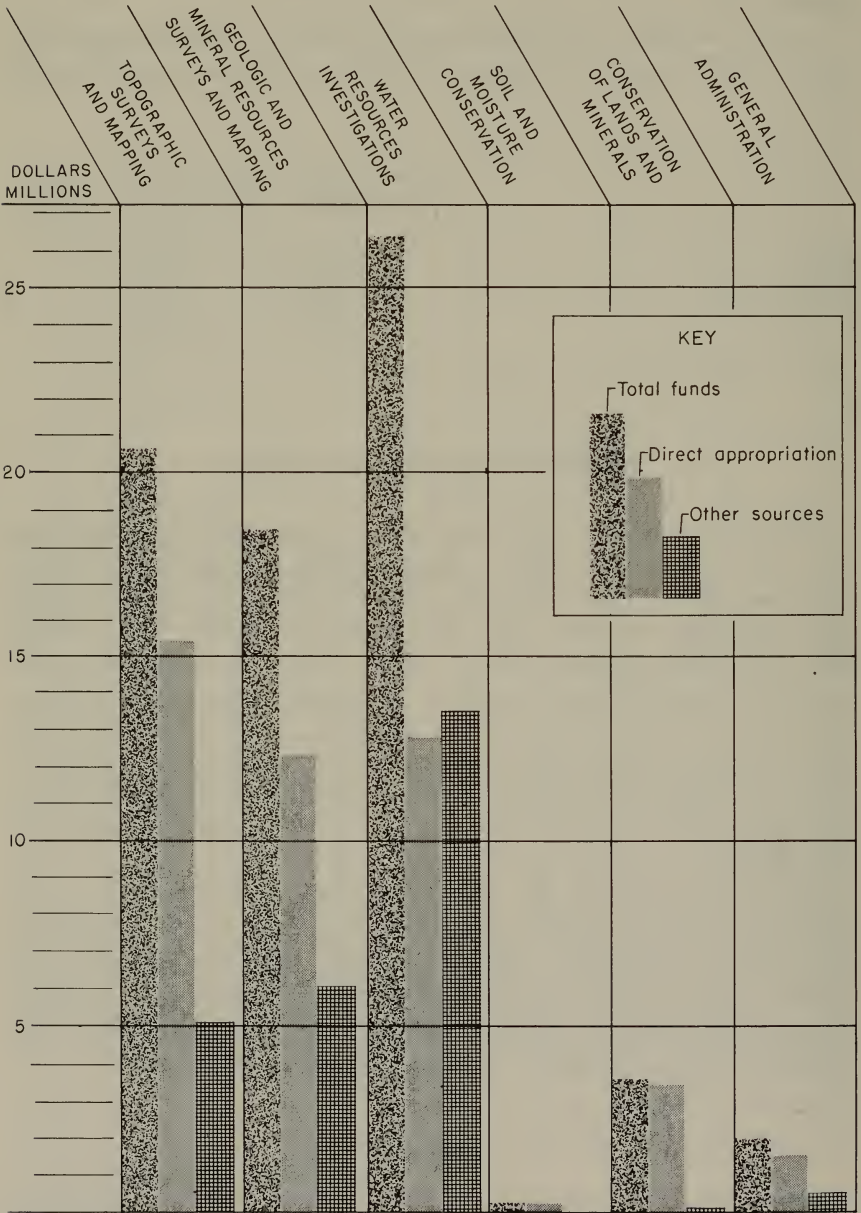
This year marks the 10th anniversary of the establishment of the first Public Inquiries Office in Denver, Colo. Since then, 6 offices have been added: Salt Lake City, Utah, in 1952; Los Angeles, Calif., and Anchorage, Alaska, 1953; San Francisco, Calif., 1954; Dallas, Tex., 1957; and Spokane, Wash., 1960. These seven offices provide points of contact where the public can obtain nontechnical information about the work of the Survey. Technical and scientific questions are referred to appropriate sources. Each office has a library of Survey publications and is a depository for open-file reports on its geographic area. Survey maps and reports are stocked for sale over-the-counter.

During the 10 years that the Public Inquiries Offices have been operating there has been a tremendous increase in the number of users of their facilities. During the first year of operation 4,662 visitors were served and a total of \$7,600 was received in payment for maps and reports. Figures for fiscal year 1961 show 60,075 visitors and \$90,100 received in payment for maps and reports.

Funds

During Fiscal Year 1961 the Geological Survey incurred obligations totaling \$71.3 million. Of this amount, \$45.9 million was from funds

appropriated to the Bureau and \$25.4 million was made available by cooperating Federal, State and municipal agencies, licensees of the Federal Power Commission and miscellaneous sources. The chart illustrates obligations by source of funds for each activity.



Bureau of Mines

Marling J. Ankeny, *Director*



GREATLY INCREASED OUTPUT of technical publications reflected the scope and speed of research and other studies by the Bureau of Mines of the Department of the Interior during fiscal 1962.

More publications were written by Bureau scientists than in any year since the agency was created in 1910. The gap between collection and dissemination of information regarding production, employment, and safety for all the mineral industries was reduced further.

Under the Helium Conservation Act of 1960, the Bureau began negotiations with industry to construct plants for producing this vital element for sale to the Government.

New successes were attained in the safety education programs conducted by the Bureau throughout the Nation's mineral industries. In the 1960 National Safety Competitions, a record number of participating firms completed the contest year without a single disabling injury.

Other attainments of the Bureau were varied and significant:

A widespread occurrence of beryllium mineralization was discovered in Idaho by the Bureau of Mines and the Idaho State Bureau of Mines and Geology.

Savings approaching \$5 million a year were reported by Federal agencies employing a corrosion warning system developed by the Bureau.

A new pressure gasifier being developed by the Bureau made several highly satisfactory test runs on lignite coal.

Studies in new and improved uses for coal were aided by use of a radioactive isotope, Gallium 68.

An advanced helium gas recycle system, seeking utilization of nuclear heat for gasifying coal and for other industrial uses, completed 1,000 hours of continuous generation.

Several new mine-drainage projects for Pennsylvania's anthracite region were started.

A simple field test for detecting cesium and rubidium was developed by the Bureau.

Publications reflecting the Bureau's important studies in secondary recovery of petroleum received national acclaim.

A new Helium-Research Center was established at Amarillo, Tex.

Plans were announced for building an atomic-research facility for studying the effects of gamma radiation on coal, metals, and non-metals.

Details on accomplishments by the Bureau are given in the following pages.

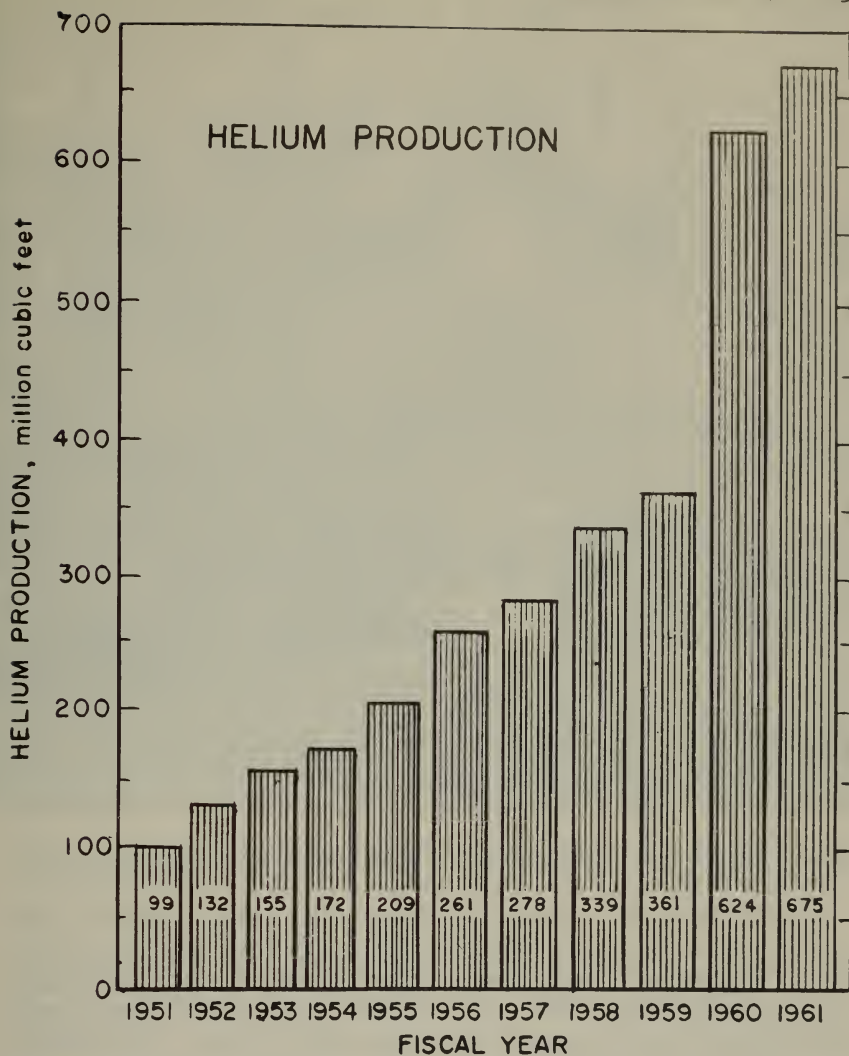
Helium

Large-scale conservation of the Nation's irreplaceable helium resources was made possible when new legislation (Public Law 86-777) became effective March 1, 1961. The legislation is the foundation for a long-range program to save for future use helium that otherwise would be wasted when helium-bearing natural gas is used solely for its fuel content.

Under authority of the new legislation, the Department plans to purchase helium for conservation storage and future use from up to 12 new helium plants financed, built, and operated by industry. The plants would be located on interstate pipelines carrying natural gas with a helium content above 0.4 percent to fuel markets from gasfields in the southwestern part of the United States. Helium acquired under the program but not needed to meet present demand will be stored underground in the Government-owned Cliffside gasfield near Amarillo, Tex.

Proposals for the new plants were solicited from industry, and 14 firms responded with plans that included 23 possible plant sites. Four of the firms, whose proposals had the best prospects for achieving conservation, were selected for further immediate consideration. Negotiations on contract provisions began. If they prove successful, construction of four helium-extraction plants by industry will be assured. As funds become available, additional selections will be made for plants at remaining locations where helium conservation can be achieved.

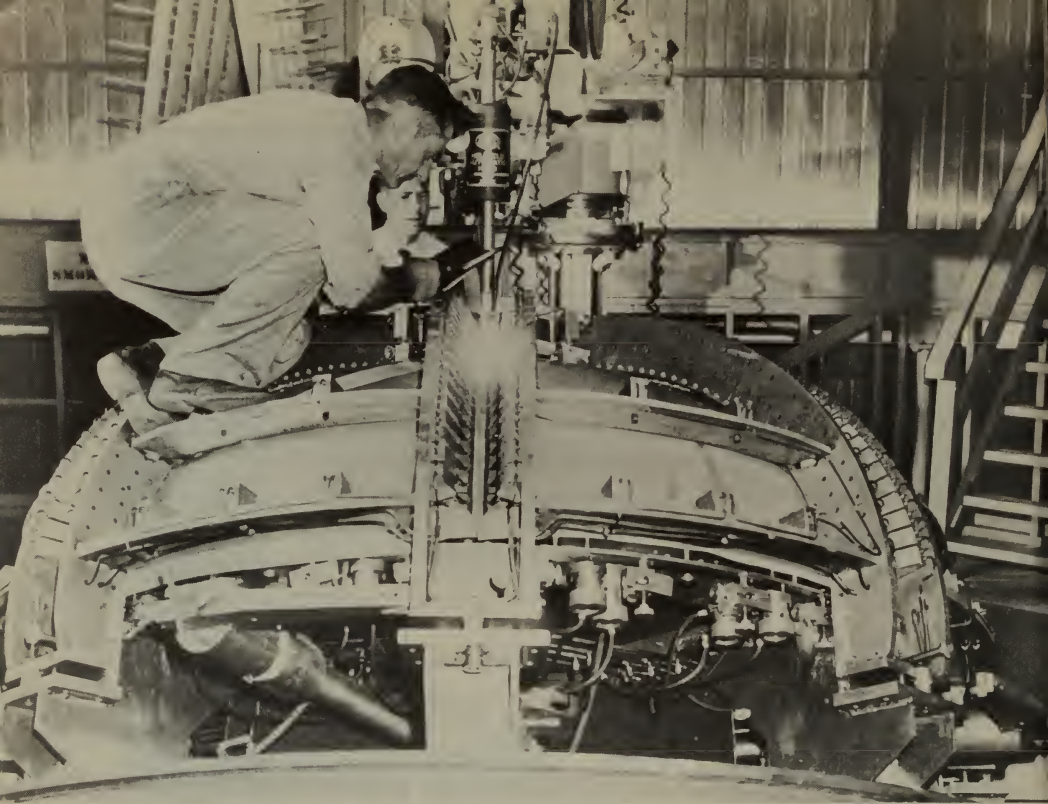
During the next 25 years, industrial plants and the existing five Bureau of Mines plants could recover about 88 billion cubic feet of



Helium production rose sharply in the last two fiscal years as the new Bureau plant at Keyes, Okla., extracted helium from commercial natural gas before it was piped to fuel markets.

helium. Total demand for the 25-year period is expected to be 36 billion cubic feet. Thus, 52 billion cubic feet would be stored for use after 1985.

The program is required to be self-liquidating, and the price of helium sold by the Bureau of Mines has been increased to about \$39 a thousand cubic feet to meet the pay-out obligations. However, early in the program, income from helium sales will not equal expenditures and additional funds will be needed to sustain it. Funds to launch



Fuel tanks for the Titan intercontinental ballistics missile are welded with the aid of a helium-shielded arc.

the program were included in the Department's budget request for fiscal year 1962.

During fiscal 1961, accelerated demand for helium required shipment of 523 million cubic feet, of which the Federal agencies received about 75 percent. Production was greater than demand and totaled over 675 million cubic feet. The excess was stored underground in the Cliffside field to increase the reserve stored there to 363 million cubic feet. The stored helium must be purified before shipment, but it is a reserve that had not been available previously.

Rockets and Missiles Big Users

Helium was used by Federal agencies in rocket and missile programs, in wind tunnel and shock tube tests, in nuclear reactor development, in medical research, in meteorological balloons, and for other purposes. Commercial users employed helium in shielded-arc welding, leak detection, gas chromatography, low-temperature research, inert atmospheres for growing silicon and germanium crystals, and in medical and scientific studies.



This gas-cleaning equipment was added to the Bureau's Exell, Tex., plant during the year to increase its processing capacity to 130 million cubic feet per day.

During 1961, all the Bureau's five helium plants at Amarillo and Exell, Tex., Keyes, Okla., Shiprock, N. Mex., and Otis, Kans., were in operation. At the Exell plant, the older section built in 1942-43 was shut down for modification and modernization to increase plant capacity about 30 percent. The gain was achieved by replacing older, less efficient low-temperature gas-processing equipment and modifying compressors to permit processing larger volumes of gas.

Although helium has been stored and withdrawn on a small scale from the Cliffside gasfield for several years, additional work was done to assure the integrity of the field for storing helium in the conservation program. A seismographic survey of the field confirmed that its geologic limits, as previously determined by other means, were known with adequate precision. Reconditioning of the gas wells in the Cliffside field began in May 1961 in preparation for receiving conservation helium for underground storage.

Helium Research Center Established

In May 1961 a Helium-Research Center was established at Amarillo. The Research Center will use existing facilities and personnel and will continue some of the studies of properties and characteristics of helium-bearing natural gas and helium-gas mixtures previously carried on at Amarillo. However, greater emphasis will be placed on basic helium research in connection with the helium-conservation program.

New reports were added to an open file of information developed from research on extracting helium from natural gas by low-temperature processing. This information will aid in designing and operating helium plants.

Minerals Developments

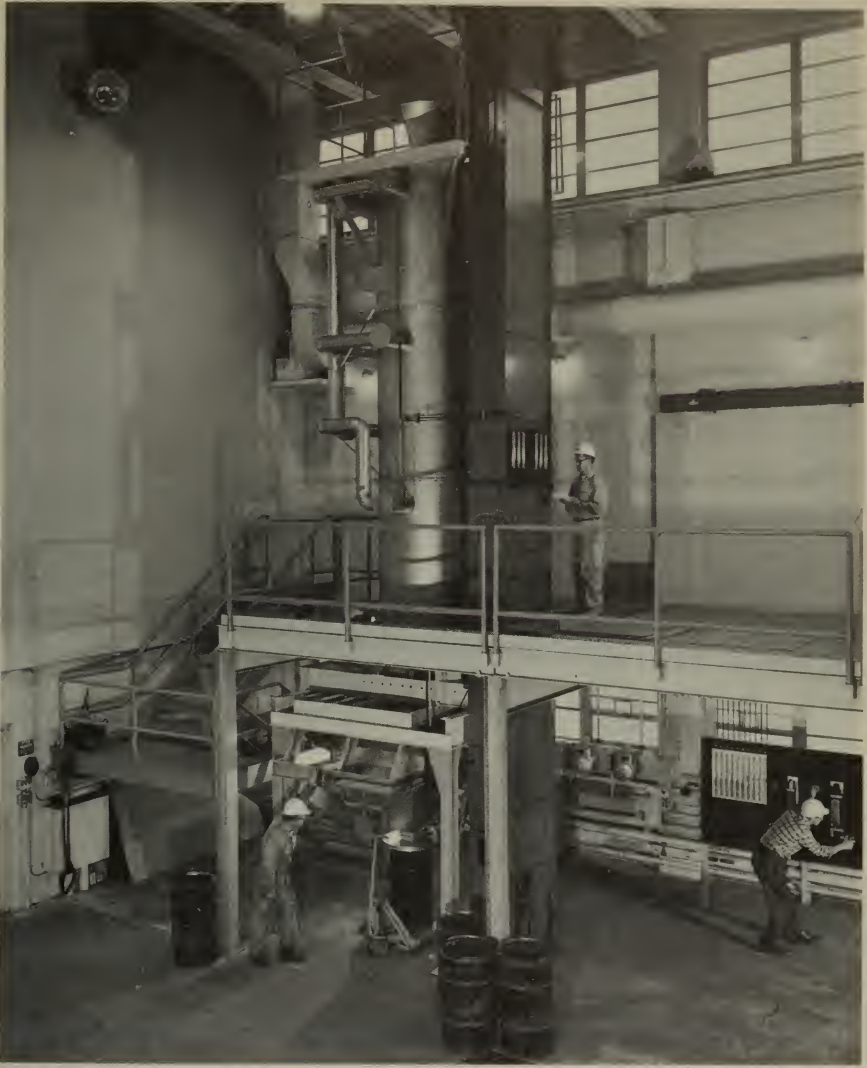
Research was emphasized during the year to meet increasingly urgent demands for metals, alloys, and compounds with the superior properties required for the Nation's space programs and other special uses. Such materials must resist high and unusual stresses and corrosion at both elevated and very low temperatures. Mining research activities were also intensified.

The Minneapolis Research Center at Fort Snelling, Minn., devoted to studies in mining research, minerals beneficiation, and extractive metallurgy, was dedicated June 10.

Assistance was given the Office of Minerals Exploration and the Office of Minerals Mobilization of the Department of the Interior, General Services Administration, the Office of Civil and Defense Mobilization, the Civil Service Commission, and other agencies. In addition, Bureau scientists served on many committees and boards, including those of the American Society for Testing Materials; the American Institute of Mining, Metallurgical, and Petroleum Engineers; the National Academy of Sciences; the American Chemical Society; and the American Standards Association.

Ferrous Metals Technology Advances

The Bureau's iron-ore program was directed toward making the large resources of low-grade domestic ores competitive in price and quality with higher-grade foreign ores. Mining studies on rock penetration and fragmentation; research on concentrating, extracting, and agglomerating iron minerals; and research on reducing the concentrates and ores to iron were included in the program.



Large shaft furnace built by the Bureau of Mines for experiments in utilizing domestic manganese ores.

Flotation and magnetic concentration studies, significant in the Bureau's work on domestic low-grade iron ores, showed that high-grade concentrate could be produced. A Bureau publication described methods of beneficiating fines produced from Alabama red iron ores.

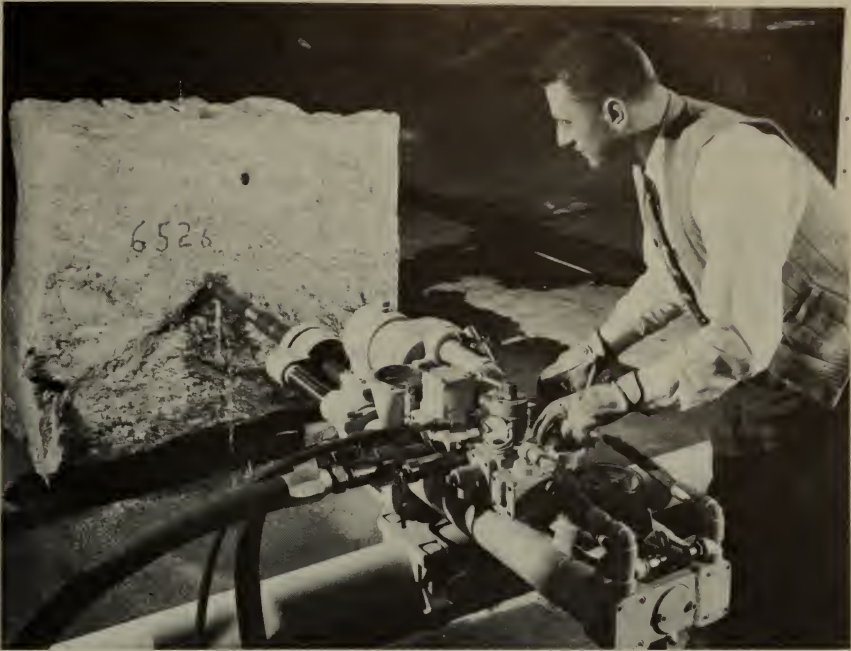
Research on agglomeration and partial reduction of iron-ore concentrate yielded important results. Blast-furnace feeds containing



Drill-core library, maintained by Bureau of Mines, is consulted by geologists, mining engineers, and others interested in mineral development.

80 percent iron were foreseen compared with ores of 60 to 70 percent iron, the best obtainable today. A report on the effect of particle size on the green strength of iron oxide pellets was published.

Use of the Bureau's small-scale experimental blast furnace to predict results of changes in operating industrial-size furnaces was described in a report. The experimental furnace operated throughout the year, largely in cooperation with private industry, to provide additional information on the injection of supplementary liquid fuels and to find the effects of higher blast temperatures, differences in burden, and other variables. Publications on the injection of natural



Rock-penetration studies are undertaken with a special experimental drill.

gas and solid fuels into the smelting zone of a blast furnace were issued.

Experimental Blast Furnace Aids Industry

Successful application of the Bureau experimental blast-furnace research was a factor in the decision by one large steel company to build a similar furnace. Injection of supplementary fuels in the smelting zone of an iron blast furnace, pioneered by the Bureau of Mines, was adopted by industry. Eleven companies were using natural gas and coke oven gas to increase blast-furnace output and reduce coke requirements.

Theoretical studies of iron oxide reduction, conducted concurrently with the applied research, augmented knowledge of the chemical reactions in blast furnaces and in other iron reduction facilities.

Molten pig iron was desiliconized with oxygen as it was tapped from the Bureau's experimental blast furnace. The new technique used a Bureau-designed vortex cone reactor. Open-hearth steelmaking time was found to be reduced greatly by using low-silicon hot metal.

The Bureau program to determine the alloying effect of uranium in steel continued in an effort to develop new uses for the growing stock-piles of depleted uranium. High-strength uranium-bearing steels were made successfully in 300-pound melts and there was progress in determining the hardening effect of uranium in these steels.

X-Ray Probes Uranium

Electron-probe X-ray spectrography was used to determine the distribution of uranium in steel. In a 5-percent uranium alloy steel, 90 percent of the uranium was found at grain boundaries and only 10 percent was distributed within grains.

A rapid-twist test experimentally determined the hot-working characteristics of molten steel before it was cast into ingots. Such a test when perfected could divert melts with poor working properties to low-grade products and result in substantial savings to the steel industry. Methods for removing contaminants from steelmaking scrap and methods to increase use of scrap in the iron and steel industry were improved.

Tungsten research centered on techniques to improve purity and ductility, fabrication, and high-temperature oxidation resistance. Continuing studies of the fundamental properties of tungsten and its compounds produced scientific facts to aid industry's use of the metal in high-temperature technology. Already adopted is the Bureau's successful tungsten-coating process developed at the Rolla Metallurgy Research Center. A commercial vapor plating plant using the process was installed recently with technical direction by Bureau metallurgists. Demand for the tungsten chemical employed in this process justified commercial production of what only a short time ago was a laboratory curiosity.

Pure tungsten metal prepared by the Bureau's method was found to be one of the most satisfactory materials available for high-temperature uses in atmospheric and space environments. Promising new techniques for extracting tungsten from its ores and concentrates resulted from experiments by Bureau scientists, and may permit mining tungsten deposits hitherto considered unprofitable.

Fused-Salt Electrolysis Finds New Uses

A new Bureau report described the Bureau's open-cell fused-salt electrolytic process for producing high-purity molybdenum directly from its oxides. This process promised to be an outstanding contribution in the extractive metallurgy of molybdenum. Bureau scien-

tists also investigated fused-salt electrolytic techniques for removing trace impurities from molybdenum, and studied molybdenum alloys systems for high-strength, high-temperature applications.

Researchers demonstrated the technical feasibility of producing chromium ferroalloys from offgrade domestic chromite, and the Bureau published a report describing electric smelting tests on Montana chromite concentrates. Fused-salt-bath electrolytic techniques for extracting chromium or its compounds directly from chromite were investigated. Effects of temperature and other variables on chemical reactions during electric smelting of chromite were studied.

A fluorescent X-ray spectrograph, developed by the Bureau, was described together with its instrumentation for dynamic selective-oxidation-rate studies. This apparatus measured in seconds the rate of formation of trace element oxides at temperatures above 1,400° F.

Evaluating Thermodynamic Properties

The Bureau evaluated and compiled thermodynamic properties of 65 elements. It concluded its kinetic studies of the carbothermic reduction of manganous oxide and obtained significant information. Direct-reduction studies of low-grade Cuyuna Range materials yielded high-iron products with good recoveries and a leachable synthetic manganese ore.

Thermal decomposition of manganese sulfate was accelerated appreciably by the addition of 5 percent petroleum coke. In the melt-quench-leach process for extracting manganese from rhodonite and other manganese silicates, simple means were found to control operating difficulties caused by gel formation.

Nickel with a cobalt content of less than 1 part per million and total impurities of about 100 parts per million was prepared from an impure cobalt-bearing nickel starting-material by the Bureau's new combination electrorefining and solvent extraction process. Cobalt containing only about 40 parts per million of nickel also was recovered from the same starting-material.

Nonferrous Metals Research Gains

Research continued to develop methods for beneficiating domestic beryllium-bearing materials and to prepare high-purity beryllium metal and oxide. Disseminated beryl was recovered from low-grade ores in North Carolina in a concentrate suitable to produce high-grade beryllium compounds. Phenacite and bertrandite ores from Western States were concentrated successfully by flotation and a patent on the procedure was sought. Beryllium and uranium produced by

molten-salt electrorefining techniques were of such high purity that other Government agencies requested quantities large enough to permit evaluation for special applications.

Fundamental studies of experimental magnesium-base structural alloys determined the relation of composition and structure to tensile strength and vibration-damping capacity under various stress conditions.

Radioactive isotopes were used more effectively in measuring and controlling metallurgical processes. Isotope tracers helped to measure pulp flow rates, to determine the beryllium or trace metal content of ores and products, and to control the thickness of copper anodes during casting.

Titanium investigations developed basic data on reactions in the electrolysis of titanium in fused salt. A new approach to electro-winning titanium directly from its oxide was tested. Improved titanium-casting mold materials were prepared capable of containing molten metal at 2,100° C. Vapor-phase reduction of titanium tetrachloride with sodium was attained in the laboratory.

Research was completed in recovering alumina and fluoride from waste materials of aluminum production plants; a simple Bureau batch flotation technique was modified so it could be used in a continuous-circuit process.

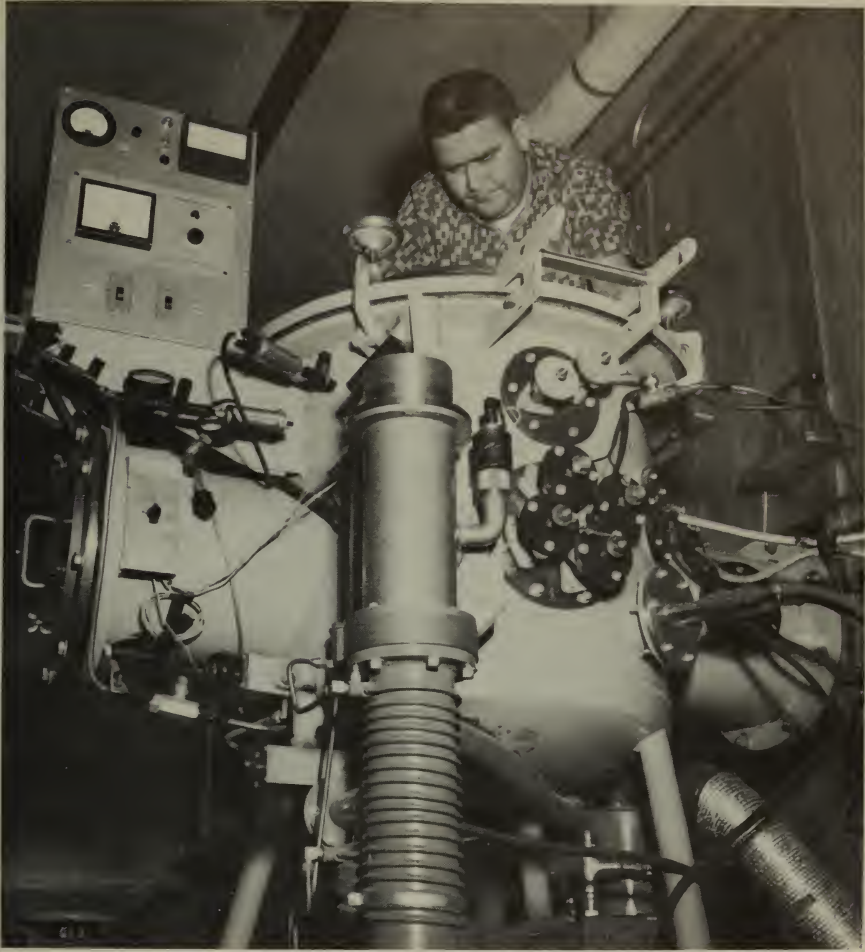
The Bureau published its research on a subhalide and a molten-zinc leaching process for recovering aluminum from crude alloys produced from domestic low-grade material. Studies progressed on electrolytic techniques for recovering aluminum from both high- and low-temperature fused-salt baths and organic baths. Basic data on reactions in the lime-soda-sinter process for recovering alumina from aluminum silicate materials also were published.

Research in the extractive metallurgy of cesium culminated in an improved method of producing metal of commercial purity at lower cost.

Field tests for identifying germanium and columbium were perfected, and a highly sensitive method for detecting tellurium was developed.

High-purity columbium was recovered experimentally from scrap columbium by electrolysis in a molten salt bath. Ductile hafnium containing less than 200 parts per million of oxygen was produced by the Kroll process.

A novel electrowinning solvent-extraction process for recovering rhenium was developed and the Bureau applied for a patent on the process. A technique was devised to determine rhenium contents of less than 1 part per million in solutions.



An advanced design of an inert-atmosphere chamber is employed in electrolytic refining of rare-earth metals.

Rare-Earth Researches Productive

Research on rare-earth metals and compounds continued productive during the year. Stable cerous oxide reduced from ceric oxide was found to be a superior feed material in electrowinning studies. An inert-gas fusion technique was devised to detect small quantities of oxygen in electrolytes, and an ion-exchange method, using polarography and flame photometry, permitted detection of extremely small quantities of impurities in cerium metal. Cerium metal was effectively zone-refined by solid state electrolysis. Lanthanum was successfully electrowon.

New ways were developed to recover yttrium and thorium from domestic thorite ores. Methods for beneficiating low-grade uranium ores and minimizing radioactive pollution of surface waters by uranium mill wastes were improved. Crude scandium concentrate was recovered successfully from uranium mill-waste liquors in a truck-mounted portable pilot plant. Improved chlorination and active-metal reduction techniques produced higher purity thorium metal. Radiological hazards associated with melting and fabricating thorium were determined and safer procedures were devised.

New advances in Bureau secondary metals research included recovering tin from hardhead, purifying lead and tin by vacuum distillation, and using ultrasonics for improved electrodeposition of metals. A gas-fired vacuum retort was designed. A Bureau-developed process for economically reclaiming cadmium and magnesium proved to be a key factor in the sale of Government-owned surplus incendiary bomb casings.

Flotation reagents were studied by absorption spectrophotometry, the better to understand the reactions of flotation processes. Knowledge of chlorine metallurgy was increased by studies on chloridizing base metal sulfides and on the vapor pressure of metal halides.

Microbes Aid Metallurgy

Possible roles of micro-organisms in extracting copper from presently uneconomical low-grade materials were studied further. Technical innovations in the segregation process for treating low-grade mixed oxide-sulfide copper ores were explored. Expanded application of the process would provide low-cost production from presently sub-marginal ores.

Mining research on ground-control problems in deep mines developed new information on the effectiveness of precast, segmented, and reinforced concrete drift sets; explosively shaped rock bolts for obtaining rapid bolt anchorage; and the factors affecting hydraulic transportation of stope fill. Research on fundamentals of breaking rock with explosives demonstrated that the charge diameter should equal—as nearly as possible—the hole diameter.

The Bureau method for evaluating performance of explosives by measuring strain produced in the surrounding rock was compared with an underwater test used by an explosives manufacturer. Noise abatement investigations proved a Bureau-designed muffler effective in reducing sound generated by a pneumatic drill. Development of ways to measure pressure in rock masses led to the design of instruments that should increase safety and reduce costs in open-pit and



A device for measuring the stress in walls and pillars of underground mines is used by Bureau researchers at a commercial operation.

block-cave mining. Theoretical statistical studies led to a new sampling theory, promising better statistical correlation of exploration drilling prediction of ore content than previously achieved.

A new centrifuge, developed and used for photoelastic study of models of open-pit mine slopes, was about to be used to study problems in rock mechanics and achieve more efficient pit slope designs.

Nonmetallic Minerals Yield Secrets

New data on fluorophlogopite developed from research on synthetic mica during 1961. Melting temperature was more accurately determined and a new law was found that governs the twinning of its crystals. Resistivity data on a number of glass-bonded natural and synthetic micas clearly demonstrated the electrical superiority of the



A small gasoline motor powers a drill used by Bureau of Mines to penetrate permafrost in Alaska's Kuskokwim River area in quest of mercury ore.

synthetic mica products. Preparation of various synthetic micas and the effect of composition changes on their properties were reported in a Bureau publication.

Samples of reconstituted-mica paper made by the Bureau from water-swelling synthetic mica were distributed in response to requests from the electronic and electrical industries. Investigations on ways to improve the properties of this paper continued in cooperation with the General Services Administration and were to include substitution of various ions during paper formation, treatment of the formed paper, and changes in composition of the water-swelling mica.

Valuable new information was obtained on special properties of yttrium, lanthanum, cerium, and many rare-earth oxides to aid in evaluating these materials. Possible new uses for them are as additives to standard high-temperature ceramic materials such as alumina, magnesia, and zirconia. Measurement and control of temperature developed by a Bureau-designed image furnace for studying superrefractories were accomplished.

Study of Thermal Expansion

More than 20 government, university, and industry laboratories from three continents collaborated under Bureau leadership in 1961 to study how to measure accurately the thermal expansion of refractories at temperatures up to 3,000° C. The cooperative effort included comparison of results obtained, on a standard sample, using X-ray diffractometer, X-ray camera, dilatometer, interferometer, and tele-microscope methods.

Research on the synthesis of asbestos continued, particularly on the crystalline structure of inorganic asbestiform fibers. Studies were completed on garnierite, scapolite, richterite, and potassium-lead-silicates. Silicon carbide fibers were synthesized both in "cottony" and needlelike fibers. Exploratory experiments proved that the synthesis of long fibers should be feasible.

Preliminary tests of a method of dewatering primary phosphate-rock slime yielded encouraging results. The method may solve a serious problem confronting the phosphate industry in Florida and Tennessee.

Fire Clays Upgraded

Alkali content of subgrade fire-clay samples was reduced more than 50 percent using a Bureau-developed leaching process. Ultrasonic energy proved useful as a pretreatment step in ion-exchange removal of alkali. Research on removal of quartz and pyrite from fire clay continued with excellent results, and an interim progress report was published. The Bureau's wet-attrition-grinding process was further refined and adapted for continuous grinding and produced clay of paper-coating grade in laboratory runs.

Elemental boron samples were obtained by reducing boron trichloride with zinc or lithium and purifying it by melting in an electron-beam furnace. Preparation and testing of sintered compacts of boron continued, and improvements were made in analyzing and measuring techniques. A method of preparing commercial-quality zirconium diboride directly from zircon was described in a report.

One phase of test work was completed and a report was issued on a series of flotation tests of Nevada and California fluorspar ores. Another project was devoted to a process for recovering fluorine from low-grade sources by defluorinating siliceous fluorspar ores in a rotary kiln and recovering hydrofluoric acid from the gases.

Study of the damaging effects of vibrations from quarry blasting continued. Development of criteria for predicting damage to surface

structures was essentially completed and vibration levels resulting from different commonly-used blasting techniques were compared. Research on ground support problems in the Western phosphate field advanced. Precast lightweight concrete supports were designed and built for trial in adits with typical "heavy-ground" conditions.

Petroleum and Natural Gas

The Bureau of Mines research program in petroleum and natural gas during the year resulted in many contributions for conserving the Nation's reserves of these fuels. The laboratory phase of a study of physical properties and clay content of oil sands in the Powder River Basin, Wyo., was completed and preliminary results were published.

Studies completed under this project have shown how the physical properties and clay content of oil-bearing rocks affect the productive capacity of wells. In new studies on the oil and gas sands in the Green River Basin, Wyo., special attention is being given to the Patrick Draw field, a major new discovery and now the largest oil producer in Wyoming.

Two reports were published on a study of well-completions in Naval Petroleum Reserve No. 4, Alaska. This study is of particular interest because 11 wells were drilled into the reservoir rock, part of which is in permafrost which has a temperature below the freezing point of water. Results of drilling the 11 wells on the Umiat structure indicated that the use of the drilling muds containing water, particularly fresh water, lowered the productivity of some of the wells.

Although all the wells penetrated sandstones that contained oil and gas, the highest production rates were from the wells completed with oil and oil-base drilling muds in the holes. Wells drilled with sodium chloride brines and cable tools had intermediate production rates. This information is timely because of the drilling program underway in Alaska and Northern Canada.

Data from computing programs illustrated flow problems for two fluids, two temperatures of flow, and two flow rates. They show pressures as a function of time, position in the formation, and flow rate. This information can be applied to problems of removing gas from a reservoir or return of gas to a reservoir for storage.

In particular, it permits estimates of the future delivery capacity of wells under two contrasting sets of circumstances: (1) Assuming that properties of the fluid will never change; and (2) taking into consideration the fact that fluid properties do change as pressure changes and as condensate accumulates in the pores of the structure.



Water containing radioactive hydrogen is fed by a Bureau of Mines engineer into an Oklahoma oil well as part of a study on secondary recovery of petroleum.

Research on gas storage resulted in a publication describing back-pressure tests used to measure the deliverability of gas when stored. Laboratory investigation of the effect of silane injection on the capacity of sandstone to transmit gas at various water saturations was completed and the report was readied for publication.

Prompted by the interest of companies in using relatively cheap inert gases as "cushions" in natural-gas storage, the Bureau cooperated with the American Gas Association in starting research on the problem of diffusion and mixing between such a cushion gas and the "operating" gas. Gas chromatography permitted quantitative measurement of diffusion of a nitrogen cushion and natural-gas operating gas through a sandstone core.

Research Results Published

The use of sodium tripolyphosphate for increasing injection rates in secondary-recovery operations grew during the year from a few field tests and trial treatments to routine use in more than 100 water-flood operations. Only a few wells failed to develop marked improvement in injection rates after tripolyphosphate was used. Two Bu-



Smog resembling that found in certain cities is created by the Bureau of Mines in this special chamber as part of its study on atmospheric contamination. Exhaust from an automobile engine is fed to the chamber, mixed with air, and then bathed in special light to simulate sunlight. The result: Eye-irritating smog.

reau reports were published to describe results from using this chemical.

An outstanding attainment from a study made in California was the determination of organic acid constituents in oilfield waters. The relatively high concentration of such salts appeared to be unique and was characteristic of waters that have been in contact with crude oils in the reservoir rock. This study has helped California operators in their dealings with the State Water Pollution Control Board, which regulates the disposal of oilfield waters.

Storage Tests Yield Information

Five petroleum product survey reports, based on facts submitted by oil companies, were published. They included two reports showing inspection data on motor gasolines and one each on aviation, diesel, and burner fuels marketed in the United States.

Gasoline and other distillate fuels often form undesirable products, such as gum, when stored. Fifty-two weeks' storage tests at 110° F.



This equipment is being used by the Bureau of Mines in one of its several studies on air pollution. The instrument-filled station wagon is used to analyze exhaust fumes from the vehicle itself as it travels and to test the effectiveness of catalysts in removing contaminants. The trailer is a generating unit that provides power for the instruments.

showed that several commercial-type hydrogenated fuels were as stable as untreated fuel. On the other hand, a blend of unhydrogenated material formed more than eight times as much gum as a similar hydrogenated blend. Storage studies on a gasoline showed that sulfur and nitrogen compounds contribute markedly to the formation of gum.

In air-pollution research, a cooperative project with the Public Health Service dealt primarily with study of composite automobile exhausts produced during a series of accelerations, decelerations, and cruise and idle operations to simulate traffic conditions. Analyses of composite samples showed a consistent relationship between composition of the exhaust and that of the fuel.

Studies on the use of catalysts to eliminate hydrocarbons from automobile exhausts revealed that uranium oxide alone has limited activity but when promoted with chromium and copper is much more effective.

Gas Chromatographic Unit Designed

A new gas chromatographic unit was designed and construction was nearly complete. The unit is designed specifically for isolation and identification work in crude oil analysis where complete separation of complex samples is needed. A molecular still, constructed to distill a

barrel of oil at low pressures and temperatures, was modified and was tested successfully.

A method was developed to use rotating-bomb calorimetry for measuring the heat of combustion of organic silicon compounds, a class of substances for which all methods previously used in other laboratories had been unsuccessful. To calculate values of heat of formation from the results, values of the heat of formation of fluosilic acid were needed. These were developed by a novel method. Thus, the thermochemistry of organic silicon compounds is now on a firm experimental basis, fulfilling a need for more and better thermodynamic data that has become especially apparent in research and development of new missile fuels and rocket propellants.

The Bureau completed a publication containing comprehensive thermodynamic tables for 100 petroleum sulfur compounds.

Oil Import Administration Aided

The Oil Import Administration continued to base policy formulation and administration of controls upon reliable petroleum statistics provided by the Bureau. At the request of the petroleum industry, supply-demand balances by districts on the Oil Import Administration basis were published each quarter. The use of Bureau forecasts, prepared twice yearly, was extended to become the basis upon which over-all residual fuel oil import quotas were determined.

New Facts Gathered on Oil Shale

Investigations of samples from the potentially important oil-shale beds in the Piceance Creek basin in Colorado disclosed that the specific gravity of oil recovered from this source decreases with increasing depth in a uniform manner.

Preliminary studies on black oil shales of the eastern United States revealed a lack of similarity in chemical and physical properties. Considerable interest in these shales has developed because gas can be produced from them by hydrogasification process and because they occur near major market areas.

The possible use of depleted uranium as a catalyst for increasing octane ratings of gasoline or for hydrogenating shale oil was examined. Yields of gasoline from hydrogenated crude shale were not as good with depleted-uranium catalysts as with other catalysts, but octane numbers of gasoline obtained with depleted uranium were higher.

Health and Safety Activities

Background information obtained under actual mining conditions in gassy coal mines proved particularly useful in the Bureau's development of a practical methane-monitoring system. A notable advance occurred in safety-education with wide use of the course of instruction for supervisors emphasizing psychological approaches to accident prevention.

Research on primary hazards developed better methods of face ventilation with continuous miners; roof-bolting and roof control methods were improved; the hazards of float-coal deposits were investigated; new and modified mining equipment was approved in accord with Bureau permissibility standards; and experimentation continued in coal-mine-fire control.

The mining industry suffered one major disaster in fiscal 1961—an explosion in an Indiana coal mine—matching the major disaster record of the preceding year.

Primary Hazards Attacked

Research on face ventilation included a pioneer study of a small blower, complete with duct work, mounted on a continuous mining machine in an operating gassy coal mine.

Reports, complete with recommendations, were submitted on five coal mines and two noncoal mines after extended ventilation surveys. Several complicated ventilation problems were solved with the aid of an electric analog.

Experiments continued with a commercial prototype of an articulated, self-propelled roof shield—designed by Bureau engineers—in a mechanized Pennsylvania bituminous coal mine. Time studies showed safety and efficiency would be gained with two shields in a working section. The mine operator then acquired a second shield, embodying improvements.

A smaller, more compact, sonar device for exploring structural characteristics of mine-roof strata was being constructed as the year ended. Advanced electronic circuits and modern transistors will make the unit portable and safe for use in gassy and dusty coal mines.

Roof-Bonding Evaluated

Roof-bonding experiments to eliminate caving of fragile roof at intersections in a West Virginia coal mine were evaluated. A combination of roof-bonding and bolting was studied for consolidating highly fractured ground in noncoal mines.

Unpredictable, sudden roof failures in a Pennsylvania coal mine were investigated to determine whether this condition was related to gas or hydrostatic pressure in the overlying strata and to develop remedial measures to prevent similar occurrences.

Major roof-bolting research efforts were directed toward improving materials, developing basic data on the functioning of installed roof bolts, designing methods to determine stability of bolted mine roof, and developing devices to insure safe and efficient roof-bolting installations.

Research progressed on a "penetrometer" to determine the anchorage capability of roof rocks "in situ" at the anchorage horizon of a roof bolt. Equipment was tested in the laboratory to study the effect of dynamic loading on roof-bolt anchorages before redesign for underground tests.

Float-Coal Hazards Assessed

Investigation of the explosion hazard of float-coal deposits began in the Bureau's Experimental Coal Mine. Because of their fineness and tendency to form surface layers, float-coal deposits present a greater hazard than normal mine dust in return airways. Danger from light deposits can be neutralized by generalized rock dusting but more effective protective measures are required with heavy float-coal deposits, particularly when a weak gas explosion is the igniting source.

Efficiency of fire-extinguishing agents and techniques of their application were tested by using them on a simulated burning mining machine. Visibility and approachability were determined to be the primary factors affecting rapid control of underground fires. Water containing an alkali-metal salt or wetting agent was found more effective than plain water. Liquids applied as fog were most efficient, but solid stream application was best when close approach to a fire was possible. Use of new Bureau-developed equipment to force high-expansion foam to a fire from a remote location eliminated the brattice cloth (deflecting) curtain otherwise needed to provide fresh air in approaching a fire in a dead-end entry.

Investigation of methane-monitoring systems continued. A commercial bimetallic switch was modified for operation by a catalytic pelletment (Bureau name for a platinum filament pelletized with alumina and coated with a catalyst). Two switches were used in a system. The first switch, when methane concentration reached 1 to 1½ percent, actuated a visual or audible alarm. The second switch, at a methane concentration of 2 to 2½ percent, operated a relay to shut

down mining equipment. A recording methane detector was developed and was used to aid in evaluating performance of such experimental systems.

Field Trials for Methane Detectors

Field trials of both monitoring and recording methane detectors were made in three operating commercial coal mines. Monitoring detectors were mounted on mining machines. Recording detectors were connected to a two-channel meter to give a continuous graphic record of variations in methane concentration. All equipment worked well, seemed unaffected by working conditions, and gave encouraging results.

Experience from these field trials later proved invaluable in an investigation of gas generation and behavior following a gas explosion in an Indiana coal mine.

New Mining Equipment Tested

Industry continued to improve mechanized mining equipment during the year, thus increasing demands on the Bureau for technical assistance and testing to determine permissibility or acceptability of all types of electrical and diesel-powered devices.

During fiscal 1961, Bureau approvals were issued covering the designs of 20 shuttle cars, 13 loading machines, 5 conveyors, 2 distribution boxes, 1 loading station, 4 face drills, 5 utility trucks, 5 conventional mining machines, one 20-shot millisecond delay blaster, 19 continuous mining machines, 1 water spray pump, 3 rock dusters, 2 roof bolters, 1 timber setter, 2 air compressors, 1 mine pump, 1 hydraulic continuous miner, 1 portable blower, 1 air-velocity monitor, 1 miniature methane detector, 1 diesel-powered transloader, 3 diesel locomotives, 3 diesel ore carriers, 3 diesel-powered crawler tractors with shovels, and 1 diesel-mechanical shuttle car. Formal approvals totaled 167 and 1,235 informal extensions of approval were issued for electrical-mechanical equipment.

Explosion-tests were given 101 compartments and 3,326 tests were made in explosive mixtures of natural gas and air. Flame tests were run on 17 conveyor belts and 15 cable samples.

Nineteen approvals and 10 extensions of approval were issued for roof drills with integral dust-collecting systems. Sixteen approvals and 157 extensions of approval were issued for respiratory-protective devices. Five of the 16 were of filter-type paint-spray respirators, first of their type to meet Bureau standards.



Radiation hazards in uranium mines were studied by the Bureau of Mines in cooperation with the Public Health Service. A Bureau engineer (right) collects radon-daughter products from the atmosphere.

Service to the mining industry was advanced by adoption of regulations for testing and for approving as permissible mobile diesel-powered transportation equipment for gassy noncoal mines and tunnels.

Silicosis Problem Evaluated

The Bureau's program to promote healthful working conditions in the mineral industries emphasized work on gases, dusts, and respiratory-protective devices.

Environmental surveys were coordinated with medical studies by the Public Health Service to evaluate the silicosis problem in metal mining. Since starting this program in April 1958, 59 surveys of work environment, affecting approximately 20,000 employees of representative underground metal mines, have required collection and examination of more than 17,000 airborne-dust samples. The surveys still are underway.

In uranium mines, studies began to determine the full-shift, weighted-average exposure of workers to alpha-emitting decay products of radon. Resulting information was correlated with results of "spot" samples ordinarily collected during regular inspections. Investigations and inspections in these mines continued to evaluate health and safety hazards other than radioactivity. The Bureau cooperated closely with the Public Health Service, the Atomic Energy Commission, and the Federal Radiation Council in developing recommendations for evaluating and controlling radiation hazards in uranium mines.

About 21,000 atmospheric samples were analyzed in three gas-analysis laboratories during the year. Most were collected during Federal coal-mine inspections but other sources included inspections of uranium mines, fire seals in underground coal mines, environmental surveys in noncoal mines, underground construction operations at power projects, missile sites, tunnels, and laboratory investigations.

Facts were assembled and performance studies were made on portable, colorimetric, tube-type gas detectors to assess their usefulness in estimating concentrations of certain mine gases. A nondispersive infrared gas analyzer was acquired to aid in determining low concentrations of carbon monoxide in air containing varying concentrations of methane. Infrared-absorption spectrometry was applied to qualitative and quantitative analyses of a variety of gas-air samples.

Dust concentrations or particle-size distributions were determined from 700 samples of airborne dust obtained during environmental surveys in metal mines, three dust surveys in coal mines, performance testing of roof drills with integral dust-collecting systems, and laboratory studies on dust sampling and evaluating techniques. To ascertain the general composition of dust breathed by workmen—with particular reference to free silica—about 250 samples of solid materials were analyzed by X-ray diffraction and emission spectroscopic methods.

Tunnel Workers Receive Special Training

Further laboratory-type and field tests in the medical lock of a tunnel being driven under compressed air improved the Bureau's

technique for using 2-hour, self-contained, oxygen-breathing apparatus in air pressures greater than normal. Several employees of the tunnel contractor were trained in this highly specialized technique, the first such Bureau training ever to be given.

Apparatus was assembled and tests were started on two types of aerosol for evaluating the performance of respirators designed for protection against highly toxic dusts and fumes. One aerosol was a solid fluorescent material (uranine) and the other was fine liquid or "smoke" particles (dioctyl phthalate or DOP).

Additional Instructors Trained

The Bureau training course on fundamentals of accident prevention for coal-mine supervisors stimulated increasing interest. Additional instructors were trained and equipped to further this educational activity and enrollment was more than twice that of the previous fiscal year.

During fiscal 1961 the Bureau's various accident-prevention courses were completed by more than 6,300 mineral-industry workmen and officials. The fatality rate was markedly improved in uranium mines in the vicinity of Grants, N. Mex., after the course, "Metal-Mine Accident Prevention," was completed by 300 supervisors and over 200 other employees.

Thirty thousand workers completed first-aid and mine rescue training as emphasis continued on 100-percent employee participation.

Three new safety motion-picture films as well as slides, posters, and other visual aids in safety education were produced during the year. Films in the Bureau's safety series were viewed by 140,000 mineral-industry workers; and lecture-demonstrations of fire, explosion, and mine-gas hazards were attended by more than 100,000.

Over 600 chapter and council meetings of the Holmes Safety Association, sponsored by the Bureau, were attended by more than 26,000 workers, mostly coal miners.

Thousands of Workers Honored

The Bureau continued its effort to determine which areas of the mineral-extractive and related industries require special emphasis on accident prevention. It collected, compiled, and published injury and employment data voluntarily supplied by operators in the mining and quarrying industries throughout the United States. To comply with the Federal Coal Mine Safety Act, statistics on coal-mine injuries and fatalities and related information were published monthly



Purposely set fire in Bureau's experimental mine is fought with water during research on reducing hazards in coal mining.

and annually. Similar information was published annually for industries other than coal.

More than 1,200 mines, quarries, and plants were enrolled in the 36th National and other safety competitions conducted by the Bureau in cooperation with industry associations. Some 3,000 employees and officials of operations that won safety honors were awarded Certificates of Accomplishment in Safety.

Inactive Coal-Deposit Fires Controlled

During fiscal 1961 13 fire-control projects were completed, 2 in the public domain, 2 on Indian-reservation land, and 9 on private property. Control work on six of these fires was started during fiscal 1960. Work was in progress to control or extinguish nine other fires, two in the public domain, and seven on private property. One of the latter is near Lloydsville, Westmoreland County, Pa., where an experimental fire-control method involving surface sprinkling is

being investigated. Experimentation with this method is to be continued during fiscal year 1962.

With Bureau guidance, 93 fires in inactive coal deposits have been extinguished or controlled since 1949, when funds were first appropriated for this purpose. Of these fires 49 were in the public domain, Indian lands, or in other properties where Federally-owned coal was endangered, and 44 were on private property. Most of the latter were in residential areas. Under this program an estimated 308 million tons of coal has been conserved, about three-fourths of which is Federally owned.

The Bureau knows of 217 other uncontrolled fires in inactive coal deposits. Of these, 110 have been investigated and their control is to be undertaken as money permits and as private matching funds are available where such funds are required. Maintenance work has been done, as necessary, on completed projects to keep fires from rekindling.

Federal Coal-Mine Inspectors Busy

The ninth full year of coal-mine inspection under the Federal Coal Mine Safety Act was completed. Title I of the Act authorizes the Bureau to enter and inspect coal mines, report on hazards, and recommend (but not require) their correction. Title II of the Act contains specific enforcement provisions designed to prevent explosions, fires, inundations, and man-trip and man-hoist accidents in mines regularly employing 15 or more men underground.

Of 10,454 active coal mines recorded during the year, 1,094 were classed as title II mines. The remainder, 7,581 small underground mines, 241 auger mines, and 1,538 strip mines, were classed as title I mines.

During the year, 2,681 routine inspections were made of coal mines subject to title II. In addition, special followup inspections were made to determine whether previously cited violations of mandatory provisions had been abated.

Federal mine inspectors observed 7,606 violations of the mandatory safety provisions, many of which were corrected immediately and thus required no formal action. They issued 1,043 notices setting a reasonable time for abating dangers, 180 notices granting time extensions, and 1,004 notices certifying that dangers had been totally abated.

Withdrawal Orders Issued

During the year, 118 orders were issued requiring withdrawal of men from all or part of 73 mines; 65 orders at 49 mines were issued

because of imminent danger, and 53 at 24 mines were issued because of failure to abate violations within a reasonable time. By comparison, 101 withdrawal orders were issued at 58 mines during the previous year. Orders were issued classing as gassy 14 mines previously considered nongassy.

One appeal was made to the Director for annulment of a gassy-classification order issued under Sec. 203(d) of the Federal Coal Mine Safety Act. The Director denied this application, and his decision was appealed to the Federal Coal Mine Safety Board of Review—an independent tribunal set up under the Act.

Federal inspectors and engineers also made 10,928 routine inspections of title I mines (including 1,224 inspections of strip mines and 261 inspections of auger mines) and numerous additional roof control, electrical, ventilation, dust, blasting, and related surveys and investigations of fatal and serious accidents, mine fires, gas and dust ignitions, and miscellaneous conditions.

Preliminary reports show 323 coal-mine fatalities in calendar year 1960, compared with 292 in calendar year 1959. The fatality-frequency rate per million man-hours of exposure increased from 0.98 in 1959 to 1.16 in 1960. The fatality-frequency rate for the first 5 months of 1961 was 1.36. One major (5 or more persons killed) coal-mine disaster occurred in fiscal 1961—an explosion in an Indiana mine in which 22 men lost their lives.

A Bureau survey showed that fire-resistant hydraulic fluids now are being used in approximately 100 coal mines, ranging from 100 percent use to experimental installations. The Bureau has pioneered in studies of this safer material and encourages the use of fire-resistant hydraulic fluid as a mine-fire preventive measure.

Bituminous Coal Activities

Bureau of Mines research in bituminous coal was conducted in a continuing effort toward wise conservation of this valuable natural resource through improved methods of mining, preparation, processing, and utilization. Significant achievements occurred during the fiscal year in all phases of the work.

In studying the effectiveness of high-pressure water jets to extract coal from the solid, the Bureau mounted a hydraulic monitor over the conveyor of a conventional loading machine. This permitted a more continuous mining cycle when operating in a flat-lying coalbed. To achieve better control of the hydraulic mining operation, a test laboratory was built underground to determine nozzle efficiency and jet-flow patterns.

A portable recorder was developed to measure continuously the release of methane at the face of gassy mines. This unit operates on battery power, thus eliminating the need for mine electricity being brought to the instrument and also making the instrument useful at many additional places in a mine.

Examination of a magnetic product obtained from a fly ash demonstrated its suitability for use as a dense medium in coal-washing and ore-dressing processes. Experimental work at the pilot-plant level indicated that the spherical shape of the magnetic particles and their exceptional purity would be advantageous under some operating conditions encountered in commercial plants.

Chemicals Field Emphasized

Seeking to understand better the ultimate structure of coal, ultra-thin sections of coals of all ranks were prepared having a thickness of 2 to 8 millionths of an inch. These extremely thin sections are particularly suitable in studying coal properties and structures with modern techniques such as electron microscopy, electron diffraction, and ultraviolet-visible and infrared spectroscopy.

Possible processes for producing industrial chemicals from bituminous coal were evaluated. Using these facts, researchers began studying the production of hydrogen cyanide from coal or char.

The Bureau attempted to strengthen coal's position in the energy market by reducing the cost of transportation. One phase was construction of an experimental hydraulic transport system. Power requirements, speed of moving coal, and size degradation were studied. Coal up to 2 inches was used.

In a continuing search for better methods for analyzing coal, the Bureau developed a procedure for determining the major constituents in coal ash. This proved to be quicker and nearly as accurate as so-called "classical methods."

Road Paving Examined

The use of a mixture of bituminous coal and petroleum asphalt for paving roads was evaluated in the laboratory. Test strips on a Government-owned roadway are being laid to check the laboratory findings.

Using the principle that certain bacteria will accelerate the oxidation of iron in pyrites, the Bureau discovered a microbial method for desulfurizing coal. In the presence of iron-oxidizing bacteria, 50 to

60 percent of the pyritic sulfur in the coal was removed in 96 hours. Organisms capable of using organic sulfur also were found for studies on microbial elimination of organic sulfur from coals.

The effect of gamma irradiation on coal structure and properties was explored. The Bureau determined that little significant change occurs as a result of irradiation. With the coal, a decrease in coal solubility in pyridine was noted and with another coal the irradiation caused a shift in the X-ray diffraction pattern and produced an increased evolution of gas on vacuum pyrolysis.

Small Helium-Heated Gasifier Built

A laboratory-scale helium-heated coal gasifier was operated to demonstrate that coal can be gasified by recycled helium. The process required the helium to be heated to high temperatures. In the future, nuclear sources might be used to supply the necessary heat.

The feasibility of the fixed-bed gasification process for lignite, using oxygen, was definitely established for operating pressures of 80 pounds per square inch, gage. Lignite char, steam-dried lignite, and natural lignite were used successfully as fuel. Since satisfactory operation of the gasifier is assured at the 80-pound-pressure level, the equipment is being modified to demonstrate the full commercial advantages obtainable: high capacity, moderate oxygen consumption, and excellent steam decomposition.

Bituminous Coal Information in Wide Use

Production of bituminous coal and lignite continued downward for the fourth successive year, despite increases in the national demand for energy. At year's end, output began moving upward, largely because of shipments to electric power utilities. Special analyses were prepared, in the form of bituminous coal and lignite distribution studies, to delineate changes in coal-marketing patterns as related to coal's changing position in the competitive energy market.

Comprehensive information was assembled and published regarding the changing picture of international coal trade, particularly as influenced by significant shifts in other countries to competing fuels, and indications of increasing availabilities of oil and natural gas to Western Europe from Middle East and Iron Curtain countries. Detailed information was supplied to other Federal agencies on coal developments at home and abroad and for determining the role of solid fuels in mobilization planning.

New Explosives Schedule Developed

A new schedule (1-H) for testing explosives to determine their permissibility for use in underground coal mines was published. It included a new gallery test based on a statistical design which represents a major change in explosives testing. An investigation of stemming materials showed that water or common salt is more effective in reducing the incendivity of explosives than corresponding weights of fire clay. Noise-control studies have provided much new information regarding the relationship between meteorological conditions and sound transmission through the air.

Problems created by the recent use of low-cost ammonium nitrate-fuel oil blasting agents in some underground mineral and metal mines were investigated. Included are problems of air loading, priming, electrical hazards, and fumes. Cooperative research with other Government agencies yielded valuable new information on phenomena in detonating gas mixtures and the mechanism of the initiation of detonation in liquid explosives.

Investigations conducted for other Federal agencies on flames and massive fires are providing useful criteria for developing new procedures for combating catastrophic fires and for the handling of some of the new missile fuels. Also, the fire hazard of liquefied natural gas was found to be surprisingly similar to that of gasoline.

Several accidents involving fires, explosives, and explosions were investigated. Potentially hazardous situations involving flammable materials also were studied.

New Facts on Air-Pollution

The Bureau remained active in the Federal air-pollution program. In cooperation with the Public Health Service under Public Law 84-159, research centered on the automobile as a source of urban air contamination. Fuels-exhaust composition relationships were determined further through development and application of improved exhaust sampling and analysis techniques.

Research shed new light on conditions under which hydrocarbon and carbon monoxide exhaust components can be reduced to acceptably low levels. Studies were continued to develop economic ways to abate the sulfur dioxide nuisance that sometimes results when large industrial furnaces burn sulfur-bearing fuels.

Ways to use depleted uranium as an automotive exhaust oxidation catalytic agent were studied in cooperation with the Atomic Energy Commission.

Anthracite

Studies by the Bureau during the year stressed ways to develop markets for anthracite, better preparation practices, and improved methods. The Bureau also continued its functions under the joint Federal-Commonwealth of Pennsylvania mine-water-control program.

Fundamental research included identification of products obtained by nitric acid oxidation of anthracite and the development of a technique for determining the electrical resistivity of anthracite. An apparatus was assembled for studying the surface properties of anthracite.

A cell containing approximately 23,000 curies of Cobalt 60 was installed at the Anthracite Research Center during the year. Research underway with the unit includes the effect of gamma radiation on the reactions that occur when anthracite is irradiated with other materials (oxygen, hydrogen, steam, carbon dioxide, sulfur, chlorine, and fluorine) at various temperatures and pressures. This work should determine if gamma radiation promotes reactions that result in the formation of compounds of possible commercial value.

Briquets Tested in Blast Furnace

Special briquets produced during the year will be calcined and then tested in the Bureau's experimental blast furnace. The Bureau of Mines and the Bethlehem Steel Company agreed to extend pressure-drop studies of different sizes and shapes of anthracite briquets and other burden materials in the Bureau's experimental stock column to determine optimum operating conditions. Preparation studies consisted largely of tests with cyclones to determine their efficiencies in desliming and deashing anthracite fines.

A prototype hydraulic mining system was designed and was installed in a mine of a cooperating company. Hydraulic mining experiments were scheduled to begin. Information on the performance of the equipment will be used to determine the feasibility of using water for mining anthracite.

Work continued in developing a workable system for the vertical-hydraulic-transport of coal in pipelines. A pilot-size unit at the Anthracite Research Center received preliminary tests and minor design revisions were made.

Mine Workings Surveyed

Studies are being made for the Corps of Engineers to determine structural conditions and the extent of mine workings in various beds

beneath and adjacent to channels of the Susquehanna River and its major tributaries.

Activity of the joint Federal-State Anthracite mine-water control program continued at a slow pace. Only three control projects, costing a total of about \$400,000, were approved for Federal participation during the year.

Economic and statistical surveys included information on production by type of mining, consumption, distribution, stocks, mining equipment, and the competitive relationship of anthracite to other fuels.

Public Reports

Bureau of Mines scientists and engineers added considerably to scientific literature in fiscal 1961 by writing a record 791 manuscripts. Their varied fields covered thermodynamics, metallurgy, mining methods, explosives testing, research in helium, petroleum, and coal, and other work concerning conservation and development of minerals and the saving of life. Among these were 309 reports for publication outside the Department.

Bureau publications issued included 202 reports of investigations on original research, 91 information circulars on new developments in industry, 7 bulletins giving results of completed programs or describing major phases of continuing research, and an up-to-date edition of the popular three-volume Minerals Yearbook. In honor of the Bureau's 50th anniversary, two special volumes were issued listing separately all the official Bureau publications and all journal articles and other material prepared for the outside press from July 1, 1910, to January 1, 1960.

Bureau Films Seen by Millions

The industry-sponsored motion-picture program of the Bureau retained its nationwide popularity throughout the year. Informational films in sound and color, telling the story of America's mineral heritage and potential, were shown 214,000 times, and were seen by 11,400,000 people in group audiences. Approximately 12,000 reels were in circulation during fiscal 1961.

Recent Bureau film releases received artistic and scientific recognition. "California and Its Natural Resources" received the 1961 Award of Outstanding Merit at the 12th Annual National Film and Filmstrip Competition of Scholastic Teachers. "The Magic of Sulphur," a revision of a highly popular Bureau subject, was selected

by the U.S. Committee on Visual and Auditory Material of the U.S. Information Agency to compete in the Sixth International Scientific-Didaetic Film Festival held in 1961 at Padua, Italy. "Alaska and Its Natural Resources" was selected for entry in the 15th Edinburgh International Film Festival in Scotland.

The films on Alaska and Sulphur were added to the Bureau's film library early in 1961. "The Magic of Sulphur" is an all-new version of a subject that has ranked high with Bureau audiences for more than 30 years. "Alaska and Its Natural Resources" is an entirely new motion picture. At year's end, four new films were in production under standard industry cooperative agreements. The motion pictures deal with copper, potash, synthetic rubber, and phosphorus.

During 1961, new methods of distribution were undertaken in the educational television field. Station WQED, Pittsburgh, Pa., began a pioneering series of telecasts, based wholly on Bureau films. The series, developed as a unified educational program, was entitled, "Down to Earth," and was part of WQED's "Summer High School of the Air."

Foreign Activities

Evaluation of mineral developments abroad for their effect on the domestic mineral economy continued as an important function of the Bureau. The principal attainments in fiscal 1961 were: compilation of world production and international trade statistics for the Bureau's Minerals Yearbook; preparation of 13 special analytical reports on foreign minerals of which 11 were published, including a summary of the mining and petroleum laws of the world, the only study of its kind ever issued in a single volume; servicing a thousand requests for information from the public and other Government agencies.

Recognizing the worldwide nature of progress in science and technology, the Bureau cosponsored an International Symposium on Mining Research with the Missouri School of Mines at Rolla, in February 1961. Over 300 delegates from 55 countries presented 51 papers which greatly enriched the technical literature in this field.

The Bureau's latest summary of world mineral production revealed new peaks which reflected demand arising from population growth and rising standards of living. Rapid advances in atomic and space technology show that a greater variety of mineral products is required and that research to utilize marginal deposits should be intensified.

The United States and the free world maintained an overwhelming lead in mineral production, but the Sino-Soviet Bloc was narrowing

the gap. In recent years Russian gains have been less impressive, but since 1953 Communist China has moved from 7th to 3d place in coal production and from 16th to 7th place in steel. The Bureau's studies showed that Red China is striving for still higher objectives and possesses the mineral resources to support them. By standards prevailing in the West, however, communist overall performance is inefficient. Consequently, communist gains in mineral production did not represent equivalent gains in industrial strength.

Soviet Petroleum Experts Visit

The Bureau's foreign activities included exchanges of information with mineral groups in other parts of the world. During the past year, the Bureau participated in an exchange of visits by petroleum experts from the United States and the U.S.S.R.

The Bureau's antarctic program was handicapped by unusually bad weather during the 1960-61 austral summer. Nevertheless, early in the season a Bureau engineer discovered major deposits of coal of good quality near the head of Mackay Glacier. Adverse weather prevented a return for more detailed study.

Foreign technical assistance was conducted in cooperation with the International Cooperation Administration by thirteen Bureau technologists on long-term assignments in Afghanistan, Indonesia, Korea, Laos, Mexico, Nepal, Pakistan, Peru, and Taiwan. Three other engineers completed short-term assignments in Malagasy and Mexico. Fifty-three foreign technicians from 16 countries received training at Bureau installations during fiscal 1961.

Mineral-Resource Activities

Results of 23 mineral-resource examinations and surveys, studies of mining and milling methods and costs, and investigations of mineral economic problems were published by the Bureau of Mines during the year.

Among the more important mineral economic investigations reported was a comprehensive analytical study of the iron and steel scrap industry in California and Nevada. This study was widely acclaimed by industry and Government as an outstanding contribution to the understanding of scrap-metal economics. Other significant projects completed, but not yet published, were a study of the Pacific Northwest steel industry and an analysis and projection of the future of Alaska's mineral industry.

Mineral-resource examinations and surveys covered a wide range of commodities, including coal, mercury, beryllium, low-grade iron and nickel ores, clays, barite, and titanium. Several of the investigations were conducted in cooperation with State agencies.

Mobile Laboratory Used

The nationwide search for beryllium required the use of several unique instruments for testing rock samples quickly. These included a mobile spectroscopic laboratory and a beryllium-detection device using a radioactive source.

The Bureau's investigation of the Beluga Coal Field, near Anchorage, Alaska, continued. Diamond drilling indicated a potentially large deposit of special interest as a possible source of low-cost coal for on-site production of electric power.

A popular report on the petroleum and natural-gas fields of Wyoming was published during the year. It contains maps and individual findings for 271 fields, together with analyses of oil, gas, and water samples.

Mining and milling methods and costs studies were made at asbestos, copper, iron, lead, stone, and uranium mines.

Bureau of Mines personnel participated in preparing a report on the economic development of the northeastern Minnesota iron-mining area, a region that has suffered from persistent and substantial unemployment.

Possible participation in the rapidly expanding Federal Oceanographic Research Program was planned. Ocean bottom samples were examined mineralogically, contacts were made with university oceanographic departments, and sampling methods were observed during a short voyage off the coast of southern California and Mexico.

River Basin Activities

Water, as a mineral, is as important to industry as it is to all life. More attention is given each year to water problems, even in the "well-watered East," in accord with the "multiple-use concept." The mineral industry, in areas of previously plentiful supply, is increasing recirculation and reuse to lessen its total water demand. Sediments and other pollutants increasingly are being extracted from mineral-plant effluents. Water-conservation agencies are beginning to recognize the desirability of maintaining mineral resources in production in reservoir sites rather than condemning them to perpetual inundation. In all these fields during 1961, the Bureau of Mines served

as consultant and adviser in furthering the Nation's interest in multiple efficient use of its resources.

Assistance and guidance by the Bureau of Mines were used directly for the first time during preauthorization negotiations which resulted in an agreement between the Bureau of Reclamation and the Pure Oil Company. Its terms will permit the oil company to retain and exploit mineral rights under the Norman Reservoir in Oklahoma. Wise uses of underground mineral resources, along with development and use of surface water resources, were assured.

Mineral engineering and consulting and investigative services were supplied other Federal agencies, many during early planning stages. Agency engineering reports reviewed included 40 for the Federal Power Commission, 54 for the Corps of Engineers, 55 for the Soil Conservation Service, and 9 for the Bureau of Reclamation. Informal field-level reviews not included in these totals were numerous. Special mineral reconnaissance surveys and reports were completed for the Bureau of Reclamation for 11 proposed reservoir sites to evaluate possible mineral involvement. Others are in progress.

A mineral-potential report completed on northwestern California—rich in resources but sparsely populated—aided in estimating that area's future water needs and establishing a base to compute exportable water needed desperately elsewhere.

Missouri River Basin Studies

Mineral resources in three Indian reservations in the Missouri River Basin were evaluated for the Bureau of Indian Affairs. Mineral reconnaissance surveys in six of the Reclamation Bureau's proposed reservoir sites in the basin were completed.

Field and laboratory studies of canal-lining materials were made in six irrigation districts where seepage is a problem. Preliminary basic research indicated that seepage can be reduced when certain canal-lining minerals are impregnated with a dilute solution of sodium carbonate or other water-soluble salts. Feasibility of the method for actual field use was about to be evaluated as the fiscal year ended.

To stockpile lignite is difficult because of its tendency to ignite spontaneously. A progress report was issued on the efficiency of the Bureau's storage method, proved by long-range tests to be exceptionally competent. Manuscripts were written on pulverization tests of North Dakota lignite and on raw materials for chemical industry in Montana.

Office of Oil and Gas

Jerome J. O'Brien, Jr., *Director*

THE OFFICE OF OIL AND GAS, a staff agency, has in the daily performance of its duties been a focal point for guidance and information to Federal agencies, Congress, and the public on petroleum and gas resources and their utilization in peacetime and the problems of mobilizing for defense in the nuclear age.

Technical assistance rendered to NATO through its Petroleum Planning Committee and Working Group achieves coordination of U.S. defense planning with the NATO countries. For the first time, the PPC met in the United States in April 1961. At the sessions in Washington, D.C., OOG officials were members of the U.S. Delegation and reported on progress in U.S. petroleum and gas mobilization planning. As U.S. delegate at two other meetings held in Paris, France, during September 1960 and June 1961, an OOG executive served as petroleum adviser and participated in the work of the Working Group.

OOG provided an adviser to the U.S. Representative at meetings of the Oil Committee of the Organization for European Economic Cooperation held in Paris in June 1961, and furnished assistance in studies of the Committee.

Historical Petroleum Summaries Developed

To increase the utility of information in the Office of Oil and Gas on worldwide petroleum developments and the foreign supply and demand complex, OOG has nearly completed historical summaries for the years 1955 through 1960 covering crude oil production, refinery

throughput, and demand for each of the principal petroleum products. Data have been gathered, evaluated, and recorded for both the Eastern and Western Hemispheres, including 105 countries and geographic areas.

With this basic information as the foundation for projections and with occasional help from the oil industry, OOG has been able to aid the Department of Defense in its military planning for petroleum supplies, and to advise other agencies on oil matters. Twelve classified studies involving free world oil supply and demand problems, and the ability of industry to produce existing and new types of fuels in the volumes and at the locations required by the military were completed this year for the Department of Defense. Eleven reports were also developed for the Department of State. These data have expedited the work of OOG in complying with general requests for information.

Domestic Preparedness Stressed

Further intensive study of the United States petroleum position and prospects was continued and new information developed in support of an informed view of long-range petroleum and gas problems. Late in the year, OOG representatives participated in interdepartmental conferences whose object was to advance the formulation of policy statements relative to oil and gas in the interest of national security.

As a delegate agency of OCDM, the Office of Oil and Gas has been engaged in improving its plans for handling domestic petroleum and gas resource and supply problems in an emergency. During the fiscal year the Petroleum and Gas Unit of the National Defense Executive Reserve has been doubled to 84 reservists for the eight regional areas of the United States.

These men, possessing technical know-how and ability to discharge the duties of key positions in an emergency petroleum and gas agency at the regional level, would be available for full-time Government employment in time of national crisis. This year, training included participation in civil defense exercises and in briefings concerning the National Plan for Civil Defense and Defense Mobilization regarding courses of action to be taken in emergency to deal with production, refining, processing, transmission, storage, distribution of petroleum and its products; natural and manufactured gas; and petrochemicals produced by the industry, excluding synthetic rubber, carbon black, and ammonia.

Readiness measures taken to implement emergency planning included cooperation with State and local officials and representatives

of the oil and gas industry with respect to their arrangements to meet postattack emergency situations for survival, detection and measurement of radioactivity caused by atomic explosions, continuity of company operations, facilities security, appraisal of damage to facilities, and rehabilitation.

Preplanning necessary were damage assessment studies carried on by OOG for its use and that of OCDM and its National Resources Evaluation Center, plotting on maps the precise locations of over 3,000 petroleum storage facilities of significant capacity, updating data on U.S. refineries, natural gasoline plants, oil fields, military storage, and tetraethyl lead plants, and consideration of needs for communications facilities.

Government-Industry Cooperation

The National Petroleum Council provided the Department with valuable assistance and reports during 1961. The NPC Report on Maintenance and Chemical Requirements for U.S. Petroleum Refineries and Natural Gasoline Plants, dated February 7, 1961, contains information not previously available that will permit greatly improved estimates on availability of petroleum products in a postattack or disaster period when transportation is seriously disrupted.

The results of an extensive study undertaken late in 1959 were presented in a report, dated May 15, 1961, entitled "Proved Discoveries and Productive Capacity of Crude Oil, Natural Gas and Natural Gas Liquids in the United States." This was the Council's first study of proved reserves of crude oil; the last study on the subject having been made by the PAW in 1944, but the fifth NPC report on crude oil productive capacity.

Liaison with the oil producing States has been maintained by the Director of OOG at the meetings of the Interstate Oil Compact Commission which he attended regularly and by direct contact of the Office's executive staff with State regulatory bodies. The Director and technical staff members served on important interagency committees concerned with oil and gas matters, attended meetings of industry groups and trade associations to effect an understanding of Government-industry problems resulting from changing economic conditions and concepts in defense planning.

OOG reviewed a number of congressional bills and furnished guidance for the Department's use in reporting to Congress on proposed legislation. Numerous individual requests for information from the public, the Congress, and other agencies, of both U.S. and foreign governments, have been answered daily by the Office of Oil and Gas.

Office of Minerals Exploration

George Fumich, Jr., *Director*

THE OFFICE OF MINERALS EXPLORATION experienced a decided increase in public interest in its program toward the end of fiscal 1961, generated by Secretary Udall's proposal to add six mineral commodities to the list of those eligible for exploration assistance and to increase Government participation from 50 to 75 percent for 18 others.

The proposal appeared in the Federal Register (26 FR 2799) on April 4, 1961, and within the 30 day period provided for comment, 60 statements were received from firms and individuals, of which all but three favored the proposed changes. Public interest was indicated further by the number of requests for information about the program received during the last quarter which totalled 1,156, a marked increase over the 956 inquiries received during the three quarters preceding the announcement.

However, the Appropriation Committees of the Congress expressed opposition to the proposed increase in Government participation and consequently, that provision has been omitted from the amendment to the regulations. Gold, silver, iron ore, sulphur, bismuth, and tellurium were added to the list of eligible commodities shortly after the end of fiscal 1961. All commodities listed will be eligible for 50 percent Government participation.

Program Functions

The Office of Minerals Exploration was established on September 11, 1958, under Public Law 85-701, to provide governmental financial assistance in exploration for domestic mineral reserves, excluding organic fuels.

OME also administers contracts in force and certified projects remaining from the exploration program under the Defense Production Act of 1950, as amended, conducted from mid-1950 to June 30, 1958, by the Department's former Defense Minerals Exploration Administration.

Under the OME program, the Department of the Interior contracts with qualified applicants to pay one-half of the cost of approved work in exploration for the mineral commodities listed in the OME regulations. Funds contributed by the Government are repaid by a royalty of 5 percent on any production during the progress of the exploration work.

If the Secretary of the Interior certifies that production may be possible as a result of the exploration, the royalty obligation continues until the Government's contribution is repaid with interest, or for the 10-year period usually specified in the contract. The royalty payment applies to both principal and interest, but it never exceeds 5 percent. The contractor is not obligated to produce, nor is the Government obligated to purchase any production. If nothing is produced, there is no obligation to repay.

During fiscal 1961, 44 applications were received requesting financial assistance in exploration estimated to cost \$2,220,000. One application previously received was reconsidered. This brings the total for the OME program to 139 applications for exploration exceeding \$9,722,000 in estimated costs and seeking deposits of 21 mineral commodities in 24 states. Actions taken on these applications are shown in the following tabulations:

Disposition of OME applications

Action	Number	
	Fiscal year 1961	Total
Received	44	139
Denied	14	58
Withdrawn	11	26
Contracts executed	12	31
Pending on June 30, 1961		25

The 12 contracts executed during the fiscal year 1961 brought the total of executed contracts to 31. Royalties on production during the course of the exploration have been received under six contracts in the amount of \$4,450. Contract actions are shown in the following table:

Summary of OME contract data

Contracts	Fiscal 1961			Program through June 30, 1961			
	Number	Total value	Government participation	Number	Total estimated cost	Government participation	Government participation spent
Contract amounts as amended	12	\$554, 176	\$277, 088	31	\$1, 350, 436	\$675, 218	\$232, 991
Amendments which changed contract amounts	1	-350	-175	3	-680	-340	-----
Certified as possible production							-----
Terminated without certification	7	198, 590	99, 295	12	302, 090	151, 045	48, 335
Cancelled without Government expenditure	1	34, 340	17, 170	3	88, 830	44, 415	-----
In force as of June 30, 1961 not certified				16	959, 516	479, 758	184, 656

DMEA Operations

The recoverable mineral commodities found on the 396 certified DMEA projects are estimated to have a value of approximately one billion dollars at current market prices.

Royalties collected incident to the sale of minerals found under DMEA contracts amounted to \$382,953 in this year. Total royalties received since the start of the program amount to \$3,954,099. Sixty projects have repaid in full the \$1,804,812 contributed by the Government. Actions on DMEA contracts are shown below.

Summary of DMEA contract data

Contracts	Fiscal 1961			Program through June 30, 1961			
	Number	Total value	Government participation	Number	Total estimated cost	Government participation	Government participation spent
Contract amounts as amended				1, 159	\$56, 770, 493	\$34, 805, 244	\$23, 337, 410
Amendments which changed contract amounts				220	6, 223, 003	3, 748, 831	-----
Certified as discoveries	5	\$1, 650, 267	\$848, 807	396	29, 554, 346	18, 238, 005	14, 773, 755
Terminated without certification	5	965, 295	482, 648	677	24, 177, 658	14, 802, 234	8, 399, 961
Cancelled without Government expenditure				83	2, 245, 459	1, 368, 490	-----
In force as of June 30, 1961				3	793, 030	396, 515	163, 694

Office of Minerals Mobilization

William E. S. Flory, *Acting Director*

THE OFFICE OF MINERALS MOBILIZATION carries out the responsibilities of the Secretary of the Interior for national defense preparedness in metals, minerals and solid fuels, and for production and distribution of metals, minerals and solid fuels, consistent with the National Plan for Civil Defense and Defense Mobilization and delegations by the Office of Civil and Defense Mobilization, as well as nonmobilization assignments of problems in metals, minerals and solid fuels.

During the fiscal year 1961, the Office continued to evaluate the extent to which metals, minerals and solid fuels available from all sources would be able to meet estimated national defense emergency requirements. It continued to cooperate with the Department's Bureau of Mines on studies of markets, price and domestic production component of the mobilization base.

Mobilization base-type studies were made on antimony and oxygen-free copper. Other complex evaluations undertaken in fiscal year 1961 included problems encountered in the Arizona domestic asbestos purchase program, exploration and mining of beryllium bearing ores, upgrading of stockpile electrolytic copper and oxygen-free copper, the synthetic mica research program, supply-demand analysis on tellurium and a review of the world copper industry. Two revised evaluations were made of high temperature and special property materials.

An examination of the Mexican fluorspar reserves was made for OMM by the Department's Geological Survey in cooperation with the Government of Mexico.

Defense Preparedness

Members of the staff participated in phase I of Operation Alert 1961 at OCDM's classified location. Duplicate files and documents are maintained by OMM at the relocation site for use in alert exercises and in the event of a national emergency.

A member of OMM staff is an instructor of radiological monitoring, and participated in courses for instructors held in Boston, Atlanta and Syracuse during fiscal year 1961.

Defense Stockpiling

The Office advised OCDM in formulating and carrying out plans for stockpiling of strategic and critical materials and disposals from Government inventories of metals and minerals in excess of defense requirements.

In fiscal year 1961, OMM also assisted OCDM in the National Resources Evaluation program by assembling, coding and keeping current input data on metals, minerals and solid fuels for use in computing machines for assessing bomb damage of industrial facilities in the event of an enemy attack.

Executive Reserve

A joint meeting of members of the solid fuels and minerals units of the Department of the Interior Executive Reserve was held in Washington, D.C., for the purpose of indoctrination and training. The Office continued to recruit industry officials to serve in the OMM unit of the National Executive Reserve, and during the fiscal year additional reservists were designated to serve in this capacity, making a total of 67 reservists enrolled by the close of the fiscal year.

The OMM represented the Department of the Interior on the Interdepartmental Materials Advisory Committee on stockpiling matters, on the Supplemental Stockpile Advisory Committee for barter on acquisitions of materials by barter, on the Operating Committee of the Advisory Committee on Export Policy on export control matters, and on the Interdepartmental Committee on the Soft Coal Industry.

Office of Geography

Meredith F. Burrill, *Director*



THE OFFICE OF GEOGRAPHY provides research and other staff services for the interdepartmental Board on Geographic Names and the Secretary of the Interior in the field of foreign nomenclature.

During the year the office processed for standardization by the Board and prepared for publication about 250,000 names in Albania, Greece, Spain, Portugal, the Cape Verde Islands, Hungary, Denmark, the Faeroe Islands, the Arabian Peninsula, and Yugoslavia. Thirty thousand names were edited on maps or otherwise supplied to users as the result of inquiries.

Procedures for name standardization were formulated for 36 foreign areas. Special attention was given to studies of terms used to identify and classify named entities, to the nonroman alphabet languages of southeast Asia, and to the names of the newly independent African countries and their internal administrative divisions. International standardization of names continued to be a matter of primary interest.

Board on Geographic Names

William G. Watt, *Chairman*

Meredith F. Burrill, *Executive Secretary*

The interdepartmental Board on Geographic Names, established in 1947 to provide a central authority for standardizing geographic names for use by the Federal Government, is composed of representatives of the Departments of the Interior, State, Army, Navy, Post

Office, Agriculture, Commerce, and Air Force; the Government Printing Office, the Library of Congress, and the Central Intelligence Agency.

The Secretary of the Interior acts conjointly with the Board in achieving name standardization and provides staff facilities and maintains the records of the Board and its Committees. Foreign names staff functions are performed by the Office of Geography, domestic names functions by the Geological Survey.

The Board conferred with representatives of the Permanent Committee on Geographical Names for British Official Use and further clarified and extended policies leading toward the standardization of geographic names on an international basis.

Staff work on domestic names was maintained on a current basis and the previous backlog liquidated. Three lists containing 1,418 domestic decisions were published during the year and 447 additional domestic names were approved for a fourth list.

The Board's Advisory Committees on Antarctic Names and on Arabic and Persian continued active in their fields of special interest. A new project extending the Board's work in Antarctica was initiated with National Science Foundation support.

Office of Coal Research

George A. Lamb, *Director*

THE OFFICE OF COAL RESEARCH, still less than a year old, has made notable progress in establishing its program to expand the use of coal. The law creating the OCR—Public Law 599 of the 86th Congress—was passed in 1960, after 4 years of hearings and legislative study.

In fiscal 1961, an organization was created and staffed, basic policies and guidelines were established, and activities are underway that are expected to culminate within a few months in a going research and development program.

Industry-Government Cooperation

A General Technical Advisory Committee, composed of 19 representatives from all segments of the coal industry, has been appointed by the Secretary of the Interior to advise him and the Office of Coal Research on the development and direction of the program. This representation includes coal producers, consumers of coal (chemical companies, public utilities, railroads, and retailers), educational institutions, labor, and manufacturers of coal equipment. The Committee held its first meeting on June 6, 1961.

Scientists, engineers, and economists of outstanding capability in the various areas of activity encompassed by the program are being assembled into an advisory panel to assist in judging the technical merits of research proposals and to assist in assessment and solution of knotty problems. The scientists and engineers on this panel largely were selected with the advice of the National Academy of Sciences—National Research Council.

Function of OCR

The function of the Office of Coal Research is to contract for research that will stimulate the production and wise consumption of coal, and otherwise to sponsor and promote research with and among recognized interested groups, including commercial research labora-

tories, colleges and universities, coal companies and trade associations, State and Federal agencies, and qualified individuals. Research is defined by the statute itself as meaning scientific, technologic, and economic research, and the practical application of that research as well.

The mission of the Office of Coal Research is to exploit the full potentiality and versatility of this abundant resource to the maximum welfare of our Nation. Toward this end, the Office of Coal Research will devote its efforts to enlarge and increase the use of coal not only within its present known areas of use, but also by seeking new uses to which coal may be applied economically and practically.

The Office of Coal Research was established as a separate agency of the Department of the Interior in order to make it possible to hit hard at a program designed for expeditious commercial results without conflicting with the coal research program of the Bureau of Mines, while at the same time providing for the coordination of the two in order to get a unified national coal-research program.

An appropriation of \$1,000,000 to the Department of the Interior for fiscal 1961 for the Office of Coal Research was provided by Congress.

Office of the Assistant Secretary

Public Land Management

John A. Carver, Jr., *Assistant Secretary*

THE DEPARTMENT OF THE INTERIOR is sometimes characterized as a loose confederation of bureaus. The five bureaus which fall within the supervisory orbit of the Assistant Secretary for Public Land Management represent an extreme range of diversity of mission, from the broadest spectrum of government itself in the Trust Territory of the Pacific Islands and other Territories, to the essentially proprietary nature of operating a mainline railroad in Alaska.

Even among the land managing agencies—National Park Service, Bureau of Land Management and the Bureau of Indian Affairs—there are fundamental differences in outlook. The touchstone of management responsibility for Indian lands is trusteeship; for park lands, preservation; for public domain lands, beneficial use on a sustained yield basis.

It has been the aim of the Assistant Secretary, Public Land Management, to weld these bureaus together in spirit toward a Departmental, rather than a bureau, approach to their respective operating responsibilities. Bureaus which can draw upon each other for specialized knowledge and experience can better serve the public, at less cost to the taxpayer.

The Department of the Interior's enormously broad experience in the management of natural and human resources ought to be available across all bureau lines.

Bureau of Indian Affairs

Philleo Nash, *Commissioner*



A "NEW TRAIL" for Indians leading to equal citizenship rights and benefits, maximum self-sufficiency and full participation in American life became the keynote for administration of the program of the Bureau of Indian Affairs of the Department of the Interior shortly after the close of the 1961 fiscal year.

This keynote was provided in a 77-page report submitted to Secretary Udall by a special Task Force on Indian Affairs which he appointed in February 1961. The report was presented shortly after the end of the fiscal year, and its major recommendations were at that time accepted and endorsed by the Secretary.

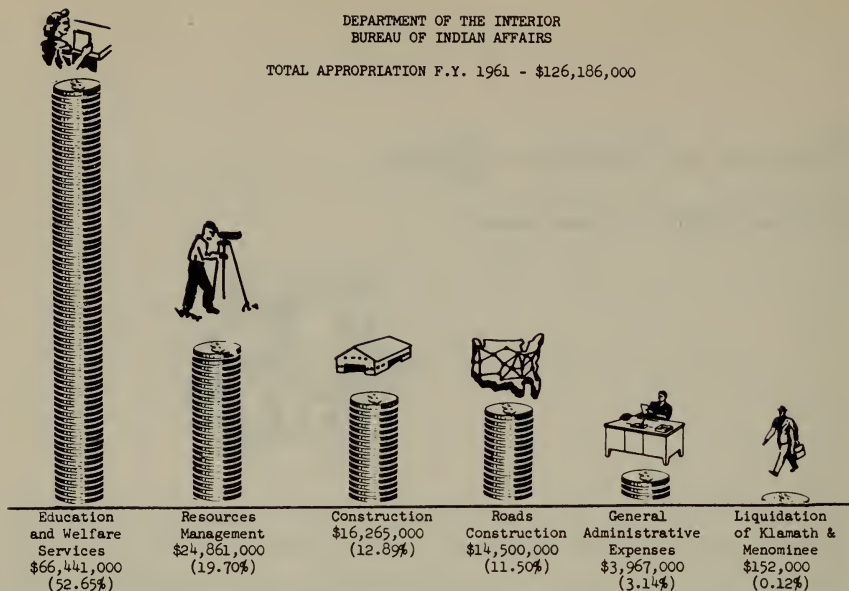
Probably the most important single recommendation was for a shift in program emphasis away from termination of Federal trust relationships toward greater development of the human and natural resources on Indian reservations.

This was coupled, however, with a recommendation that eligibility for special Federal service be withdrawn from "Indians with substantial incomes and superior educational experience, who are as competent as most non-Indians to look after their own affairs." Emphasis was also given to the beneficial nature of Federal programs—such as those under the Social Security Act and the Area Redevelopment Act—which treat Indians and non-Indians alike.

In addition, the report recommended (1) more vigorous efforts to attract industries to reservation areas, (2) an expanded program of vocational training and placement; (3) creation of a special Reservation Development Loan Fund and enlargement of the present Revolving Loan Fund, (4) establishment of a statutory Advisory Board on Indian Affairs, (5) negotiation with States and counties, and resort

DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

TOTAL APPROPRIATION F.Y. 1961 - \$126,186,000



to the courts where necessary, to make certain that off-reservation Indians are accorded the same rights and privileges as other citizens of their areas, (6) collaboration with States and tribes to bring tribal law and order codes into conformity with those of the States and counties where reservations are located, (7) acceleration in the adjudication of cases pending before the Indian Claims Commission, and (8) more active and widespread efforts to inform the public about the status of the Indian people and the nature of their problems.

Heirship Lands

Calling attention to the complex problem of "heirship" land allotments owned by numerous Indians who either cannot be located or cannot agree on use of the property, the report advocated transferring these fractionated holdings to the tribe and permitting the latter to compensate the owners through some system of deferred payment.

As a step toward transferring the responsibility for Indian education to local school districts, the Task Force urged renovation of present Federal school buildings, construction of new plants, and road improvements so that more Indian children can be bussed to classes. It also called for greater efforts to involve Indian parents in school planning and parent-teacher activities. As a measure to relieve overcrowding of present facilities, the report suggested that consideration be given to keeping them in use throughout the entire year. During the summer months, it added, some of these facilities could also be used

for programs to help Indian youngsters make constructive use of their leisure time.

Task Force Make-Up

The Task Force was headed by W. W. Keeler, principal chief of the Oklahoma Cherokees and oil company executive. The other members were Philleo Nash, longtime student of Indian affairs and former lieutenant governor of Wisconsin; William Zimmerman, Jr., assistant commissioner of the Bureau from 1933 to 1950; and James Officer, a University of Arizona anthropologist. Acting Commissioner John O. Crow consulted with the Task Force and accompanied it on field trips.

The Task Force study extended over a period of about 5 months and included consultations both in Washington and the West with numerous tribal leaders and non-Indian experts in the field.

Tribal Programs

In fiscal 1961 the Menominees of Wisconsin with their 3,270 enrolled members and forest holdings valued at about \$35 million reached the stage of full independence from Federal trusteeship in the management of their property. Federal trust relations were also ended under tribally developed plans on seven small rancherias of California.

Progress toward the same goal was made on the Klamath Reservation in Oregon, the Uintah-Ouray Reservation in Utah, the Catawba Reservation in South Carolina and 31 additional California rancherias. The first steps leading toward such a program were taken on the Colville Reservation in Washington.

Development of programs for the effective use of tribal funds was noteworthy on the Pine Ridge and Cheyenne River Reservations of South Dakota; on the Coeur d'Alene Reservation of Idaho; and among the Quapaws of northeastern Oklahoma.

Menominee Tribe of Wisconsin

At midnight, April 30, 1961, Federal supervision of the affairs of the Menominee Tribe of Wisconsin ended by proclamation by the Secretary in accordance with the Act of June 17, 1954 (68 Stat. 250), as amended.

The transfer of control of the lands, forest, and other properties of the 3,270 Menominee Indians to a State-chartered corporation, the

creation of Menominee County by the Wisconsin legislature to provide for the political organization and social needs of the people, and the establishment of a trust with a Milwaukee bank to hold and invest funds belonging to Menominee minors and other persons in need of assistance were the major results of nearly 7 years of argument, negotiation, and finally cooperative action involving the Menominee people, the officials of Shawano County, the State government at Madison, and the Congress and the Bureau of Indian Affairs. Although Federal responsibility for these Indians has now been officially terminated, the friendly interest of the Bureau in their success in a new era of self-government and self-management as citizens of the State of Wisconsin will continue indefinitely.

In September 1960 Congress amended the original 1954 termination act for the fourth time by granting the tribe an extension of the trust period from December 30, 1960 to April 30, 1961, but directing the Secretary to begin negotiations for private trustees immediately in order to be prepared to act in the event the tribe had not organized under its own termination plan by March 1, 1961.

Tribe Takes Action

Happily for all concerned, this proved unnecessary. Beginning in November 1960 the tribe began to act expeditiously to implement its own plan which the Secretary had approved in principle in 1959. In December the tribe's general council elected seven voting trustees (four members of the tribe, three nonmembers) for the proposed Menominee Enterprises, Inc., which was to own and operate its timber industry and other properties.

On January 9, 1961 the Secretary formally approved the final draft of the tribe's termination plan. On January 13 the seven voting trustees met and designated the nine directors (four tribal members, five nonmembers) who were to control the policies and operations of the new corporation.

On February 24, the tribe informed the Secretary that the Menominee Enterprises, Inc., had been duly established and was a going concern. On January 23 articles of incorporation had been filed with the Secretary of State of Wisconsin; on February 7 the Secretary of State had issued a certificate of incorporation; and on February 10 the Board of Directors had met at Keshena for the election of officers, and had, among other business, accepted the initial stock subscription of \$327,000 from tribal funds in the U.S. Treasury to issue 100 shares of \$1 par value stock in the name of each Menominee member.

On March 7, 1961 the tribe (in accord with a resolution of the general council in January) chose by secret ballot proposed members of the Menominee County and Town Board for appointment by the Governor when, by State law, the new county and town should come into existence.

Final Proclamation

All provisions of the 1954 act having been complied with, Secretary Stewart L. Udall on April 29, 1961 proclaimed in the Federal Register the "termination of Federal supervision over the property of the Menominee Tribe of Wisconsin and of the individual members thereof" effective midnight April 30.

He also had published in the Federal Register the text of the "Plan for the Future Control of Menominee Indian Tribal Property and Future Service Function." This was important not only as a matter of public information, but was vital in the creation of Menominee County. Chapter 259 of Wisconsin's Laws of 1959 had provided that the State's 72d county should come into existence on the date of publication of the termination plan in the Federal Register, as required by the Act of June 17, 1954. On May 5, 1961, at Keshena, Governor Gaylord A. Nelson swore in and installed the first board members and officers of Menominee County and Menominee Town.

Meanwhile, early in 1961, bills had been introduced in Congress to postpone again the date of termination and to provide various types of Federal assistance to the Menominees following termination. As April 30 passed before action by Congress, there was no delay in the termination date. H.R. 4130, providing for a loan to Menominee Enterprises, Inc., and Federal aid to the State in providing essential education, health and welfare services to the Menominee during the period of transition was still pending in conference between the Senate and House as the fiscal year ended.

Klamath Tribe of Oregon

As one of the final steps in the administration of the Act of August 13, 1954, as amended, sales of Klamath tribal lands designated for the withdrawing members were completed within this period. A proclamation issued by the Secretary of Agriculture taking title to the 10 large, unsold sustained-yield units for a National Forest was published in the Federal Register on April 15, 1961. On April 18, 1961, the Portland Area Director made a pro rata distribution of \$43,124.71 to each of the 1,660 individuals withdrawing from the Tribe with offsets for land purchases, loans and other indebtedness. Sixty-nine additional bank trusts were established during March 1961,

making a total of 191 trusts for adults and 743 trusts for minors among the withdrawing members.

Claims attorneys for the Klamath Tribe in April 1961 filed Petition No. 125-61 before the Court of Claims, contending that the second 1958 appraisal of the Klamath tribal forest lands of \$90,791,123 did not adequately consider values for water rights, waterpower sites, recreation potential and similar items.

The United States National Bank of Portland has assumed management of the lands of the 473 remaining members on the 1957 roll. All termination action is to be completed by August 13, 1961.

Ute Tribe of Utah

On September 8, 1960, funds totaling \$7,700,000 were appropriated for the compromise settlement of the Uintah Ute Indians' claims, Dockets No. 44 and 45, before the Indian Claims Commission. On December 19, 1960, a cash distribution of \$3,900 was approved for each of the 490 members of the Affiliated Ute Citizens (mixed-bloods). Concurrently, approval was given for six per capita payments totaling \$975 to each member of the Ute Indian Tribe (full-bloods), the balance of their portion being retained for future tribal programming.

Under authority of the Act of August 27, 1954 (68 Stat. 868), as amended, the Affiliated Ute Citizens in 1958 organized the Antelope Sheep Range Corporation and the Rock Creek Cattle Corporation for the purpose of managing and administering the grazing lands acquired under that act. It was agreed in 1960 that the shares of stock of the two range corporations would be purchased by the Ute Indian Tribe (full-bloods). Purchase of these shares was begun soon after January 1, 1961. As of June 30, 1961 the Ute Indian Tribe had acquired approximately 400 shares of the 490 issued in each corporation.

To permit more efficient budgeting and control procedure, the long-range (10-year) program was converted into a continuous program, budgeted on a 5-year basis.

California Rancherias

Administration of the Act of August 18, 1958 (72 Stat. 619), providing for the termination of Federal trusteeship of 41 of the 115 rancherias and reservations in California, was completed in regard to 7 rancherias. On April 11, 1961 there was published in the Federal Register a notice of termination for the Strawberry Valley, Cache Creek, Buena Vista, Paskenta, Ruffeys, Mark West, and Table Bluff rancherias. According to this permissive legislation, the people of a rancheria must agree on and submit a plan for the distribu-

tion of their land and other group assets before termination can take effect.

By the end of the fiscal year, 31 rancherias, in addition to the 7 mentioned above, had submitted distribution plans. As the Bureau completes the steps required in these plans, the Federal trusteeship of the rancherias will be ended. If plans are eventually approved and carried out for all 41 rancherias included in the law, the action would affect the status of approximately 1,295 Indians living on a total of 7,669 acres of trust land.

Catawba Indians of South Carolina

On July 2, 1960 the Federal Register carried a notice that the Catawba Indian Tribe of South Carolina had accepted the terms of the Act of September 21, 1959 (73 Stat. 592) providing for distribution of the tribe's assets among the membership and termination of Federal trusteeship. Administration of the act proceeded during the year, with members of the tribe selecting tracts of land for individual ownership or electing to accept cash from the sale of surplus land.

When administration is completed by terms of the 1959 act on or before July 2, 1962, the status of approximately 731 Indians and 3,389 acres of trust land will have been affected.

Colville Indians of Washington

The Business Council of the Confederated Tribes of the Colville Reservation of Washington carried forward the preparation of plans for the ultimate termination of Federal supervision over their lands and affairs as provided by the Act of July 24, 1956 (70 Stat. 626). Tentative proposals were required to be submitted to the Secretary by July 24, 1961.

Shortly after the close of the reporting year, the Business Council on July 12, 1961 submitted a two-stage termination plan: the first stage would provide by legislation an intensive survey and appraisal of the tribe's resources, together with the preparation of a final membership roll; on the basis of these findings, the second stage would consist of submitting a legislative program for final termination of Federal supervision.

Standing Rock Rehabilitation Program

The Standing Rock Sioux Tribe of North and South Dakota continued administration of its \$9 million rehabilitation program made

possible by land-taking settlements for Missouri River development under the Act of September 2, 1958 (72 Stat. 1762). In July 1960 the tribe initiated its industrial development program with \$770,000 set aside for this purpose. It invested \$110,000 of this money in a new building at McLaughlin, S.D., which will be operated as a quilting plant by the Harn Corporation of Cleveland, Ohio.

In April 1961 the educational loan grant program was started. The tribe has allocated \$2 million for post-high school loans and grants for academic studies or vocational training.

In May 1961 a community development program, involving a total outlay of \$770,000 was approved. The eight districts of the reservation will receive varying amounts. The money may be used for a community hall, recreation center, water and sanitary facilities, or for any other purpose which can be justified as benefiting the community as a whole.

As of June 30, 1961 the family plan phase of the rehabilitation program (which was described in some detail in last year's annual report) showed a total of 255 new houses completed on the reservation at a cost of \$514,527; 78 approval contracts not completed for an estimated \$128,535; 79 old houses acquired for \$131,586; 48 trailers at \$80,108; and 10 additions to existing houses at a cost of \$10,890; or a total outlay of \$865,646.

Oglala Sioux

On June 13, 1961 the Housing and Home Finance Administrator announced approval of a \$166,000 loan for construction of a housing-for-the-elderly project on the Pine Ridge Indian Reservation. The project was initiated by the leaders of the Oglala Sioux Tribe. The sponsoring organization, the Pine Ridge Settlement Home, is composed of both Indian and non-Indian men.

The home will consist of a one-story building which will contain 23 living units to accommodate 38 persons, a central dining room, and a recreation room. A monthly charge of about \$75 per person will be made, including room, board, utilities, laundry, and social and recreational activities.

Cheyenne River Sioux

Since the inception of its Rehabilitation Program in 1956, the Cheyenne River Sioux Tribe has taken the position that it was not subject to the taxes imposed by the Federal Unemployment Tax Act and that it was not required to withhold Federal income tax deductions from its employees' salaries.

This matter has been the subject of extensive discussions and correspondence between the tribe and the Internal Revenue Service. During June, 1961, the Internal Revenue Service attached the tribe's funds on deposit in a bank at Mobridge, S. Dak., and subsequently seized \$206,000 of such funds.

Coeur d'Alene Judgment Fund Distribution

The Act of July 17, 1959 (73 Stat. 221), authorized the use of the judgment funds awarded to the Coeur d'Alene Tribe of Idaho by the Indian Claims Commission for any purpose authorized by the tribal governing body and approved by the Secretary of the Interior. The tribal officials requested an initial per capita payment of \$1,000 be made to each Indian whose name appears on the Coeur d'Alene census roll of July 1, 1940, and who was living on July 17, 1959, except those designated as "NE," meaning not enrolled.

On October 14, 1960, the Commissioner authorized the Portland Area Director to make a \$1,000 per capita payment from the judgment funds to each person whose name appears on the payment roll, containing the names of 490 individuals, prepared by the Coeur d'Alene tribal officials for that purpose and approved by the Commissioner on October 14, 1960.

The Area Director was also authorized to pay \$1,000 to each person whose name appears on a supplemental payment roll to be prepared by the tribal officials containing the names of individuals adopted into the membership of the tribe and children of one-fourth or more Indian blood born after July 1, 1940, to members of the tribe. A supplemental payment roll containing the names of 302 individuals so determined to be eligible to share in the judgment funds was approved by the Acting Commissioner on April 28, 1961.

Quapaw Judgment Fund Distribution

Pursuant to the Act of July 17, 1959 (73 Stat. 221), a roll was prepared for use in distributing the judgment of \$927,668.04 awarded the Quapaw Indians by the Indian Claims Commission. Of 1,379 applicants for enrollment 1,144 persons were determined to be eligible to share in the judgment funds.

On May 4, 1961, the Area Director of the Muskogee Area Office was authorized to distribute per capita to those persons whose names appear on the roll the balance of the judgment funds remaining after deduction of administrative costs incurred in the preparation of the payment roll. The amount available for distribution on May 1, 1961, including interest accruals through April 30, 1961, was \$1,029,600. The share paid each of the 1,144 persons on the roll was \$900.

Area Redevelopment Activities

Under the Area Redevelopment Act of May 1, 1961 (75 Stat. 47), the Secretary of Commerce has delegated to the Bureau of Indian Affairs (through the Secretary of the Interior) broad responsibilities in carrying out those provisions of the law pertaining to Indian reservations and Indian tribes.

Following this delegation, the Bureau took immediate action on the selection of criteria and formulation of standards under which Indian reservations might be designated as "Reservation Redevelopment Areas" eligible for assistance under the Act. As of August 1, 1961 48 reservation areas (including 4 areas in Alaska) have been so designated. It is anticipated that additional reservations will be designated from time to time.

Major emphasis is currently being placed on assisting Indian Tribes, as well as non-Indian groups, in the designated "Reservation Redevelopment Areas" in the formulation of overall economic development programs required under the Law. These programs are to point up the present economic conditions and problems in the areas, describe the potentialities for upgrading the local economies and providing needed job opportunities, and submit specific program proposals to achieve these potentials.

Additional Bureau responsibilities under the Act will involve assistance to the tribes in outlining and carrying out specific projects under the approved overall economic development programs in designated reservation redevelopment areas, and the development of a program to provide occupational training of unemployed and underemployed Indians in these areas to enhance their opportunity for employment.

Education

Enrollment of Indian children of school age increased 3 percent in fiscal 1961 as compared to the preceding year. Of the 112,746 children enrolled, 57.6 percent attended public schools, 34.5 percent were in Federal schools, and 7.9 percent in mission and other private schools. Public school enrollment increased by approximately 1,450 students.

During the year 1961, the Bureau has dropped from its census of Indian school children those residing in California, Idaho, Michigan, Minnesota, Nebraska, Oregon (except the Warm Springs Agency), Washington, Wisconsin and Texas. These are the States which have accepted responsibility for the education of their Indian children. The comparisons given above are based on figures adjusted to reflect this change.



One of the 20 school construction projects completed by the Indian Bureau in fiscal 1961 was the 22-classroom Oglala Elementary School on the Pine Ridge Reservation in South Dakota.

The Bureau of Indian Affairs in fiscal 1961 operated 270 schools with an enrollment of 41,729 including those under 6 and over 18 years of age. In addition, dormitory facilities were provided at 19 locations for 3,953 students who attended public schools. Dormitory operations of this type are used to meet unusual emergency needs and do not reflect a permanent pattern for educating Indians.

Quality in Education

As a part of the improved reading program and the advancement of scholarship generally, in Bureau schools, emphasis is being given to the upgrading of libraries in all areas and to developing students' habits and skills in library use. The Bureau-wide film depository has also continued to improve significantly its collection and its services to schools.

Improved curriculum guides and additional teaching materials have been put into use in many schools with good results.

Teachers and supervisory personnel have worked continuously on criteria for developing superior teaching and on techniques for achieving it.



Girl Scouts, hobby clubs, and other leisure time activities provide opportunity for making friends, pursuing special interests, and developing traits of good citizenship.

Manuals for teaching efficient housekeeping skills have been developed and are being used in all schools.

One school is making use of the teaching team techniques in a pilot project to determine its effectiveness in Indian schools and results indicate that much wider use can be made.

Through accelerated efforts and meticulous attention to the use of the English language, there was a notable increase in language skill in several areas. Several schools are experimenting with new combinations of techniques in the language arts program and the results are being studied carefully for possible wider use.

Guidance

Leadership in the coordination of the guidance services in boarding schools has been strengthened through in-service training sessions for all levels of positions. Use of educational leave, extension classes in cooperation with State colleges, and Area conferences are improving understanding and professional services.



Young Navajo students are helping to assemble a classroom unit on government.

More individual counselling is being accomplished and close personal attention to the emotional problems of boarding school students has received special study in connection with educational and vocational guidance.

Summer Programs

During fiscal 1961, approximately 2,200 Indian youth participated in summer programs sponsored by the Bureau. These programs, designed to enrich the experiences of Indian youngsters and contribute to their overall development, are held on 27 reservations and at 10 nonreservation boarding schools. Work, academic, recreational, scouting, camping, and arts and crafts programs were among the numerous activities engaged in by these students.

School administrators report that summer programs have played an important role in changing attitudes about school and inducing youngsters to return and remain in school. Several indicated that the 1960-61 school year was their best year in terms of pupil adjustment. Other officials report that antisocial behavior among juveniles has been substantially reduced in areas conducting summer programs.



To promote physical fitness, all students are encouraged to participate in sports and other physical activities. The tennis players above are students at the Inter-mountain School, Brigham City, Utah.

Non-Federal Schools

Concurrent with the emphasis on improving the quality of the instruction and guidance programs within Bureau-operated schools, staff personnel have initiated studies designed to learn the problems and possible approaches for assisting Indian children who are not adjusting or have dropped out of public schools.

The findings of the study project in one area are being documented and shared with all other Areas, and with public school officials to assist them in developing a better understanding of the background, social and educational needs of Indian children.

Adult Education

The purpose of the adult education program is to assist the Indian people to raise their general education level and thus reduce the educational disparity which exists between Indian people and the general population. It provides an opportunity for them to acquire the necessary skills and understanding to live better and participate more effectively in today's world.

Adult education teaching units have been established upon the request and with the concurrence of the tribal governing bodies at 28 agencies and locations throughout the United States. These teaching units are now serving approximately 107 Indian communities and offer a wide variety of instruction. The programs range from reading and writing courses to instructing individuals and groups of Indian people in specific subjects and civic skills. Personnel of the adult education program are in the process of developing a series of in-service training guides which will be used to strengthen the instructional and other phases of the program. Throughout this past year there have been approximately 5,800 adult Indian participants or learners in this program. Of this number several have completed the required studies for high school graduation, while others have been engaged in informal learning activities.

More than 600 Indian students attended college in 1960-61 with the help of Federal loans and grants made available through the Bureau. Sixty-six of these students graduated from 4-year colleges at the end of the school year. The Bureau assisted many other Indian students in securing non-Federal scholarship aid.

Welfare

During the fiscal year 1961 the assistance trends of previous years continued. There was a substantial increase in the requirements for assistance to needy families on reservations. Funds originally appropriated were insufficient, and it was necessary to secure a supplemental appropriation of \$1 million to meet the increased need. There was also a marked increase in provision of social services to families and individuals not receiving financial assistance, and an increased use of Bureau social workers by tribal courts. Child welfare services to dependent and neglected children were a major function of the welfare program, and counseling services regarding use of restricted individual funds continued to be an important responsibility.

General Assistance

The caseload and expenditures for general assistance have risen steadily during the past few years due largely to decreasing opportunities for unskilled labor because of mechanization of agricultural operations. This trend is continuing.

Expenditures for general assistance in 1961 were over 12 percent higher than in 1960, and the average monthly caseload of persons was over 8 percent higher. Assistance needs increased in almost all

Areas, with the greatest increases occurring in the Phoenix, Billings, and Juneau Areas.

The number of needy Indians receiving general assistance varied in the usual seasonal pattern from a low of 2,568 households with 6,513 persons in July to a high of 6,156 households with 21,066 persons in March. The average monthly caseload was 4,086 households with 12,749 persons. The average monthly assistance grant was \$75.06 per household. This average grant includes many households with some income but requiring supplemental assistance.

Social Services

Social services are provided when necessary to persons receiving assistance. In addition to this group, approximately 10,000 cases, which did not receive financial assistance, received counseling or guidance to some degree. This included families, unattached individuals, and dependent and neglected children.

Social workers have noted an increase in voluntary requests for such services and in requests for counseling by tribal courts, particularly with respect to children.

Child Welfare

The problems of dependent and neglected children resulting from unstable or broken homes remain a matter of serious concern on many reservations. Bureau funds provided care for over 2,300 children during the year. The number of children called to the attention of social workers increases steadily. Foster home placement and placement of physically and mentally handicapped in appropriate institutions have increased; the resources and staff time available for children, however, are still insufficient to meet the need.

Although the child welfare workload has increased substantially in recent years, this is apparently due primarily to the fact that, because of improved coverage and growing awareness by Indians of their social problems and the availability of social services, more attention has been focused on conditions which have existed for some time.

The Indian adoption project being conducted under a contract with the Child Welfare League of America is progressing satisfactorily. Under this project, Bureau social workers on selected reservations can refer homeless children for adoptive placement to qualified adoptive agencies selected by the Child Welfare League of America. During the past year, 20 Indian children were placed through six agencies in adoptive homes. Three of the children were under the custody of a State Welfare Department which used the resource made available through the adoption project.

Jurisdiction

As has been reported in previous years, legal jurisdictional problems continue to hinder or prevent the provision of adequate services for dependent or neglected children on reservations in several States.

Commitment of adult Indians, as well as children, to appropriate State institutions has also been hindered. Several emergency situations have been handled through improvised measures, but no real solution to this problem has been found. The only element of progress is that at both the State and Federal levels more attention has been focused on the murky legal situation which results, without intent to discriminate, in Indians on reservations not having available to them certain social resources requiring court action which are available to other citizens.

Law and Order

Pursuant to the authority granted by the act of August 15, 1953 (P.L. 280, 83d Congress; 67 Stat. 588), the State of South Dakota enacted legislation, signed by the Governor on March 9, 1961, providing that the State would assume jurisdiction of criminal offenses and civil causes of action arising in the Indian country within the State at such time as the Governor is satisfied that the United States has made proper reimbursement to the State and its counties for the added costs in connection with the assumption of such jurisdiction.

Such a Federal subsidy, however, is not required by the statute prior to the State assuming jurisdiction over criminal offenses and civil causes arising on highways within the Indian country in the State.

The Department of Interior has no authority to subsidize State and county law enforcement activities among Indians on reservations. Consequently, this legislation, excepting that section relating to the assumption of jurisdiction over highways, has no present applicability to Indian country within the State of South Dakota.

At the request of the Seminole Tribe, and in accordance with the act of August 15, 1953, *supra*, the Florida Legislature enacted House Bill No. 2241, signed by the Governor on June 14, 1961, assuming jurisdiction over criminal offenses and civil causes of actions involving Indians, or other persons, rising within Indian reservations throughout the State. The act became effective July 1, 1961.

On May 12, 1961, Sections 11.9 and 11.9CA, Title 25, Code of Federal Regulations, which prohibited the appearance of professional attorneys in proceedings before the Court of Indian Offenses, were

revoked from Departmental regulations. This revocation applies to the 15 Courts of Indian Offenses, but will have no application to those courts established by tribal enactments. These latter courts have regulations similar to the revoked provisions.

Attention to Juveniles

Matters involving Indian juveniles came into more prominence during the fiscal year. Several additional juvenile officer positions and two probation and parole positions were established, and programs for the alleviation of juvenile delinquency, including guidance and counseling for both juveniles and adults coming to the attention of the Indian courts, have been established. As directed by the Senate Appropriations Committee in its report on the Interior Appropriation Bill for 1961, the Bureau conducted a survey of juvenile delinquency on Indian reservations in the Pacific Northwest, including the States of Washington, Oregon and Idaho, to determine the magnitude of the problem and the steps that are required to resolve it.

Construction of several badly needed jails on Indian reservations was commenced during the fiscal year. These buildings will provide incarceration facilities, courtroom, and office space for the administration, care and confinement of Indian prisoners.

Relocation and Training Services

One of the main aims of the Bureau is to provide Indian people with opportunities to become self-sufficient through full-time, year-round employment. In order to accomplish this objective, eligible Indians are assisted to relocate in off-reservation locations or to prepare themselves through enrollment in adult vocational training courses which upon completion, will qualify them for suitable employment.

Vocational training is provided at established public or private trade schools or through on-the-job training in established industries or business establishments. Although most employment opportunities in the past have been found in large industrial areas distant from the reservations, increased emphasis is now being given to locating jobs as near the reservation areas as possible for those applicants who can best be served in this manner.

These services during fiscal year 1961 were somewhat curtailed by the economic recession and the increase in unemployment throughout the country. However, by offering more effective staff services,



Steady employment means better living standards for many Indian families who have relocated with Indian Bureau help to urban communities.

including individualized employment placement service, this activity was able to continue operating effectively. The high percentage of unemployed people in some areas and the comparative difficulty of finding suitable employment for unskilled workers emphasized the need for additional on-the-job and institutional training opportunities.

Despite the difficulties of finding stable employment during this period, most relocated Indians were able to remain in their new locations and the majority of them who were laid off are now again working on suitable jobs of a permanent type. Use of local facilities and established services available to Indians and non-Indians alike was more effective than in previous times when unemployment was high. The preparation of the applicants prior to departure from the reservation is becoming increasingly more effective, and trained and experienced staff people at destination points offer the type of service which Indian people need for fully effective relocation.

Vocational Training Activity

Since adult vocational training service (authorized under P.L. 959 of the 84th Congress) was added to the program, it has been difficult to establish an orderly flow of applicants entering these training

courses. Because the program is extremely popular and there has been a heavy backlog of applicants, large numbers of enrollees have tended to enter training early in the fiscal year.

During fiscal 1961, a new procedure was established which insured an orderly flow of new enrollees entering training. This resulted in equal and fair consideration being given to all applicants from all locations, thus enabling staff workers to offer more effective service.

A survey completed in March 1961 showed that 81 percent of those who completed institutional training under this program were placed in suitable year-round jobs. The survey also showed that 52 percent of those who discontinued training for one reason or another prior to completion had accepted employment, and this fact underlined the effectiveness of the counseling program which is conducted during the training period.

A summary statement of services provided by the Bureau to Indian people during fiscal 1961 in the field of relocation and training follows:

	<i>Units</i> ¹	<i>Persons</i>
Relocation for Employment.....	1, 822	3, 468
Relocation for Vocational Training (Institutional) :		
Training units carried over from previous year.....	724	1, 520
New units entered training during fiscal year 1961.....	1, 227	2, 576
Total served during fiscal year 1961.....	1, 951	4, 096
On-the-Job Training Services :		
Training units carried over from previous year.....	150	465
New units entered training during fiscal year 1961.....	486	1, 661
Total served during fiscal year 1961.....	636	2, 126
Total units served by program fiscal year 1961.....	4, 409	9, 690

¹ A "unit" is either an unattached individual receiving relocation or training services or an individual together with family dependents being assisted under the program.

Industrial Development

The purpose of the Bureau's Industrial Development Program is to assist the Indian people in cooperating with their neighboring communities in the development of plans and programs which will attract industry to the areas surrounding the reservations and thus provide employment opportunities and improve economic and social conditions.

During fiscal year 1961, continued emphasis was placed on (1) working with tribal leaders to explain the basic concepts of industrial development and the need for cooperation with communities near the reservations to create the proper industrial climate; (2) assisting tribal

and community groups in organizing industrial development foundations and similar entities in order that they will be in a better position to negotiate with industrialists interested in reservation area locations; (3) gathering necessary basic information on resources available and assisting in the preparation of fact sheets and brochures; and (4) providing information and assistance to industries which have indicated interest in expansion of their present production facilities in reservation areas.

The growing interest of Indian tribes in industrial development is shown by the fact that the following tribal groups have taken action to earmark their own tribal funds, as indicated, for industrial development purposes:

The Confederated Salish and Kootenai Tribes of the Flathead Reservation, Montana.....	\$35,000
Colorado River Tribe, Arizona.....	60,000
Mississippi Band of Choctaw Indians, Mississippi.....	135,000
Lac Courte Oreilles Band of Lake Superior Chippewa Indians, Wisconsin.....	40,000
Navajo Tribe, Arizona.....	225,000
Lac du Flambeau Band of Lake Superior Chippewa Indians, Wisconsin.....	40,000
Mescalero Tribe, New Mexico.....	51,000
Eastern Band of Cherokee Indians, North Carolina.....	150,000
Standing Rock Sioux Tribe, North Dakota.....	770,000
Three Affiliated Tribes of the Fort Berthold Reservation, North Dakota.....	50,000

In addition, a number of other tribes are in the process of developing programs and earmarking funds for use in attracting industries to the reservation areas. The sources of the funds being programmed are from judgment awards and damages due to flooding of resources by dam construction, and from leases and royalties, and other income.

Industrial Promotion

Nearly 500 meetings were held during the year with tribal groups and with civic organizations of communities near reservations to bring about a better understanding of industrial development goals and problems. As a result of the work done to date with the various tribes and communities, 66 industrial fact sheets and 31 brochures have been prepared to cover communities on or near reservations. The communities and towns within the reservation areas are cooperating to the fullest extent with the Indian tribes in developing methods of financing industrial facilities. Assistance has been given in the organization of 10 industrial development corporations with a combined capitalization of \$1,850,000.

The development of overall plans for proper utilization of Indian lands which have a high degree of industrial potential is essential for use in the selection of industrial sites. With this in mind, the

Bureau contracted during the year for land use surveys for the Isleta Pueblo, New Mexico, and the Colorado River Reservation, Arizona, as well as for supplemental studies and plans for the Salt River and Gila River Reservations in Arizona.

A tourist road map of the United States, entitled Guide To Indian Reservation Areas, showing the reservations and giving a brief description of each with points of interest, was published and distributed to various Federal, State, community and other interested organizations, Tribes, and the general public, as a means of developing interest in tourist and recreational possibilities of the reservation areas. Further steps are being taken to develop the full tourist potential of the Indian reservations in order to provide additional job opportunities for the local Indians.

Industrial Plants Established

During this fiscal year, nine industrial plants were completed in the reservation areas, which in full operation will provide approximately 865 jobs. About 75 percent will be occupied by Indian workers.

For example, a large midwestern manufacturer and wholesaler of fishing tackle established an assembly plant on the Pine Ridge Reservation, South Dakota, in March 1961, after negotiations with the Oglala Sioux Tribe which were instigated by the Industrial Development staff. The company manufactures fish hooks, glass rods, reels, lures, spinners, and other fishing tackle products and is expected to add certain other products as the operation develops. The company leased two reconditioned buildings from the Tribe and more space will be made available as the operation expands. Starting in January 1961 as a pilot project with 12 Indian employees, the operation expanded to about 180 employees doing both hand and machine operations by June 1961. Anticipated expansion will provide employment for more than 260 persons during 1961-62. Company officials have found the Indian workers to be capable, enthusiastic, and particularly adapted to skilled handwork.

Another example is the charcoal briquetting plant established on a site at Pablo, Mont., on the Flathead Indian Reservation, as a result of negotiations carried on by Industrial Development personnel with the parties involved. The plant uses sawmill waste materials in the production of briquettes. The Tribe erected and leased two buildings to the company and operations began in December 1960, with 14 employees, 9 of whom were Indian. The plant is now in full operation with about 34 Indian workers. Local Indians are given preference for employment.

At McLaughlin, S. Dak., a large manufacturer of quilting and other soft goods leased a 20,000 sq. ft. building constructed by the Standing Rock Sioux Tribe. The plant was completed in June 1961, and the dedication was scheduled for July 7, 1961. Initially the company is employing about 25-30 Indian workers and this number will be expanded as demand warrants to approximately 75 workers.

A basket manufacturing company was located at Reserve, Wis., on the Lac Courte Oreilles Reservation. The plant was installed in a remodeled tribal building and began operations in August 1960 with 42 employees, 30 of whom were local Indians. It was destroyed by fire in October 1960 but a new building was constructed and operations began again in March 1961. The work force consists of 37 Indian employees and expansion is contemplated as the markets develop.

Realty

At the close of the 1961 fiscal year the Bureau was exercising trust responsibilities for 52,157,852.99 acres of Indian-owned land throughout the United States. Included in the total were 40,537,761.77 acres beneficially owned by tribes or tribal groups and 11,620,091.22 acres of allotted land beneficially owned by individual Indians. Because of a continuing trend toward disposal of allotments and enlargement of tribal holdings, the allotted acreage was somewhat smaller and the tribal acreage somewhat larger than they have been in recent years.

Acquisition and Disposal

Altogether 14,466 transactions involving land acquisitions and disposals, including 1,974 probate inventories, were processed by the Bureau during fiscal 1961. Approximately 130,000 acres were acquired through purchases and exchanges by individual Indians and tribes during the year, while some 1,090,000 acres of trust or restricted lands were removed from Bureau supervision during the same period. The termination program at the Menominee Reservation and the sale of Klamath tribal lands pursuant to the Klamath termination program accounted for approximately 759,000 acres of this total.

Approximately 53,000 acres were removed from Bureau supervision by the placing of unrestricted title in the hands of competent Indian owners at their request. The balance of the acreage consisted of other minor tribal land dispositions and disposals made at the request of Indian owners.

Sales to unrestricted status at the request of Indian owners accounted for 1,533 approved transactions; issuance of fee patents to

Indian owners, removals of restrictions and certificates of competency for 849; exchanges and partitions for 1,151; purchases for 682; and other miscellaneous transactions for 3,104. The Bureau also processed an additional 5,173 realty applications which resulted in no transfer of property rights for the reason that the applications were either disapproved or withdrawn.

Oil and Gas Activity

Although there have been some oil and gas lease sales of special interest, the lessees are continuing to evaluate their leases and surrender those not regarded as desirable. Bonuses in excess of \$2½ million were paid for Navajo leases in Utah and New Mexico. On one offering of leases for royalty bids, the high bid was 62.58 percent. Bids of almost \$900,000 received for Uintah and Ouray (Utah) leases show renewed interest in the area. The royalty income amounted to \$31,220,847, an increase of more than a quarter of a million dollars over the prior year. Navajo lands accounted for most of the production and royalty.

The total income from oil and gas development amounted to \$44,396,987, almost \$3½ million below the previous year. This reduction resulted mainly from the few leases sold and the surrender of leases which reduced the rental income.

During the year, the royalty rate was increased from 12½ percent to 16⅔ percent on future leases. Prior to the increase, the rate of 16⅔ percent had been in effect on the Osage Reservation for many years and for a short period on the Navajo and Wind River Reservations.

Waterflood plans under consideration for Navajo, Wind River (Wyoming) and Blackfeet (Montana) lands indicate a new era of production for these reservations.

Other Minerals

The income from minerals other than oil and gas amounted to \$3,196,615, an increase of more than \$500,000. The major portion of this income resulted from uranium operations on the Laguna Pueblo and the Navajo and Spokane (Washington) Reservations. A royalty reduction for low-grade uranium ore on the Navajo Reservation increased the mining interest on the reservation. The Fort Hall Reservation (Idaho) continues to return a sizable income from phosphate operations. Due to low prices for ore the marginal lead and zinc mines on the Quapaw Reservation have temporarily suspended operations.

Contracts were approved for the construction of the Four Corners Power Project on the Navajo Reservation near Fruitland, San Juan County, N. Mex., which will include a 350 KV plant. The plant will use considerable coal produced by a major concern operating under a Navajo tribal lease. Construction of the power plant began in January. It is hoped that the project will serve to increase Indian employment.

The need for prospecting with a view to obtaining as much information as possible about the mineral resources of Indian reservations has been generally recognized. Fortunately, major companies have shown interest and two preferential prospecting permits covering large areas were granted. One covered the entire San Carlos Reservation and the other covered a large area comprising a known iron ore deposit on the Fort Apache Reservation, both in Arizona. At the fiscal year's end a similar permit was under consideration on the Papago Reservation.

Records and Management

In fiscal 1961, the Records Section continued to develop, and began to actually operate, its Land Records Improvement Program. This program is a phased project designed to clarify and modernize the titles to Indian lands and to institute a systematic method of maintaining current title information. The fullest advantage possible is taken of electronic data processing systems to insure accuracy and speed of operation.

During the year, the Bureau closed 1,835 cases granting rights-of-way over Indian lands for various purposes. Present statutory authority vests the power to grant rights-of-way over or across Indian lands in the Secretary of the Interior. With some exceptions, specifically mentioned by the statute, the grant of rights-of-way may be made only with the approval of the Indian owners. The authority of the Secretary to grant rights-of-way, when such grants are in accordance with the prescribed regulations, has been delegated to the operative field level.

At the close of the year there were 33,605 surface leases or permits of all kinds in force on Indian lands, covering 4,165,057 acres and providing an annual rental of \$10,759,888 for the Indian owners. These leases and permits cover the use of Indian lands for farm, farm-pasture, grazing, and business purposes. They do not include lands incorporated in range units.

The long-term leasing act of August 9, 1955, as amended, is responsible for a continued increase in the leasing revenue to Indians. Leases for business, residential, recreational and other improvement purposes

reached a total of 4,616 at the end of fiscal year 1961, with an income to the Indians for the year in the amount of \$1,147,572.

Recreation Developments

One of the most promising trends of the year was the tremendously increased interest shown by the general public and by Indian tribes in the development of recreational facilities on Indian lands. Manifestations of this interest, many of which are still in the initial stages included offers to lease sizable lakeshore acreages on the Pyramid Lake Reservation in Nevada; inquiries about areas situated along the Colorado River on the Fort Mohave Indian Reservation in California, Nevada and Arizona; continuing development of tourist facilities on the Eastern Cherokee Reservation in North Carolina; and new recreational development on the Dania Reservation north of Miami, Florida.

In all of these areas the interest is in developing facilities commercially under long-term lease contracts. Along with this there has been a growing interest in tribally sponsored and financed development of recreational potential in such areas as the several reservations adjoining reservoirs constructed by the Corps of Engineers for control of the Missouri River (Fort Berthold in North Dakota and some of the Sioux Reservation in South Dakota).

This type of tribal development of recreational potential was to a large extent spearheaded by the Fort Apache Tribe in Arizona with the construction of artificial lakes and reservoirs within its reservation, the initial development being known as Hawley Lake, previously reported. This tribe is actively engaged in planning further similar development of its strategically located natural resources for recreation. Many reservations have over the years made their superior hunting and fishing facilities available to their non-Indian neighbors on a special license basis. The population explosion as it effects the western states will inevitably increase the demand for all types of recreational development.

Forestry

Late in fiscal 1961, Federal trusteeship over the Menominee and Klamath Indians was terminated by operation of Public Laws 83-399 and 83-587, as amended. For about 50 years preceding termination, the forest on each of these reservations had been managed by the Bureau of Indian Affairs as income producing properties. During this period, nearly 5 billion board feet of timber was sold



Top—This picture, taken in 1934, shows Indian forest lands just 9 years after logging under a sustained yield program of management carried out by the Bureau of Indian Affairs.

Bottom—Here we see the same part of the Indian forest—20-odd years after the earlier logging operation, showing vividly how timber growth has recovered under the Bureau's forest management program.



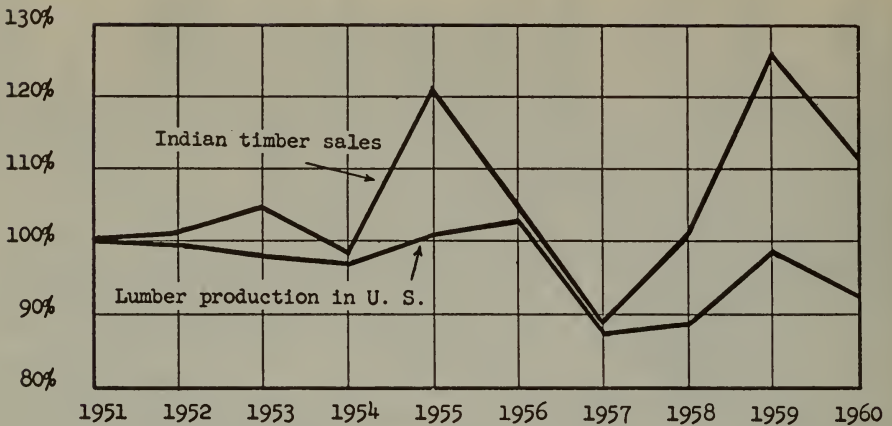


Figure 1. Indian timber sales far outstrip lumber production in the United States.

from the Klamath Reservation for a total of \$42 million. On the Menominee Reservation more than 1 billion board feet of standing timber was cut and processed through the Menominee Tribal Sawmill. For the timber the sawmill paid the Menominee Tribe more than \$10,600,000.

Informed public opinion places the Menominee and Klamath Reservation forests today among the most important and valuable in their respective areas. The present condition of these forests, following a half-century of use to produce income, vindicates the sustained-yield principles under which they were managed. These same general principles of sustained-yield management are being applied to the 5.7 million acres of commercially important Indian forests that are still under Bureau supervision.

Timber Sales

As a result of unfavorable markets in the forest products industries, the demand for Indian timber dropped off in comparison with the previous year. The 474 million board feet of timber cut and paid for in fiscal 1961 was 18 percent below the record-high volume of 1960. Cash income in 1961 was \$8,141,000 or 31 percent below the preceding year and the average price received was \$17.16 per thousand board feet compared with \$20.63.¹

In recent years, new forest inventories have revealed greater volumes of timber available for cutting than had previously been estimated. Plans were therefore made to increase the annual cut at several reservations. The increases have been accomplished except

¹These figures are exclusive of Klamath and Menominee Reservations.

as these plans have been affected by depressed conditions in the forest products industries. Figure I and table A show the 10-year trend by calendar years in volume of Indian timber cut, and the comparable trend in total production of lumber in the United States. They reveal (a) that the volume of Indian timber sold from year-to-year generally follows the trend of lumber production in the United States and (b) that, despite these fluctuations caused by general business conditions, there has been an upward trend in the volume of Indian timber sales.

Table A shows, in addition, that cash income from Indian timber sales has increased to a much greater degree than the volume of sales, because of substantial increases in the average price per thousand board feet received in these sales.

TABLE A.—*Sales of Indian timber and lumber productions in United States (by calendar years)*

Calendar year	Indian timber cut under contract (exclusive of Klamath and Menominee Reservations)				Lumber produced in United States	
	Volume		Value		Million board feet	Percent of 1951
	Thousand board feet	Percent of 1951	Cash receipts	Percent of 1951		
1951.....	464,126	100.0	\$4,680,078	100.0	37,515	100.0
1952.....	467,641	100.8	5,941,686	127.0	37,462	99.9
1953.....	484,986	104.5	6,809,266	145.5	36,742	97.9
1954.....	456,185	98.3	6,788,667	145.1	36,356	96.9
1955.....	560,479	120.8	8,181,949	174.8	37,858	100.9
1956.....	487,445	105.0	9,269,392	198.1	38,629	103.0
1957.....	412,292	88.8	7,942,752	169.7	32,901	87.7
1958.....	467,376	100.7	8,540,100	182.5	33,385	89.0
1959.....	585,239	126.1	11,614,280	248.2	37,055	98.8
1960.....	517,743	111.6	10,287,928	219.8	34,737	92.6

Forest and Range Fires

During calendar year 1960, high temperatures and prolonged dry spells created a serious fire situation throughout much of the country. In that year, the Bureau of Indian Affairs took action on 1,467 fires. These fires burned more than 130,000 acres, including 25,000 acres of timberland. More than \$1,100,000 was spent to suppress them.

The area burned was less than one-quarter of 1 percent of the area requiring protection. But for the 10-year period, 1951 to 1960, the 1960 year ranked first in number of fires, second in total acres burned, and second in average acres per fire. By a wide margin, 1960 was first in total fire suppression costs, and in average cost per acre burned. Even with this unhappy record, however, the Bureau of Indian Affairs was more fortunate than some other land managing agencies. It was a bad fire year generally throughout the country.

Timber Sales and Employment

Contracts for the sale of Indian timber provide that the purchaser shall employ Indian labor in preference to other labor not already in his employ whenever Indian labor seeks employment and is competent. Ordinarily, however, the Indians have not taken full advantage of this provision, and relatively few Indians are working for the timber purchasers.

The Bureau has begun a review of forest management programs at each reservation having important forest resources to determine the intensity of management that will provide the greatest return to the Indian owners in terms of stumpage income, employment opportunities and community stabilization. It is expected that one result of this study will be the development of cooperative plans, by the Bureau, tribal representatives and industry, to awaken interest in this employment among the Indians, and to screen applicants into the particular jobs for which they are or may become best qualified.

Irrigation Activities

During fiscal 1961, extensive studies (including surveys, investigations, and plans) were initiated to establish a program for (1) completing existing Indian irrigation projects, (2) developing additional Indian irrigation resources requiring authorization by the Congress, and (3) rehabilitating and improving existing irrigation works with a view to transferring the operation and maintenance of projects from the Federal Government to acceptable water-user organizations. Considerable emphasis has been placed on this program. When completed, the reports will provide firm ultimate project acreages as well as an inventory of project needs and programs for the development of proposed project facilities and the rehabilitation and betterment of existing project facilities. It is anticipated that all project reports will be completed during fiscal 1963.

Legislation to authorize the proposed Navajo Indian irrigation project embracing approximately 110,000 acres of land on the Navajo Reservation was pending in Congress at the close of the reporting period. If authorized, the project will provide irrigated farm lands for about 1,120 additional Navajo families.

Major items of construction and rehabilitation work under way during 1961 include the following:

Arizona: Colorado River Project—Construction of deep drains and construction of large main canal structure. San Carlos Project—



Canal for conveyance of irrigation water over rough desert to irrigated lands below where Navajo Indian is applying water carried by this canal in equal controlled flows through siphons to individual crop rows.



Drilling and equipping of deep wells and rehabilitation of existing wells.

California: Coachella Valley Project—Construction of laterals and drainage system.

Idaho: Michaud Unit, Fort Hall Project—Construction of drains, canals, and structures; and installation of concrete pipe.

Nevada: Duck Valley Project—Land development.

New Mexico: Hogback Unit, Navajo Reservation Project—Land development, extension of main canal, construction of drainage ditches, and construction of wasteway structures. Middle Rio Grande Pueblos—Land Development and construction of main service canals.

In addition to conducting studies for the preparation of feasibility, completion (definite plan) and rehabilitation reports, as well as the development and management of Indian irrigation projects, a great deal of time and work has been spent on protecting Indian water rights through court action and state compacts. Some of the major water rights litigation include *Arizona vs. California*, the Ahtanum suit, and the Anadarko suit. None of these actions advanced to final ruling in the reporting period. Bureau officials are also involved in the development of interstate water compacts between California and Nevada, California and Oregon, and Nebraska, Wyoming and South Dakota.

Agricultural Extension

In fiscal 1961 more than 10,500 meetings were held by Bureau technicians, county agents, and land grant college extension service specialists. These meetings, attended by approximately 250,000 Indian people, were held for the purpose of giving demonstrations, holding discussions, conducting work shops or giving instructions in an effort to promote incentives which will result in better living conditions among Indian families.

In addition to group meetings, individual farm and home calls are made by extension agents to stimulate interest in community activities, improved livestock and crop production and home management practices. The subject selected by Indians in which they desire assistance and information varies greatly among tribes and community groups. Extension services have been instrumental in organizing community effort in order that they may take advantage of non-agricultural economic development, which furnishes employment to their members.



Community-sponsored wool schools have created interest among the Navajos. Local people have a sense of pride in the success of such training meetings. Here a Navajo sheep owner discourses on the merits of these four separate wool clips.

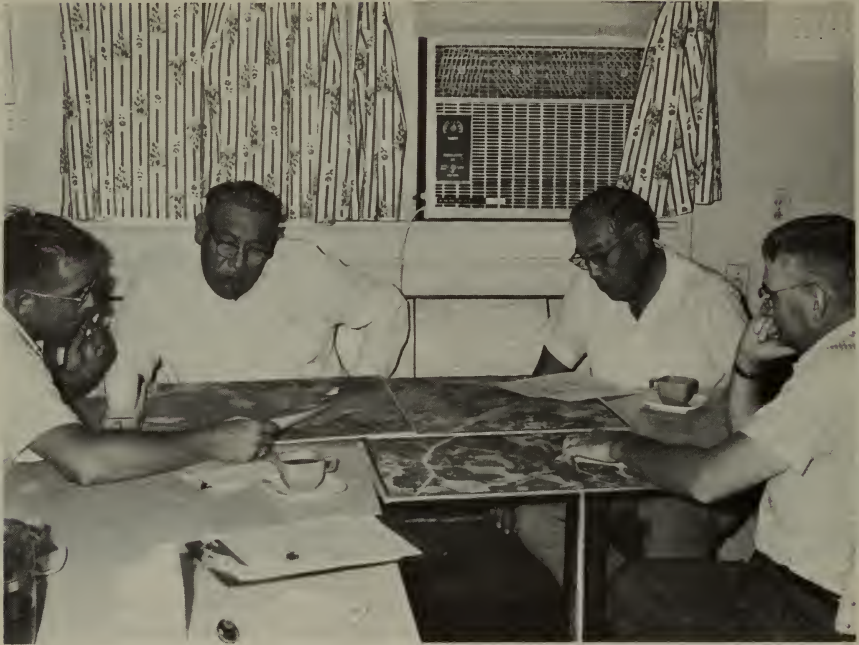
4-H Club Program

Along with these adult extension activities there were approximately 10,000 Indian boys and girls throughout the country participating in 4-H Club activities on the same basis as non-Indian boys and girls. Many of these 4-H Club members have received county and statewide recognition for their achievements in project completions and in giving demonstrations.

Soil and Moisture Conservation

The soil and moisture conservation movement has been very popular in the United States since passage of the basic Soil Conservation Act of 1953. The program is much newer, however, on Indian lands. The first token appropriation for soil and moisture conservation work on Indian land was in 1942. Even in the early 1950's there were still some Indian reservations that did not have an SMC program. Today the program is active on all Indian land held in trust. In 1961 the Bureau spent \$5,080,163 and the land users spent \$21,819,086 in labor and material in applying conservation practices on Indian land.

Increasing demands for soils information necessary for farm, ranch, watershed and reservation planning prompted the Bureau in the early 1950's to increase its staff of soils technicians assigned to



A group of Osage Indians being assisted by a Bureau Soil Conservationist in farm and ranch planning. This will enable them to conserve their soil and moisture and increase crop and forage production.

inventory work. By 1956 high-quality soil inventories were available for approximately 6,437,000 acres of Indian lands.

In 1957 the inventory program was expanded to include forage resources since the latter information was also essential in order to properly plan utilization of range lands. The program was also intensified to complete the mapping phase at the earliest possible date because several tribes were requesting the inventories to use in overall planning. At the same time added emphasis was placed on helping the Indians to understand and use the information in preparing plans for the development and utilization of their soil, water and forage resources.

By July 1, 1961, the Bureau had completed approximately 13 million additional acres of soil inventories and a similar amount of range inventories of Indian lands. In total, high-quality soil inventories are now available for roughly 19,500,000 acres. This represents completion of approximately 47.5 percent of the 41 million acres of open Indian land needing to be mapped. Since 1959 the program has been progressing at the rate of approximately $3\frac{1}{2}$ million acres per year. This rate of progress will allow completion of the mapping phase of the work by 1967.

The interpretation phase of the inventory program, involving the teaching of Indian people to use the information, has progressed but not at the rate of the mapping. Increased emphasis is being put on this part of the work each year.

Range Management

Progress was made in range management during 1960 in the face of continued drought. Indicative of progress was the action of the Mescalero Tribe in New Mexico in retaining a commercial management firm to prepare a management plan for the Indian livestock business, and the employment of a livestock manager. Several of the Pueblo Tribes in New Mexico have adopted range management plans and voluntarily reduced their livestock numbers in response to advice of Bureau range specialists. The Southern Ute and Ute Mountain Tribes of Colorado and the Apaches of New Mexico are taking steps to place their range lands under good management. Educational work with the Indians is receiving increased emphasis.

Drought Conditions

Drought conditions have continued not only in the southwest but in the Dakotas and eastern Montana. This has resulted in reduced forage production and scarcity of water for range livestock. Little damage has resulted to the forage cover in the Northern Great Plains due to past conservative management designed to meet periodic drought conditions. Drought continues, however, to be severe on a number of the southwestern reservations where livestock numbers in excess of grazing capacities further complicate the situation. It was necessary for the Department of Agriculture to continue its free feed-grain program on a number of these reservations.

Indian livestock operators used 83 percent of their range. Grazing privileges not immediately needed by the Indians were sold to non-Indians through competitive bidding. The rates received compare favorably with the highest rates received on other lands in the respective states.

The range for 1960 was used as follows :

	Acres (thousands)	Percent of acreage used	Animal units grazed (thousands)	Use value (thousands)
Total range.....	40,942			
Total use.....	40,412	100	748	\$6,038
Non-Indian use.....	6,376	16	306	1,996
Indian use.....	34,046	83	442	4,042
Not used.....	530	1		



Top—Improved pastures developed with technical assistance furnished by the Bureau of Indian Affairs are producing up to 800 pounds of beef per acre. Seminole stockmen are selling 400-pound calves at 6 to 7 months of age and are now getting an 80-percent calf crop on the improved pastures.

Bottom—Before the soil and moisture conservation program was started among the Seminole Indians of Florida, their cattle were ranging in the Everglades, as shown, getting about a 20-percent calf crop, 9 pounds of beef per acre, and selling year-old calves weighing 255 pounds.



Roads

The Bureau's road program includes both construction and maintenance of certain roads serving Indian lands. The program in fiscal 1961 totaled \$21.2 million and was active on 160 reservations in 21 States.

The \$2.8 million road maintenance program provided routine maintenance on 16,216 miles of reservation roads and bridges. Maintenance work included surface repairs, blading, repairs to drainage, clearing of right of way, and snow removal. All work under this program was performed with reservation equipment and government forces.

The road construction program consisted of \$4 million for Navajo-Hopi, Routes 1 and 3, as provided by Public Law 85-740, an amendment to the Navajo-Hopi Rehabilitation Act; and \$14.4 million for the Bureau system as authorized by the Federal-Aid Highway Act of 1958.

There were 172 projects ranging in cost from \$5,000 to \$976,000 in this construction program. All engineering projects and some of the smaller construction projects were completed with government forces. Most of the projects were advertised for contract with some contracts covering two or more projects. Sixty-two contracts were awarded at \$5,000 to \$100,000; 31 at \$100,001 to \$500,000; and 9 at over \$500,000.

The construction work accomplished during the year on all reservations included 319 miles of grading and draining; 264 miles of gravel surfacing; 268 miles of asphalt surfacing; 2,916 feet of bridges; 647 miles of surveys and plans for future projects.

Progress on Routes 1 and 3 on the Navajo and Hopi Indian Reservations was on schedule. Sections on Route 1 between Tuba City, Ariz., and Kayenta, Ariz., were either completed or under contract. On the eastern end, the sections between the New Mexico-Arizona State line and Mexican Water, Ariz., were either completed or under contract. The remaining unimproved section of Route 1 is between Kayenta and Mexican Water. Route 3, beginning at Tuba City, Ariz., and extending easterly across the Navajo and Hopi Reservations is asphalt-surfaced for the entire length but is being widened and resurfaced in accordance with State highway standards.

As part of the Menominee Termination Program, the Bureau entered into an agreement with the State of Wisconsin providing for transfer to the State of all Federal public roads on the Menominee Reservation and their designation as State, county, or township roads. The Bureau agreed to provide the rights-of-way and to re-

construct certain roads. All work required of the Bureau under this agreement was completed or under contract at the termination date on April 30, 1961.

Arts and Crafts

The Indian Arts and Crafts Board has the responsibility of promoting the economic welfare of Indian tribes through the development of their arts and crafts. It provides technical advice and assistance in production and marketing to Indian crafts groups and to individual Indian artists and craftsmen.

The Seminole crafts program was taken over by the Seminole Tribe in 1960 and became a part of the tribal enterprise system. In line with the request of the Tribe, the Indian Arts and Crafts Board has continued to provide advice and assistance through the services of an arts and crafts specialist. Reports from this group indicate that the volume of business has increased during the year and the craft shop is rapidly becoming a well-known State attraction.

This has been an important year for the Qualla Arts and Crafts Mutual at Cherokee, N.C., which has now spent one year in its new \$50,000 highway sales center building. In addition to an increase in sales, this group has had a number of important exhibits during the year.

Sioux Craft Activity

At the Sioux Exhibit and Craft Center, Rapid City, S. Dak., a complete card index and accession book was compiled on the collection of 1,200 artifacts. An anthropologist familiar with Sioux Indian history and an expert in the Sioux language has prepared labels for the museum specimens with the correct Sioux name, both in the usual spelling and in the phonetical spelling used in linguistics. The various reservations in the area are showing increased interest in craft production and the arts and crafts specialists are making periodic visits to these reservations to advise and assist in the establishment of craft organizations.

For the Southern Plains Exhibit and Craft Center at Anadarko, Okla., this has been a year of growth and advancement. There has been an increasing demand for high quality Indian crafts and this has resulted in increased business for the cooperatives. A number of special exhibits have been held during the year and it is gratifying to note the interest the Indian people in the vicinity take in these exhibits.

An arts and crafts specialist has been appointed to give direct assistance to the Hopi craftsmen in Arizona. Various improvements have been made on the quonset hut where the Hopi Silvercraft Guild is located, thereby making the operation of the Guild much more effective. As a result of this assistance, the Hopi Guild has had a very successful year as far as sales are concerned.

Credit Activities

Further progress was made during 1960 in the financing of Indians, despite a general tightening up of credit by the lending institutions that serve citizens generally and a shortage of funds available for loans through the Bureau. The rate of progress, however, slowed down. Financing of Indians through customary institutions increased nearly 11 percent in 1959 over 1958. In 1960, the increase was only about 7 percent. This situation caused a greater demand for loans upon the Bureau which it was unable to meet.

Nevertheless, the Indians continued to be better financed in 1960 than probably at any time in their history. Total financing increased from about \$100,360,000 in 1959 to \$107,344,000 in 1960.

Financing Through Customary Financial Institutions





Total financing through customary institutions increased from about \$67,670,000 in 1959 to about \$72,620,000 in 1960. Lenders in the areas where Indians live are becoming more and more conscious of the credit needs of the Indians.

Financing by banks showed a satisfactory increase over 1959—about 18 percent. Loans to Indians by the Farmers Home Administration showed a decrease of about 5 percent from 1959, and loans by production credit associations a decrease of about 3 percent.

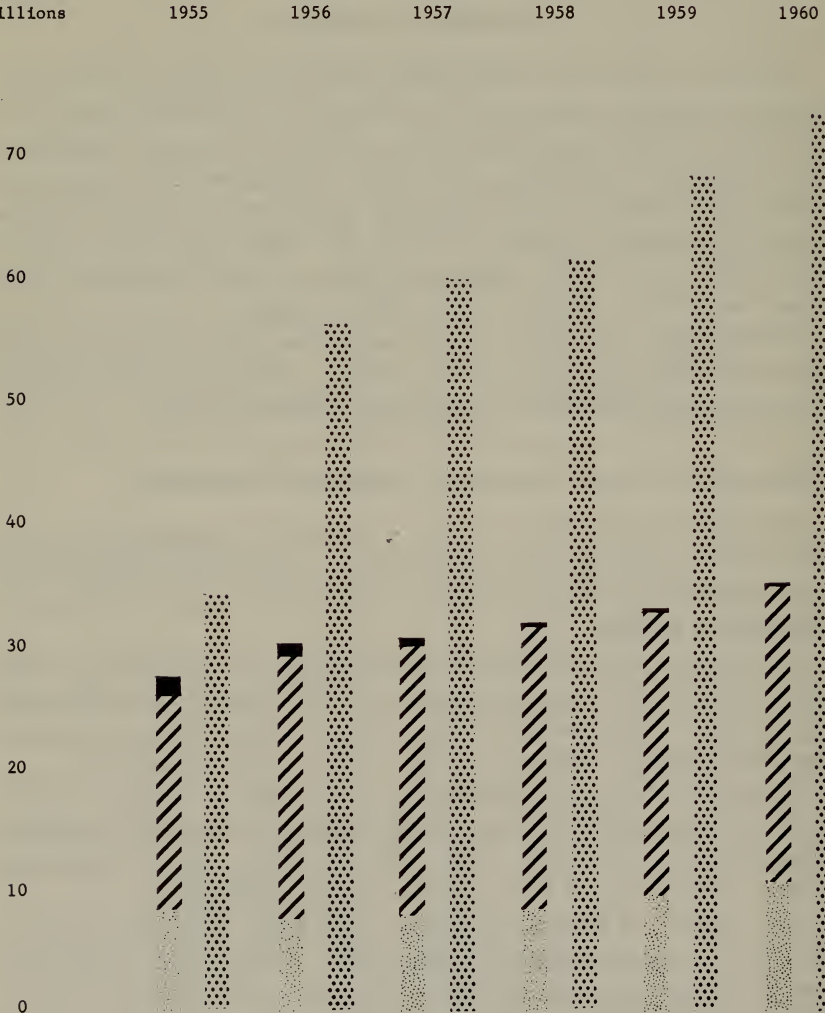
There were 135 loans outstanding at the close of the year with an unpaid balance of \$815,334 secured by mortgages of trust land approved pursuant to the Act of March 29, 1956 (25 U.S.C. 483a). The unpaid balance at the close of the previous year was \$579,010.

The number of Indians desiring to use their chief asset, land, as security for loans is constantly increasing. Although the authority to pledge Indian land as collateral provides a worthwhile means of assisting the Indians to obtain justified financing, continued vigilance is necessary to prevent this authority from becoming merely a mechanism whereby improvident Indians may unwisely be separated from their land.

COMPARATIVE SUMMARY OF FINANCING RECEIVED BY INDIANS
AND THEIR ORGANIZATIONS

Key:  Customary Credit Channels (non-Bureau)
 Through Bureau Programs: Revolving Credit Fund
 Tribal Funds
 Programs in Process of Liquidation

Dollars
Millions



Financing Through Bureau

The following shows the total financing through the Bureau outstanding at the close of the past two years:

	1959	1960
Tribal funds advanced.....	\$22,972,052	\$23,982,484
Loans of revolving funds.....	9,515,749	10,572,318
Programs being liquidated.....	202,433	168,963
Total	32,690,234	34,723,765

Tribes with funds of their own available for financing are required to use their own money before applying for loans from the United States. Such funds are used for the same purposes as loans from the revolving fund.

The volume of loans from the revolving fund in 1960 was the second largest in any year since the fund was established. In 1950, the peak year, \$3,274,070 was loaned. By comparison the 1960 amount was \$3,145,375. Repayments on principal in 1960 totaled \$2,084,271 and \$4,535 was cancelled. The net increase in loans receivable over 1959 was \$1,056,569.

Since the demand for loans in 1960 far exceeded the funds available, it was necessary to curtail the submittal of applications for additional loans during the year.

Use made of funds loaned and tribal funds advanced

	<i>Balance at—</i>	
	<i>June 30, 1959</i>	<i>June 30, 1960</i>
Loaned to individual Indians.....	\$7,885,484	\$8,858,065
Loaned to cooperatives.....	191,554	224,651
Loaned to and invested in enterprises.....	19,442,772	20,795,623
Loans to attract industries.....	129,830	284,281
Other loans and miscellaneous.....	126,147	119,787
Cash on hand.....	3,147,892	2,610,489
Other net assets.....	1,766,555	1,830,869
Total	32,690,234	34,723,765

Transactions during 1960 are summarized as follows:

Loaned to individual Indians.....	3,819,669
Loaned to cooperatives.....	39,984
Financing of enterprises.....	2,134,301
Total	5,993,954

Loans Made in Alaska

Loans made in Alaska have impaired the soundness of the revolving fund. Of the \$10,572,318 outstanding in loans, \$5,274,115 was on loans made in Alaska.

These loans fall into the following categories:

1. Loans to Native villages for the operation of stores and trading posts.....	\$424, 800
2. Loans for relending to members and miscellaneous.....	403, 653
3. Loans to villages to operate salmon canneries.....	4, 444, 662
	<hr/>
	5, 274, 115

The first category of loans to villages to operate stores and trading posts has been successful. The economic life in many of these remote villages centers around the store or trading post. This part of the program beneficially affects a larger number of people than other parts of the program.

Potential losses on loans in the second category are higher than those on loans made elsewhere, due mainly to poor fishing seasons in southeastern Alaska. However, losses will not be so high as to impair the soundness of the revolving fund.

The loans in the third category constitute the problem area. Because of the large amount of funds necessary to finance canneries and because their operations have been generally unsuccessful, the soundness of the revolving fund has been impaired. The liabilities of the canneries exceeded their assets by more than \$1 million at the close of the fiscal year. The interests of the United States in its loans has become progressively less secure from year to year. Present indications are that large losses will be suffered.

Plant Design and Construction

In fiscal 1961, the Bureau completed 20 school projects which made available 2,274 additional classroom seats for Indian children previously unable to attend school for the lack of classroom space. Twenty-one other school projects with a total of 1,633 additional seats were started but not completed during this same period.

Construction was also in progress on 28 miscellaneous projects, including employee housing, sanitary facilities, water exploration and jails.

The Bureau assisted the Division of Indian Health, U.S. Public Health Service, by completing the design and construction of 6 hospitals and 3 miscellaneous projects as well as starting the construction of 14 other health projects, which included several hospitals and clinics.

Bureau of Land Management

Karl S. Landstrom, *Director*



FISCAL YEAR 1961 was a milestone of progressive advancement in the conservation, administration, and utilization of public lands and natural resources under jurisdiction of the Department's Bureau of Land Management. New directions were charted for the conservation, management, and use of more than 477 million acres of land owned by all citizens of the United States.

Responsible for the management of the national land reserve of 168 million acres, plus nearly 310 million other acres in Federal ownership, the Department of the Interior, through its Bureau of Land Management, took bold action to insure protection of the public's vital interest in these important natural resources—many of which, a few years ago, were considered useless and without values.

Lands and Recreation

"The Federal Government owns nearly 770 million acres of public land, much of it is devoted to a variety of essential uses. But equally important are the vacant, unappropriated and unreserved public domain lands, amounting to some 477 million acres—a vital national reserve that should be devoted to productive use now and maintained for future generations."

Thus, President John F. Kennedy defined conservation goals and spelled out objectives for improvement and protection of the public domain, recognizing that wise investment in a land resource program will return vast dividends tomorrow and that failure to act now may be opportunity lost forever.

Public Interest Paramount

The Department ordered an 18-month moratorium on most types of applications for public lands under the nonmineral public land laws. This temporary suspension, which terminates on September 1, 1962, is permitting the Bureau of Land Management to eliminate existing backlogs, review the entire land management picture, and implement long-range and resource management programs of the Department of the Interior.

In recent years, some unethical land locators and promoters have abused the privilege of filing applications and petitions for public lands at a cost of millions of dollars to the public. With district land offices flooded with promoter-inspired applications, honest citizens were hampered in their legitimate desires to acquire public lands.

Action for Conservation

A major step toward protection of the public interest was the adoption of a public land conservation program governing all transfers of land out of Federal ownership. Under this program, the Government must receive a full return for its property in terms of money—or other values—and any disposition or lease of public lands must meet the test of serving the public interest.

Under this conservation program, lands which cannot properly be developed under existing public land laws will be retained in Federal ownership pending enactment of appropriate legislation. Private exchanges will be approved only where acquisition of the offered lands will yield substantial benefits to long-range Federal land and resource management.

Entries under the agricultural land laws are now prohibited in areas where they would be inconsistent with national agricultural policy or would lead to marginal or submarginal crop production. By this means, activities of the Bureau of Land Management are coordinated with programs of the Department of Agriculture. In addition, lands which are more valuable for other uses will not be classified for agricultural entry.

Land Inventory and Classification

The President's call for an inventory and evaluation of the nation's public domain holdings brought about a land tenure analysis or inventory program. This program, called "master unit classification," recognizes that the existing pattern of land administered by BLM is largely unplanned. Land use, in the past, has simply followed a

transfer of lands under a variety of laws, many of which have conflicting purposes.

On an orderly basis, the new program will permit needed tenure adjustments and provide a sound basis for a sustained resource management. Tenure will be secured for lands which should remain in Federal ownership. Title to those lands which are not required for Federal land programs will be transferred, and lands with significant public values will be acquired, retained, and managed.

Recreation

A major requirement of an adequate nationwide system of public parks and other areas for adequate outdoor recreation is the proper use of the national land reserve.

The Bureau of Land Management works closely with State and local governments to help them meet their public recreational needs. One major means of accomplishing this is by lease or title transfer under the Recreation and Public Purposes Act. Under this law, States may purchase up to 6,400 acres a year for park purposes, except that the limit for 1961 and 1962 was set at 12,800 acres.

To stimulate expansion of public recreational facilities, an acquisition schedule has been adopted for public lands for outdoor recreation. State and local governments can purchase land areas from the national land reserve for \$2.50 an acre, or lease them for 25 cents an acre per year. This price eliminates one of the major stumbling blocks to State and local recreation programs—their inability to finance expensive land acquisition plus necessary improvements and facilities.

Most of the lands involved are located in 11 western States and Alaska, although small acreages exist in Minnesota, Louisiana, Florida, Arkansas, Alabama, and Wisconsin.

Lands obtained under this schedule must be open to the public without discrimination or favor. As provided by a recent Act of Congress, the lands must forever be dedicated to public recreation use—otherwise, they will revert to the Government. No more than a reasonable charge may be made for use of recreation facilities, and entrance fees may not exceed those charged at similar State or local installations. In addition, the lands must be developed and managed in accordance with a BLM-approved program of utilization.

The new price schedule has also been extended to sites for public education, wildlife restoration projects, and wildland fire control stations, provided that similar requirements are met. This replaces a former policy of selling such lands at up to 50 percent of normal



Trespass—illegal occupancy of public lands. This unsightly junkyard is in a valuable public recreation area along the lower Colorado River.

market price. In the past, a high price tag has seriously handicapped some communities seeking expansion.

In many States, there was a great deal of activity under the Recreation and Public Purposes Act. Utah initiated an active program for developing a State park system, with over 60 sites already applied for. Several of these—including one for a scenic area on the Great Goosenecks of the San Juan River—were transferred to the State by the Bureau of Land Management. Local governments in Nevada have applied for school sites, and the State has applied for a sizable area for Valley of Fire State Park near Lake Mead. Washington has leased 29 islands in Puget Sound for recreation sites.

In conjunction with the Master Unit System, an inventory of recreation lands will identify those having special attraction making them suitable for public outdoor recreation. More than 1,000 of these areas were identified during fiscal year 1961.

When areas are suitable for multiple usage, appropriate classifications will protect and administer any recreation potential. During the year, several such areas were established, including one of over 300,000 acres in the Monache-Walker Pass area of California, which was classified for retention in public ownership under section 7 of the Taylor Grazing Act. This classification provides that discretionary dispositions detrimental to public values of this area will be avoided.

Wildlife Conservation

A new aspect of public land management was inaugurated during the year, when an area of 92 square miles in central California was designated the Caliente National Cooperative Land and Wildlife Management Area.

This is the first formal Federal-State land and wildlife management area in the United States. It consists of 58,868 acres of public land administered by the Bureau in cooperation with the Department's Fish and Wildlife Service and the State of California. It will be utilized to develop the recreation, wildlife, and other natural resources of the area.

Under consideration are other potential land and wildlife management areas.

Recreation Construction

During the fiscal year, the Bureau of Land Management constructed camping and picnic facilities at eight recreation sites located on O&C lands in western Oregon. These were the first recreation facilities outside Alaska constructed by the Bureau. They are located adjacent to major access roads, also constructed by the Bureau, for management of forests and other resources under its jurisdiction.

Under provisions of the Recreation and Public Purposes Act, many States and counties are constructing sites adjacent to Federal, State, or county highways. There remain undeveloped, however, many desirable outdoor recreation areas in remote and uninhabited regions where there are large concentrations of public land.

Despite a lack of facilities and in many cases a lack of good roads, the recreational use of the national land reserve has accelerated very rapidly since 1950. Included are hunting, fishing, camping, hiking, picnicking, sight-seeing, rockhounding, and many other pursuits. An initial recreation inventory revealed that recreation visits exceeded 2.3 million.

One illustration is the Owens Valley in California, which is the watershed for the City of Los Angeles municipal water supply. Despite a lack of facilities, there were over 200,000 visits to the public-domain lands in this area in 1960. A lack of needed facilities resulted in unsightly and unsanitary conditions on the public lands were created. A similar situation exists along the lower Salmon River in Idaho and in many other areas in the western States.

Legislation

In performing its mission of land and resource management, the Department of the Interior has been hampered by outmoded public land laws. Many of these laws are obsolete or otherwise insufficient, and they frequently reflect social and economic conditions of the last century—they no longer apply to situations of today.

Increased economic activity in public-land States has caused a growing need for land for commercial and industrial purposes. While this need exists in connection with many industries, it is particularly pressing for electronics, aircraft, and missile industries. There is no means easily available for the sale or lease of public lands, in tracts of sufficient size for these purposes. Cumbersome and round-about methods have to be used, such as exchanges for the acquisition of suitable lands.

At the same time, there has also been an increasing demand for public lands for urban and suburban development, and for recreation purposes.

Land To Grow On

To meet these and other needs, a proposed bill authorizing the classification, segregation, lease, and sale of public lands for urban, business, and occupancy sites was sent to the Congress during fiscal 1961. This bill provides for the disposition of lands at not less than their fair market value, either by direct sale of tracts to State and local governments up to 5,000 acres or by public auction of tracts up to 1,280 acres to private organizations or individuals.

All such sales would be under conditions assuring development for the purposes intended and preventing speculative ventures, in order to protect public interest in the lands.

Public interest in small tracts continued during fiscal year 1961. Emphasis on public sale, rather than leases, resulted in a decreased number of applications and an increased number of tracts transferred. Land offices at Los Angeles, Sacramento, Reno, and Phoenix held weekly auctions. As many as 3,000 tracts are currently available at the Los Angeles office, the realization of a long-sought inventory goal.

State Selections

An amendment to the State selection laws resulted in some increased activity. Under this amended rule, States may select part of the lands under a Federal mineral lease, even when some of the other lands involved in the lease are not available to the State.



A 23,000-acre grass and brush fire moves into a mature stand of ponderosa pine. Over half of the fires on BLM lands last year were caused by the carelessness of man.

Most States have exercised nearly all selection rights, and they are being encouraged to complete selections as soon as possible. In Washington, over 30,000 acres were transferred to the State. Arizona eliminated the entire backlog of pending applications, and transferred 45,000 acres to the State.

In Alaska, the State selection program continued to dominate the activities of the Bureau of Land Management. Over 1,000 applications were on file at the close of 1961, as the State exercised selection rights granted by the Statehood Act. After early concentration on lands in the Anchorage area, the State is currently selecting large areas in the Fairbanks area. This high level of activity is expected to continue, since the State has selected only 10 percent of its congressional land grant.

Withdrawals and Restorations

In 1961, steps were taken to streamline withdrawal procedures and to clarify policies in order to expedite administration. During the year, 275 public-land orders were issued, 153 of them since February 1, 1961.

Nearly 9 million acres in northern Alaska were withdrawn for the Arctic National Wildlife Range—to preserve the unique wildlife, wilderness, and recreational values of the region. At the same time approximately 20 million acres of Alaska lands, formerly withdrawn under Public Land Order No. 82, were restored to the public domain. Executive Order 8344 was revoked, so that 500,000 acres of public lands on Kodiak Island became available for State selection.

Forest Resources

In the management of lands and resources under stewardship of the Bureau of Land Management, all phases of forestry are of major importance. Accepted projections of population expansion for the next four decades clearly challenge our ability and need to increase the quantity and quality of this vital resource.

In addition to balanced use of forest resources and the need to sustain a maximum timber yield, the Bureau of Land Management is concerned with the care and conservation of forest lands, and the protection of these lands from fire, insects, disease, trespass, and other depredations.

Forestry Management

The national land reserve contains almost 35 million acres (exclusive of Alaska) of commercial forest land and woodland—of which 6 million acres are commercial forest lands and 29 million acres are woodlands type. The standing merchantable volume on these lands is about 109 billion board feet with 74 billion board feet of this on the commercial forest land.

The Oregon and California Railroad (O&C) grant lands are among the most intensively managed of any Federal timber holdings. During the fiscal year and during the convening of the 5th World Forestry Congress, over 100 foresters from 24 nations made a tour of these famous timber lands. As quickly as conditions permit and warrant, the remainder of the national land reserve which can support commercial timber stands will be brought under comparable intensity of management.

Uniform Practices

An agreement to study uniform timber management practices on Federal timber lands was adopted by the Secretaries of the Interior and Agriculture. Involved were the Department's Bureau of Land

Management and its Bureau of Indian Affairs as well as the Forest Service.

Thirteen specific recommendations were agreed upon to standardize and reconcile timber sale and management practices, recognizing the necessity for bringing together widely scattered resource policies of the Federal Government existing for many years.

Among the study recommendations adopted, are orders to agencies to standardize inventory procedures, reconcile differences in determining allowable timber cut, and make detailed field studies toward possible uniform log measurement standards.

Other recommendations include possible adoption of a joint nursery program, and solutions for land jurisdictional problems in the complicated checkerboard ownership of western Oregon.

Timber Sales

Many of the public lands in the West have heavy stands of timber. The regulated harvest of this timber contributes considerable revenue to Federal, State and County treasuries where the timber is located, and also contributes to the economy of nearby communities, the State, and the entire Nation.

The O&C and Coos Bay Wagon Road grant lands, of western Oregon, comprising over 2 million acres of some of the finest Federal forests in the Nation, are intensively managed by the Bureau of Land Management to obtain maximum product yield on a sustained basis. More than half of the industrial employment in Oregon is based on timber-using industries. These lands contribute about 14 percent of the total raw material used by the timber industry.

From these lands during the past year nearly 1 billion board feet of timber, valued at more than \$26¼ million, was sold. This represents the full annual allowable cut of 874.2 million board feet. In addition, a volume of nearly 125 million board feet of salvage and thinning, not chargeable against the allowable cut, was produced. This supplemental volume of nearly 125 million board feet over the allowable cut represents approximately \$3 million in direct payrolls to production workers in the timber industries of western Oregon.

These timber sales also contribute substantially to timber using communities. Where the need exists, the full allowable cut is offered for sale.

Over 10 percent of the timber offered for sale from the national land reserved during 1961 did not receive bids, and the values were lower than in the previous year. This lack of interest and lower prices is attributed to slowness in lumber markets during the year.



A Bureau forester examines a blister rust canker on a young sugar pine.

Timber sales are the largest source of revenues in the total forestry program, with receipts of nearly \$6 for every dollar appropriated in fiscal year 1961.

Forest Thinning

The Bureau of Land Management is engaged in commercial thinning where permitted by silvicultural and industrial needs. During the last fiscal year, there was a substantial increase in sales of such timber. In such sales, less desirable species and other trees are logged. These trees would normally die before the end of harvest or rotation age, because of growth competition, insect attack, disease, or damage.

Volumes realized from these sales were in excess of the annual sustained yield, since these trees would never have reached maturity. In addition, the residual stand of trees is vastly improved, with the final harvest yielding better and more valuable trees. Because thinning sales are made in stands of timber representing younger age classes sensitive to mechanical injury, logging is restricted to small tractors or horses in order to minimize damage to remaining trees.

Bids totaling more than \$296,000 were received for the 17½ million

board feet of thinnings removed from approximately 2,000 acres during fiscal year 1961.

Reforestation

The future of the Bureau's forest resource management rests in its ability to successfully establish young, vigorous forest stands. During fiscal year 1961 several important steps were taken to achieve this.

For the first time, sufficient supplemental appropriations to rehabilitate burned over forest lands were obtained, almost as the embers were cooling. Funds of \$225,000 were made available for snag falling, contour plowing for erosion control, tree seed and planting stock, and planting and reseedling of fire-damaged public-domain forest lands in Oregon, Idaho, Colorado, Wyoming, and Montana.

The most intensive continual reforestation of Federal lands is on the O&C grant lands. Through excellent and far-sighted cooperation of 18 western Oregon counties, money was made available by 1965, to place all reforestable acreage into full production for seeding or planting.

To insure a supply of seed and planting stock, seed banks and cooperative agreements for growing stock have been established. Under one cooperative agreement with the State of Oregon 5 million seedlings will be produced yearly for use of the Bureau of Land Management.

Forest Inventory

Since there will be no significant increase in forest acreage and possibly a decrease due to urban expansion, the demand is being met by a maximum product yield in conformance with sustained yield management. A vigorous, realistic inventory must be maintained—not only to assure an orderly harvest, but also to provide foresters of the Bureau of Land Management with necessary data to recover what has previously been considered forest mortality.

The first intensive forest inventory was completed on the grant lands and intermingled public domain lands in western Oregon in 1959, and is now being conducted on 3.8 million acres of commercial timberlands in the national land reserve. This inventory is scheduled for completion in 1965. Following the trend of the western Oregon inventory, increases in annual allowable cuts may be anticipated. If the need exists, such increases will be reflected in scheduled sales of timber when the inventory is approved.

Foresters are conducting a new inventory of portions of the Bureau of Land Management western Oregon forest lands that were inven-

toried about 10 years ago. No marked change in the annual allowable cut is anticipated, but valuable regulatory information will be secured by this new inventory.

In executing the new inventory, a network of permanent sample plots has been established. These plots are periodically reexamined—and growth condition, stand conditions, mortality, volume, information, and other data are obtained.

Access Roads

A basic requirement of forest resource management is access. Large stands of mature and over-mature timber require roads designed and built for heavy logging equipment needed to harvest the resource.

Just a decade ago the Bureau of Land Management began constructing access roads which also served other Federal and private uses as well as hunting, fishing, mining, grazing, and fire protection. In many areas, plans can be prepared without the compelling or controlling factor of road development.

Accomplishments to date include construction of 230 miles of high-standard logging roads of which 44 miles were completed during 1961. An additional 153 miles are currently under construction. A total of 152 miles have been surfaced with rock for year-round operation, of which amount 26 miles were surfaced this year. An additional 51 miles are currently under contract for rock surfacing. To reduce maintenance costs, 51 miles of timber access roads have been black-topped, 18 miles of which were completed during 1961.

During fiscal year 1961, more than \$38.4 million was appropriated for construction and acquisition of access roads. An additional \$250,000 was made available for maintenance of access roads.

Protection of Resources

Conservation and wise use of the Nation's public lands and resources require comprehensive, long-range plans for protection against the destructive forces of nature and the carelessness of man.

Natural resource protection covers many fields—from fighting forest fires in remote sections of northern Alaska to investigating trespass cases on the lower Colorado River. Insect and disease control are also necessary, as well as rehabilitation of lands destroyed by fire or flood.



Disease is a silent, but deadly enemy of our forests. This camp in an overmature stand of white pine along the Rogue River in western Oregon was set up by BLM to combat an infestation of white pine blister rust.

Protection Responsibilities

To centralize protection responsibilities and enable the Bureau of Land Management to provide professional supervision and direction of all activities relating to protection of the lands and resources, a new organizational division was established during fiscal year 1961.

Protection responsibilities include fire prevention and suppression, trespass, and insects, pests and disease control.

Trespass

Primary protection responsibility is the investigation of trespass, or unauthorized use of the national land reserve and its resources. There has been an intensified effort to eliminate illegal uses of public lands and resources.

Trespass includes such things as unauthorized cutting of timber, land occupancy, disturbing the surface of public land for agricultural and nonmineral materials, burning the surface resource, and grazing of forage. There are an estimated 20,000 cases of trespass on the national land reserve.

Considerable effort was devoted to the prosecution of timber trespass in fiscal 1961. Normally the processing of cases is delayed because of court actions, detailed cadastral surveys, and complex investigations. Collections on claims repay the loss to the taxpayers and serve as deterrent to future violations.

Action was initiated to prepare an occupancy trespass inventory for future use. The program envisions elimination of a substantial portion of the unauthorized occupancies within 2 years.

Grazing trespass on Federal range lands was a continuing problem. Penalties imposed by State law were often inadequate to discourage habitual grazing trespassers. New regulations and trespass manual instructions are serving to simplify and provide uniform trespass procedures.

Fire Control

Fire control involved prevention, preparedness, and early suppression of all fires found upon or threatening resources on lands under jurisdiction of the Bureau of Land Management. The fire control objective was to train, organize and develop a force to hold fire losses to a minimum.

Fire Conditions

Fire is the principal enemy of our forests, rangelands, and watersheds. This fact was brought into sharp focus by the critical fire season early in fiscal year 1961.

Several factors contributed to extreme fire weather conditions which prevailed over the western States during this fire season. Subnormal winter precipitation was followed by light spring rains and extreme summer drought.

Grasses cured earlier than usual, especially at higher elevations, creating a serious flash-fuel situation. Prolonged periods of above-normal temperatures, accompanied by low humidity, high winds and recurrent "dry" lightning storms combined to create one of the worst fire seasons in many years over vast areas of the West.

Preparedness and Prevention

As a part of preparedness and prevention, per diem fire guards were assigned to specific areas in advance of the fire season. All equipment and tools were checked and made ready, or replaced where the need was determined, in preparation for a normal fire season.

Emphasis was placed on informing the public of fire danger through such news media as radio, television, the press, motion pictures, fire posters, fire warning signs, and form letters or notices. In some districts with high risk areas and histories of man-caused fires, stepped-up prevention practices were initiated. These included issue of campfire permits, closer supervision of controlled burning, and fireproofing of risk areas and highways bordered with flash fuels.

Daily fire-weather forecasts and predicted burning indices enabled release of more accurate, timely, and effective fire-danger information to the public.

Fire training was increased over previous years. Forty-two organized fire-training schools were held. Personnel of the Bureau of Land Management concerned with fire suppression received training in all districts. School time varied from 2 days to 2 weeks. Also, personnel attended 17 cooperative schools conducted by the Forest Service, State Fire or Forestry Departments, and other agencies.

In addition, extensive training was given to Alaskan natives, while New Mexico and Arizona personnel participated in training Southwest Forest Firefighter Crews. Some districts conducted weekly or periodic training sessions for emergency firefighters and temporary employees. Type and intensity of training varied, but the greatest emphasis was placed on fire supervisory and organizational training.

Suppression

In 1960, areas burned over included 321,000 acres of Federal land and 123,000 acres of State and private lands protected by the Bureau of Land Management. Damage to Federal lands was nearly \$3 million, and to State and private lands about \$1 million. Over 91,000 man-days were spent fighting fires with a suppression cost of almost \$5 million, which included \$217,000 from regular funds and \$83,000 of cooperative funds.

The fire season was especially critical in Idaho, Montana, and Oregon. In the 13-day period from July 13 to July 26, 14 fires burned 103,000 acres in these States. Suppression costs on these fires were in excess of \$1,200,000. In addition, well over 100 smaller fires burned during the same period throughout the West.

During July and August at the height of the fire season, organized crews were in short supply and in heavy competition with other fire-fighting agencies for personnel and equipment. During the fire emergency in Montana and Wyoming, all available Southwest Forest Firefighters and Montana Indian crews were employed. The National Guard assisted on major fires. While they were not used extensively



How old is it and how fast did it grow? BLM foresters can tell the age and growth pattern of a tree by using an increment borer. This instrument removes a small round section from the tree. Age can be determined by counting the annual growth rings.

as firefighters, their services in communications and logistics were invaluable.

Motorized equipment obtained from the military was of considerable value in combating fires. Civilian and military aircraft were in sufficient supply to meet the needs of normal fire situations. Some types, particularly air tankers and helicopters, were sometimes difficult to obtain during the peak of the fire season.

One evident weakness in aerial fire control was the lack of good air-to-air and air-to-ground communications.

Situation in Alaska

The Bureau of Land Management is responsible for fire protection and suppression on 225 million acres in Alaska. The fire-control organization in Alaska is too small to meet this enormous responsibility. However, generally favorable fire weather during late 1960 resulted in depressed burning conditions. The State experienced only a moderate fire season. Lightning storms, usually the principal cause of fires in Alaska, were often accompanied by enough precipitation to prevent fires.

The small force of 17 smokejumpers and aerial retardant attack bombers continued to prove effective in Alaska. During the past 4 years, helicopters, specialized planes, and smokejumpers have been used successfully on fires in remote sections of the State.

Contract Fire Protection

Federal lands under contract protection in Idaho, Montana, eastern Oregon, and eastern Washington had the most severe fire season in many years. Summer drought coupled with low humidities and high temperatures combined to create an explosive fire situation.

The highly valuable O&C and Coos Bay Wagon lands of western Oregon experienced a fire season of great severity. In fact, the combined summer-fall fire season was the most severe in nearly 20 years.

Lightning Fires

The number of lightning-caused fires increased from 612 in 1959 to 668 in 1960. Arizona, Idaho, New Mexico, Oregon, and Wyoming had a large increase in fires caused by lightning. Lightning accounted for 49 percent of reportable fires in areas protected by the Bureau of Land Management.

On these lands, 51 percent of the fires were man-caused. This emphasizes the need for a vigorous program of public information and education.

Protection and Prevention

Statistics relating to causes of fire emphasize the need for vigorous fire prevention.

In view of the critical 1960 fire season, which had an increase of 210 fires over the 1956-60 average, early and aggressive action held fire losses well below the 5-year average.

The average number of all fires on lands under jurisdiction of the Bureau of Land Management was 1,418 for the 5-year period. The number of fires in 1960 was 1,628. The 5-year average annual burn was 1.5 million acres. Area burned in 1960 was 350,000 acres or 1.2 million acres less than the 5-year average. Average dollar value damage for the 5-year period was \$4.8 million. Damage in 1960 was \$3.1 million or a reduction of \$1.6 million.

Statistics indicate that while there was about 14 percent increase in number of fires, there was about 75 percent reduction in area burned and approximately 34 percent decrease in dollar value damage to the national resources.



A potential public recreation site in the desert of southern California. Classified by BLM for retention in public ownership and development of recreation resources this palm lined oasis will offer a cool, quiet retreat for desert travellers.

Rehabilitation of Burned-Over Lands

A supplemental appropriation of \$1,425,000 was used for reforestation and revegetation on burned-over lands. In order to control runoff, some lands were terraced and dikes, retention dams and debris basins were built. Perennial grasses were seeded on all major burned-over areas, and tree seed and seedlings were planted on potential forest sites in the fall of 1960 and spring of 1961.

Insect Control

Insect infestations are difficult to detect and may be present for several years before damage is noticeable. They often reach epidemic proportions before adequate control measures are underway. While far less spectacular than fire, annual damages by insects far exceed that of fire. Last year's severe fire season will promote breeding of many species of insects.

Moderate to severe outbreaks of bark beetle infestations were reported during the past year in Idaho, Wyoming, Nevada, and Cali-

fornia. The most serious of these insect attacks was the Black Hills beetle infestation in Wyoming. An \$8,000 appropriation was obtained for control during 1961 and it is expected that at least 2 years will be necessary to complete this work.

Disease Control

The only known epidemic tree disease affecting timber under jurisdiction of the Bureau of Land Management is the white pine blister rust, a disease common to all five-needle pines. The principal control measure is to eradicate the alternate host of the disease, generally called ribes. Ribes eradication was carried out on forest lands in Idaho and Oregon, where white pine stands make up the major commercial timber. During the 1960 field season, 38,000 ribes plants were treated and destroyed on approximately 1,350 acres.

Disease Suppression

Blister rust control remained a perennial problem. There are two possibilities which appear promising at the present time based on BLM studies during the past year. If an antibiotic treatment using acti-dione proves conclusive, the Bureau will begin using this treatment on a large scale operation next year. The second approach is a tree breeding project.

Rust-resistant tree cones were control pollinated. Cones from these trees should produce several pounds of seed next year. Eventually either rust-resistant trees or antibiotic treatment will eliminate the present control system of grubbing or chemically treating ribes plants. Appropriations for the blister rust control program amounted to \$46,900 during fiscal year 1961.

Engineering

A new Division of Engineering was organized by the Bureau of Land Management to provide technical engineering service to land and resource managers.

Standards will be established for construction of access roads, detention dams, water reservoirs, recreation sites and facilities, and other projects. All public land surveys will be completed under this technical engineering service, which also prepares maps for administrative use as well as public land survey plats. Also developed are communications standards, and selection of electronic equipment.

Public Land Surveys

The Bureau of Land Management is responsible for all public land (cadastral) surveys in the United States. This responsibility dates back to the 18th century. Cadastral surveys create and establish land boundaries, identify parcels of land, and furnish descriptions and areas for various subdivisions for title purposes. Cadastral survey boundaries are permanently monumented on the ground and all surveying records are permanently documented in the form of survey field notes and survey maps called "plats." These notes and maps are available for public use.

The system of rectangular surveys inaugurated by the Continental Congress in 1785, with some improvements, is the coordinated system of land subdivision used today. It provides for the division of lands into townships 6 miles square, each township being subdivided into 36 sections 1 mile square, with boundaries running due north-south and east-west.

Cadastral surveys are often the first step in the development and management of the resources on the national land reserve. On-the-ground identification of land boundaries by standard markers aids in the planning of sustained yield programs involving timber and forage resources. These markers facilitate soil and moisture conservation work, as well as the development and lease of mineral resources.

Resurvey Emphasis

In 1961, major emphasis was placed on the surveys and resurveys needed for the transfer of school sections to the States—principally in Utah and California, for the adjudication of State selections and exchanges, and for the conduct of public land sales.

Also included in 1961 was the resurvey of public lands on which the original monuments had either disappeared or were in a poor state of preservation.

There remain about 112 million acres of unsurveyed public lands in 11 Western States. Much of this lies within the limits of National Forests, National Parks, Wildlife Refuges, or other permanent reservations, where there is no immediate need to survey the lands. On the other hand, there are extensive unsurveyed areas in Utah, Nevada, Arizona, and California, where the rectangular system of public land surveys should be extended to identify school lands, develop mineral resources, and provide data for administration and development of public lands and resources.

Surveys and resurveys amounting to over 1 million acres in the public land States were officially accepted during the fiscal year 1961.

Field work accomplished during this year was in excess of 3 million acres. Of this total, slightly over 1.3 million acres were of State selections in Alaska.

Alaska Surveys

Some 360 million acres of public lands are unsurveyed in Alaska. Because of remoteness, climate, and physical characteristics of the terrain, much of this area will never need to be surveyed.

Surveying in Alaska has been concentrated on those lands selected by the State under the terms of its Statehood. The new State was granted over 103 million acres, with the right to make selections over a 25-year period.

To meet these State selection needs, the Bureau of Land Management increased its surveying organization in Alaska. Field work is being accelerated to meet a yearly survey requirement goal of 4 million acres per year. This is the average needed to provide transfer of the allowable 103 million acres to the State in the stipulated period.

Under the Statehood Act, the Bureau has surveyed only exterior boundaries of approved selections at intervals averaging 2 miles.

In the expanded program in Alaska, new survey techniques have been developed and put to use. These involve the use of electronic distance-measuring devices, photogrammetric procedures, and improved instruments.

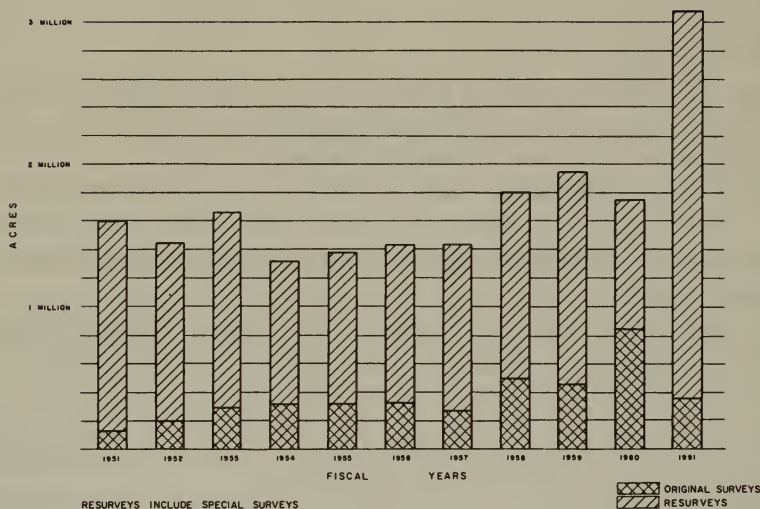
Outer Continental Shelf

During 1961, in cooperation with the State of Louisiana, work proceeded toward determination of the low-water line of that State in the Gulf of Mexico.

In order to prepare for increased leasing of submerged lands off the State of California for exploration and development of phosphate, a leasing map has been completed covering over 92,000 acres. It encompasses a block system of identification and description, based on coordinates adopted by the State of California. The leasing map covers an area of the ocean floor some 40 miles west of San Diego, at the southernmost tip of San Clemente Island, in depths of over 160 fathoms.

Considerable progress was also made during the year on the construction of leasing maps of the submerged offshore areas of northern California. Four leasing maps of three areas covering 2½ million acres have been completed.

BUREAU OF LAND MANAGEMENT
 CADASTRAL ENGINEERING SURVEYS
 1951 to 1961



Protraction Surveys

Two years ago, the Bureau of Land Management initiated surveys of unsurveyed areas of public land States by means of protraction diagrams. Protractions follow the rectangular system of public land surveys on maps, even though the boundaries are not laid out on the ground. This is only a temporary measure designed to serve as a basis for descriptions of the lands.

Protraction diagrams are successfully employed as a basis for mineral leasing and replace complicated metes and bounds descriptions. Protractions also accommodate development of the new system of public land records.

During the year, protraction folios were completed covering approximately 134 million acres in Alaska. Of this total, 76 million acres, diagramed on 268 protraction sheets, were officially approved, and made available for oil and gas leasing and other purposes. These protractions are valuable in aiding State selections, and assist in simplifying the surveys necessary to define the exterior boundaries of the State selections.

Western Activity

During the year, some 46 protraction sheets covering 6.7 million acres in Montana, 30 sheets covering 6.5 million acres in Utah, and

2 sheets covering 665,000 acres in New Mexico, have been completed and officially approved. In addition, 14 sheets of protraction surveys covering 1.5 million acres in Nevada were completed. The 14 sheets completed for Nevada mark the beginning of protraction surveys in that State. All unsurveyed areas in Arizona and Montana are now covered by protraction diagrams.

Protractions for Wyoming were introduced near the end of the fiscal year, when a preliminary diagram was submitted to the Bureau of Land Management in Washington for inspection and recommendations.

Range Resources

Management of the Federal rangelands by the Bureau of Land Management has stressed the administration, conservation, protection, development, and balanced use of these Federal lands and resources.

An inventory and evaluation of the Nation's public lands was undertaken, and plans for a separate appraisal of range resources and needs were formulated. Detailed economic studies are under preparation to determine appropriate fees and rental charges for grazing on public lands.

Last year more than 10.8 million cattle, sheep, and horses grazed on the Federal rangelands. This was authorized by more than 19,000 permits for use within grazing districts, and over 9,800 leases for use of other Federal lands. In addition, more than 1.3 million big-game animals made use of rangelands within grazing districts.

Range Surveys

A program of range inventory has been actively pursued, which will provide resource data for management planning and grazing use adjustments. By the end of fiscal year 1961, almost two-thirds of the 161,500,000 acres of Federal range in 59 grazing districts had been completed.

To improve methodology, an analysis of the Bureau's range study methods was completed during the year. As result, a number of refining modifications are being made in range survey and other evaluation procedures.

After making initial management adjustments indicated by range surveys, the Bureau of Land Management began more detailed allotment appraisals. These involve condition, trend, production, utilization, and climatic determinations.

Range Condition and Trend Studies

Comprehensive field surveys of range conditions were conducted annually in the 59 grazing districts. In December 1960, surveys had been completed for about 151,600,000 acres of usable rangeland. Only about one-fifth of each district is covered each year with available manpower. In this way, each part of a district is covered once in 5 years. Approximately 6,700,000 acres in grazing districts are unusable for grazing.

For the calendar year 1960, a cumulative summary shows for the respective classes of range conditions the following percentages of useable area: excellent 2 percent; good 14 percent; fair 53 percent; poor 27 percent, bad 4 percent. Trends in condition of useable range were as follows: improving 20 percent; indefinite or static 62 percent; and declining 18 percent.

Range condition and trend, 1955 to 1960

Year	Usable acreage (thousands)	Range condition class, percent of useable area					Trends in condition, percent of useable area		
		Excellent	Good	Fair	Poor	Bad	Improving	Static or indefinite	Declining
1955.....	156,069	3.0	20.0	51.0	22.0	4.0	22.0	57.0	21.0
1956.....	150,835	2.1	18.0	52.0	24.8	3.1	19.7	54.1	26.2
1957.....	149,221	2.3	17.0	53.1	24.4	3.2	22.0	55.0	23.0
1958.....	150,668	2.0	16.0	52.0	26.0	4.0	25.0	56.0	19.0
1959.....	151,930	2.0	15.0	52.0	26.0	5.0	24.0	57.0	19.0
1960.....	151,628	2.0	14.0	53.0	27.0	4.0	20.0	62.0	18.0

The 1960 data show a continuation of the same undesirable changes in range condition and trend that have prevailed generally during the past 5 years. The current pattern of retrogression, however, is neither universal nor uniform. It is related in part to various stages of depletion occurring prior to the start of management and in part to the effectiveness of rehabilitation conducted in later years.

Most of the States reported abnormal and unfavorable climatic influences as the principal reason for decline in range condition. Critical deficiencies in precipitation, with consequent scanty forage production and shortage of livestock water have persisted through three successive years in some States. Rangeland fires, incomplete adjustment of stocking rates, insect and rodent depredation, and expansion of big-game herds are some reasons advanced as contributory causes.

Utilization Studies

On many range areas, checks were made of the degree of grazing use. In some districts, fairly broad areas were inspected. But most

of these examinations were made on seeded tracts, big-game concentration areas involving mainly winter ranges, or on other problem sites.

The tendency of livestock to congregate on seedings often results in overuse, which must be controlled. Game range studies were usually conducted in cooperation with the State game departments. Utilization checks provided a guide to the hunting harvest needed to attain proper objectives of range management.

Range Appraisal

The Senate Committee on Appropriations, in Senate Report No. 294 on H.R. 6345, requested the Secretaries of the Interior and Agriculture to initiate a trial program for public land range appraisal. The Bureau of Land Management and the Forest Service have developed a work plan for conducting the study.

The chief purpose of the public land range appraisal is to obtain current information concerning the condition, production, potential, needed improvements, and a forecast of future long-range management plans for the public lands.

Grazing Fee Study

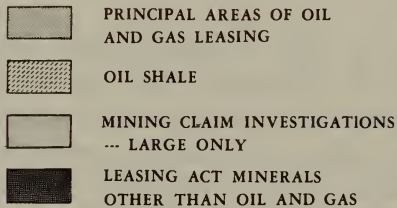
The bureau began a study to determine the effects on ranching operations and land use of grazing fees charged for use of public lands. Involved in this study are a number of influencing factors, including the market value of the grazing resource as shown by private and State grazing land transactions, and the costs and returns of typical livestock ranches having public-land grazing privileges.

This latter study phase is being conducted jointly by the Economic Research Service, Department of Agriculture, and several State agricultural experiment stations under cooperative agreements with the Bureau and the Forest Service. In addition to the effect of grazing fee level on range profits, the influence of grazing privilege adjustments thereon is also being investigated.

Range Adjudications

Completion of the range adjudications continued to receive special emphasis. This activity determines qualification for use of the Federal range, adjusts qualifications to proper season of use and proper rate of stocking, and apportions or allots the available range among those qualified. Since completion of this activity serves as the basis from which a sound management program can proceed, its early completion is essential.

MINERAL ACTIVITY ON FEDERAL LANDS 1961



During the 1961 fiscal year 2 percent of the total adjudication job was completed leaving an uncompleted balance of 39 percent. Accomplishments by States for the fiscal year were as follows:

Progress in range adjudication for 1961 fiscal year

State	Total job— Number of operators	Percent com- pleted 1961	Percent re- maining to be adjudi- cated
Arizona.....	557	-----	Completed
California.....	378	0	59
Colorado.....	1,684	6	17
Idaho.....	2,433	4	57
Nevada.....	1,260	0	55
New Mexico.....	4,030	-----	Completed
Montana.....	2,929	6	38
Oregon.....	1,097	6	75
Utah.....	2,848	5	65
Wyoming.....	1,242	0	62
Total.....	18,438	2	39

Conservation and Improvement

Eradication of undesirable brush was accomplished on 124,786 acres by chemical sprays, chaining, and mechanical brush beaters. Valuable forage species can then be established to increase forage supplies and improve soil stability.

In addition, 228,011 acres were seeded with forage grasses which will improve the quantity and quality of feed supplies for livestock and game.

Other land treatment practices, including pitting, furrowing, and deep tillage, on 15,329 acres increased water absorption and soil moisture and afforded greater protection against wind and water erosion.

During the year, 29 detention dams, 28 diversions, 119,590 linear feet of dikes, and 574 reservoirs were constructed by the Bureau of Land Management.

Protection and management were facilitated by water developments, including 31 wells, 116 spring developments, 311,505 linear feet of pipeline, and 773 miles of fencing.

In range improvements, cooperative efforts and the contribution of \$500,000 by stockmen resulted in completion of 856 miles of fencing, 23 wells, 93 spring developments, 93 cattle guards, and 371,418 acres of rodent and predator control.

Additional conservation and improvement measures were completed entirely with funds contributed under authority of section 4 and 15 of the Taylor Grazing Act. This meant an additional 814 miles of fencing, 360,415 feet of pipeline, 84 wells, 50 spring developments, and 49 corrals to the total projects constructed.

Weed Control

Weed control included the investigation of weed infestations, surveys to locate and inventory weed problem areas and their influence on the range, planning of control measures, completing projects and instituting management practices, and cooperative research studies.

To a large extent, this work was concerned with the control of halogeton, a poisonous weed, which accounted for extensive losses among sheep and cattle. More recently, Medusa head rye and host plants for the beet leafhopper have received considerable attention.

The beet leafhopper, carrier of the curly top virus causing severe damage and loss to bean and other agricultural crops, has several annual range weeds as alternate plant hosts. The bean industry is an important part of the agricultural economy of the Snake River

Plains in Idaho. Adjacent lands are primarily annual grass and annual weed ranges of the host plant type.

The lands on which beet leafhopper control work was completed were also lands which, for the most part, were invaded by halogeton, and are in the path of the advancing Medusa rye. While efforts are normally directed to the control of specific weed problems, emphasis toward replacement of these undesirable and low-value plants with competitive perennial vegetation of high forage value resulted in effective control of all weed species and increased range forage.

Wildlife Management

The need for forage resources to maintain an increasing number of big game animals was a matter of major concern on rangelands administered by the Bureau of Land Management. Cooperation with other agencies in wildlife propagation and management, and completion of technical studies are developing the tools needed for wildlife management.

Obtaining a proper balance between the use of the range resources by wildlife, including 1.3 million big game animals, and domestic livestock continue to prove difficult.

To assist in this work and to provide professional leadership, wildlife biologists and game management experts have been added to the staff of the Bureau of Land Management.

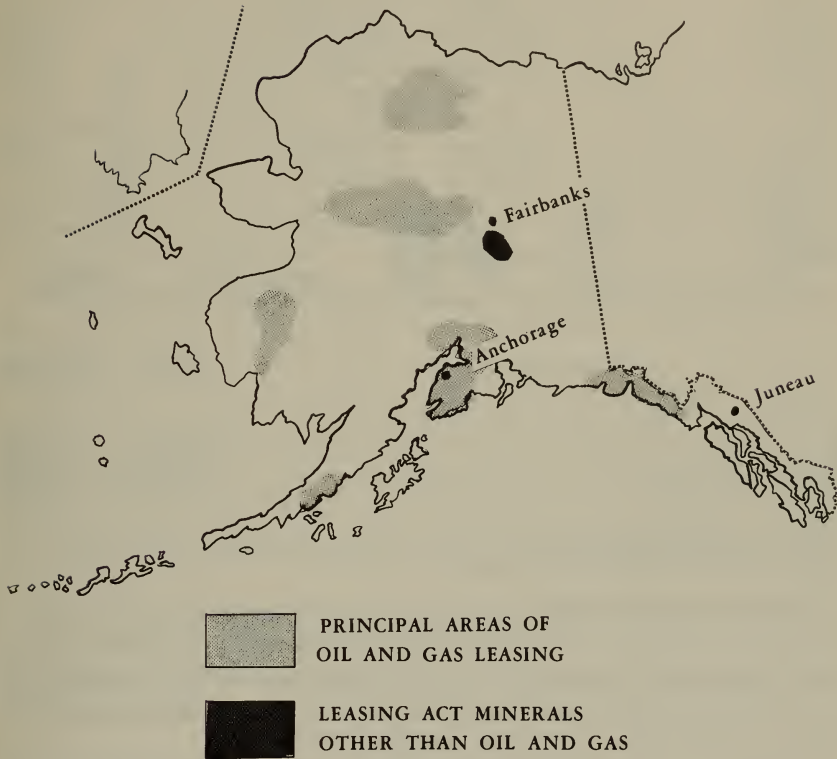
Mineral Resources

Conserving the mineral resources in Federal ownership is a major responsibility of the Bureau of Land Management. This work, particularly in the last half of the fiscal year, also involved preparing proposed legislation to meet today's increasingly complex problems of obtaining balanced usage of public land resources.

The Bureau of Land Management is responsible for the management and conservation of minerals on 477 million acres of public lands, on lands in National Forests, military reservations, and other Federal lands; and on lands in which minerals are reserved to the United States. Also administered are mineral resources on the Outer Continental Shelf.

Conservation of minerals is the use of such resources in ways to insure the optimum return to the public, to minimize waste, maximize income, resolve conflicts in land use, and assure adequate reserves for the future.

MINERAL ACTIVITY ON FEDERAL LANDS 1961



Other objectives include Federal interest in international affairs, and maintenance of a strong mineral industry.

Receipts from mineral activities constitute a major part of the income of the Bureau of Land Management. These receipts are many times greater than expenditures, and a major portion is derived from oil and gas leasing. On the public lands in the continental United States, 37½ percent of the leasing income is returned to the States from which the income was received, 52½ percent to the Reclamation Fund, and 10 percent to the general fund. In Alaska 90 percent goes to the State. From leasing on the Outer Continental Shelf, all of the income goes to the general fund.

An appreciable amount is returned to the States from mineral leasing activities on lands of the Bureau of Land Management. In 1961, the amounts (preliminary) were as follows:

State	Amount	State	Amount
Alabama -----	\$865	Nebraska -----	\$7, 954
Alaska -----	3, 555, 417	Nevada -----	193, 558
Arizona -----	172, 006	New Mexico -----	8, 090, 779
Arkansas -----	48, 384	North Dakota -----	87, 893
California -----	2, 942, 415	Oklahoma -----	53, 823
Colorado -----	3, 326, 454	Oregon -----	11, 523
Florida -----	250	South Dakota -----	45, 765
Idaho -----	283, 531	Utah -----	2, 927, 014
Kansas -----	154, 847	Washington -----	2, 155
Louisiana -----	139, 197	Wyoming -----	13, 019, 772
Michigan -----	4, 009		
Mississippi -----	2, 601	Total -----	36, 697, 634
Montana -----	1, 627, 422		

The following table shows mineral income for the last 5 years:

Fiscal year	Minerals income	Outer Continental Shelf income ¹
1961 -----	\$116, 926, 549	\$7, 304, 687
1960 -----	324, 018, 287	229, 456, 819
1959 -----	95, 877, 021	3, 412, 205
1958 -----	94, 769, 021	3, 460, 851
1957 -----	83, 396, 655	2, 208, 703

¹ Does not include \$355,796,290 in escrow as of June 30, 1961 pending final action by the Supreme Court on the Outer Continental Shelf boundary dispute.

Outer Continental Shelf receipts are becoming a significant measure of income. From 1955 through 1961, not including amounts in escrow, the Outer Continental Shelf has produced almost one-half billion dollars, or about one-fifth of the total amount received since 1785 from the disposition of public lands and resources.

Total receipts from the Mineral Leasing Act of 1920 are approaching \$1 billion, and during the year amounted to \$92,329,733. As provided by the Mineral Leasing Act, the States received \$36,697,634 as their share.

Estimated mineral production from Federal lands (1961)

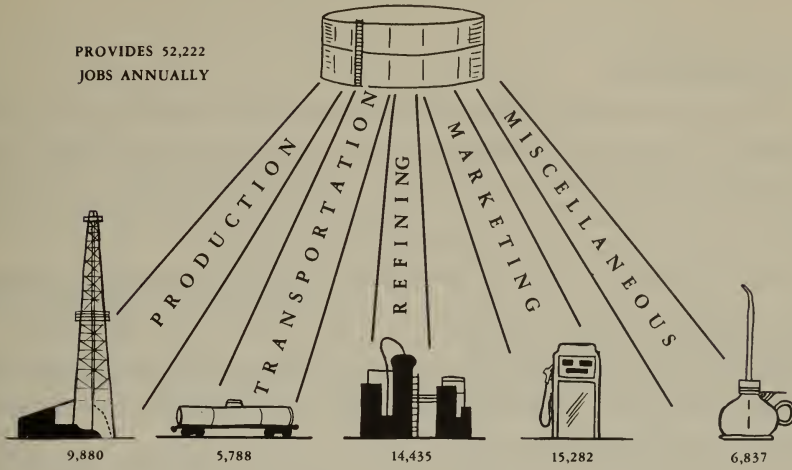
	Public lands	OCS	Miscellaneous ³	Total
Petroleum, bls. ¹ -----	160, 526, 000	55, 476, 000	64, 826, 000	280, 828, 000
Natural gas, mcf ² -----	507, 069, 000	310, 680, 000	157, 251, 000	975, 000, 000
Potash, tons -----	12, 631, 000			12, 631, 000
Coal, tons -----	5, 400, 000		37, 000	5, 437, 000
Sand and gravel, tons -----	11, 000		2, 861, 000	2, 872, 000
Sodium salts, tons -----	1, 037, 000	357, 000		1, 394, 000
Phosphate, tons -----	1, 185, 000		812, 000	2, 057, 000
Sulfur, tons -----		165, 000		165, 000

¹ bls.—barrels

² mcf—thousand cubic feet

³ Acquired lands, Naval Petroleum Reserve No. 2, Indian, military and others.

CRUDE OIL PRODUCTION FROM PUBLIC LANDS



	Production value	Royalty value
Public lands.....	\$501,093,000	\$62,217,390
Outer Continental Shelf.....	253,568,000	47,555,600
Acquired lands.....	20,592,000	2,641,247
Military and other.....	9,739,000	1,425,769
Total.....	784,992,000	113,840,006

The total oil and gas production value on public lands was about 7 percent of the total industry output.

In addition there was considerable production of other minerals on unpatented mining claims—the amounts of which are unknown.

Extent of Activity

The number of oil and gas leases on public lands decreased to 135,132, covering about 103 million acres on June 30, 1961. The decrease resulted partly from the temporary suspension of leasing—after passage of the Mineral Leasing Act Revision of 1960—until annual rental rates were fixed. A number of “wildcat” leases in Alaska were dropped. On the Outer Continental Shelf, acreage under oil and gas lease decreased to 1,710,951.

A great increase in oil and gas lease activity (167,000 new cases compared to 119,000 in 1960) resulted from the monthly drawing of leases which expired or were cancelled. The number of minerals adjudication cases closed in 1961 was up 40 percent over 1960, to 289,484 with total unclosed cases on June 30, 1960 amounting to only 57,321 or

over 2,000 less than last year. These unclosed cases amounted to only 20 percent of the total closed or roughly 2½ months' work.

New Legislation

A major amendment to the Mineral Leasing Act was the Act of September 2, 1960, which extended the primary terms of noncompetitive oil and gas leases from 5 to 10 years. Annual rental rates for noncompetitive leases were raised to 50 cents an acre for the entire lease term. This rate is the minimum established by Congress.

New regulations combine the acreage limit for leases and options from 46,080 acres and 200,000 acres respectively in any one State (except Alaska) to 246,080 acres.

Leases presently outstanding, which receive the 5-year extension provided by law, are required to pay a rental of 50 cents an acre for each year of the extended term.

The rental rate for competitive leases prior to discovery was raised from \$1 an acre per year to \$2 an acre per year. The old rates for noncompetitive leases had been 25 cents per acre for the first year, nothing for the second and third, and 25 cents for the fourth and fifth years and 50 cents for each succeeding year.

Noncompetitive oil and gas leases are issued for a single term of 10 years. Competitive leases are issued for a single term of 5 years. Both leases continue as long as oil and gas is produced in paying quantities.

Other Activities

Activities under Public Law 167 (Act of July 23, 1955), which authorized the Government to manage the surface on unpatented mining claims, are nearing completion.

Under this law the Federal Government has the right to manage surface resources, including timber and forage, on all unpatented mining claims staked after July 23, 1955. For all claims before that date, the Government may gain the right to manage the surface resources under legal procedures provided by law.

This is a conservation measure to prevent mining claims from being staked or used for nonmining purposes, and to prevent timber waste. Before the law was passed, neither the Government nor a miner could legally harvest the timber on an unpatented mining claim.

Legal actions required by law require the Bureau of Land Management to examine areas for any unpatented mining claims. A notice is then published that a determination of surface rights on mining claims will be made. A miner may choose not to respond to the

notice—in which case he loses no mineral or mining rights whatsoever, while the Government acquires the right to manage the surface resources. Or he may file a so-called verified statement.

If a miner files a verified statement, validity of a specific claim is determined by the Bureau of Land Management. If it is valid, the Government will not gain the right to manage the surface. If it is not valid, the Government obtains the right to manage the surface resources. These proceedings are not used to determine validity of a mining claim for patent purposes.

Examinations Underway

At the end of the fiscal year, the Bureau of Land Management had completed preliminary examination of approximately 5,600,000 acres. About 5,345,000 acres were published. This resulted in the filing of 514 verified statements for 2,558 mining claims. Over 30 percent, or 2,139 claims, were examined by mineral examiners of the Bureau of Land Management.

Determination of surface rights was completed on nearly 90 percent of the acreage under preliminary investigation. Of the claims examined, the Government did not acquire the surface management rights on 582 claims covering 10,842 acres.

In addition to public domain lands, notices were published or requests were received to publish notices from the Forest Service on 103,155,000 acres. Verified statements were processed involving 17,077 mining claims. Closing decisions, completing the determinations of 44,760,000 acres, were issued.

A total of 139 patents to mining claims covering 16,193 acres were issued during the year. The Bureau closed 305 mineral patent applications cases.

Public Law 359 (Act of August 11, 1955) permitted the location of mining claims on powersite lands. During the fiscal year, 12,457 claims were staked on these lands and recorded in land offices. A major decision by the Department, *B. E. Barnaugh*, 67 I.D. 366 (1960) held that failure to record a claim will not result in forfeiture.

Public Law 357 (Act of August 11, 1955) permitted mining claims for uranium on public lands classified or known to be valuable for coal. It also provided for the extraction of uranium intermingled with lignite, with the payment of 10 cents per ton for any lignite removed. By the end of the fiscal year, 3,206 claims were located on public lands (most of which were in South Dakota) and recorded with the Bureau of Land Management.

Land Speculation

In California and Arizona, land speculators and promoters presented a serious problem, which required aggressive action by the Bureau of Land Management. Promoters located mining claims, usually for an unsuspecting client, without a valid discovery and for purposes other than mining.

A study by the Bureau of Land Management indicated that in southern California, there are more than 2,000 dubious locations. Administrative steps were taken to examine such claims, and to eliminate invalid claims. This often resulted in loss of a claim as well as money by the innocent victim of a promoter.

An effort was made to alert the public to such activities of speculators. In this effort, valuable support was given by local Better Business Bureaus.

Outer Continental Shelf Activity

New possibilities developed for use of the Outer Continental Shelf. Leasing there was not restricted to oil and gas. Leases were granted in the Gulf of Mexico for salt and sulphur. And interest was shown in leasing of phosphorite, 40 miles off the coast of California. Such activity is the first on the West Coast.

The Solicitor expressed the opinion that the Outer Continental Shelf Act did not limit leasing to 100 fathom (600 feet) depth, but rather to the limit of technology. This opinion will result in greatly increased acreage available for leasing in the future.

At the end of the fiscal year, there were 487 active Outer Continental Shelf leases—covering nearly 2 million acres.

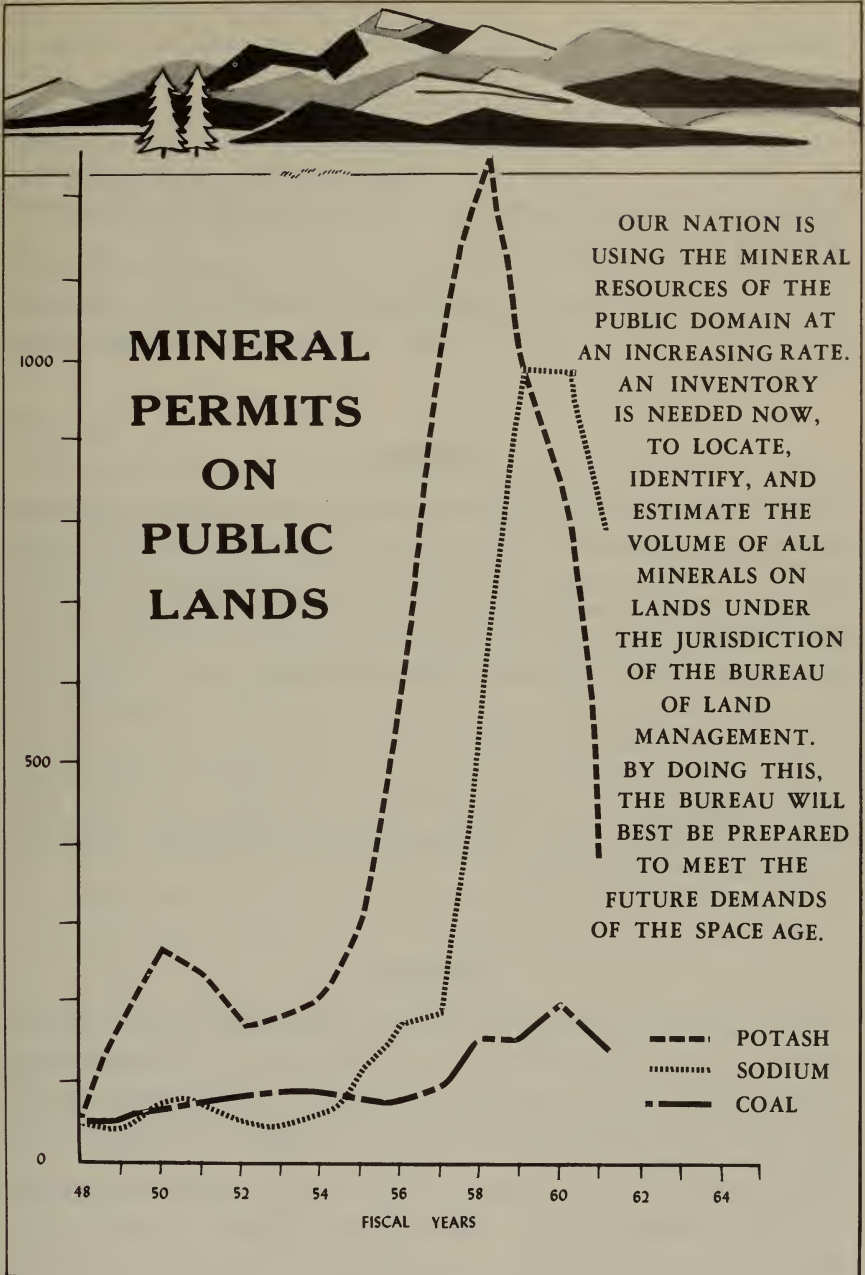
Plans for the Future

Groundwork in the past year has been laid so that in fiscal year 1962 an inventory of the national land reserve will be started. This resource inventory will aid greatly in the conservation and management of minerals on or in all public lands.

Eastern States

Remaining public lands in the 13 public land States east of the Mississippi River were administered during the year by the Eastern States Office, now part of the Division of Field Services.

Except in one area in Minnesota, remaining tracts of public domain in these States are scattered and of small acreage.



During fiscal year 1961, title to 13,125 acres in these States was transferred to State and local governments, organizations, and individuals. Of this total, 453 acres were sold at public auction; 2,368 acres sold to individuals under the Color of Title Act; 790 acres sold to qualified applicants under the Recreation and Public Purposes Act; 2,983 acres to States in exchange for State lands needed for Federal land programs; and 6,508 acres in satisfaction of acreages due States under land grant acts.

Receipts from land sales during the year amounted to \$70,121, while receipts from both competitive and noncompetitive mineral leases and permits on public-domain and acquired lands amounts to \$12,252,451.

Staffing

As of June 30, 1961, the Bureau of Land Management had 2,641 permanent employees, 310 of whom were at headquarters in Washington, D.C. At that time also, there were 904 seasonal employees.

Permanent employees assigned to State and district offices were as follows: Oregon, 550; California, 224; Colorado, 199; Montana, 143; New Mexico, 132; Wyoming, 142; Washington, 30; Arizona, 91; Idaho, 141; Nevada, 132; Utah, 205; and Alaska, 264. Reporting directly to the Washington Office were the additional permanent employees; 47 with the Records Improvement Project in Montana, 4 with the Outer Continental Shelf Office in Louisiana, 3 with the local office in Minnesota, and 24 hearings and field committee personnel in the various Western States.

Finance

Total appropriations during fiscal year 1961 for operations of the Bureau of Land Management were: Management of lands and resources, \$32,071,000; construction, \$350,000; O&C grant lands, \$7,017,594; range improvements, \$863,070; and public lands administration act, \$254,163.

Suppression of fires on timber and grazing lands under the jurisdiction of the Bureau of Land Management required a supplemental appropriation of \$3,700,000. In addition, this was the first fiscal year in which a supplemental appropriation of \$1,425,000 was received for the immediate rehabilitation of burned-over areas.

In 1961, a new appropriation was established for the work on the O&C grant lands, which is performed with the equivalent of 25 percent of the total receipts derived from the sale of timber on these lands.

These funds are used for the construction, acquisition, and maintenance of access roads, and for reforestation, conservation and recreation purposes.

The appropriation for range improvements is based on 25 percent of the receipts from grazing fees and issued for water development, fencing, seeding, and other work.

The final appropriation also is a new appropriation in fiscal year 1961, and results from the Public Lands Administration Act (P.L. 86-649). This appropriation is based on contributions received under the Act, and is used for specific projects for which the contribution is made.

Receipts

Gross receipts from the sale and management of public lands and resources during fiscal year 1961 totaled \$159,246,157. These receipts came from the following sources: Mineral leases and permits \$116,981,971, including \$7,304,687 from rents and royalties on the Outer Continental Shelf; timber sales \$32,125,757; sales of public lands \$4,250,000; grazing leases, licenses and permits \$2,982,188; fees and commissions, \$2,476,549; rights-of-way, \$209,724, and \$219,968 from all other sources.

Distribution of Receipts

Receipts of the Bureau of Land Management for fiscal year 1961 were distributed as follows: \$51,935,891 to 27 public land States, of which \$14,454,673 went to the 18 western Oregon timber land counties; \$52,261,699 deposited to the Reclamation Fund; \$51,500,444 to the General Fund of the Treasury; \$3,233,499 transferred to other Government agencies; \$314,624 earmarked for Indian trust funds; and approximately \$739,842 returned to the grazing districts for range improvements.

Grand total of all receipts of the Bureau of Land Management and its predecessor agencies now total \$2,423,012,831. Since 1946, when the Bureau of Land Management was established receipts now total \$1,686,367,678.

National Park Service

Conrad L. Wirth, *Director*



A NEW ADMINISTRATION, the half-way point in the Mission 66 program, and inception of the Parks for America movement marked fiscal 1961 for the Department of the Interior's National Park Service

Vigorous words backed by immediate commitments to action launched President Kennedy's approach to America's Recreation Frontier. In his Special Message to Congress on Natural Resources, the President charted a dramatic course to preserve the Nation's rapidly disappearing recreation lands.

He stressed the importance of the National Park System—its contribution to "America's health, morale, and culture . . ." He urged immediate congressional action ". . . leading to the establishment of seashore and shoreline areas such as Cape Cod, Padre Island and Point Reyes." And he instructed the Secretary of the Interior, in cooperation with other conservation groups—public and private—to "formulate a comprehensive Federal recreational lands program."

The sense of urgency conveyed in the President's message has been relayed by Secretary of the Interior Stewart L. Udall to every level of the National Park Service. In an address on March 6, 1961, Secretary Udall stated: "The talk today is of overurbanization, exploding population, and vanishing countryside. . . . We are today in a state of long-term crisis. . . . The overriding mandate to conservationists today is to preserve the natural habitat of man—to preserve it against the onslaught of bulldozers, cement mixers and subdividers."

It is in this context of crisis that we must assess the accomplishments of the National Park Service during the year, that we must evaluate the Mission 66 program—with 5 years gone and 5 to go—that we must take our sights on a future that will challenge our best energies.

Accomplishments

What then, have been the accomplishments this year? Details are related in following sections of this report, but the selected summary below is useful for overall perspective. During fiscal year 1961, the National Park Service:

Provided recreation opportunities for nearly 76 million visitors and at the same time preserved the wilderness and natural values of the parks. This is the most important single accomplishment of the Service and the System; it is the final measure of all other activities.

Activated five new areas, among them Haleakala in Hawaii: America's 30th National Park.

Opened 10 new Park visitor centers to the public.

Continued studies of potential local, State, and Federal recreation areas throughout the country.

Initiated public tours of Glenmont, the Thomas A. Edison home.

Tightened motorboat regulations in wilderness areas.

Inaugurated important wildlife management programs and studies.

Embarked on a concentrated land-acquisition program for Civil War areas, in line with the Nationwide Centennial Observance.

Improved boundaries of many parks and eliminated key private inholdings, notably at Mammoth Cave National Park.

Launched the Registered Historical Landmark Program.

Accelerated construction programs to provide relief for economically depressed areas.

Strengthened maintenance functions to assure better preservation and use of park resources.

Encouraged substantial new investments by concessioners to provide better visitor facilities.

Expended or obligated \$92 million for 1,147 construction projects, including new and improved campsites and new visitor centers.

Completed and opened for public use 438 facilities representing an investment of \$21 million.

Improved management, protection, and interpretation at parks by adding 1,222 new permanent employees.

Improved the caliber of present employees through training programs, such as those conducted at the Service's Training Center in Yosemite National Park.

Underpinning the Service's aspirations for the future was a comprehensive legislative program. Given the need for quick action to save significant open lands, the most important elements of this program were legislative recommendations to create new park, recreation, and shoreline areas. Cape Cod, Padre Island, and Point Reyes National Seashores were among those recommended. Other pending



Canoeing on the Chesapeake and Ohio Canal is a favorite outdoor sport shared by bikers who frequent the towpath throughout the year. The influx of vacationers who like the great outdoors requires determined efforts by the Park Service to find more recreation areas in the National Park System.

bills would authorize, among others, Great Basin and Prairie National Parks and Ozark Rivers National Monument.

Mission 66 Reappraisal

Mission 66 is a 10-year conservation program for the National Park System. Its whole purpose is to make possible the best and wisest use of America's scenic and historic heritage. That means maximum enjoyment with maximum protection of those features and those qualities which make it a national park system unmatched in the world. The purpose has not changed, but the magnitude of the task has. That is why substantial time and energy has been devoted this year to reappraising Mission 66.

Five years ago, conditioned by the "patch-on-patch" psychology of the war years, park plans seemed overbold. But the vitality, the mobility, and the prosperity of this Nation have proved that they were not bold enough.

In the 5 years just past, hundreds of construction projects have been completed, a unique system of interpretive centers for park visitors has mushroomed across the land, camping facilities have been improved, roads have been repaved and relocated.

But instead of the urgency being over, we find ourselves facing a new dimension where an action program is required which dwarfs the first 5 years of Mission 66.

As President Kennedy commented, cooperation between conservation agencies and groups must be strengthened at every level. Conservation and wholesome recreation are the elements of one national problem; the National Parks are not islands unto themselves.

Visitor facilities and existing parks are not enough now, much less for coming generations. By the year 2000 there will be more than 360 million Americans.

Public response to Mission 66, on the whole, has been overwhelmingly favorable. The American people wanted and got improved facilities in their parks. They appreciated this turn for the better. But there has been concern and criticism, too.

Is Mission 66 overdeveloping the parks? Are the essential values of the System being compromised in the attempt to provide for the onslaught of visitors? These voices have been listened to. Where they have been uninformed, every effort has been made to allay fears with facts. Where the voices have offered solid criticism and have pointed out mistakes, programs have been modified to prevent jeopardy of lasting values in the parks.

The National Park Service is charged with a single, but twofold purpose: To provide for public enjoyment of the parks in a manner that leaves them unimpaired for future generations. Preservation is combined with use, not alienated from it. The purpose of Mission 66, in its inception and yet today, has been to contain and channel the inundation of people before sheer volume destroyed the basic values of the System. The wilderness character of the System has not been sacrificed to Mission 66, but saved by it.

Observations indicate that the principal activities of park visitors are camping, hiking to outlying points of interest on park trails, nature walks with naturalists, and attending campfire programs and lectures. The vast majority of those who travel to the parks have a good appreciation of what the parks are for and how they should be used.

Challenge of the Future

The "quite crisis" of disappearing recreation lands has awakened Americans. They are tired of going to crowded, over-regulated parks.

They want space and they want quite. These are other names for freedom.

Out of the pervasive need for expanded recreation lands a new conservation movement has sprung: Parks for America. It involves the cooperative effort of Federal, State, and local park and recreation agencies.

It is an education in the growing interdependence of our society to hear men and women from these different governmental levels discuss park and recreation problems. The problems are mutual and they demand mutual solutions. In this realization and the action program it compels lies the challenge and the hope of America's recreation future.

Parks for America ties together the many strands that make up America's Recreation Frontier: Mission 66 and a growing, balanced National Park System; the National Recreation Plan; and State and local park and recreation systems.

In concert, the many agencies and governmental levels involved have the chance to save significant portions of man's natural habitat for our children's children.

Mission 66

Outstanding as a milestone of the program was the Mission 66 Frontiers Conference held in April 1961 in Grand Canyon National Park. Here the park superintendents, representing the grass roots of park conservation, met with the planners and administrators to take stock of progress made during the first half of the program and to set the stage for the next 5 years. A sober examination of what had been accomplished, an evaluation of successes and failures, and a re-dedication to the promise of Mission 66 were the main accomplishments of the Conference.

A reappraisal of the objectives as well as the progress of the program was a significant feature of Mission 66 activity during the year. The result has strengthened our resolution to bring the program to full accomplishment. Gratifying progress is being made, but it must be speeded up. Increased emphasis must be given to developing a comprehensive program of research to enhance the knowledge needed for all phases of park protection, interpretation and maintenance. Management improvement also needs to be pushed forward at a faster pace. Staffing schedules must be made to keep pace with the provision of physical facilities.



Preservation and restoration are continued operations of the National Park Service at Harpers Ferry National Monument as in many other units of the park system. The picture shows Shenandoah Street in Harpers Ferry, a town of outstanding scenic and historic interest.

Employee training needs to be stepped up all along the line. But one of the greatest challenges is the necessary expansion of the National Park System itself.

As a Nation we must provide for the physical, cultural, and spiritual well-being of the people. We must protect and preserve the natural and historical features that represent the greatness of America. The National Park System must be expanded if this is to be done and the growing population is to be provided the open space it needs for refreshment and relaxation. We have learned from the seashore studies that delay in acquiring park and recreation lands means lost opportunities. Remaining areas of natural, scientific, historic, and recreational significance on a national scale must be found and dedicated to the public welfare before they are lost forever.

Providing parks and recreational opportunities for people is not alone a Federal responsibility. An important part of Mission 66 planning consists of developing programs in cooperation with State,

county, municipal and other local agencies. Parks for America is being launched as a cooperative program designed to pull together the aims, resources, and skills of all professional park people and citizen groups in a unified plan for a stronger and culturally richer America.

Recreation Resource Planning

Localities, States, the Federal Government together face a crisis in saving space now, and together they must act to set aside national recreational areas and city playgrounds, State parks and county green belts, and pay a high price for land that will soon be even more costly or else committed to developments. Time and economics no longer will allow piecemeal action. There must be a pooling of funds and effort by Federal, State, and local governments if park needs now and for the future are to be met.

Accordingly, the National Conference on State Parks, the American Institute of Park Executives and other organizations are cooperating with the National Park Service in a concerted program to provide adequate Parks for America, an eleventh hour effort to seek authority and money to bid successfully in the competitive land market while suitable parklands are yet available, and to defend existing parks against encroachment. Secretary Udall has given Parks for America wholehearted endorsement.

Nationwide Recreation Planning

As an integral part of Mission 66, the National Park Service is preparing a nationwide plan for parks, parkways, and recreation areas to be published in 1962, outlining a program that would provide all segments of our present and future population with adequate outdoor recreation areas near their homes for frequent day and weekend use, as well as more remote areas for vacation use. In the studies leading to the plan, we are working closely with the President's Outdoor Recreation Resources Review Commission.

The report will present a list of specific potential sites as well as recommended sites for consideration as parks, parkways, and recreation areas in each of the 50 States, of local, State and National significance. Following publication of the report, the Service expects to cooperate with the States in the preparation of individual State plans.

The inventory of some 5,000 existing local, State and Federal parks and recreation areas has been completed and approximately 2,400

potential areas have been studied so far. Also preliminary State plans have been prepared in cooperation with park and planning officials of West Virginia, North Carolina, Ohio, Nevada, and Missouri.

River Basin and Regional Studies

The Service cooperated with the United States Study Commission, Southeast River Basins, in preparing recreation plans for eight river basins encompassing parts of Georgia, Alabama, Florida, South Carolina, and North Carolina.

In cooperation with the Corps of Engineers, the Service is also conducting a recreation study of the Potomac River Basin covering parts of Virginia, Maryland, Pennsylvania, and West Virginia. In these river basin studies recreation is a major planning purpose along with water supply, flood control, and pollution abatement.

The Service cooperated with the Department's Bureau of Land Management in the evaluation of the recreational potentialities of certain public domain lands to determine their suitability for administration as park or recreation areas by an appropriate level of government.

National Park System Plan

As a part of Mission 66, work has gone forward on the National Park System Plan to round out the National Park System and insure its future adequacy. Sixty-one areas, totaling more than 3.5 million acres, have been identified as having National Park possibilities, and studies of 10 more are under way.

Of more immediate import, are 11 specific recommendations, many of them supported by bills in Congress, to create new National Park areas. These include Cape Cod, Oregon Dunes, Point Reyes, and Padre Island National Seashores; Chesapeake and Ohio National Historical Park to make adequate the canal property now in National Monument status; and National Historic Site designation for Fort Bowie and Hubbell Trading Post in Arizona, and Old Fort Davis in Texas.

Also included in the recommended legislation is a bill to authorize establishment of Alexander Hamilton's home in New York as a National Monument, and Abraham Lincoln's boyhood home in Indiana as a National Memorial. Buck Island Reef, near St. Croix, Virgin Islands, one of the finest marine gardens in the Caribbean, has been recommended for establishment as a National Monument.

Areas Authorized or Established

Five new units were added to the National Park System during 1961. Arkansas Post National Memorial commemorates white settlement of the lower Mississippi Valley. Russell Cave National Monument, donated by the National Geographic Society, protects an archeological site of 8,000 years of continuous habitation by prehistoric Americans.

Fort Christian, believed to be the oldest standing structure in the United States Virgin Islands, was established at St. Thomas National Historic Site. In addition, the portion of Hawaii National Park on the island of Maui was designated as a separate park—Haleakala—and the Chesapeake and Ohio Canal lands were given National Monument status.

Boundary Adjustments

The boundaries of 10 units of the National Park System were improved by legislation and presidential proclamation during 1961, and action is being considered to make boundary adjustments in 11 other areas.

Encroachments continued to threaten the National Parks during 1961. Mining claims and prospecting beset Mount McKinley National Park, Alaska, Death Valley National Monument, and Grand Canyon National Park, Ariz. A proposed interstate highway would bisect Ocmulgee National Monument.

Reservoir Planning and Management

Twenty-seven recreation reports were prepared for the Department's Bureau of Reclamation and 31 for the Corps of Engineers, and agreements were negotiated with State and local agencies for the management of recreation lands and facilities at 7 Reclamation reservoirs. Forty-two applications for Federal Power Commission permits and licenses were reviewed and recommendations furnished to the Office of the Project Review Coordinator. Increasing emphasis has been given to review of Reclamation reservoir proposals to assure that current reports and pending legislation provide adequately for recreation lands and facilities.

Assistance was given on 629 occasions in 47 States on a wide variety of problems including interpretative planning on 24 parks in 10 States; additionally, participation from the standpoint of interpretation was given in four training meetings. Included also is planning assistance to several Indian tribes for developing park and recreation



The ever-increasing number of visitors to the National Parks and Monuments requires a constant enlarging of and adding to parking, picnic and campgrounds.

potentials of their lands to accommodate tourists and vacationers, thus strengthening the tribal economies.

Requests for such assistance from the States is expected to rise appreciably in the future because of park expansion programs resulting from increased appropriations and bond issues such as those approved last year in Kentucky, Michigan, and New York, and others being considered in California, New Hampshire, New Jersey, and Pennsylvania.

Real Property Disposal

Recommendations were furnished to General Services Administration on 28 applications submitted by the States and their political subdivisions to acquire Federal surplus real properties for public park, recreation, and historic monument purposes. Of special significance, are the applications of the State of California to acquire as part of the proposed 6,000-acre Golden Gate Headlands State Park on both sides of San Francisco Bay, 291 acres of the historic and scenic Forts Baker and Cronkhite in Marin County. The Service

now has compliance responsibility on a total of 205 properties embracing 34,038 acres.

Recommendations also were furnished to the Bureau of Land Management on 62 similar applications to acquire public domain lands for the same purpose.

The 1960 edition of State Parks—Areas, Acreages and Accommodations lists 2,589 State parks, monuments, historic sites, recreation areas and other types of areas included in the State park systems embracing almost 5½ million acres and administered by 99 agencies in the 50 States. The tabulations give for each area the name, location by county, acreage, and the availability of water recreation and overnight and eating accommodations.

State Park Statistics, 1960 reports: (1) attendance of 259 million including 20 million overnight guests, (2) expenditures of \$56 million for operation and maintenance and \$31 million for land acquisition and improvements, (3) revenue from operations of nearly \$23 million, and (4) 7,412 year-round and 10,125 seasonal personnel.

Interpretation

The interpretative program of the National Park Service continued to render an educational service to ever-increasing numbers of visitors to the parks and monuments, as well as to the country's newspapers, magazines, and radio stations.

The program itself was improved by the opening of new visitor centers, which during the year saw a record number of visitors. The latest audio-visual techniques are being developed to make more effective the presentation of the park story in these visitor centers. The interpretative program teaches geology, natural history, history, and archeology to the visitors of the parks and monuments. It contributes substantially to the conservation movement in America. Interpretation becomes a more important phase of the National Park Service's activities and operations from year to year.

Visitor Centers

Visitor center, exhibits, programs, and services for better understanding of the National Parks, have demonstrated their value in helping visitors enjoy the Parks.

Six new visitor centers were opened to the public during the fiscal year, including centers at Everglades National Park, Fla.; Great Smoky Mountains National Park, North Carolina and Tennessee; Mt. McKinley National Park, Alaska; Death Valley National Monu-

ment, Calif.; Effigy Mounds National Monument, Iowa; and Wright Brothers National Memorial, N.C.

Service to the Public

The interpretive program of guided trips and talks offered park visitors by professional naturalists, historians, and archeologists, supplemented by self-service facilities such as publications, museum exhibits, roadside and trailside exhibits, signs, and markers, and audiovisual presentations, both indoors and outdoors, was considerably expanded during the 1961 fiscal year.

A significant increase in personal services is attributable to the filling of 25 new interpretive positions. Eleven park areas, previously without an interpreter on the staff, were enabled to initiate an interpretive program.

Some 49 nonprofit cooperating associations contributed \$119,111.00 for aid to the National Park Service for research, equipment, books and materials used in the interpretive program. These associations produced 19 new interpretive publications, bringing the total to 190.

Roadside and Trailside Interpretation

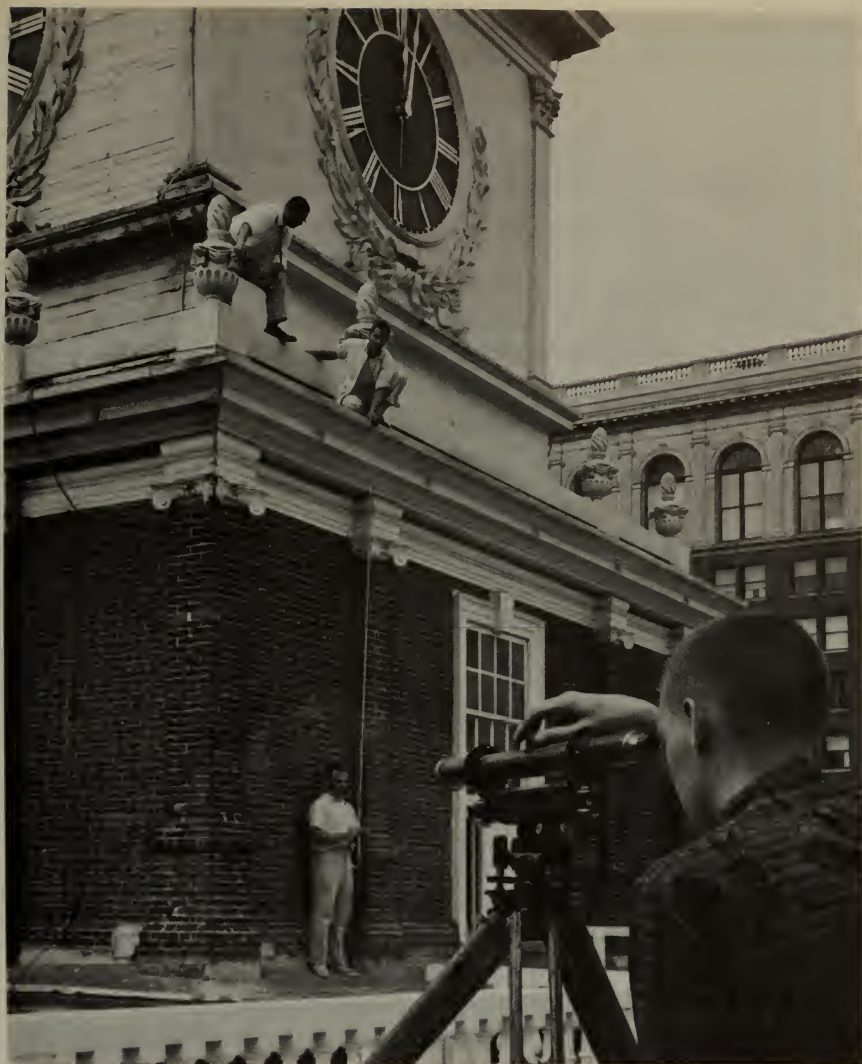
Roadside interpretive exhibits, signs, and markers, and self-guided trails were developed or expanded in many parks during the 1961 fiscal year.

Parks where new roadside or wayside interpretive facilities were installed include Great Smoky Mountains, Everglades, Crater Lake, Mount McKinley, Olympic, Virgin Islands, and Yosemite National Parks; Badlands, Effigy Mounds, George Washington Carver, and Fort Frederica National Monuments; Richmond National Battlefield Park; Blue Ridge Parkway; and in a number of other areas of the National Park System.

An innovation in outdoor interpretation is a self-guided underwater trail at the Virgin Islands National Park, where swimmers follow underwater labels that interpret marine features along the route.

Audio-Visual Planning and Installation

The trend toward greater use of interpretive audio-visual devices continued during the year. Installations were made as follows: Automatic slide/sound equipment in five Park visitor centers; self-contained cabinet slide/sound projectors in four visitor centers; audio-visual equipment for five Park amphitheaters; 18 audio stations in



Conservation, protection, and restoration are important activities in units of the National Park System. Here summer architectural students employed by the Historic Structures Section of the National Park Service are working high on the tower of Independence Hall, Independence National Historical Park in Philadelphia, Pa.

nine Parks; one electric map with automatic recorded message; and utilization of filmstrip in one automatic installation.

Significant in future planning were four custom-built, battery-powered audio stations, now providing visitor-activated recorded messages at such diverse spots as an elevated nature trail in the Everglades, a mountain pass in Coronado overlooking the route followed by Spanish conquistadores, an overlook at Bryce Canyon, and a view point in Saguaro.

Another of the year's developments which may prove equally significant is the use of motion picture animation techniques to bring "life" to still photographs in the making of motion pictures. The first sound motion picture production thus made—"The Lincoln Country"—is proving vastly more effective than the former slide/sound presentation at Lincoln's Birthplace, Kentucky.

Museum Program

Fort Sumter National Monument, S.C., converted a coldly functional gun emplacement into an attractive museum. Eleven other parks installed museums in their visitor centers. Fort Frederica, Ga., placed weatherproof exhibit cases inconspicuously along the streets of the colonial settlement so visitors could rebuild and repeople the town in imagination as they explored the site.

Among historic structures carefully refurnished were Officer's Quarters at Fort Laramie National Monument, Wyo., and the Maltese Cross Cabin at Theodore Roosevelt National Memorial Park, N. Dak.

Regional offices have established clearing-house safeguards to assure that park collections contain objects important for interpretation, and to eliminate inappropriate specimens.

At Independence Hall National Historical Park in Philadelphia, a great eagle painted on the ceiling in Congress Hall has been salvaged and will be restored to its honored place. Workmen have also uncovered the original fireplaces in the walls of the building. The ceiling in Congress Hall was collapsing in the chamber that served as the first home of the Senate of the United States. To preserve the intricate and delicate plaster design of the ceiling tracery, photogrammetry techniques were brought into play. Stereoscopic photos were made, which permitted the architectural draftsmen to produce precise drawings of the design. This means of making accurate and detailed drawings opens exciting vistas for the historian, the architect and the administrator.

For example, architectural drawings of a church and steeple which would take a crew an entire summer, with scaffolds and all the para-

phernalia such a structure would ordinarily require, can be accomplished with photogrammetry techniques for a portion of the cost and in a fraction of the time. Stereoscopic pictures, with camera locations, angles and distance rigidly controlled, and skilled technicians to compute the measurements with the help of precise mechanical interpreters, tell more of a building's detail than the most careful measurement by traditional methods.

For this reason, photogrammetry is also coming to be used whenever practicable in the Park Service's Historic American Buildings Survey. The H.A.B.S., as the survey is more commonly abbreviated, is a joint undertaking of the Park Service, the American Institute of Architects and the Library of Congress, to enhance the cultural life of the Nation by a comprehensive archive of historic architecture, similar to those already existing in Europe. This past fiscal year saw a gratifying increase in donations and fuller participation by academic and professional organizations. The year's projects contributed more than 300 sheets of measured drawings, 731 photographs and 420 data pages.

Natural History

The interrelationships and ecological requirements of park wildlife received increasing study because a better understanding of these requirements is basic to the fullest interpretation, protection, and utilization by the public, of park values. Some major findings:

On Isle Royale National Park, following many years of severe damage to the forest understory by an overpopulation of moose, a balance has been restored by a number of preying wolves which arrived from Canada.

In Death Valley National Monument, the interrelationship between bighorn sheep, wild burros, and man has been more clearly revealed. It had long been thought that burros which ran wild and multiplied after being turned loose on the desert by prospectors, were driving the native bighorn sheep from their ancestral watering places. This year sheep and burros were found watering together in many areas without conflict; molestation and occupancy of water sources by man proved to be the major factor in depleting the sheep.

Research

Archeological, historical, biological, or geological research was conducted in most of the National Parks and Monuments by Service personnel, cooperators, collaborators, contractors, or other interested parties.



The quiet crisis of disappearing recreation lands has finally awakened Americans. They are tired of going to crowded, overregulated parks. They want space and they want quiet. These are other names for freedom.

Archeological research was carried out in 21 National Park Service areas. Major projects were initiated at Everglades, Yosemite, Sequoia-Kings Canyon, Olympic, Whitman, Grand Canyon, Appomattox Court House, and were continued at Effigy Mounds and at Wetherill Mesa in Mesa Verde.

The service also carried on an extensive archeological salvage program in 35 reservoir areas under cooperative agreements with the Smithsonian Institution and 30 State and local institutions.

Biological research continued on arctic-alpine ecology at Rocky Mountain, Grand Teton, and Mount Rainier. Ecological studies were continued at Sequoia and Joshua Tree. Fisheries studies were conducted at Olympic and Everglades. The Desert Bighorn study at Death Valley was completed, while wildlife studies at Mount McKinley, Grand Teton, Isle Royale, and Acadia were continued.

In cooperation with the Department's Geological Survey, glacial studies at Mount Rainier and Glacier were continued. Additional geologic work was also done at Yellowstone, Wind Cave and Badlands.

Intensive research in all historical areas continued with special projects inaugurated at George Washington Carver and Dinosaur.

Park Publications

Increased public interest in the National Park System was reflected throughout the year in a larger than ever demand for publications, factual reports, maps, folders, and reprints of principal addresses by Department and Park Service officials.

Some 11,314,000 free informational publications were produced and more than 889,482 were sold by the Government Printing Office—yet the demand far exceeded the supply.

As in previous years, handbooks on the historical significance and natural history of park areas and various reports on the scientific findings of researchers supplemented the free informational program.

Printing of foreign-language folders in Spanish, German, French, and Russian was authorized for Independence National Historical Park in Philadelphia.

National Survey of Historic Sites and Buildings

The National Survey of Historic Sites and Buildings, as part of the Mission 66 program, completed inventories and studies of sites and buildings in six periods of themes of American history. From these studies, the Advisory Board of National Parks, Historic Sites, Buildings and Monuments recommended that 94 sites and structures be classified as having exceptional values in illustrating and commemorating the history of the United States under the terms of the Historic Sites Act of 1935.

These classified sites were approved by the Department as eligible of Registered National Historic Landmark status. This new program is an outgrowth of the National Survey. It is designed to recognize and encourage the preservation of sites and structures by State and local agencies, historical societies, and individuals.

Recognition is accorded by the issuance of Landmark certificates and small bronze markers. At the end of the fiscal year, 115 certificates and 11 markers had been prepared. The Department does not bear the expense of restoring or maintaining these Landmarks.



Cape Cod National Seashore not only has one of the finest beaches in the United States but has an endless variety of recreation opportunities in its heath, marsh, forests, and lakes. President Kennedy, on authorizing the establishment of the Park, said that he hoped it would be one of a whole series of great seashore parks for the use and benefit of all of our people.

Ranger Activities

Fiscal year 1961 produced 75,756,000 visits to the National Parks, a rise of 6 percent over fiscal 1960. This may be compared with the decade 1950-60 average of 6.7 percent annually, during which time the population of the country rose at a yearly rate of 1.8 percent.

Camping continued to overtax facilities and exhibit shifts in patterns. Of the 4,840,000 camper days recorded during calendar 1960, 14 percent were spent under overcapacity circumstances, compared with 15 percent in the previous year. The trend toward trailer camping was evident. Trailer camping in 1960 rose to 26 percent of all camping, compared with 23 percent in 1959.

Forest Fire Control

For the fourth successive year, the number of fires has increased. Subnormal precipitations, dry fuels and other weather factors produced ideal burning conditions, especially in the western parks. There

were 540 fires, a substantial increase over the previous 5-year average of 345.

Fire losses amounted to 8,896 acres against the previous 5-year average of 7,109, but this loss is still less than the allowable burn standard of one-tenth of 1 percent of the total area requiring protection from fire. Fire losses in four California national parks contained 87 percent of the total fire damage area. The ratio of man-caused fires to the total number of fires decreased by about 7 percent over the previous year. The safety record of no fatalities or serious injuries was maintained.

The use of aircraft and aircraft-supported operations was expanded over previous years and was instrumental in holding down damages and costs. Fire control personnel had to be rapidly shifted between parks and regions to man some of the larger fires. The Department of Defense cooperated in the fire suppression activities by supplying aircraft when commercial assistance could not be obtained.

Insect and Tree Disease Control

Control operations were expanded to combat outbreaks of bark beetle infestations, particularly in the pine forests in Yosemite, Sequoia, Kings Canyon, Crater Lake, and Grand Teton National Parks. The needleminer which is attacking lodgepole pine in Yosemite National Park has a 2-year life cycle. Direct control to combat the infestations in the moth-egg stage was increased.

The programs for controlling white pine blister rust infections were reoriented. Ecological studies of the rust and the development of an antibiotic permit deferment of control in some parks but requires intensified control in those parks where standards of control are higher. Actidione, an antibiotic for infections on western white pine, is being used for all control projects where this tree species is present.

Wildlife Management

Reappraisal of wildlife management requirements and programs revealed the need for increased emphasis on ecological investigations, control of overpopulations, and many management oriented activities. Acadia National Park accomplished a desirable deer reduction. An inventory of fish and wildlife management responsibilities in each park was prepared with suggestions for effecting adequate management program staffing.

Range ecology studies at Grand Teton National Park resulted in the formulation of a program for the reduction of elk numbers this fall.

Protection Training

Park Rangers, staff foresters, fire control aids, blister rust workers, and other protection technicians received a wide variety of intensive protection training. The numerous facets of ranger activity assignments require specialized emphasis on such subjects as visitor protection, forest and structural fire control, safety for park visitors and park employees, search and rescue techniques, wildlife management, law enforcement, and mountaineering.

The second water safety and rescue seminar—specializing in boats and boat handling—was conducted at Lake Mead National Recreation Area for 25 park rangers and 6 other Federal and State employees. The National Park Service Training Center at Yosemite National Park graduated 50 Service employees and a Navajo Tribal Parks employee. The total number of graduates from the Training Center during its 4 years of operation is now 203.

Operations

Results of a careful Service-wide reappraisal of the Mission 66 Development Program are reflected in the April 1961 edition of the Control Schedules. This 215-page compendium of actual and projected construction and development cost data is revised annually to reappraise the Mission 66 10-year development program and future long-range planning.

The latest edition provides a convenient financial summary, by individual parks and construction categories, with summary cost columns to show: (1) costs of the first 5 years of Mission 66 (1957-61); (2) forecast of total Mission 66 costs; (3) annual cost projections for years after 1966 through 1972; (4) 1973 and future years costs; and (5) grand total costs.

In addition to the Mission 66 Control Schedules, a 6-year program of public works projects, in compliance with Bureau of the Budget requirements was prepared. This information covers all areas of the Service, in alphabetical arrangement by State and county locations.

The Branch of Programs has developed procedures for preparing and processing formalized programs for certain activities carried on with annual operating appropriations. The results of this initial activity were utilized in arriving at long-range program goals, as shown in the current edition of the Mission 66 Control Schedules. Further steps in application of programming principles are being worked out and are expected to be put into operation during the next fiscal year.



Haleakala National Park on the island of Maui, 125 miles from Hawaii, was formerly part of Hawaii National Park but was established as a separate National Park—the 30th—on July 1, 1961. The dormant volcano has a crater 7½ miles long, 2½ miles wide, and 21 miles around. The crater floor, 3,000 feet below the summit, covers an area of 19 square miles.

Maintenance

As a result of a Task Force study, recommendation and subsequent approval, maintenance activities in the Regional Offices are now on a functional rather than a professional basis as heretofore.

In recommending the establishment of a Branch of Maintenance in each Regional Office, the Task Force stated that a functional type organization would pinpoint responsibility and thus the needed impetus would be provided to systematically and continuously assist the parks in planning, developing, and carrying out the type of overall maintenance program required to protect the Government's investment and adequately serve the needs of the visitor.

Staffing levels commensurate with the workload in each Region have been established and action has been taken to realign personnel to meet requirements.

Concessions Activity

Thirteen concessions authorizations were negotiated, six of which have been executed on behalf of the Government. Eight of those negotiated included construction programs, with investments totaling approximately \$10,228,000. These will result in new and improved facilities at Lake Mead, Shenandoah, Glen Canyon, Big Bend, Mammoth Cave, Isle Royale, Olympic, Yosemite, Petrified Forest, and Blue Ridge Parkway.

Four prospectuses were issued soliciting offers for facilities at Haleakala, Fort Sumter, Lake Mead, and Rocky Mountain. Five offers were received as a result of the Fort Sumter prospectus, but none resulted from the one issued for Haleakala. The Lake Mead and Rocky Mountain ones are still outstanding.

Virginia Peaks of Otter, Inc., completed restaurants and service stations at Whetstone Ridge and Otter Creek in Blue Ridge costing about \$200,000; Yosemite Park and Curry Company spent about \$500,000 in improvements in Yosemite; Fred Harvey completed new facilities on the South Rim of Grand Canyon costing about \$160,600; and Virginia Sky-Line Company invested nearly \$377,000 in new facilities in Shenandoah. Concessioners also completed improvements at Glacier, Grand Teton, Hawaii, Lake Mead, Lassen, National Capital Parks, Rocky Mountain, and Yellowstone, totaling approximately \$536,355.

Other Activities

The House Interior and Insular Affairs Committee issued a statement confirming the concessions policies of the Service, and further resolved that the policy of granting a preferential opportunity to existing concessioners to negotiate a new contract, if service has been satisfactory during the life of their expiring contracts, shall be interpreted to apply to nonprofit distributing organizations.

Land Acquisition

Appropriations for the purchase of lands during fiscal year 1961 totaled \$2,475,000, allocated as follows: \$400,000, Civil War areas; \$500,000, Minute Man National Historical Park; \$250,000, Independence National Historical Park; \$540,000, Mammoth Cave National Park; \$275,000, Castillo de San Marcos National Monument; \$100,000, Petrified Forest National Monument; and \$410,000 in other areas of the National Park System. Some 26,450 acres were acquired by purchase, donation, transfer, or exchange, of which 2,440 acres were donated.



Burnside Bridge at Antietam National Battlefield Site is of both scenic and historic interest and illustrates the Service's dedication to the conservation of the scenic, scientific, and historic heritage of the United States for the benefit and inspiration of its people.

Completed purchases and accepted options cover 2,830 acres of land in Glacier, Mammoth Cave, Rocky Mountain, and Yosemite National Parks; Badlands, Black Canyon of the Gunnison, Capitol Reef, Castillo de San Marcos, Joshua Tree, and Petrified Forest National Monuments; Gettysburg National Military Park; Manassas National Battlefield Park; Fort Clatsop National Memorial; and Gloria Dei National Historic Site.

The purchases of the Great Onyx and Crystal Caves in Mammoth Cave National Park were the most significant acquisitions during the year.

Water Resources and Water Rights

The Department approved, with the concurrence of the Secretary of Agriculture, the application of the city and county of San Francisco under the Raker Act of 1913 for a change in a right-of-way location at the Hetch Hetchy project, Yosemite National Park and Stanislaus National Forest. The change, as approved, will permit a

tunnel to be constructed between O'Shaughnessy Dam and Early Intake on the north side of the Tuolumne River under appropriate stipulations regarding the release of water to the stream for preservation of fish life and esthetic values.

A major problem has arisen in southern Florida involving the Everglades National Park as a result of the planning and development of the southern Florida flood control project of the Corps of Engineers. It will be imperative to provide a systematic release of water to the park to preserve its natural conditions. Preliminary discussions with the Corps of Engineers to achieve the desired results were started this past year.

Design and Construction

At the outset of fiscal year 1961, more than \$106 million was available for 1,365 projects for the construction programs of the National Park Service, including balances from preceding years. This increased to 1,559 projects at more than \$108 million. By June 30 more than 88 percent of these funds were obligated and contracts for 719 projects totaling more than \$71 million were active. Four hundred and thirty-eight projects totaling more than \$21 million, were completed. With the expanded construction programs 24 contracts for professional and engineering services were consummated.

Roads and Trails

There were 125 miles of major road projects under construction at a cost of \$11,847,975 for 28 projects. Fourteen projects covering over 52 miles of reconstruction and about one-half mile of new construction were completed at a cost of \$4,407,437. Also 17 projects totaling 139 miles of reconstruction and 7 miles of new construction were placed under contract at a cost of \$7,716,625. Eleven miles of the reconstruction were completed.

Completions included reconstruction of the Jackson Lake Road at Grand Teton, the Bear Lake Cutoff at Rocky Mountain, three bridges at Yellowstone, the East Rim Drive at Grand Canyon, two bridges at Mount McKinley, a portion of the Newfound Gap at Great Smoky Mountains, the Cape Royal Road at Grand Canyon, the Nisqually River Bridge at Mount Rainier, and paving of the Tioga Road at Yosemite.

Larger projects placed under contract were the New Fremont River Road at Capital Reef, reconstruction of the Chief Mountain Road at Glacier, a portion of the park road at Mount McKinley, by-



The National Park Service is increasing the number of visitor centers where audiovisual programs—employing improved electronic equipment—supplement personal services to explain the natural or historic aspects of the park or monument to the visitors.

pass road at Hawaii, Walnut Canyon Road at Carlsbad, and the final portion of the Newfound Gap Road at Great Smoky Mountains. The Cape Royal Road at Grand Canyon, the Two-Medicine Road at Glacier, and the Arnica Creek-Bridge Bay portion of the Grand Loop at Yellowstone, were completed.

Projects involving 164 minor roads and trails in 63 parks totaling more than \$6,800,000 were completed. Among these were rehabilitation of tour roads in Saratoga; walks, trails, and parking area at Mammoth Cave; the Painted Desert Road system in Petrified Forest; and the road system in the Grand development, Yellowstone. Parking space and campground facilities were significantly increased.

A large number of projects were completed on the motor roads and in adjoining recreational areas. The completions on roads represented 20 major contracts costing approximately \$8,800,000, including 30 miles of paving, 46 miles of surface treatment, 30 miles of grading and base course work, and 20 bridges and grade separations. A 14-mile section of the Blue Ridge was opened near Roanoke and except for a missing link of 15 miles, it is complete in Virginia. In North

Carolina, 12 miles of paving was completed and except for 5½ miles travel is continuous for 96 miles from the State line to Asheville. A new 13-mile section was opened where the Parkway soars to a climactic four State view at an elevation of 5,820 feet.

Parkways

The National Parkways construction program was concentrated on additional visitor facilities and the provision of continuous travel. The \$16 million contract authorization provided the following: Blue Ridge Parkway \$4,058,300, Natchez Trace Parkway \$4,574,000, Foot-hills Parkway \$3,075,200, Colonial Parkway \$20,400, George Washington Memorial Parkway \$3,537,500, Baltimore-Washington Parkway \$359,200, Palisades Parkway \$175,000, and advance planning \$200,000.

On the Natchez Trace remaining grading and several major bridges were completed on the 165-mile unit between Jackson and Tupelo; 112 miles were paved. Public service features completed on the Blue Ridge and Natchez Trace included picnic grounds, campground roads, trails, comfort stations, and utility systems.

On June 30, there were 33 major contracts totaling approximately \$24,700,000 in process under the Bureau of Public Roads major roads program, including 75 miles of final paving, 66 miles of grading and base course work, 23 bridges and grade separations, 8 tunnels, and other road work. About \$10 million worth of construction is on the Blue Ridge, \$5,800,000 on Natchez Trace, and \$6,700,000 on George Washington Memorial Parkway.

Advisory services provided jointly by the Bureau of Public Roads and the Service were started in Tennessee on the Great River Road. This will be a mile-to-mile location and boundary report which will allow the Mississippi River States to proceed with lands and access control for protection of the Parkway corridor.

Buildings

Visitor centers were completed at Everglades (where \$33,000 was spent to repair damage by Hurricane Donna), Devils Tower, Petrified Forest, and Fort Vancouver; four are under construction. Also completed were a Sports Center at Rock Creek and Potomac Parkway. One dormitory and 46 permanent and 33 seasonal Park residences were completed. An additional 44 residences are under construction.

A \$3,796,000 contract was awarded at Jefferson National Expansion



The National Park Service opened 10 new visitor centers to the public during the budget year. Like this one at Wright Brothers National Memorial in North Carolina, they are equipped with audio-visual and other display material to make the presentation of the park story more effective and attractive to the ever-increasing number of visitors.

Memorial for the building of the grand steps and side steps to the overlook structures, foundations for the Gateway Arch and Visitor Center, and relocation of Levee Street and the railroad tracks east of the Memorial. Including Federal, city, and Terminal Railroad funds, \$23 million has been authorized for the Memorial. It is scheduled for completion in 1964.

Utilities and Miscellaneous Structures

The Service continued its expansion of public use facilities and miscellaneous structures; such as sand stabilization at Cape Hatteras; dredging lagoon at Bridge Bay, Yellowstone; and grounds improvement at Independence. A total of 146 projects in 115 parks totaling more than \$3 million were completed. Also 92 water and sewer projects in 74 parks, totaling over \$5 million were completed, notably the

water and sewer system in Grand Canyon, which included a 3 million-gallon water storage facility; a new water supply system at Petrified Forest; and additional utilities in Yellowstone totaling more than \$500,000.

Sixteen power or communication projects in 23 parks were completed. Outstanding were the leased two-way radio systems at Natchez Trace at a cost of \$525,000, a similar system at Blue Ridge, \$452,000, and another at St. Johns, Virgin Islands, \$47,000.

Master Plans

In keeping with the Service's objective of providing at least some visitor use facilities in parks immediately after establishment, good progress has been made toward the development of Master Plans for new parks. Construction of facilities in conformance with the Master Plans has already been started or scheduled in Horseshoe Bend, Pea Ridge, Wilsons Creek, Russell Cave, Flaming Gorge, and Glen Canyon.

National Capital Parks

National Capital Park facilities in fiscal 1961 were used by an estimated total of nearly 141 million persons. Of this figure, more than 5¼ million were counted at the five major memorials. There were 366 special events.

A new C&O Canal barge, more authentic historically, with improved public address system and passenger comforts, replaced the old barge in May. Visitor hours at the Washington Monument and Lincoln Memorial were extended. In its first year of operation, 125,000 participants used the Rock Creek Nature Center, overtaxing facilities in May, June, and October.

Operation of the 194-man United States Park Police force helped to cut traffic accidents and crime incidence. New uniforms, high visibility outer-garments for traffic control, an up-to-date "mobile relay" radio system, and intensive training all contributed to the improvements.

With the worst winter in two decades, National Capital Parks used 4,600 tons of sand, 79 tons of calcium chloride, and incurred the expense of \$100,000 for patching potholes in park roads caused by freezing and thawing. Research continues on Dutch elm tree diseases and turf improvement. Propagation of plants included 18,000 at nurseries and greenhouses and 3,900 waterlilies and lotuses at Kenilworth. Some 60,000 plants were used in display beds.



Crowds of interested visitors to Harpers Ferry National Monument gather around a park historian for information and guidance—typical of visitor activity in most of the historic sites and battlefields being administered by the National Park Service.

Mission 66 Improvements

Noteworthy among these were the Harry T. Thompson Boat Center, reconstruction of Bingham Drive in Rock Creek Park, improvements to Pulaski Park, new tennis courts in East Potomac Park, exterior painting of Executive Mansion, campfire circle at Catoctin, and a fire house at Prince William Forest Park.

Contract work for fiscal 1961 shows: 21 contracts completed at a cost of \$1,172,151; 11 contracts in progress at a cost of \$2,795,945; and 16 contracts to be awarded before June 30 at an estimated cost of \$1,507,540, for a grand total of \$5,475,636.

Important planning work in progress includes the Park Operations Building, restoration of Ford's Theater, and development of Greenbelt Park.



Pottawatomie County in northeastern Kansas is the location of a proposed Prairie National Park—a plan to conserve a sizable representative section of the prairie as nearly as possible in its original condition.

Planning and Land Acquisition

Legislation was introduced for (1) acquiring 790 acres at Great Falls, Va., now on a 50-year lease; (2) acquiring Mockley Point area opposite Mount Vernon; (3) extending George Washington Memorial Parkway from Mount Vernon to Woodlawn; and (4) establishing a Board to screen proposed memorials in National Capital Parks areas. Added to park lands were 388.63 acres valued at \$1,188,512. Lost by transfer or sale were 5.03 acres assessed at \$511,591.

Budget and Finance

The Service's financial position was further strengthened through appropriation increases for the 1961 fiscal year. There follows a comparison of the 1961 appropriations with those for 1960:



Camper at the Elkmont Campground in the Great Smokies pick their own spot and register by inserting an "occupied by" card in the proper card holder on the big board. On leaving the campers remove their card and the board once again shows a "vacancy."

Appropriation item	1960 Fiscal year	1961 Fiscal year	Increase
Management and protection-----	\$16, 772, 000	\$20, 509, 000	\$3, 737, 000
Maintenance and rehabilitation of physical facilities-----	14, 435, 000	15, 800, 000	1, 365, 000
General administrative expenses-----	1, 475, 000	1, 581, 000	106, 000
Construction-----	16, 735, 000	21, 528, 000	4, 793, 000
Construction (liquidation of contract authorization)-----	30, 000, 000	30, 000, 000	-----
Total cash appropriations-----	79, 417, 000	89, 418, 000	10, 001, 000
Construction (amount by which roads and trails and parkways contract authorization exceeds cash appropriation)-----	6, 000, 000	4, 000, 000	-2, 000, 000
Total new obligational authority--	85, 417, 000	93, 418, 000	8, 001, 000

Of the total increases reflected in the foregoing, \$1,576,000 was for increased salary costs as authorized by Public Laws 85-584 and 86-568; \$1,079,000 was required to meet unusual emergency costs incident to forest fire suppressions, building fire losses, and storm damages; and \$2,953,000 for construction at Jefferson National Expansion Memorial. The remainder, \$4,393,000, was for strengthening the various Service programs, including Mission 66 development.

Audit Activity

Substantial progress was made during this fiscal year in achieving the desired 3-year audit cycle for approximately 200 concessioners, 208 area and field finance offices, and 48 natural history and history associations cooperating with and rendering aid to the National Park Service. Approximately 50 percent of the field finance offices, 25 percent of the areas and concessioners, and 30 percent of the cooperating associations were audited during the fiscal year. In addition, special financial examinations were conducted covering prospective concessioners, an electric power company, and certain entrance station activities.

Office of Territories

Richard F. Taitano, *Director*



FISCAL 1961 saw a continued rise in political, social and economic progress in the territories. The Legislature of American Samoa convened for the first time as a law-making body, as provided in the first Constitution of American Samoa adopted in April 1960. The Virgin Islands Legislature met in a session outstanding in mutual cooperation and understanding and adopted many enactments of importance to the islands, among them a new civil rights act.

In the Trust Territory of the Pacific Islands, the sense of solidarity among the peoples of the islands was strengthened through the annual conference of the Inter-District Advisory Committee to the High Commissioner, representing Micronesian delegates from all districts and envisioned as the future legislative organ of the Territory.

Legislation is pending in the Congress to provide Guam and the Virgin Islands with nonvoting representation in the United States House of Representatives. Representatives from the Department of the Interior and the territories strongly recommended enactment of the legislation.

American Samoa, the Virgin Islands and Guam this year for the first time have been included in certain Federal aid programs, such as the recently enacted Area Redevelopment Act and the Federal aid to public schools bill passed by the Senate.

American Samoa

Political development continues to play an important role in American Samoa. With the approval and promulgation of the first

Constitution of American Samoa on April 27, 1960, the territory awaited with anticipation the opening of the Seventh Legislature of American Samoa on March 13, 1961, the first held under the new Constitution. The opening session was attended by traditional leaders and Government officials and the tone of the whole session complemented the remarks of the Secretary of the Interior that the Legislature's record will greatly influence the rate and extent of the future development of self-government and self-determination.

The first bill signed by the Governor on April 3, 1961, under the new Constitution created a sports commission. Subsequent acts abolished the Government cooperative, revised the appellate court system, provided for regulation of professional surveyors, repealed Chapter 32 of the Code of American Samoa, provided for the sale of the Bank, prescribed penalties for the deposit of materials on public highways, and provided for payment of compensation to legislative members.

Conference Preparations

Among the major assignments facing the new administration was the preparation for the South Pacific Conference in American Samoa in July 1962. Since this is the first time the conference, which is scheduled every 3 years, will be held on American soil, international interest will be focused on the policies and programs in American Samoa.

Realizing the conference will be a major challenge and an unparalleled opportunity, the Government began early to consider its requirements. A South Pacific Conference Planning Committee, consisting of Samoans and local Government employees, was appointed to coordinate the needs of the conference for necessary landscaping, catering and housekeeping, public relations, and entertainment arrangements.

Construction of adequate housing facilities for the expected 200 delegates was the first major project to be instituted. Work was begun in February on the construction of two new buildings at Utulei with early schedules being met. Construction is in accordance with the Government's 6-year plan for developing school facilities and at the termination of the conference, the buildings will be reconverted to original design for high school expansion. Airport construction continued to receive emphasis during the fiscal year. Insufficient equipment and breakdowns plagued the construction of the proposed 9,000-foot runway but work in general was accelerated. The objective is now a minimum operating airport facility by June 1962 with final completion scheduled for early 1963.



Chief Judge Arthur A. Morrow administering the oath of office to Governor H. Rex Lee on May 27, 1961, in a public ceremony held in the village of Fagatogo, American Samoa. Former Governor Peter Tali Coleman is shown at the right.

Senate Unit

A special Senate Study Group arrived in American Samoa in December 1960 to conduct a study and investigation of conditions in the territory to determine economic improvement and provide a greater amount of self-government. Emphasis on the responsibility of the United States in the South Pacific and in the forthcoming conference was further evidenced by the Study Group in proposing a more active role in the development of Samoa in the American tradition without a sacrifice of the native culture.

As a means of training Samoans in the art of long line fishing, the local tuna company purchased a fishing vessel in Japan for this purpose. The acquisition of this vessel will add to the skills of the men of the territory, provide additional employment opportunities, and help raise the standard of living in Samoa.

A change in the Social Security Act as authorized by Public Law 86-77 extended coverage to American Samoa effective January 1, 1961. All employees of the Government and its instrumentalities, exclusive of those persons contributing to the Federal Retirement system, were



Group of Micronesians attending college in Guam.

included in the program on a compulsory basis, and for the first time applicants in the southern hemisphere have been issued Social Security cards and provided Government workers with an important extension of benefits.

These major political, economic, and social changes during the fiscal year contributed in great measure to territorial development and the Government closed the year's operations confident that with the increased interest on the national and international levels in the South Pacific and in Samoa, subsequent changes would continue to be for the betterment of the Samoan people and their way of life.

Guam

The growth of political awareness in Guam was reflected in the November general election for members of the Sixth Guam Legislature and the Municipal Commissioners. Of 14,183 eligible, 11,922 persons registered to vote. Eighty-nine percent of the registrants cast ballots in the election.

The Legislature of Guam during the year enacted a number of measures to provide for the people of Guam improved services in education, health, public welfare and other fields.

Reorganization of the executive branch during the year included consolidation of the Office of Civil Defense under the Department of Public Safety; transfer of the Division of Public Welfare from the Department of Finance to the Department of Medical Services; abolishment of the position of Director of the Budget and the con-



New Asan Point Public Health Center is one of four completed in Guam in the fiscal year 1961.

consolidation of this office with the Department of Finance; transfer of the Alcoholic Beverage Control Administration to the Department of Finance; consolidation of the Public Utility Agency with the Department of Public Works; and transfer of the responsibility for the maintenance of parks from the Department of Land Management to the Department of Public Works.

Enrollment in the public schools increased to approximately 13,500 pupils. The College of Guam, which is accredited by the Western College Association as a Junior College, was authorized to expand to a four-year college.

Capital Improvements

Work accomplished on capital improvement projects by the Department of Public Works represented a total expenditure of approximately \$1,650,000. Major projects completed during the year included the construction of the Agat Junior High School, with a student capacity of 1,000, and the Andersen Elementary School, with a 14-classroom extension. The second increment of the new Administra-



Fort Apugan, an old Spanish Fort on Guam which was restored this year, showing the new road leading into it and Agana in the background.

tion Building, a two-story reinforced concrete structure, was completed and occupied.

Final plans were completed for the Agana Urban Region. This planning was partly financed through an Urban Planning Grant from the Housing and Home Finance Agency. Development was started on four park areas and one beach for recreational purposes. Four new Public Health Centers were opened for service.

During the fiscal year, 13 local residents were appointed to key positions in the Government formerly held by off-island contract employees. Since the advent of the new administration two local residents were appointed by the Governor as department heads.

Commercial Activity

The Commercial Port of Guam handled 175,658 revenue tons of cargo, consisting of 107,143 revenue tons of imports valued at \$24,667,984.88; 48,045 revenue tons of exported cargo valued at \$8,120,906.64, and 20,470 revenue tons of transshipped cargo.



U.N. visiting mission visits a school in Palau District.

Volume and sales of Guam-produced fruit and vegetables increased over 150 percent the last 6 months of 1960, as compared to the same period in 1959.

The poultry program has expanded and commercial egg production averaged 38,400 dozen per month as compared to 30,150 dozen in fiscal year 1960. Four sites were established for an artificial fish shelter experimental project and two sites were blasted for reef habitat improvement.

Social security was inaugurated for employees outside the Government.

Trust Territory of the Pacific Islands

To develop and unite this strategic territory for the benefit of its 70,000 some inhabitants is the United States role and policy. Probably nowhere in the world are efforts being made to achieve economic progress, political unity and social advancement in an area so fragmented: more than 2,000 islands (97 inhabited) containing less than 700 square miles of land set amidst 3 million square miles of Pacific waters.

The United Nations Trusteeship Council's annual oral examination of conditions in the Territory was conducted at the United Nations in June 1961. The present and former High Commissioners served as Special Representatives of the United States before the Council, with the Staff Anthropologist and the president of the Truk Congress as Advisers. Earlier in the year, a four-member UN Mission toured the Territory and submitted a report on the U.S. administration.

Increased coconut production continued as a major effort, with added emphasis on the development of cacao, introduction of spice and fruit crops, also new varieties of cash and subsistence crops. Preparations were being made for opening of the Trust Territory Farm Institute, an agricultural training school, at Ponape in January 1962. Fish drying and smoking were conducted on a commercial scale as a phase of the Government's fisheries development program at Palau. Preparations were underway for a Territory-wide School of Fisheries to open there in October 1961. Support was given to the Palau Fishermen's Cooperative. A seminar to extend information about the functioning of cooperatives and credit unions is to be held at Palau in July 1961 under joint auspices of the Trust Territory Government and the South Pacific Commission.

Efforts applied in agriculture and fisheries over the past several years resulted for fiscal year 1961 in (1) the highest copra production ever recorded, almost 14,000 short tons, and the highest copra income, approximately \$1,700,000; (2) substantial increases in cacao, approximately 5,000 pounds exported and some 500,000 beans used for seed; (3) greater production and sales of marine products, the Palau Fishermen's Cooperative setting a record in 1 month with 27,500 pounds of frozen and smoked fish exported.

Legislature Meets

The Inter-District Advisory Committee, whose members are elected by the representative legislative bodies in each district, met in annual conference during the year. The Social Subcommittee, appointed in 1959, reported its findings and recommendations on problems of education, health and youth behavior. A new Subcommittee on Economic Development was established and will report at the September 1961 conference, and at the same conference a Subcommittee on Political Development is scheduled to be formed. The program of municipality chartering was continuing.

Implementing the policy of promoting Micronesians to higher administrative responsibilities as they become qualified through training and experience, 61 Government positions in 19 different categories have been filled by citizens of the Territory. A new annual salary

schedule was placed in effect, giving increased compensation to 14 Micronesians in high-level professional and administrative positions.

A scheduled in-service training program was carried out, with 18 Government employees sent from the districts to Guam for advanced training in administrative services and in trades and vocations. Medical and dental officers (Micronesians) in successive teams received supplemental and refresher training at naval facilities in Guam. Within the districts, in-service training was provided in a wide range of activities including communications, agriculture and fisheries, safety and first aid, legal and constabulary functions, management, accounting and clerical procedures, public health services, sanitation and vocational English.

Education Progress

A newly established School of Dental Nursing at Majuro graduated its first class in June 1961 and the School of Nursing at Palau continued to prepare young men and women for nursing careers in the Territory. The training of elementary schoolteachers occupied an important place in the overall educational program. Model schools were conducted under supervision of teacher-trainers, who also visited outlying schools to provide guidance and assistance. Grants-in-aid facilitated the building of new elementary schools. Carpentry, mechanics, agriculture and fisheries were among courses offered in the several intermediate schools, and at the Pacific Islands Central School in Ponape.

More than 50 students were attending institutions of higher learning in the U.S., Guam, the Philippines and Fiji on Trust Territory Government scholarships, their courses including general education, medicine, sanitation, agriculture, fisheries, public administration, community development, and vocational training. A like number were studying in similar fields on scholarships provided by their local congresses or trading companies, while private funds, UN fellowships and other special grants were enabling still others to acquire advanced education.

Through development of the Territory's resources—human and physical—the goals of economic, political and social progress were advancing.

Virgin Islands

The Virgin Islands continue to make remarkable progress, both politically and economically. Politically, the elected legislature has shown an increasingly mature grasp of its responsibilities, and the



View of the Oswald E. Harris Court, a 300-family public housing project under construction in St. Thomas, Virgin Islands. It is expected that this project will be completed by January 1962. It will help to relieve the extreme shortage of adequate housing in St. Thomas.

territorial government has greatly expanded the scope of its service and private economy has prospered.

Plans are nearing completion to extend the Harry S. Truman Airport in St. Thomas some 500 feet to accommodate turboprop planes by the end of the calendar 1961, as well as to pave the runoff section of the Alexander Hamilton Airport in St. Croix to permit jet planes to land within the next few months.

Distribution of federal surplus commodities to public assistance clients, which had not been implemented for several years, was given priority attention and the program is now in effect.

A College Conference of leading educators in the United States has been called for late July to discuss the best ways and means of starting a college in the Virgin Islands.

A new Department of Commerce was created to give fresh impetus to moves needed to bring more business to the islands. An economist and a legal consultant were employed in Washington to make certain that all new plans to encourage commerce would be implemented in a way which would not impinge on Federal laws, regulations, and policies.



New Kindergarten School at French Village, St. Thomas, Virgin Islands, under construction. The wooden building in the foreground was formerly used as a kindergarten school.

Within the office of the Government Secretary, a new real property tax assessment program has been made effective with a scientific system of real property appraisal and evaluation.

Revenues Increase

The Department of Finance reports total revenue for the fiscal year 1961 at \$8,872,113.16, an increase of 22.34 percent over the previous fiscal year, the highest in the island's history.

Within the Department of Commerce a preliminary study reveals that revenues derived from visitors will exceed last year's figures by approximately 10 percent. Three new small industries were established.

In the Department of Education, construction was started on two new elementary schools in St. Thomas to eliminate overcrowding. Within the Department of Health, polio vaccine was given to 97 percent of school children. A new clinical annex of the Charles Harwood Memorial Hospital is nearing completion. X-ray facilities were installed for the first time at the Frederiksted Clinic.

The Public Works Department is supervising the construction of a number of public works projects including a large elementary school in St. Thomas, a pier at Frederiksted, an abattoir in St. Croix, and a number of road projects in all islands. A vigorous plan for acceleration of street cleaning and garbage removal and beautification has been placed in operation.

The Department of Social Welfare, in collaboration with the Department of Health, instituted the Medical Assistance for the Aged Plan providing complete medical care for all persons over 65 years of age meeting eligibility requirements of this Federal program.

The Department of Agriculture and Labor served the farmers by supplying seeds, seedlings, fruit trees, fertilizer and insecticides, land preparation, marketing of farm products, and farm management.

The Department of Property and Procurement issued awards on major construction projects with total value in excess of \$4 million.

The Department of Public Safety conducted a police training school for a large number of recruits from all islands and instituted a policy of transferring personnel from one district to another. A traffic bureau was created and continued a vigorous campaign against traffic violators.

Government Comptroller

The Office of the Government Comptroller of the Virgin Islands, created by Public Law 517, 83d Congress, approved July 22, 1954, is a Federal Agency under the general supervision of the Secretary of the Interior.

During the fiscal year 1961, this office was very active in making comprehensive and limited audits of the several departments and agencies of the Government of the Virgin Islands. Special Audits of several governmental activities were also made. The audit of Cashiers' Receipts for fiscal year 1960 was completed.

As required by the Revised Organic Act of the Virgin Islands, as amended, the certification of the net amount of government revenues which form the basis for Federal grants for the civil government of the Virgin Islands, for the fiscal year 1960, was submitted to the Secretary of the Interior, and the annual report of the fiscal condition of the Government of the Virgin Islands was submitted to the Governor, the Comptroller General of the United States and the Secretary of the Interior.

Virgin Islands Corporation

The Virgin Islands Corporation had a most successful year with respect to its sugar operations. The sugarcane ground and sugar pro-

duced was the greatest in the history of St. Croix. Both power systems, St. Thomas and St. Croix, experienced another year of expanding growth which severely taxed available generating facilities. The construction of a salt water conversion plant on St. Thomas was started in April, and it is expected that the plant will be in operation by December.

The production and processing of sugarcane is the major operation of the Corporation on St. Croix. The high rainfall during calendar year 1960 contributed substantially towards making the 1961 sugar crop the best in the history of the Virgin Islands. A total of 163,193 tons of sugarcane were ground and 16,555 tons of sugar, raw value, manufactured, both new records. An average production of 44.4 tons of sugarcane per acre was also a record. During 1958 and 1960, production dropped to 14.6 tons per acre and 19.4 tons per acre respectively when two extreme droughts were experienced. It is significant that an increase over 1960 of nearly 10,000 tons of sugar could be realized from the same acreage of land, and the results clearly demonstrate the importance that rainfall plays in the production of sugarcane in St. Croix.

There was considerable improvement in the power situation in St. Thomas. The 2,500-kilowatt generator, installed in December 1959, was finally accepted by the Corporation and has given good service. The power demand continued to grow at a rapid rate and the increase over the previous year was 27.2 percent. A steam turbine generator is being installed in connection with the salt water distillation plant and will bolster the present output by an additional 2,500 kilowatt. The distribution system on St. John which is served by a submarine cable from St. Thomas was extended to Coral Bay and power will soon be available throughout most of St. John.

Power operations on St. Croix received two unfortunate setbacks due to an electrical fire in the powerplant and the shearing of a piston in a high speed engine. A new 2,216-kilowatt diesel engine was purchased and will be in operation late in the calendar year. The peak demand increased 18.8 percent over the previous year and undoubtedly would have been greater except for limited generating capacity.

Conservation Activities

A total of 14 earth dams were constructed under the soil and water conservation program in cooperation with the Soil Conservation Service and the Virgin Islands Soil Conservation District Board. The six dams constructed on St. Thomas had an estimated capacity of

2,583,365 gallons and eight on St. Croix, 12,307,941 gallons. The growth of the islands has severely taxed all available water sources and these dams have played an important part in both water conservation and flood control.

The Forest Service continued to cooperate with our Forestry Program, through providing personnel and technical assistance. The activities were concerned primarily with reforestation, improvement of existing forest areas, and making available forest products for utilization locally. The demand for mahogany slabs exceeded available supply, and there has been increased use of chemically treated fence posts.

The food production and livestock programs have been expanded and plans made for further developments, particularly with cattle. A commercial planting of mangos was established and seedlings of macadamia, an edible nut, were introduced from Hawaii where macadamia is a profitable crop.

Alaska Public Works

In 1949, by Public Law 264, the 81st Congress authorized a \$70 million program of public works in Alaska to foster economic and social development through provision of facilities for community life. This 5-year act was later extended by Congress to June 30, 1959. Under this program the Federal Government, upon application by a public body in Alaska, has financed the entire cost of construction of approved projects and, upon their completion, transferred them to the public bodies for whom they were built at prices that will return to the Treasury of the United States not less than 50 percent of the total cost.

The program has provided basic community facilities and other essential public works. These are a major contribution to Alaska and have materially assisted its communities in meeting the demands of the very rapid population growth of the past ten years.

Through June 30, 1959, Congressional appropriations totaling \$69,976,200 have become available. Allotments have been made in the amount of \$69,297,160 to 172 projects, to provide 61 school units, 13 hospitals and health centers, 8 municipal buildings, 50 sewer and water projects, 27 other projects including streets, utilities and small boat harbors, and 22 units for emergency relief with a value of \$436,400. Of these, 167 projects valued at \$62,011,590 are complete. Five projects estimated to cost \$7,285,570 are substantially complete and in use. These projects are in final stages and are scheduled for completion by December 31, 1961.

The Alaska Railroad

D. J. Smith, *General Manager*

Operations of the Railroad produced gross revenues of \$14,302,279.90. Expenses, including depreciation charges of \$2,071,010, amounted to \$14,503,804.57. The resulting deficit, \$201,524.67, was due, in large part, to wage increases authorized during the fiscal year. These amounted to approximately \$171,500. Losses from passenger train operations amounted to about \$300,000, further contributing to a deficit operation. Despite the operating loss, the preservation of working assets through the charges for depreciation will provide for capital improvements of about \$1,870,000.

The railroad carried 1,313,359 revenue tons of freight, an increase of 5.23 percent compared with the prior year. Revenue passengers totaled 82,742 compared with 76,991 for the prior year, or an increase of 7.47 percent.

The use of containers for the movement of freight in the Alaska trade has found increasing favor with shippers. To meet the growing demand for containerized shipments, the railroad's fleet of unit rail boxes was increased (net) by 106 during the year, to a total at June 30, 1961 of 323. Congressional approval of program changes was obtained in consequence of which authority was granted for the acquisition of 100 additional units. An order for 50 of the boxes will be placed early in fiscal year 1962, with orders for the balance to follow at a later date, contingent upon service demands.

To implement the unit rail box program a 35-ton fork lift was placed in service on the Seward Dock, and cranes were installed at Moose Pass and Palmer.

As part of the continuing program to maintain the roadbed and track in a safe operating condition, the ballasting and tie renewal

project begun last year, which covered the 25-mile area south of Curry, was completed. Similar work was started on an additional 15-mile stretch of track.

The feasibility of the project having been determined previously, facilities were installed for the remote control, over wire lines, of VHF radio units at distant stations. This permits direct communication between the dispatcher and trains, between trains and track forces, and between the dispatcher and track forces. In addition to the safety features provided, savings of upwards of \$40,000 per year are anticipated.

The installation of air conditioning equipment in six passenger coaches and two buffet cars during the year featured improvements in passenger service designed to attract tourist traffic. The improvements were made at a cost of approximately \$36,000.

Operations and administrative services were constantly reviewed during the year with the objective of improving performance and effecting economies wherever possible. Particular attention was given customer service and relationships. The mission of The Alaska Railroad, as expressed in its enabling act—that of aiding in the economic development of the area—has been stressed repeatedly and efforts of interested citizenry to attract industry and to generate imports and exports through the Port of Anchorage have been encouraged.

Office of the Assistant Secretary

Fish and Wildlife Service

Frank P. Briggs, *Assistant Secretary*

THE ASSISTANT SECRETARY of the Interior for Fish and Wildlife represents the Secretary in programs designed to preserve important renewable fish and wildlife resources and assure that these resources make a material contribution to the health, recreation, and well-being of our citizens.

These renewable forms of national wealth are capable of being maintained and greatly improved by proper management but equally possible of destruction if unwisely exploited. Properly managed, these resources can provide food and employment, directly and indirectly. The training and recreation afforded by these resources strengthen national defense by contributing to the general health and physical fitness of millions of citizens and the existence of seaworthy ships with trained crews is a direct national asset.

To carry out the responsibilities of his office, the Assistant Secretary functions in both national and international fields. The international aspects of the task stem from the fact that neither birds nor fish respect national boundaries but migrate when and as the forces of nature direct.

The trend toward greater interest in the sea and a greater utilization of its products has accelerated with many Nations increasing the size and efficiency of their fishing fleets and with new national flags appearing on the fishing areas of the high seas. A new interest

in the sea has been exhibited by many countries and the concerted research activities of many American agencies stress the importance of oceanography in meeting and solving resource conservation problems.

The trend also is for more utilization of outdoor areas by those who want to hunt and fish and those who want to hike and look while the developing Nation absorbs more and more of the outdoor areas which were once available for recreation and wildlife habitat.

To meet these problems, which are numerous and which cover millions of square miles of land and water, the Assistant Secretary supervises the Fish and Wildlife Service. The work of the Service is accomplished by two bureaus—Sport Fisheries and Wildlife, and Commercial Fisheries—coordinated by a Commissioner.

In brief, the activities of these units consist of meeting international fish and waterfowl problems through international commissions, treaties, and conservation; in extensive research on both sport and food fish in laboratories, lakes, streams, and on the high seas; by management of the migratory game bird resources and by the operation of a huge National Wildlife Refuge and National Fish Hatchery system; by the management of the great fur seal resources; by research on various wildlife problems, including studies on genetics, disease, the effects of pesticides on fish and wildlife, methods to control pest and predators without damage to trees, bird banding studies, breeding and wintering ground studies, techniques for measuring waterfowl production, and numerous other activities; exploratory fishing and gear improvement programs to help the American fisherman in his competitive relationship with the fishermen of other Nations; intensive study to get the most and best nutritive value from sea products; and so on through an almost endless roster of activities.

More detailed reviews of the problems and operations of the fish and wildlife program are discussed in the following pages.

Fish and Wildlife Service

Clarence F. Pautzke, *Commissioner*



THE COMMISSIONER OF FISH AND WILDLIFE heads the Department of the Interior's Fish and Wildlife Service and coordinates the work of its two component bureaus—the Bureau of Sport Fisheries and Wildlife and the Bureau of Commercial Fisheries. He is a member of several international fisheries commissions. In the Office of the Commissioner are staffs handling conservation information-education work, program review, and international activities.

Conservation Education

The purpose of the educational activities of the Commissioner's Office is to create public understanding and appreciation of the conservation goals, efforts, and practices of the Fish and Wildlife Service.

Its activities are based upon the concept that the public should know not only what its conservation agencies are doing with their stewardships but also should know why the actions were taken. Only when there is public understanding of the necessity for conservation can there be an intelligent public appraisal of and support for conservation programs.

A new duck identification field guide, *Know Your Ducks*, an illustrated shirt-pocket-sized leaflet, was issued and 600,000 copies were ordered for distribution before the fall waterfowl hunting season started. An identification motion picture featuring field pictures and artists' drawings was in production when the fiscal year ended. This would be ready for distribution during and after the hunting season.

These two items, the field guide and the motion picture, will be important tools in helping the average hunter learn how to identify

ducks and how to avoid killing birds in short supply. The species in short supply often vary from year to year because of changing conditions. Good sportsmanship and good waterfowl management dictate that hunters learn how to identify the various hunted species. To this end, every possible effort is being made to aid hunters learn to "know your ducks."

Preparations were made for the compilation and the distribution of 2 million waterfowl hunting regulations Digests, 600,000 Digests on dove hunting regulations, small leaflets which give the hunter much of the data he needs on hunting regulations. The 1961-62 issue of the Answers to Your Migratory Bird Hunting Questions was made available.

Conservation Backgrounds, an interpretative series which helps the reader understand various conservation problems, was continued.

A motion picture on safety was produced, and footage for an educational motion picture on commercial fishery biology was prepared.

Two new exhibits were prepared for use in two of the Bureau of Sport Fisheries and Wildlife regions. Material was supplied field men and conservation agencies for the promotion of the after-season sale of duck stamps for the acquisition of migratory waterfowl.

Safety

The Office of the Commissioner sponsored and coordinated an active Safety program to reduce work injuries, property damage, motor vehicle accidents, fires, and tort claims in the component bureaus of the Fish and Wildlife Service. Regional facilities of both bureaus have aggressively participated with resultant reductions in the cost of all but property damage accidents. Records based on the calendar year show a continuing reduction in the disabling work injury frequency. The Bureau of Commercial Fisheries received the Department of the Interior Safety Award in recognition of an outstanding Safety program, achieving substantial reduction of disabling work injuries in competition with other bureaus of the Department during the calendar year.

International Activities

The nine existing international fishery commissions continued to apply generally effective cooperative effort in the conservation of fishery resources of importance as food for the ever-growing world population. Also, the outlook is bright for improved conservation measures for the migratory birds of great value to Canada, Mexico, and the United States.

The Fish and Wildlife Service assisted the International Cooperation Administration in providing technical assistance to friendly foreign countries in the development of fish and wildlife resources. Fishery technicians were on regular assignment to 11 countries; and a special survey was completed in Panama, and another in several countries of West Africa was initiated. A number of foreign students and observers were given training in the United States in the fields of fisheries and wildlife.

Bureau of Sport Fisheries and Wildlife

Daniel H. Janzen, *Director*



THE BUREAU OF SPORT FISHERIES AND WILDLIFE of the Fish and Wildlife Service, Department of the Interior, recorded several events during the year of paramount importance to wildlife conservation and public recreation.

Acquisition of lands for waterfowl was greatly accelerated. Funds were obligated for the purchase of 43,461 acres for refuges and 25,000 acres of small wetlands for waterfowl production—more than seven times the acreage for which funds were obligated during the preceding year. With establishment of three large wildlife areas on public lands in Alaska, the National Wildlife Refuge System was increased from 17½ million acres to 28½ million.

Complete protection given canvasbacks and redheads in the 1960–61 hunting season resulted in an increase in their numbers. Although the continental population of migratory waterfowl remained nearly constant in the past year, mallards and black ducks declined slightly in numbers.

In the greatest offensive ever conducted against market hunting in the United States, 169 persons were arrested or cited to court in a single day. They had sold some 5,000 illegally killed ducks and geese to an undercover agent posing as a market buyer. Such mass arrests illustrate well the effectiveness of the undercover agent system and the extent of market hunting.

Research Gets Attention

Intensive study of the effects of pesticides and herbicides on wildlife continued. Under laboratory conditions chemicals commonly

used to control insects and weeds were found to inhibit breeding in mallards and pheasants; also it was found that big game animals in treated western forests may accumulate residues of insecticides in their bodies. Studies are continuing in an effort to learn the long-term chronic effects of these modern chemicals on fish and wildlife and to find effective agents that do not create unusual hazards for living natural resources.

Research on light traps, scaring devices, immobilizing chemicals, and sterility-producing agents to control birds and animals that damage agricultural crops and fowl cattle feed lots had promising results. Wide use by farmers of the Bureau-developed pocket gopher burrow builder, which deposits bait in underground burrows, gave quick protection of crops at reasonable cost.

Reduction of hazards to aircraft at airports by flocks of starlings, gulls, and swallows, was studied in cooperation with the Federal Aviation Agency. It was recommended that airports be made less attractive to the birds by removing feeding areas, nesting sites, and roosting places.

Game Fishing Popular

In recognition of the importance of marine game-fish resources and their recreational value to Americans, a marine game-fish research program was established at Sandy Hook, N.J. Inventories of this valuable resource are in progress on the Atlantic, Pacific, and Gulf coasts.

More than 1,880,000 man-days of sport fishing were enjoyed by Americans on national wildlife refuges, national forests and parks, and on military installations and Indian reservations, as a result of cooperative programs between the Bureau and other Federal agencies.

National fish hatcheries increased their output of young fish 15 percent during the year, largely to meet the increased demand for trout to be stocked in newly created tailwaters below large dams.

Management of Fish and Wildlife

Provisions of the amended Migratory Bird Hunting Stamp Act of August 1, 1958, which became effective July 1, 1960, earmarked all proceeds from the sale of Duck Stamps (except expenses incurred by the Post Office Department in connection with sales) for the location and acquisition of lands for waterfowl use. In a greatly accelerated program of land acquisition, funds were obligated for the purchase of



Some of the 50 million Americans who get rest and recreation from fishing in the Nation's lakes, streams, and reservoirs.

43,461 acres of land for refuge purposes and 25,000 acres of small wetlands for waterfowl production purposes.

Eight national wildlife refuges were established during the year: Wapanocca, Ark., and Burford Lake, N. Mex., on leased land; Kern and Modoc, Calif.; Mackay Island, N.C.; and Ouray, Utah, on purchased land; Washita, under provisions of the Fish and Wildlife Coordination Act, on Foss Reservoir in Custer County, Okla.; and San Juan, Wash., on lands withdrawn from the public domain.

The 5,966-acre Modoc Refuge in northeastern California is an important breeding area for Great Basin Canada geese and will provide balanced habitat for Canada geese and ducks. To the south in the San Joaquin Valley, the newly acquired 10,544-acre Kern National Wildlife Refuge is in a region in which waterfowl formerly darkened the skies. As sources of water are developed, large populations of ducks and geese are expected to congregate here.

Winter Grounds for Snow Geese

The recently established Mackay Island Refuge, in the northeast corner of North Carolina, is in the heart of the famous Back Bay-

Currituck Sound waterfowl area. In addition to providing a resting and feeding area for a heavily gunned population of important waterfowl species, the refuge attracts the largest wintering concentration of greater snow geese remaining in North America.

The San Juan National Wildlife Refuge—52 acres of rocky islands off the coast of Washington in the Strait of Juan de Fuca—is a natural haven for oystercatchers, gulls, cormorants, puffins, guillemots, and other migratory birds. There is an influx of northern sea birds during the winter months.

New Alaska Areas

By administrative action, three national wildlife ranges on public land in Alaska were established. The ranges total 11,185,000 acres.

The 8,900,000-acre Arctic Range is the only area in the United States where an undisturbed portion of arctic environment, large enough to be biologically self-sufficient, will be preserved. The range will save unique wildlife, wilderness, and recreational values that are outstanding in North America. Major game species include the grizzly, black, and polar bear; caribou; Dall sheep; moose; and wolverine.

The Clarence Rhode Range, 1,800,000 acres of low-lying tundra on the coast of the Bering Sea, is the primary nesting area of the cackling goose and the major nesting ground of the black brant in the United States. Emperor, lesser Canada, and white-fronted geese; whistling swans; little brown cranes; eiders; pintails; scaups; common scoters; and oldsquaws nest on the range, as do many shorebirds.

The 415,000-acre Izembek National Wildlife Range, on the tip of the Alaska Peninsula, is a waterfowl feeding area with vast eelgrass beds in Izembek Bay and tremendous crops of berries in the bordering upland tundra. The tidal lagoons support nearly the entire continental population of black brant for 2 to 3 months of each year. The range is also within the principal migration lane of cackling and lesser Canada geese and supports a number of other species during the fall and early winter.

Pothole Drainage Combated

Thousands of potholes and marshes have been drained in the Dakotas and Minnesota in the past 25 years, and more will be drained in the future. This important pothole area is in the southern part of the best waterfowl-producing grounds on the North American Continent. Public ownership and leasing are the most practical ways

MAJOR FEDERAL AID FISH AND WILDLIFE DEVELOPMENT AND LAND ACQUISITION AREAS



Since the inception of the cooperative program between the States and Federal Government, known as the Federal Aid in Fish and Wildlife Restoration Program, nearly 2½ million acres of land and water have been acquired and developed at a cost of \$51 million. Virtually every State is actively engaged in this form of fish and wildlife restoration.

to preserve this habitat and ensure a place for ducks to nest and raise their young.

Using funds provided by the sale of Federal Duck Stamps, 146 tracts were optioned or acquired for waterfowl production areas in North and South Dakota this year.

Sport-Fish and Wildlife Restoration

Funds totaling \$5,485,000 were apportioned to the States and island possessions for Federal aid in sport-fish restoration during 1961. Land acquisition to provide more recreational fishing areas continued to be an important part of the program. This continuing endeavor has resulted in the completion of 165 public fishing lakes, covering some 21,300 acres, in the period between July 1, 1951, and June 30, 1961.

During this 10-year period, 384 public access areas have been purchased and developed with fish-restoration funds, opening more than

800 miles of streams and 40,000 acres of lakes to public fishing. Research was primarily concerned with population dynamics and the control and estimate of harvest.

States and island possessions were apportioned \$14,217,430.17 in 1961 for Federal aid in wildlife restoration. Land acquisition was a major objective in many States. Fee title purchase of 146,912 acres in 1961 at a Federal-State cost of \$5,059,288 brought the overall total of lands purchased under the Federal Aid Program between 1938 and 1961 to 2,403,684 acres, at a combined State-Federal cost of \$51,305,354.

States continued to develop and manage the lands within their jurisdiction that were acquired under the Federal Aid Program. Habitat improvements to meet the food, water, and cover requirements of wildlife using the areas made up the main activities under development projects. Research continued on all major and migratory game species.

Wildlife Management

Responsibilities of the Bureau under the Migratory Bird Treaty Act necessitate obtaining current, reliable data on the status and distribution of migratory waterfowl populations in North America in order to establish a basis for prescribing annual hunting regulations.

To accomplish this objective, the following waterfowl surveys were conducted: (1) A survey of waterfowl hunters following the hunting season to measure the extent of the kill and the effect of regulations on hunting activity and kill; (2) A January survey of continental wintering areas to measure the distribution and relative number of birds after the close of the previous hunting season; and (3) A survey of the major continental breeding areas during May, June, July, and August, to measure the size and distribution of the breeding population and the number of young produced.

The trend of the continental migratory waterfowl population generally remained fairly constant. Some major species, such as mallard and black ducks, showed slight losses, while other species showed substantial gains. In this latter group, canvasback and red-head increased significantly following a complete closure on these two species during the 1960-61 hunting season.

Fishery Management

Public use of the many fine fishing waters on Federal lands that resulted from fishery management activities of the Bureau has almost doubled in the past 2 years. Cooperative fishery programs with the Department of Defense, Veterans' Administration, Forest Service,

the Department's National Park Service and its Bureau of Indian Affairs, and Indian tribes, and on Wildlife Refuges themselves resulted in an estimated 1,880,000 man-day of recreational fishing in 1960.

Two laws approved by the 86th Congress are of special significance: Public Law 86-797, known as the Sikes Act, authorized the formation of cooperative plans for fish and wildlife on military areas, including use of special permits for fishing and hunting; Public Law 86-686 authorized cooperative units in sport fisheries. These units will train fishery scientists and conduct research and surveys of fishery resources of national interest.

Sport fishing on Federal lands that resulted from cooperative fishery management activities

Area	Number of installations	Days of fishing
Department of Defense:		
Air Force.....	34	98, 598
Army.....	49	252, 776
Navy and Marine Corps.....	21	54, 467
Veterans' Administration.....	12	27, 250
Indian reservations.....	26	305, 450
National parks.....	7	60, 400
National forests.....	10	376, 500
Wildlife refuges.....	32	698, 648
Miscellaneous areas.....	9	14, 272
Total.....	200	1, 888, 361

River Basin Studies

The Bureau participated with the Manitoba Department of Mines and Natural Resources in a study of the effects of the Grand Rapids hydroelectric project, Saskatchewan River, Manitoba, on fish and wildlife resources. A report of the study was transmitted to the Manitoba Government on March 10, 1961. The Bureau report indicated the high value of 1,600,000-acre reservoir area as fish, waterfowl, fur animal, and moose habitat and recommended measures to lessen about one-half the tremendous wildlife losses predicted.

A schedule of daily values for use in evaluating the effects of Federal dams and other water-resource projects on fish and wildlife has been developed in cooperation with other Federal agencies. Use of this schedule of values for fishing and hunting is a forward step in the consideration of the multiple effects of such projects on flood control, irrigation, agriculture, navigation, and fish and wildlife. The schedule will be improved and probably will be extended to other types of recreation that are becoming so popular in connection with such projects.

To stimulate public interest in utilizing opportunities for increasing fish and wildlife recreational benefits, the Bureau prepared and published Circular 100, entitled *Better Hunting and Fishing on Small Watershed Projects*. This 12-page illustrated circular describes the types of fish and wildlife developments eligible for Federal cost-sharing and outlines procedures for their inclusion in projects constructed under provisions of the amended Watershed Protection and Flood Prevention Act.

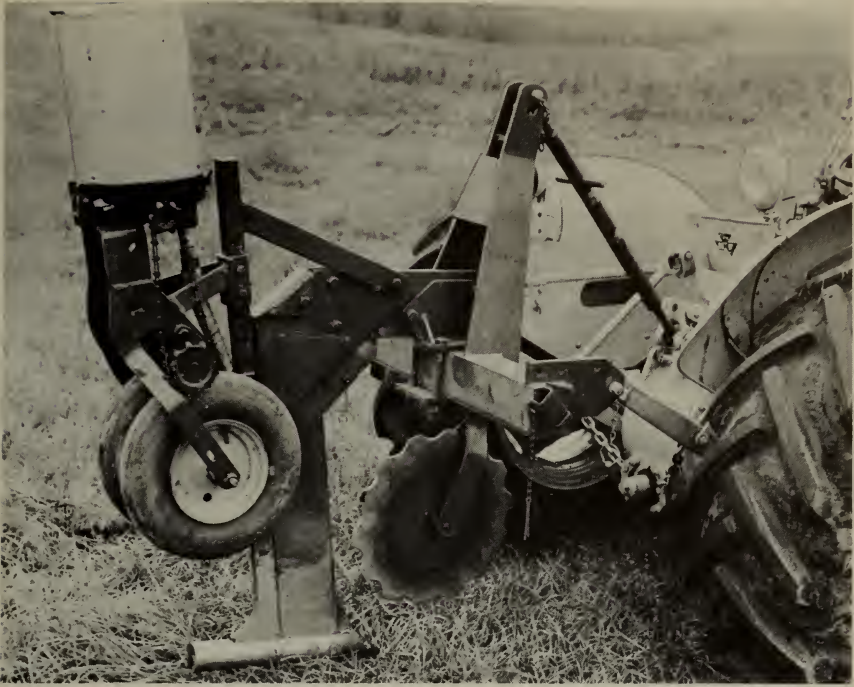
National Fish Hatchery Program

The stocking of inland waters with fish from national fish hatcheries was directed toward providing the greatest recreational enjoyment to the maximum number of people in 1961. The national program is planned (1) to meet fish stocking needs in areas owned or controlled by the Federal Government, (2) to assist the States to stock public waters where recreational fishing is high and State programs are not adequate to meet stocking needs, (3) to provide the initial stock of fish for farm ponds in cooperation with the States, and (4) to improve fish-cultural techniques, especially for species difficult to propagate, and to make this information available to the States.

Recreational fishing has shown tremendous gains in popularity in recent years. This trend has made it necessary to explore every means to maintain existing sport-fish populations and build up new populations as environmental conditions permit. The stocking of trout in tailwaters below major-dams resulted in the creation of major fisheries on several river systems. The stocking of farm ponds continues in a major effort to provide fishing for a rapidly increasing number of anglers. The farm-pond program has made sport fishing available to lower-income groups, formerly deprived of this form of relaxation.

Greater attention was given during the year to applying research findings to fish production, primarily in the fields of nutrition and disease. In-service training schools at Cortland, N.Y.; Leetown, W. Va.; Marion, Ala.; and Seattle, Wash., were operated at capacity to increase the fish-cultural knowledge of hatchery employees.

The Congress provided funds to complete the replacement of the Miles City, Mont.; and Edenton, N.C., warm-water fish hatcheries, and to continue the construction of new hatcheries at Alchesay and Willow Beach, Ariz.; Garrison Dam, N. Dak.; and Gavins Point, S. Dak. Also, the Congress provided funds to continue improvement and expansion of facilities at 10 existing hatcheries. Funds were provided for study of a potential fish hatchery site in the Walker Lake area of Nevada.



The burrow builder, developed by the Fish and Wildlife Service, helps the farmer protect his crops from burrowing animals by constructing artificial burrows and depositing poison bait in them.

Controlling Harmful Animals

The Bureau's cooperative program with State, County, and other local governments and organizations, and with agriculture and industry, reduced the depredations and transmission of diseases by mammals and birds. Selective techniques, carefully applied, lessened the severity of the damage to crops and losses of domestic stock without endangering other animals. Human activity and modern complex technology have brought new conflicts with wildlife. Restrictions on remedial efforts increased as a recreation-seeking public made more and more use of public lands, and safety precautions to prevent injury to people, pets, and domestic animals received special attention. Less efficient and more tedious techniques replaced better, but more hazardous, methods on many multiple-use areas at increased cost.

Cooperative predator control projects with State conservation departments resulted in increased game supplies and thus aided recreational hunting.

The burrow builder, a major improvement for protecting agricultural crops from pocket gophers, was introduced early in the fiscal

year. Attached to a tractor, it constructs an artificial burrow underground and deposits bait in the tunnel. Machines are already widely used, with an estimated 100 in the States of Minnesota and Wisconsin alone. For the first time, many farmers were able to give their crops adequate protection from burrowing animals at a reasonable cost.

Techniques for controlling depredations by nuisance and harmful animal species were demonstrated to many groups of agriculturalists and students, and to numerous organizations. Assistance with programs to reduce the incidence of rabies in wildlife continued to show good results. Radio and television programs, how-to-do-it leaflets, and the Bureau's rabies and rodent control exhibits provided useful information to millions of people. New sets of colored slides illustrating wildlife damage problems and methods of control were produced and shown to audiences throughout the country.

Enforcement Activities

The Bureau's relentless and sustained offensive against the market hunter and his commercialization of migratory game birds has again forcefully illustrated the threat which this type of activity poses to the welfare of the resource. The extent of this activity is evident from the arrest of 169 individuals in five States on May 5, 1961. During the past 2½ years they had sold some 5,000 ducks and geese to an undercover agent.

This mass arrest of market hunters was the largest operation of its kind ever conducted in the United States. The Congress expressed its awareness of the seriousness of this crime when it amended the penalties provision of the Migratory Bird Treaty Act by enacting Public Law 86-732, approved September 8, 1960, which provides for a fine of up to \$2,000 or 2 years in jail, or both, on conviction for selling or taking migratory birds with the intent to sell.

The following table compares the frequency of violations of fish and wildlife conservation laws administered by the Bureau of Sport Fisheries and Wildlife in the fiscal years 1960 and 1961:

	Fiscal year 1960	Fiscal year 1961
Cases pending at beginning of year.....	485	715
New cases.....	4,808	5,119
Cases terminated:		
Declined.....	333	286
Dismissed.....	167	192
Acquitted.....	150	184
Won.....	3,928	4,250
Cases pending at end of year.....	715	922
Fines and costs:		
Suspended.....	\$10,741.70	\$8,484.60
Paid.....	\$147,629.37	\$150,168.04
Jail sentences:		
Suspended.....	3,080 days	6,247 days
Served.....	2,816 days	3,335 days

In addition to cases involving violations of Federal regulations, U.S. game management agents participated in the apprehension of 2,079 persons for violation of State wildlife conservation laws; 1,953 of these cases were terminated in State courts with \$73,140.50 in fines and costs assessed along with 4,473 days of jail sentence; \$7,603.50 of the fines and costs and 3,214 days of jail sentences were suspended.

Refuge Visitors

The 11 million persons who visited the national wildlife refuges in 1960 were far outnumbered by the waterfowl visitors. Last year, there was the astounding total of over 1.5 billion "duck-days" on the refuges. For example, one bird remaining on an area for a week is counted as 7 duck-days. Only use of a refuge by ducks, geese, swans, and coots is represented in this figure. In addition, thousands of herons, shorebirds, gulls, terns, and even greater numbers of songbirds use the refuges. An estimated 132,000 big game animals on the national wildlife refuges largely remain there throughout the year, as do many small fur animals.

Unlike human visitors, wildlife obtains its food on or near the refuge. To supplement the natural foods—tons of aquatics, marsh foods, and other natural foods, and an estimated 600,000 tons of green forage—100,000 refuge acres were farmed by refuge personnel or by neighboring farmers on a cooperative basis, to produce 2 million bushels of grain for the wildlife visitors.

Fish and Wildlife Research

Twelve laboratories and their 11 field stations were engaged in 241 research work units during the year. Quarterly progress summaries and an annual progress report were distributed to related and cooperating State and Federal agencies, and 65 manuscripts were published or in press at the end of the fiscal year.

The research organization provided for 148 professional and supporting fishery research workers in the fields of fresh-water and marine biology, chemistry and biochemistry, pathology, parasitology, microbiology and histology, entomology, and fish husbandry.

Field observations on insect and plant pest-control operations are revealing the incidental effects of the chemicals on fishes, but more important, they are suggesting means of lessening damage to the resource. A laboratory bioassay technique being developed promises to supplement, verify, and hasten the often tedious chemical analyses for minute pesticide residues. In a long-term study assessing the

chronic effects of DDT, groups of cutthroat trout are periodically exposed to various sublethal dosages in water or in their food to determine effects on survival, growth, and reproductive potential.

Marine Game Fish

In August 1960, the new marine game-fish research program was commenced with the establishment of a laboratory at Sandy Hook, N.J. The staff consists of eight marine biologists, seven on the Atlantic coast and one on the Pacific coast. A contract was arranged with the Bureau of the Census for the collection of catch statistics by coastal areas and by species and of other related data. To complement this information, an inventory of marine angling facilities is being made with the view to preparing a national atlas. The entire staff is collaborating on a systematic compilation of available knowledge on marine game-fish species. Subjects in preparation at the close of the year included dolphins, sea trouts, bluefish, striped bass, and coastal hydrography.

Estuarine Studies

A pilot estuarine study at the mouth of the Shrewsbury River was commenced and coordinated with a similar Delaware Bay study of the Bureau of Commercial Fisheries in connection with its menhaden research. Two graduate students were employed: one at the University of Miami Marine Laboratory for research on the life history of the red drum; and the second at Columbia University, in hydrography.

Planning and consulting sessions were held throughout the year with the three interstate marine fishery commissions—Atlantic States Marine Fisheries Commission, Gulf States Marine Fisheries Commission, and Pacific Marine Fisheries Commission—and with groups of marine biologists of the coastal States and the Bureau of Commercial Fisheries.

Research begun in 1949 on the important Yellowstone Lake cutthroat trout resource will be completed during calendar year 1961. An average yield of 325,000 fish has been set as a catch goal for resource-management purposes. Several possible measures, as alternatives or in combination, have been suggested to the National Park Service to relate the angler catch in the future to the productive capacity of the lake. Year-to-year fluctuations in trout runs to certain important tributaries of Yellowstone Lake have been related to water levels during the spawning and incubation periods, and a



Bureau and State waterfowl biologists sexing and aging duck wings as measure of waterfowl production.

formula has been developed for predicting stream production, to be used in establishing fishing regulations.

Wildlife Research Activities

Much of the Bureau's wildlife research was conducted with the support and cooperation of other State and Federal agencies, private conservation groups, and industries, including chemical manufacturers and timber growers. Hunters also aided in the research effort by submitting waterfowl kill figures and the wings of 36,000 ducks and more than 11,000 woodcock for use in analyzing productivity in these species.

Studies of pesticide-wildlife relationships continue to be an important segment of the Bureau's research. Extensive parts of the woodcock's winter range are near or within areas that have been treated with heptachlor for control of the imported fire ant. Samples collected 1 or more years after application of the insecticide contained as much as 0.2 parts per million of heptachlor residues in soils and 6 parts per million in earthworms. Heptachlor residues have been found in a high percentage of woodcock taken in these areas and studies have been initiated to determine the toxicity of heptachlor to this species. Preliminary results indicate that toxic effects are more likely to occur during periods of reduced food intake than when birds have free access to food.

Pesticides Affect Wildlife

Tests with captive mallard ducks have shown that some commonly used herbicides, including aminotriazole, dalapon, and derivatives of 2,4-D and 2,4,5-TP markedly inhibit reproduction. No live young were produced by birds that had taken 250 mg./kg./day of these toxicants during a 200-day period before and during the breeding season.

Abnormal coloring of the plumage of male pheasants and damage to the reproductive organs of both sexes occurred when young or adult birds were given 2 mg./kg./day of Kepone for 60 to 100 days. No live chicks were produced by birds fed at this or a higher rate before and during the breeding season. Normal coloring of the feathers began to appear within 60 days after Kepone was removed from the diet. Doses of approximately 15 percent of the estimated lethal rate produced these effects. Pheasants fed diets containing Kepone had mottled livers and lowered reproduction.

Studies of pesticide-residue accumulation in the tissues of big game animals show that when their forest habitat has been treated with DDT at the rate of 1 pound per acre, the animals accumulate the poison in amounts exceeding the tolerance levels established by the U.S. Pure Food and Drug Administration for meat from domestic livestock.

Appraisal of the long-term and indirect effects on wildlife of field applications of pesticides will require continuing and carefully designed studies. Such a study now being conducted by the Massachusetts Cooperative Wildlife Research Unit has as an objective to determine the effects of sublethal doses of DDT and Sevin on songbird reproduction, namely the towhee.

Bird Concentration Problems

Bird concentrations continue to present perplexing problems. Severe damage to growing crops, particularly grains, was reported from nearly all sections of the country, while hazards to aircraft have increased alarmingly. Increased emphasis has been given to the development of bird-control methods following the tragic crash of a propjet airliner in Boston on October 4, 1960, when it became involved with a large flock of starlings in flight.

This research supplements studies on methods of reducing crop damage by birds and other animals. The Federal Aviation Agency, much concerned about bird hazards to aircraft, provided financial and other support for studying this problem which has become more acute with the increased use of jet planes.



This concentration of birds at a city dump, which includes more than 10,000 gulls, fish crows, and blackbirds, constitutes a serious threat to the safety of passengers and crews of planes landing and taking off at an adjacent airport.

Surveys have been made at airports in various parts of the country and recommendations have been made for alleviating the bird hazard. In many instances this was accomplished through the use of scaring devices such as shell crackers, shotgun shells, and carbide exploders. Another approach has been to modify the airport environment by eliminating certain types of cover or attractive food sources.

Wildlife Leaflet 429, issued by the Bureau and the Federal Aviation Agency and entitled *Bird Hazard to Aircraft*, outlines several methods of reducing the hazard. Birds, particularly gulls, continue to be a problem in the operation of aircraft on or near airports, however, and intensified studies have been initiated to (1) obtain more information on the extent and nature of the problem, (2) test commercial materials and devices in bird control at airports, (3) determine the potential usefulness of sterility-producing agents and selected lethal chemicals, (4) investigate sonic, ultrasonic, and electronic media as bird deterrents, and (5) observe bird behavior and responses in problem areas.

Increased attention has been given to blackbirds, which cause extensive damage to corn, rice, and other crops, and starlings, which consume and foul the feed in cattle feed lots in parts of the West,



Blackbirds and starlings are among several kinds of birds subject to Fish and Wildlife Service biologists' research to alleviate depredation problems. Winter roosts, some of them comprised of millions of birds, have been located in the southeastern United States. Inset: Locations of 41 roosts found up to March 1961.

BLACKBIRD ROOSTS -- SOUTHEASTERN UNITED STATES





Research biologists, such as the one shown here talking to a group of Boy Scouts about wildlife diseases, make a valuable contribution to conservation education and public information programs of the Fish and Wildlife Service.

and damage holly grown in eastern Oregon. The floodlight trap has been improved in design and operation. This was demonstrated in January 1961, at Walnut Ridge, Ark., a rice-growing area, when in 2 nights of operation more than 200,000 blackbirds were captured. Forty-one major blackbirds roosts, each containing an estimated million or more birds, have thus far been located through cooperative surveys in the Southeast.

Other Research Activities

The Cooperative Wildlife Research Unit Program, jointly supported by the Bureau, the Wildlife Management Institute, and 15 States, completed its 25th year. Last year, 243 students graduated from unit schools, for a total of 3,445 graduates since the program began in 1935. Active research projects numbered 254, with 195 in wildlife subjects and 59 in fisheries. The program produced 154 publications in 1960.

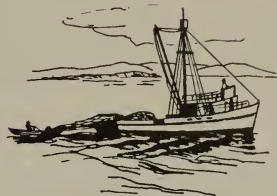
An aerial survey was made during the year of the walrus population off the coasts of Alaska in parts of the Bering Sea. On the

basis of the areas covered in the survey and the animals actually seen, Bureau biologists estimate a population of as many as 90,000 walrus.

Through the Foreign Game Importation Program conducted in cooperation with interested States and the Wildlife Management Institute, 6,033 exotic game birds of several species considered suitable for trial release in game-deficient areas were delivered to 12 States.

Bureau of Commercial Fisheries

Donald L. McKernan, *Director*



THE BUREAU OF COMMERCIAL FISHERIES of the Fish and Wildlife Service, Department of the Interior, has responsibilities for maintaining the welfare of the fishing industry and conserving and managing the resources upon which the industry depends. A wide variety of services and research are performed by the Bureau.

The fishing industry is an important producer of food and by-products. The 1960 production of the U.S. commercial fisheries was the third largest in the country's history—4.9 billion pounds valued at \$347 million. There were decreases in landings of menhaden, Alaska herring, and Pacific sardines; however, catches of clams, crabs, sea scallops, and halibut established new records. The canned packs of cat and dog food and tuna were also at alltime highs, and there were record productions of menhaden oil, tuna and mackerel meal, and frozen fish sticks and portions.

Research

The research of the Bureau has been in many fields, including food technology, biology, oceanography, exploratory fishing, gear research, and economics. Results of some research projects are briefly recounted.

Salmon

The Pacific salmon has been one of the country's most valuable fisheries during this century, and it is appropriate that a great amount of biological research be expended in a study of the salmon resource.

During the last decade the abundance of salmon, particularly in Alaska, has declined. This decrease in such an important resource has stimulated even greater efforts toward gaining an understanding of how to manage the fishery more effectively. Salmon research covers many aspects of the biology of the five species of Pacific salmon.

The continuing reduction of spawning areas by power and irrigation dams requires the providing of substitute spawning areas. One method of doing this is by artificial spawning channels. In the Upper Sacramento River, Calif., use of such channels has increased the rather low hatching survival rate of king salmon eggs severalfold.

Management of Alaska salmon runs is usually accomplished by regulating spawning escapements to streams. In many pink salmon streams most spawning occurs in the intertidal zone. It is important to know the rate of survival from such spawning. At Olsen Bay, Prince William Sound, Alaska, studies of intertidal spawning by pink salmon disclosed that after 1 month, survival rate of eggs at the upper limits of tidal inundation was 90 percent as opposed to only 47 percent in the lower zone, 3 to 4 feet above mean low tide.

Also important to salmon management is a knowledge of the nature of the homing and migration of salmon. At Spring Creek, Wash., studies of the sensory perception of salmon showed that odor plays a major role in the final stages of "homing" whereas sight is relatively unimportant.

There is a particularly urgent need for additional scientific information on salmon because the North Pacific salmon convention will be open for renegotiation in 1963. The United States then negotiates with Canada and Japan on salmon fishing restrictions in the Northeast Pacific. Late in the fiscal year, work was commenced on a 1½-year emergency salmon research program under a \$1 million supplemental Congressional appropriation. This will enable the Bureau to produce better predictions of runs and determine optimum escapements of mature fish.

Tuna

The most important fishery on the Pacific coast is tuna. Two biological laboratories, at San Diego, Calif., and Honolulu, Hawaii, perform research on the commercially important species of tuna. Several major accomplishments were noted during the year.

Tentative identification of albacore, bigeye, and bluefin tuna larvae was made from specimens collected by the Danish research vessel *Dana* in the western Pacific and Indian Ocean and by the Bureau's research vessel *Charles H. Gilbert* in the central Pacific southwest of

Hawaii. Eggs and larvae of these species were previously unknown. These identifications have opened the way for a study of the seasonal and geographical distribution and abundance of larval tuna throughout the Pacific.

Studies of blood groups of skipjack tuna indicate that this species has different subpopulations associated with major island groups in the Pacific. In contrast, similar studies on the albacore revealed that it has one far-ranging oceanwide population.

Biological Oceanography

If we are to use our marine resources wisely, it is increasingly apparent that we need to know a great deal more about biological oceanography—the science of the interactions between marine life and the sea. Recognizing the importance of this field of science, the Bureau is accelerating its biological oceanographic activities.

An expanded program of biological oceanography in the Atlantic and Pacific Oceans and the Gulf of Mexico is being coordinated with the oceanographic research of other agencies through membership on the Interagency Committee on Oceanography of the Federal Council for Science and Technology. The Bureau is contributing funds to the support of the National Oceanographic Data Center, which was dedicated in January 1961, and a staff member is serving on the Interagency Advisory Committee for the Center.

Oceanographic research emphasis has been in the North Pacific Ocean because of United States' membership on international fishery commissions dealing with salmon and tuna. Impending international fishing regulations require immediate knowledge on how the marine climate influences the distribution and availability of these two groups of fish. To this end, there have been published 10 of a planned series of 24 topographic charts of the eastern Pacific showing location of sea mounts and other features of the ocean floor that have a bearing on tuna concentrations. Since research indicated that temperature has an important influence on tuna distribution, monthly temperature charts have been issued to aid fishermen in locating tuna. Such charts are also useful to fishery scientists, oceanographers, and meteorologists.

Great Lakes

The sea lamprey invasion into the Great Lakes has caused a drastic change in the abundance of fish. The sea lamprey has decimated the stocks of lake trout; however, there have been great increases in the numbers of certain species, such as chubs and alewives, which formerly were preyed upon by lake trout. Bureau efforts in the Great Lakes



Since the Great Lakes provide an important commercial fishery, they are subject to considerable biological research by the Fish and Wildlife Service. The "Cisco" is a Service vessel regularly used in investigating Great Lakes fishery problems.

are designed to bring the sea lamprey under control; restore the lake trout stocks; and, in the meantime, develop methods for capturing and utilizing the supply of newly abundant fish.

Under the auspices of the International Great Lakes Fishery Commission, the Bureau and the Fisheries Research Board of Canada treated with a selective toxicant all 72 tributary streams of Lake Superior known to contain larval sea lampreys. This project, begun in 1958, represents a major accomplishment in the field of chemical control of an undesirable species that has destroyed the once valuable lake trout resource.

Artificial propagation is being used to restock Lake Superior with lake trout. Survival of hatchery-planted trout is excellent and growth rapid, indicating a promising future for rehabilitating the lake trout fishery. Spring plants of fish were found to be much more productive than autumn plants.

The continued development of the commercial trawl fishery for underutilized and unutilized species in Lake Michigan was assisted by

the exploratory fishing cruises of Bureau charter vessels. These efforts revealed that commercial quantities of bloater chubs were available to otter trawls at various localities in the southern part of the lake from Ludington, Mich., to Sturgeon Bay, Wis.

Atomic Energy

The Bureau was interested in several applications of atomic energy. A program on low level radiation of seafoods began at the Bureau's Gloucester Technological Laboratory under contract with the Atomic Energy Commission. The objective of this work is to determine the effect of pasteurization levels of radiation on the nutritive value and acceptability of unfrozen clam meats and haddock fillets.

A radiobiological consultant program was developed to advise the AEC, the States, and other agencies on the effects of atomic effluents on commercially valuable marine species. The effect of traces of radioactive materials discharged into the sea is becoming increasingly important in view of the rapid expansion of industrial uses of atomic energy.

At the request of the Office of Isotopes Development of the AEC, a study was made to determine the conditions under which radiation-processed fishery products should be marketed in order to provide the greatest overall benefits to the fishing industry and to the consumer. The AEC has found the published report to be valuable for planning research and educational programs.

Pesticides

The increasing use of pesticides to control undesirable plants and insects has resulted in adverse effects on desirable birds and animals. The Bureau recognized that adverse effects might also occur to commercial fish and shellfish from chemicals leaching into the water and eventually reaching the bays and estuaries. Laboratory experiments were begun in 1959 to accumulate basic knowledge of the effect of pesticides on the commercial marine species and their environment. These have disclosed that a few parts of some pesticides per billion parts of water can be harmful or lethal. Particularly sensitive are the young stages of shrimp and bivalves and the planktonic organisms on which they feed.

Studies are continuing to evaluate all common pesticides and will provide necessary information for field studies and technical advice for spraying programs in the future.

Fish Protein and Oils

The breakdown in the quality of fish after capture has always been a problem to the fishing industry. Recent research by Bureau scientists has been directed towards the causes of this breakdown, which results in off flavor and toughening of the flesh. It has been found that the deterioration in quality is caused partly by the free acids in the flesh reacting with the flesh proteins. The discovery and understanding of this interaction brings the problem much closer to solution.

The research program on fish oils has advanced significantly. A new analytical technique has been developed to separate the many fatty substances in fish oils. Now, specific groups of compounds in fish oils can be isolated for further analyses and identification. This is an important advance, for undoubtedly many industrial uses can be found for the various specific compounds yielded by the oil.

Fish Meal

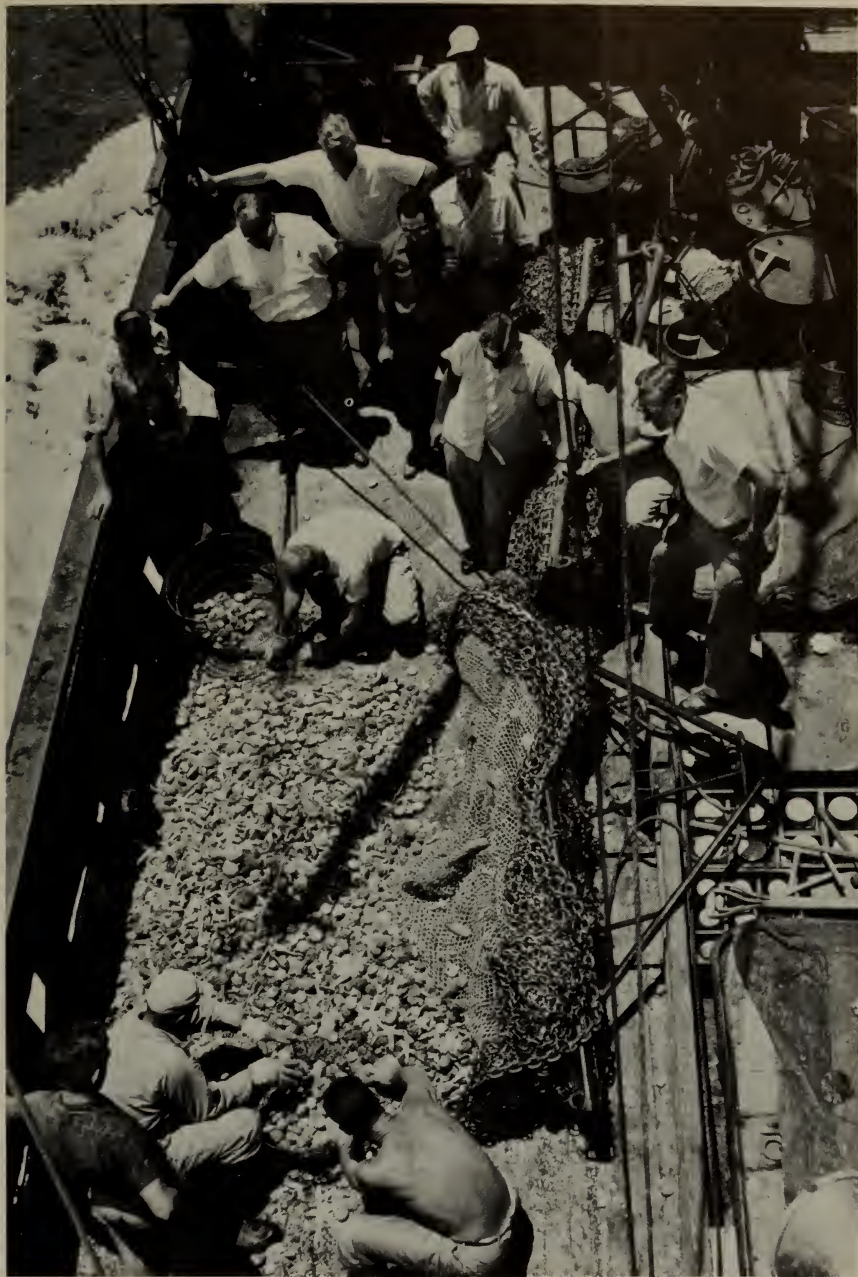
The increasing use of industrial fishery products as protein supplements for animal feeding has stimulated the Bureau's research studies on fish meals. Results of feeding studies in which various fish products were added to the food indicated wide variations in the nutritive value of the different products fed.

Further research revealed that most variations in the nutritive value of fish meal were caused by differences in the raw material used and changes that occurred during processing and handling. With this information, fish meal producers will be able to modify processing techniques and produce fish meals with much less variation in nutritive value. This standardization will be an attraction to producers of animal feed mixtures.

Exploratory Fishing

The research vessel *John N. Cobb* located bottom-fishing grounds in areas off the Pacific coast where commercial fishing had not been carried on because the bottoms were considered too rough for trawling. In the "spit" area west of Cape Flattery, Wash., commercial quantities of groundfish were found in four separate areas. Catches were dominated by petrale sole, Dover sole, Pacific ocean perch, and other rockfish.

Information on these findings were released immediately to the fishing industry, and, as a result, 1.2 million pounds of fish were



Immense beds of calico scallops were found during the year by Fish and Wildlife Service exploratory fishing vessels off the coast of North Carolina and the east coast of Florida. In one place commercial concentrations were found over an area of 1,200 square miles.

caught on the new fishing grounds. Additional suitable trawling grounds were located off the northern end of Vancouver Island.

Exploratory bottom trawling by the Bureau's research vessel *Oregon* off the coasts of Louisiana and Texas provided valuable information on the availability of industrial fishery stocks in that area. During summer the best catches were made between Ship Shoal and Galveston in less than 10 fathoms. During autumn commercial quantities of fish were found between Ship Shoal and the Mississippi Delta in 10 to 20 fathoms and on Sabine Bank in less than 10 fathoms. Catches as high as 6,000 pounds per hour were made.

A calico scallop fishery has developed on grounds off North Carolina and the Florida east coast. The Bureau has continued to give its assistance to this new fishery of great potential importance. Further cruises of the exploratory fishing vessel *Silver Bay* resulted in the discovery of additional grounds. Demonstration cruises aboard the vessel helped acquaint industry members with harvesting techniques.

Fishing Gear Studies

Two methods of increasing the efficiency of the fisheries are to develop better types of fishing gear and to provide better materials for the present gear.

In recent years, midwater trawls, a new type of gear, have been developed to operate in the mid-depths of the sea where great quantities of fish are found. Research on these trawls continues, because their design needs to be perfected and the technique of using them refined. Recent research has produced several advances. By using electronic instruments developed for evaluation of midwater trawl designs, it is now possible to determine the exact position of the trawl above the sea bottom. Trace recordings of the fish being caught can now be made. The use of such instruments should improve the efficiency of midwater trawls considerably.

Preliminary comparative fishing tests by the Bureau's research vessel *Delaware* indicate that some types of otter trawl fibers not now used by the New England fleet might result in increased fishing efficiency.

Economic Studies

Economic trends within the fishing industry were investigated by studying the relationship between the prices paid to fishermen for their catches and the prices fishermen must pay for goods and services purchased. The statistical examination of the indexes of employment and financial conditions within the industry continued.

The increasing costs of transporting fish and fishery products have serious effects on profitable marketing; consequently, transportation studies are necessary to determine how more efficient and less costly shipping procedures may be followed and how further added costs may be avoided. A study of exempt trucking of fish and shellfish was completed, and two other research studies on transportation were begun. The Bureau prepared and sent to transportation regulatory agencies several petitions concerning fair transportation rates for fish.

Research Grants and Fellowships

To encourage basic research and graduate training in fisheries science, a new program of grants and fellowships was initiated. A grant of \$10,000 was made to the University of Washington for basic research on oyster pathology. The University of Rhode Island was granted \$25,000 for a pilot study of an Aquatic Science Information Retrieval Center. The University of Miami received \$5,500 for a fellowship to be granted to a graduate student in marine science.

Construction

Completion and occupancy of new laboratory buildings at Auke Bay (Juneau), Alaska and Oxford, Md., an aquarium-storage building at Woods Hole, Mass., and a recirculating sea-water laboratory at Galveston, Tex., represent the first phase of a building construction program planned to provide adequate, up-to-date facilities for biological research.

The Auke Bay laboratory will provide facilities for basic research on Pacific salmons, herring, king crab, and other northern species. The Oxford laboratory is the Bureau's center for research on oyster mortalities and is located on a 12-acre site donated to the Federal government by Arthur J. Grymes of Easton, Md.

The aquarium at Woods Hole will permit controlled laboratory experiments on fish behavior, diseases, and physiology and in addition, will provide public displays of native marine animals. At the Galveston sea-water laboratory, studies are being made of the life history, diseases, and natural enemies of shrimp and commercial fish and the effects of insecticides on marine life.

New Research Vessel

An oceanographic-fishery research vessel for work in the Atlantic was designed, and a \$1.7 million contract was awarded for its con-



Another step in the long campaign to get answers to many of the biological problems which beset shellfish in the Middle Atlantic States was the construction of the Fish and Wildlife Service Biological Laboratory at Oxford, Md.

struction. It will be one of the first vessels constructed under the new national oceanographic program endorsed by the President and will be the first stern-chute trawler built in the United States and operated from a North American port—Woods Hole, Mass. This new 187-foot vessel will enable Bureau scientists to intensify their studies of the oceanic resources so important to the fishing industry.

Marketing Services

In addition to its research activities, the Bureau makes a large effort to provide the fishing industry with a variety of services that have immediate as well as long-range benefits. These services include such activities as standards development, fishery-products inspection, advice to cooperatives, market promotion, production of motion pictures and publications to promote fishery consumption, fish-cookery demonstrations, statistical surveys, and distribution of daily and monthly reports on fishery activities. These activities help the industry to promote the expanded use of its domestic fishery products.

Standards Development and Inspection

Under the standards-development and inspection program, 6 new processing plants subscribed to the inspection and certification service, making a total of 42 plants now operating under the Bureau's quality-assurance program. A total of 10 fishery-product standards are now being applied to products by 48 Government-trained inspectors. Over 170 million pounds of fishery products in 17 states were inspected and certified by these inspectors during the year. Assistance in procuring high-quality seafoods is also being provided to State organizations.

Forty-four fishery cooperatives were inspected for compliance with sections 1 and 2 of the Fishery Cooperative Marketing Act of 1934. Cooperatives in Alaska, Florida, California, Louisiana, Maine, and Maryland were given technical advice and assistance on a variety of organizational and management problems.

Market Promotion

The New England sea scallop industry requested marketing assistance because it was faced with depressed prices and heavy inventories, resulting from sharply increased imports and record domestic landings. A cooperative "all out sales push" was organized, and the scallop market was considerably strengthened.

Efforts were continued to develop markets for underutilized fish. Fish use in the pet-food and mink-feed industries has been steadily increasing over the past few years as a result of industry followup of Bureau market-development activities. This is aiding a number of depressed fishery industries, particularly in the Great Lakes area.

Assistance was given to Arkansas fish farmers who were having difficulties in marketing buffalofish produced in flooded rice acreage. A marketing specialist and a fishery products technologist were detailed to assist the industry. The market demand for buffalofish was increased significantly as a result of their efforts.

Consumer-education materials were distributed to newspaper and magazine food editors, radio and television food personalities, public-service directors, and extension specialists, as well as to the mass-feeding industry and the retail food trade. Several special promotional programs with agricultural commodities were developed, such as fish and lemons, fish and cranberries, and fish and olives.

Movies and Demonstrations

Nineteen Bureau-produced, and for the most part industry-financed, fishery educational motion pictures are now in national distribution



Home economists and marketing specialists of the Fish and Wildlife Service appear on many television homemaker shows annually.

through some 180 cooperating film libraries and Government distribution channels. These films have an annual viewing audience in excess of 2 million persons, exclusive of public-service television showings. An industry-financed motion picture completed during the year, *Sponge-Treasure From the Sea*, was awarded a "certificate of participation" at the American Film Festival. *Salmon—Catch to Can*, another industry-financed motion picture, was honored by "selection for showing" at the 1960 International Film Festival in Edinburgh, Scotland.

The Bureau cooperated with State and Federal vocational education officials in conducting Retail Quality and Merchandising Workshops in Philadelphia, Pittsburgh, Boston, New York, and Baltimore. These workshops demonstrated techniques for selling more fish; provided specialized instruction in proper fish handling methods to avoid quality loss; and demonstrated modern merchandising.

Bureau home economists presented 243 fish-cookery demonstrations for approximately 14,000 school and other institutional food-preparation personnel. They also appeared on numerous television and radio

food shows, participated in five national food trade conventions, and developed and distributed kitchen-tested recipes for institutional and homemaker use.

Statistical Studies

During the year, general statistical surveys to obtain detailed data on employment in the fisheries, the number of fishing craft and gear operated, volume and value of the catch, and the production of manufactured fishery products for 1959 were completed and published for all sections of the United States. Similar surveys were undertaken for 1960.

Monthly bulletins on landings of fish and shellfish in 19 States were issued. Publication of monthly landings for Michigan, Minnesota, and Wisconsin was started during the year. As a result of the addition of these landing bulletins, monthly information became available on over 98 percent of the domestic catch of fish and shellfish.

A sharp decline in the prices of fish meal and solubles showed the need for information on the past history of this industry. Several publications were issued on U.S. production and imports of fish meal and scrap and U.S. foreign trade in fish and marine animal oils. Also, arrangements were completed during the year to cooperate with the International Association of Fish Meal Manufacturers in London in assembling data on the production of fish meal, solubles, and oil.

Market Reports

The Fishery Market News Service provides the fishing industry with current information on landings, receipts, prices, demand, market, stocks, imports and exports, and new developments in domestic and foreign fisheries in order to aid in the orderly marketing of fishery products and byproducts.

From the market information furnished by the daily Fishery Products Reports members of the industry can estimate the current market for fresh, frozen, and canned fishery products. These reports are issued by seven Market News Service offices located at Boston; New York; Hampton, Va. (includes data from Baltimore); New Orleans; San Pedro; Seattle (includes data from Astoria, Oreg.); and Chicago.

Information transmitted by the Department of State from foreign reporting posts is published in the daily Fishery Products Reports and the monthly Commercial Fisheries Review. This monthly periodical, in its 23d year, features articles and news of trends and developments in the domestic and foreign fisheries.

Financial Assistance

The Fisheries Loan Fund Program continued to aid the fishing industry. New applications for 184 loans, totaling \$4,718,050 were received during the year. The backlog of cases being processed or deferred at the request of the applicants was 22 at the beginning of the year and 32 at the end of the year. Ninety-four applications were approved for \$2,247,000, and 72 for \$1,603,000 were declined or found to be ineligible. Nineteen applications were withdrawn by applicants before final decisions were reached. Collections of principal and interest totaled \$1,430,000 during the year.

These loans were made for financing and refinancing the operation, maintenance, repair, and replacement of equipment, fishing gear, and vessels. Most fishing vessel owners have been unable to obtain financing from other sources because of the depressed condition of the fishing industry. The catch of the vessels receiving loans from this program totaled an estimated 240 million pounds in fiscal year 1961. The increase in landings resulted largely from tuna catches by purse-seine vessels converted from clipper (bait) boats.

Mortgage Insurance Program

The Fishing Vessel Mortgage Insurance Program began to attract attention in the last half of fiscal year 1961. Four cases were approved, involving 10 salmon gillnetters for use in Alaska, 1 shrimp vessel in Florida, and 2 trawlers in Massachusetts.

One application was received for a subsidy under the new Fishing Vessel Construction Subsidy Program which was authorized by Public Law 86-516. The subsidy was requested for the construction of a New England groundfish trawler.

Foreign Trade Activities

A wider coverage of foreign fishery developments is being sought. Increasing competition for world fishery resources and rising imports into the United States have seriously affected important segments of the domestic fishing industry. Information provided from abroad provides a basis for the Bureau's actions to assist the U.S. fishing industry to solve the problems of import competition and export restrictions. Moreover, the U.S. fishing industry has increased its demands for more information to meet competition in home products and to determine investment and marketing opportunities abroad.

At the request of industry, the Bureau conducted short market surveys in certain underdeveloped countries to determine the prospects for increased fish consumption and the possibilities for exports of U.S. fishery products.

In collaboration with the Department of State, a new regional fishery attaché post was established in the American Embassy, Copenhagen, to cover the European area. With posts already operative in Latin America and in Japan, there are now three specialized fishery officers in the Foreign Service. Additional steps were taken during the year to improve fishery reporting from U.S. embassies and consulates located in important fishing nations. A survey was made of the fishery reporting programs at several U.S. diplomatic posts in Europe, and technical guidance was provided to the officers assigned to fishery reporting.

Tariff Negotiations

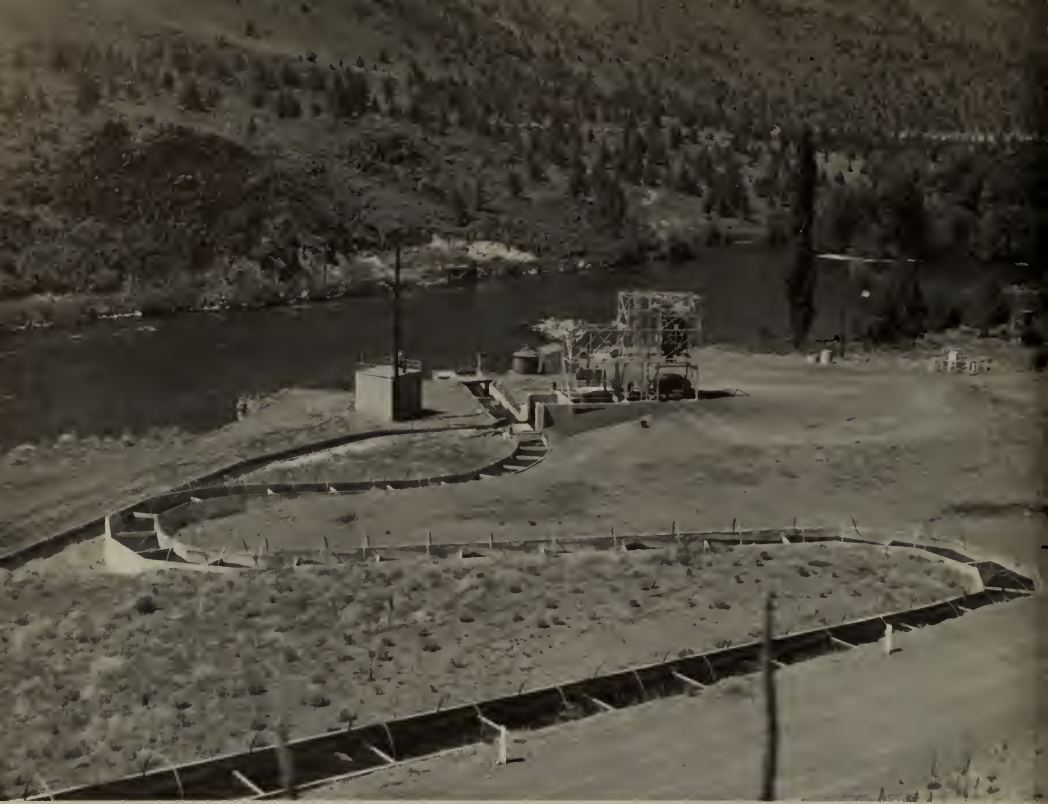
In September 1960, the United States and other members of the General Agreement on Tariffs and Trade (GATT) entered into tariff negotiations with members of the European Economic Community (Common Market). A specialist in fishery trade matters was placed on the U.S. delegation to these negotiations to advise on the technical aspects of the fishery items under consideration.

The Bureau participated in the proceedings of a Working Party of the Organization for European Economic Cooperation (OEEC) dealing with fish-marketing problems in European countries and with means of eliminating trade barriers. The results of these meetings were published.

Fish Meal Promotion

The Bureau participated in the International Meeting on Fish Meal, held by the Food and Agriculture Organization of the United Nations in Rome. The purposes of this meeting were to assess the world demand for fish meal, to consider ways of increasing the demand, and to explore possibilities of ensuing stable conditions in the international market for fish meal.

Several facts became evident at the meeting. First, there are large stocks of fish which are relatively unexploited; second, the long-range production of fish meal depends upon demand rather than supply; third, there is a pressing need for research leading to the development and use of fish flour for human feeding. The proceedings of the meeting were published and distributed widely.



Dams and other obstructions which prevent anadromous fish such as the salmon from migrating upstream to their ancestral spawning beds can be partially met in some places by fish traps and ladders such as the one shown above on the Deschutes River in Oregon.

Increased attention was given to matters of foreign aid to assure that domestic fishing interests were adequately represented in U.S. programs for economic and technical assistance to the fisheries of lesser developed countries.

Columbia River Fishery Program

Water resource development in the Columbia River Basin, particularly hydroelectric power generation projects, continues to present serious problems to the successful maintenance of the migratory salmon and steelhead resources.

The Columbia River Fishery Development Program, a cooperative venture with the State fish and game agencies of Washington, Oregon, and Idaho, and the two Bureaus of the Fish and Wildlife Service, has continued under Federal financing. This program consists of operation of hatcheries, screening of water diversions, and stream-improvement activities such as providing fish ladders at fall and removing log and debris jams.



This experimental salmon incubation channel is part of a vast program being conducted by the United States and the States of Washington, Oregon, and Idaho to restore the salmon fishery of the Columbia River.

To date 21 hatcheries have been constructed or remodelled, several hundred screens have been emplaced, over 1,200 miles of stream have been improved, and 21 major fishways have been constructed. Newly developed facilities for passing adult upstream migrants and juvenile downstream migrants are now in operation at some high dams on important tributary streams. Their success, however, cannot be determined until the adults return over a period of several years. In order for the facilities to be successful, they must sustain the runs at a level which will continue to support the existing valuable fisheries. During the year, a program of operational studies was initiated to study methods for improving production techniques, including artificial propagation.

The objective of the fishery development program is the full development of areas still available to salmon and steelhead to compensate, in part, for damages to the fishery resource resulting from the Federal water development program in the Columbia Basin.

One of the greatest threats to the runs is the construction of one or more high dams in the Middle Snake River area in the vicinity of the confluence of the Salmon River. The magnitude of the runs which

pass through this section of the river is approximately 40 percent of the spawning escapement in the Columbia River upstream from Bonneville Dam.

Consequently, projects which affect these runs will have far reaching effects upon the entire fishery resource. To find a satisfactory solution to the problem of fish passage at high dams, the Department with the concurrence of the President, has decided upon an accelerated research program, to be initiated before July 1961.

Fur Seal Resource

During the summer of 1960, the Department, as administrator of the United States fur seal industry, took 40,616 sealskins on the Pribilof Islands, Alaska. Under the terms of the Interim Convention on Conservation of North Pacific Fur Seals, Canada and Japan each received 15 percent of this take plus 375 skins.

Sales of United States-owned sealskins during the fiscal year 1961 included 59,550 skins with gross receipts to the United States of \$2.8 million. Under the terms of the Alaska Statehood Act, 70 percent of the net proceeds from the sale of sealskins shall be paid to the State of Alaska. Based on proceeds during fiscal year 1960, the second annual payment to the State was over \$1 million.

Office of the Administrative Assistant Secretary

D. OTIS BEASLEY, *Administrative Assistant Secretary*

THE ADMINISTRATIVE ASSISTANT SECRETARY in discharging the duties of the Secretary for administrative management directs and supervises seven staff divisions: administrative services; budget and finance; inspection; management research; personnel management; property management; and security.

Administrative Services

The Division of Administrative Services has primary staff responsibility for all administrative services activities of the Department. A number of special activities and accomplishments include increased usage of the Department's Central Library by approximately 7 percent and the installation of automatic audiovisual projection equipment for both slides and motion pictures in the Department museum.

During the year the museum became an accredited member of the American Association of Museums. Visitation to the museum increased to more than 70,000 during the fiscal year. Installation of an automatic short-run collator in the central duplicating plant eliminated much of the handwork previously necessary on multipage material.

Budget and Finance

The Division of Budget and Finance which has primary staff responsibility for the budget and finance activities of the Department placed increasing emphasis on systems improvements and special effort was directed to installing accrual accounting systems in the Bureau of Commercial Fisheries and Office of the Secretary.

A statement of basic principles and concepts was developed for the integrated accounting system of Geological Survey. Assistance was provided the Bureau of Land Management in the mechanization of the payroll system in the Washington office, and in the installation of automatic check endorsing machines in the larger land offices.

The Division also continued to work with the Department's National Park Service, Bureau of Land Management, Bureau of Commercial Fisheries, Office of Territories, and Office of the Secretary, in the documentation in manual form of their accounting systems for submission to the Comptroller General.

During the year, the Division reviewed and took action as necessary, on 68 General Accounting Office audit reports, of which 28 were Congressional audit reports and 40 were Bureau and Letter audit reports. In addition, action was taken as necessary on 134 internal audit reports rendered by bureaus of the Department.

Two regular budgets were processed for the Bureau of Reclamation and power marketing agencies and for the other bureaus, in addition to three supplemental appropriation budgets. The Division developed forms and procedures designed to provide the Secretary and Assistant Secretaries with summary budget information from which policy decisions could be made on the magnitude of programs to be included in the Departmental budget. Work continued on improving budget justifications submitted to the Bureau of the Budget and to the Congress, and on coordinating the Bureaus' budget structure with their organizational patterns.

Inspection

The Division of Inspection is responsible for the inspection and special investigative activities of the Department. The necessity for inspection program is to insure high ethical standards in the management and administration of the Department's affairs.

Upon the issuance of Executive Order 10939, May 5, 1961, "To Provide a Guide on Ethical Standards to Government Officials," existing memoranda were modified and new instructions to implement the provisions of the Executive Order were promulgated and distributed to employees.

The Division of Inspection also has responsibility for Departmental handling of matters under the Government's Equal Employment Policy enunciated in Executive Order 10925, March 6, 1961. Departmental policies have been revised as advocated by the President's Committee on Equal Employment Opportunity. A survey has been completed to determine the number of minority employees on Departmental payrolls, and surveys are proceeding to cover a case by case analysis of employee records of Negro employees in the Department. A review of college recruitment practices and the assembly of a descriptive statement concerning all such employment practices is also being conducted.

Management Research

The Division of Management Research is responsible for improvements of the general management and organization throughout the Department.

During the past year, the Division has participated in a number of management studies and provided management research and assistance in a variety of projects. The following are examples of the highly diversified nature of these projects:

- Survey of engineering design and construction practices of the Department.
- Reorganization studies of the Bureaus of Mines and Land Management.
- Review of the present organization of the Department to fulfill its civil defense and other emergency planning responsibilities.
- Preparation of organization and delegation statements for the new Office of Coal Research.
- Inventory of bureau management analysis activities and participation in a study of management practices among the executive agencies of the Federal Government sponsored by the Bureau of the Budget.
- Collaboration with the Bureau of the Budget in reviewing procedures for the programing and coordination of Federal surveying and mapping activities.

The Division administered a system for the preparation, review and issuance of Secretarial directives. More than 200 documents were processed for Secretarial action. Of these 113 were Federal Register documents; 74 were Departmental Manual releases; and 15 were proposed Presidential documents. In addition, the Division has acted as coordinator for the Department on committee-management policies, procedures and methods, and provided leadership on paperwork-improvement efforts of the Department.

Under the Incentive Awards Program the Department of the Interior showed a slight decrease in the number of suggestions received per 1,000 employees. However, the adoption rate for the 1961 fiscal year was 36 percent, as compared with 31 percent for the last fiscal year. The average individual awards made for suggestions or inventions also increased from \$33.67 to \$34.09. Superior performance awards still hold at about the same average. Special Acts or Services Awards increased by 41 percent.

The following statistics reflect the 1961 activities of the incentive awards program:

<i>Cash Awards</i>		<i>Honor Awards</i>	
Suggestions.....	1, 637	Distinguished service.....	47
Superior performance.....	1, 259	Valor awards.....	4
Special acts or services.....	165	Meritorius service.....	129
		Commendable service.....	532

Personnel Management

The Division of Personnel Management has primary staff responsibility for the development of policies and programs to establish and maintain an adequate, qualified and efficient working force in the Department.

Major emphasis during the year was placed on improving the Department's career development programs. The training officers of the bureaus were organized into a "Development Committee" to study bureau and Departmental executive development requirements and plans and to coordinate training in the Department.

An executive development agreement with the Civil Service Commission has facilitated the development of scientific, professional and technical employees as administrators and managers. It also has facilitated the training of administrative personnel in other types of administrative and management fields.

Studies were made of career opportunities of engineers and foresters on a Department-wide basis. Greater emphasis was placed on the utilization of student trainees in professional fields and recruitment of more well-qualified college graduates for entrance-level administrative positions. A simplified examining procedure was established, bureau board programs were strengthened, and greater coordination of the examining program was achieved.

Cooperation and assistance have been given to the Civil Service Commission on proposed classification standards for 16 series and to the bureaus in developing and preparing drafts of proposed standards for positions in three series peculiar to the Department. Assistance

was also given to the Civil Service Commission on drafting regulations on conduct and appeals of adverse actions.

In the field of safety, progress was made in taking accident prevention out of the extra curricular activity of working assignments and making it an effective integrated working tool of everyday management. In the face of rising employment, the Department rate of disabling work injuries continued to decrease and the rate in fiscal 1961 was the lowest since 1945.

During the year the pamphlet *Careers in the U.S. Department of the Interior* was revised and published and a pamphlet on retirement counseling was developed and issued.

Property Management

The Division of Property Management has primary staff responsibility for all property management activities of the Department.

Contracting and purchasing policies of the Department were revised during fiscal 1961 to provide more direct contracting activity in areas of labor surplus, and to protect the Department against identical bids among suppliers.

A comprehensive study of all documents reflecting business transactions between the Department and nongovernmental organizations and individuals was initiated to conform with the President's expanded Equal Employment Opportunity Program.

Continuing progress was recorded in reduction of housekeeping inventories, increased utilization of excess property, and in the training and orientation of employees assigned to property management functions.

Department policies for screening real property no longer needed by bureaus or offices were revised to promote more effective utilization of such property within the Department.

During the year, personal property acquired at a cost of more than \$850,000, but no longer needed in the Department, was donated to public schools and hospitals through the donable property program, administered by the Department of Health, Education, and Welfare. Approximately 54,000 square feet of filing space was released through disposing of records no longer needed for current business.

The Division continued to represent the Department on the inter-department radio advisory committee which, in collaboration with the Federal Communications Commission, prepared a U.S. proposal on frequency allocations for Space Service radiocommunication. Manual releases and technical studies were made to provide for, or improve the radiocommunications services of the bureaus and offices.

Over 300 radio frequency assignments were issued, including a number due to conversion to narrow-band frequency modulation type of operation and bureau reorganizations.

Security

The Division of Security has primary staff responsibility for the establishment and maintenance of security throughout the Department. The Division also has a special assignment for Departmental direction and coordination of the radiological defense training program.

The status of physical security measures at key facilities of the Department of the Interior, continue to receive attention. Security measures have been implemented and the personnel security program continues without any substantial change.

The radiological defense capability of the bureaus and offices of the Department has advanced at a highly satisfactory rate. At the close of the fiscal year, approximately 2,000 employees had been trained in radiological defense. In addition, the Department has established monitoring capabilities at some 265 stations in the federal fixed station monitoring network which is under the jurisdiction of the Office of Civil and Defense Mobilization. These stations are all dual purpose; they are regular installations of the Department of the Interior, and likewise serve in the federal network.

Office of the Solicitor

Frank J. Barry, *Solicitor*

THE NUMBER of matters considered in the Office of the Solicitor reached an all-time high of over 148,000. In addition, more than 60,000 hours were spent in the giving of oral advice and at the attendance of conferences and meetings. A record number of 480 appeals in land cases were received.

In connection with the establishment of the Department's Office of Coal Research, pursuant to the Act of July 7, 1960 (74 Stat. 336), and the initiation of the programs of that Office, counsel and advice was rendered.

Loan agreements, contracts of loan insurance, contracts of mortgage insurance and preferred ship mortgage forms were prepared for use by the Department's Bureau of Commercial Fisheries in connection with its fishing vessel mortgage insurance program. In each program area, the first loan was closed with the assistance of the Solicitor's Office.

Two certification forms on noncollusive bidding were adopted by the Department for inclusion in invitations for bids. One is for use in invitations for bids on materials, supplies, and equipment and the other is for use in construction, alteration and repair bid invitations. Procedures were devised for rejecting identical bids and, where necessary, readvertising or negotiating.

A revised guaranty clause was developed for use in major supply contracts. The revised clause makes fitness for intended use an express warranty, take cognizance of defects in design and condition as well as defects in materials and workmanship, and exempts latent defects from the stated limitation period within which claims for breach of warranty may be made.

A member of the Solicitor's staff represented the Secretary in proceedings before the Federal Power Commission *In the Matter of South Carolina Electric & Gas Company*, Docket No. E-6468. This proceeding is under section 10(f) of the Federal Power Act (16 U.S.C. 803(f)) to determine (1) the benefits received by the company's downstream Stevens Creek project from the Federal upstream Clark Hill project, and (2) the assessment which should be paid by the company on account of such benefits. This is the first case under that section of the Act involving a Federal project to reach the hearing stage.

A new type of contractual arrangement for the sale of federally generated peaking power was developed during the fiscal year. The agreement permits the Arkansas Electric Cooperative Corporation to pool thermal peaking power with that purchased from the Department's Southwestern Power Administration and by means of a system integration between the Government and a private utility to assure continuous service for members and customers of the Cooperative.

In connection with the Canadian River Reclamation project, Tex., the first large all-municipal water-supply project to be constructed by the Department's Bureau of Reclamation, extensive legal assistance was given by members of this Office in the preparation and execution of a repayment contract with the Canadian River Municipal Water Authority and supporting contracts between the Authority and 11 member cities.

On October 28, 1960, the United States Court of Appeals for the Tenth Circuit held that the Secretary of the Interior had no authority to cancel administratively Federal oil and gas leases obtained by fraud (*Pan American Petroleum Corporation v. Ed Pierson, et al.*, 284 F. (2d) 649). At the close of the fiscal year the Davis and Featherstone contests were being held in *status quo* pending consideration of the above case.

Extensive work was done in connection with development of the permit program designed to bring under control the trespasses of long standing on the lower Colorado River.

Among the decisions rendered by the Board of Contract Appeals, one of particular importance is *Merritt-Chapman & Scott Corporation* (68 I.D. 1). This appeal presented the issue whether the prime contractor for the construction of Glen Canyon Dam on the Colorado River was entitled to additional compensation from the Government, under an escalation clause in the construction contract, on account of increased labor costs resulting from new union labor agreements negotiated after the work had started. The Board held that the increases in pay provided for in the agreements were wage increases, to which the escalation clause applied, rather than subsistence or travel

allowances, to which the clause did not apply. The amount of the additional compensation payable over the life of the construction contract pursuant to this determination is estimated as being in the neighborhood of \$5 million. At the close of the fiscal year a motion by the Government for reconsideration was pending before the Board.

In *Layne & Bowler Export Corporation* (68 I.D. 33), the Board of Contract Appeals held that a delay caused by the fault of a subcontractor was not excusable, irrespective of whether the prime contractor was also at fault, even though the subcontractor was a second-tier rather than a first-tier subcontractor. While previous decisions of the Board had pointed towards such a strict view of the contractor's responsibility for his subcontractor's conduct, this was the first decision in which the Board expressly repudiated the contrary view adopted some years ago by the Armed Services Board of Contract Appeals.

Resources Program Staff

Charles H. Stoddard, *Director*

THE RESOURCES PROGRAM STAFF provides assistance to the Secretary, the Under Secretary, and the Assistant Secretaries on national program matters, in policy planning and coordination, and at the regional level through its six Field Committees, and inter- and intra-agency coordination of resource management operations.

The Resources Program Staff also performs liaison functions for the Department of the Interior with the Outdoor Recreation Resources Review Commission, the Department of Agriculture, the State Department, the Department of Health, Education, and Welfare, Department of the Army, and with various other agencies in related spheres of resource conservation and with related responsibilities in resource management.

In discharge of these assigned responsibilities, the Resources Program Staff furnished Departmental representation and presented coordinated Departmental positions for the GATT (General Agreement on Tariffs and Trade), working specifically with Committee III which dealt with the problem of expansion of trade of less developed countries, and with the Working Party on Market Disruption seeking an internationally acceptable method of dealing with disruption of a given market through the sudden increase of imports.

Through fiscal 1961, the Resources Program Staff continued its activities of arranging for official visits to the Department of foreign dignitaries and officials, scientists, and students interested in exchange of information. It maintained liaison with the Inter-Agency Committee on Water Resources, the Atomic Energy Commission, the National Science Foundation, the Office of Statistical Standards, Bureau

of the Budget, International Cooperation Administration, and with other Federal agencies on program matters of mutual concern.

As part of its planning function, the Resources Program Staff developed the report and outlined a plan for land use in the Lower Colorado River Valley.

In continuance of its coordinating activities with Outdoor Recreational Resources Review Commission, the Resources Program Staff compiled material and presented the Departmental position through its participation in the Third Joint Meeting of the Commission at Jackson Hole, Wyo., July 29–August 2, 1960.

With the advent of the Kennedy Administration, greater emphasis has been laid upon program planning functions, and the Staff has become more actively involved in the affairs of the Department in an advisory and planning role, while continuing its coordination and liaison functions.

In its staff advisory capacity, the Technical Review Staff has engaged in the collection and compilation of background material as well as the preparation of reports and draft proposals concerning many topics, including outdoor recreation, water resources planning, resources investment potentials, employment and effects of resource development.

The Staff has prepared testimony and background material for use before committees of the Senate and House of Representatives in behalf of legislation for the establishment of a Youth Conservation Corps, for the authorization of a National Fuels Study Commission, for enactment of the proposed Water Resources Planning Act of 1961, and other resource matters.

The Resources Program Staff represents the Department in coordination of activities delegated by the Secretaries of Commerce and Labor, under the Area Redevelopment Act, Public Law 87-27, and in the development of overall economic development projects both for Indian reservations and other depressed areas where resource development is adaptable for redevelopment purposes.

Oil Import Administration

J. Cordell Moore, *Administrator*

THE SECRETARY OF THE INTERIOR, pursuant to Presidential Proclamation 3279, dated March 10, 1959, established the Oil Import Administration within the Department and issued regulations for the operation of an oil import program.

The objective of the oil import program is to insure a stable, healthy petroleum industry within the United States capable of exploring for and developing new domestic petroleum reserves.

In administering the program, the Oil Import Administration:

1. Analyzes data prepared by the Department's Bureau of Mines relating to petroleum demand in the United States, by commodity type and petroleum districts, in order to set the overall amounts of crude and unfinished oil, and finished petroleum products to be allowed into the United States and Puerto Rico.

2. Establishes equitable semiannual oil import allocations for individual eligible oil importers by product type and district, other than residual fuel oil (which is on an annual basis), and issues import licenses.

3. Analyzes monthly reports from each importer showing the amount and disposition of petroleum imports entering the Nation under license and issues public reports concerning the oil import situation and the administration of the program.

4. Analyzes all exchange agreements of foreign crude and unfinished oils and domestic crude and unfinished oils.

5. Issues letter authorization to Collector of Customs to permit entries without an import license of small quantities of crude oil, unfinished or finished products.

6. Responds to an increasing volume of requests for information concerning the administration of the program from Congress, the press, foreign governments, other governmental agencies, and the public.

Summary of Activities

During Fiscal Year 1961, the Oil Import Administration issued 1,791 licenses for importation of crude petroleum and its derivatives to eligible importers according to commodity type.

Prior to the close of the fiscal year, the Administrator announced overall oil import levels for the allocation period July 1, 1961, through December 31, 1961, and issued individual oil import allocations to 174 eligible importers, for crude oil and finished products other than residual fuel oil to be used as fuel. For the allocation period April 1, 1961 through March 31, 1962, individual import allocations were issued to 43 eligible importers of residual fuel oil to be used as fuel.

In order to administer the oil import program more effectively, the allocation period for residual fuel oil was changed from a quarterly to an annual basis effective April 1, 1961.

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